

**Agencies and counter-agencies
shaping concerned-markets:
*The Rothamsted GM-wheat open-air
trials case.***



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Declaration

This thesis has not been submitted in support of an application for another degree at this or any other university.

This thesis presents my own work and includes nothing that is the outcome of work done in collaboration except where specifically indicated.

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The One who is always near, while others and things continuously appear and disappear.

The One whose light is always alive and provides guidance even in the darkest nights.

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Personal statement

This is not just a piece of academic work. This is an extract of my life experience. Four years of amazement, struggle, perseverance, and hope. Hope, until the last minute.

All started with a desire to free my intellect and to be challenged, because *LIFE* without challenge becomes a sort of a prison for the intellect, becomes purposeless.

Engaging in a PhD project has been a distant dream for me, in the sense that its seeds could be found in a vague past. I had it since I was a teenager I think, impressed by my paternal uncle who at the time offered an encouraging illustration of the enthusiastic academic. Then life took me through other routes, other experiences, and other revelations. But I could not silence that voice inside of me, aspiring to get back to university benches. For me, this PhD is an important achievement, but at the same time, just a bigger spot on my path of the tireless seeker I have become over the years. It may sound paradoxical, but the truth is, while quenching my curiosity, this research project generated a pressing thirst for more.

Things were not all pleasant and contenting, nor were they all difficult and disappointing. Exactly like *LIFE*. Over this journey, I did go through some tough periods due mainly to substantive changes in my family circumstances, which also impacted my health and resilience to a disturbing degree.

Then, when I thought I was nearly there, the Corona virus pandemic caught my final months of completion and decided to leave a print. All occurred so fast that I had no time to worry too much at the beginning, like in a survival mode, I focused on solutions. But, three months of complete lockdown could not flow without pain, especially that I had already started to be on a quasi-isolated mode six months prior to lockdown to focus fully on the completion of my thesis. Over the weeks, complete isolation started to get progressively heavier, reaching a point where it became emotionally unbearable. I lost concentration and had to consider working intermittently trying to manage my emotions and energy.

The lockdown period has also disturbed my work process due to very limited access to my supervisor, who occupies the position of Head of Department and has been experiencing unprecedented workload with the switch to distance working organisation over the strict lockdown period and beyond. Restricted access to campus facilities, followed shortly by the closure of the main library also complicated access to some resources. This is despite the extreme kindness of our library staff and their praiseworthy efforts to ease users' burden.

Thankfully the university, my supervisor, and my funding body were understanding enough and have accepted to extend my deadline twice, one month, and then three months, due to these special circumstances. It gave me some time to 'breathe', although my extension overlapped with the period I had to organise and assist the sale of the house I am occupying and engage in planning my move to a new place.

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Abstract

Drawing primarily on the *Market Studies* literature on Concerned-markets and Market-agencing, with reference to some *Organization* and *New Social Movement* studies on contentious markets, this thesis presents an original contribution unpacking market-agencies in controversial settings. It explores how agency is acquired and distributed across opposing *socio-technical-agencements*, and how these acting networks are stabilised and extended in terms of representational scope and power within a concerned-market configuration.

Empirically, the study focuses on the specific case of Rothamsted GM-wheat open-air trials reviving the controversy around GM farming aimed for human consumption and food prospects between 2012 and 2017. The study relies exclusively on documentary data, mainly press data, and espouses a qualitative approach using an original method, the *Cartography of Controversies*, a pragmatic methodological framework specifically designed to offer a guided and progressive investigation of socio-technical debates over five observational lenses. This research favours a relational approach, examining the interconnectedness between expressed concerns and formed supporting networks, and their underpinning references and projected futures states of the world.

It contributes to our understanding of market agencing by highlighting the dynamic nature of these relational arenas and by elucidating the mechanisms invested by actors in terms of representation and anchoring literatures allowing them to acquire agency and to favour their respective perspectives. Moreover, the study offers an in-depth exploration of actors' shades of involvement, uncovering shared attributes and

behavioural trends accounting for different levels and modes of agencing. Understanding both, shades of agency and counter-agencing, appears crucial to comprehend the dynamics of *socio-technical agencements*.

The study highlights uneven distribution of agency across *socio-technical-agencements*, but also the central role fulfilled by counter-agencing activities aiming at stabilising acting networks and preventing their irreversibility. It underscores as well the acquired nature of matters of concern's performativity, through a 'concerned-concerning' process endowing them with a rallying potential enlarging their scope of influence. Special attention is given to key roles played by 'Strong Supportive Networks' (SSN), developing a 'Perspective Speaking Potential' (PSP), and to strategies rallying 'Potentially-concerned' actors and impacts.

From a practical standpoint, the study highlights serious divergences between clashing perspectives, especially in terms of temporality, underpinning authoritative systems and ideologies. The examined opposing perspectives seem supporting incompatible market versions, based on clashing projected states of the world and inconclusive co-existence plans, complicated further by a regulatory deadlock on some crucial questions, such as, risks of irreversible contamination and liability.

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List of Abbreviations and Acronyms

AQIS: Australian Quarantine and Inspection Service
ANT: Actor Network Theory
BBC: British Broadcast Corporation
BBSRC: Biotechnology and Biological Sciences Research Council
BSE: Bovine Spongiform Encephalopathy
CC: Cartography of Controversies
DDA: Documentary Data Analysis
DDT: Dichlorodiphenyltrichloroethane
Defra: Department for Environment, Food and Rural Affairs
EC: European Commission
ENSSER: The European Network of Scientists for Social and Environmental Responsibility
ESW: Expected States of the World
EU: European Union
FDA: Food and Drug Administration
GM: Genetically Modified
GMO: Genetically Modified Organism
ICEAC: the International Court of Environmental Arbitration and Conciliation
MACOSPO: Macospol: MAPPING COntroversies on Science for POLitics
NFU: National Farmer Union
NGO: Non-Governmental Organization
PCB: PolyChlorinated Biphenyl
PP: Precautionary Principle
PSP: Perspective Speaking Potential
NASEM: The National Academies of Sciences, Engineering and Medicine
NFU: National Farmer Union
NWSSDTP: North West Social Science Doctoral Training Partnership
R&D: Research and Development
RBC: Real Bread Campaign
SSN: Strong supporting networks
STA: Socio-technical-*agencements*
TD: Technological determinism
WHO: World Health Organization
WTO: World Trade Organization

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Notes to the reader

- I have chosen the term *GM* rather than *GMOs* to refer to ‘genetic modification’, since *GMOs* is a broad and complex term that goes beyond the scope of this study’s object.
- I have reserved the terms ‘*Supporters*’ and ‘*Opponents*’ to the case study’s opposing groups. The terms could be advanced by the mention *GM* or not.
- ‘*The scientists*’ refers to Rothamsted scientists working on the debated GM-wheat prospects and trials.
- ‘*Main Actors*’ refers to the first *Necessarily-concerned* actors on both sides, a category of actors arrived at through the data analysis.
- The terms *Problematization*, *Interessement*, *Enrolement*, and *Mobilisation* when spelled in French and presented in *Italic* refer to their significance in the ANT terminology and not to their linguistic meaning in general.

1 Introductory chapter

The aim of this research is to unpack agencies allowing the performance of markets. Since controversies are considered from this study's conceptual standpoint as part of market functioning and thus inevitable, and because they are instances where actors and their actions are best exposed, I have chosen to explore market *agencements* in the context of a controversy.

Market *agencements* and agency from a *Market Studies* standpoint will be discussed in the next chapter. In this introductory chapter my intention is rather to introduce the concept of market contentiousness, attempting to contrast briefly two predominant ways of viewing it, one of which prepares the ground for a better understanding of what is referred to as '*Concerned-markets*'. Then, I will present the study's research questions and expected contributions. A third section will expose the context of the study, introducing controversy around the application of biotechnologies to food and crops, and in particular, the Rothamsted GM-wheat controversy. Lastly, I will sketch out the thesis' chapters and main subsections.

1.1 Market contentiousness¹

Markets have always been inhabited by conflicts of interest and shaken by various forms of resistant voices and protest (Glickman, 2009; Chatriot *et al.*, 2006). Way before the amplification of anti-consumerism movements during the second half of the last century

¹ A term borrowed from King and Pearce (2010)

and the advent of more contemporary pronounced forms of ecological and ethical business concerns, consumer leagues and associations have accompanied the modern industrial era, militating for the preservation of consumer and citizen rights and seeking to moralise markets (Dubuisson-Quellier, 2009). Seizing the realm of consumption to support political and societal aims is certainly not a new phenomenon (Chessel, 2003; Scammell, 2000), and the scope of market contentiousness was since then beyond mere commercial and economic preoccupations. Markets seem, at the same time, inescapable and prey of their entanglement with the political and the social.

Nevertheless, contemporary markets still could be seen as presenting an unprecedented level of contention in terms of diversity and intensity (Wilkinson, 2017; Callon, 1998a). This naturally attracted the attention of scholars accros a variety of disciplines – *consumer research, organization studies, economic sociology, market studies, social movements, political participation...-.* Over the last fifty years, the literature has witnessed an outburst of research studying social movements and market contentiousness. While, all seem to somehow agree on the diversity of actors and stakes involved in market contention, there are noticeable disagreements on its nature and origins. In my opinion, and to help situate the conceptual framework adopted by this research within the wider literature on this topic, we can split these studies into two broad categories: (1) those who see contention exterior to the market, and (2) those who view markets as inherently contentious.

1.1.1 Extrinsic market contention

For quite a long time, contentious actions were appreciated from a dual perspective as forms of protest against structures of power, such as, the state and corporations (Van Dyke *et al.*, 2004). This dualism also manifests in the way contention is seen extraneous to market settings, contesting the latter or using it as a vehicle to serve purposes that are not considered to be essentially part of it. The most famous examples could be found in traditional social movement studies, some political consumerism and consumer resistance research orientations, and some organization studies. From this perspective, contention in markets appears to be either the product of resisting the market, seen as dominant and oppressive, or resisting by the market, using the latter to fight against wider socio-political structures of domination.

The first approach - *Resisting the market*- could be described as being influenced by Marxist ideas disseminated through the Frankfurt School of thought² and critical sociology, notably of Baudrillard and Habermas³ (Roux, 2007). This configuration places market institutions (including marketing) in a dominant position and consumers in an oppositional struggle compelled to resist against the restriction of their freedom and choices, at best, adapting spaces and goods designed by the dominant system of representations (Ritson and Dobscha, 1999; Kozinets and Handelman, 2004; Zavestoski, 2002). Culture jamming, anti-branding, anti-consumerism movements appear to be good illustrations of such struggles. Contention however could take less or more visible and direct forms, and vary in intensity (Fournier, 1998) - *e.g. anti-*

² Horkheimer and Adorno (1944/1974).

³ Baudrillard (1970) and Habermas (1978).

corporate protests, brand public shaming, boycotts, defections, reduced modes of consumption- (Herrmann, 1993; Friedman, 1985; Shaw and Newholm, 2002).

Some, considering the undeniable effects consumer movements and resistance have had on firms' practices and market functioning, altering their strategies, regulation, and trading conditions (Herrmann, 1993; Grønmo and Ölander, 1991) but also how consumers create alternative ways of consumption and challenge market logics (Moisio and Askegaard, 2002; Guillard and Roux, 2014; Pitt *et al.*, 2002; Kozinets, 2002; Friedman, 1996), have attempted to challenge this understanding of market contention arguing for consumer empowerment. However, those arguing for market domination responded back contending these effects to represent a temporary situation that will shortly be mainly absorbed by the capacity of marketing offers to rebound and assimilate consumers' appeals (Rumbo, 2002; Marsden, 2001). In their views, what could be regarded as participative and emancipatory actions, is nothing more than a new form of consumer resistance, crafting and manipulating alternative identities using the gaps left by the dominant system (Ozanne and Murray, 1995). Likewise, the idea of consumers being empowered through exercising choice, is interpreted by some as being somehow fanciful since choice is also disciplining and potentially paralysing (Shankar *et al.*, 2006), entailing generally extra costs and efforts (Cherrier and Murray, 2007).

From a social movement and organization studies perspective, the transformative potency of organised contesting movements has been widely investigated and recognised. These fields of research investigated in depth how movements challenged set institutions, altered practices, and succeeded in creating new fields, organisational forms, alternative and niche markets (Rao *et al.*, 2000; Lounsbury *et al.*, 2003; Bartley

and Child, 2011; Bommel and Spicer, 2011; Maguire and Hardy, 2006; Schurman, 2004; Luders, 2006). They also explored disruptive and persuasive tactics used by contesting movements to attract attention, ally the public, and induce significant costs to their targets forcing them to consider the raised matters (King and Soule, 2007; King and Pearce, 2010).

However, despite underscoring the multiplicity of actors and processes of change, they have not completely challenged the dualistic confrontation between ‘outsiders’ and ‘insiders’. The dominant standpoint seems to describe ‘challengers’, those whose interests and choices have been restricted and ignored, against the market, its institutions and dominant ideologies. Some of these studies described how elite frames attempt to re-appropriate and contain ‘challengers’ actions and emerging concepts, using these at their advantage to preserve their favoured position.

The second approach *-Resisting by the market-* attributes the intensification of market contention to consumers and interest groups’ awareness of the scope of consumption. The latter, becoming an effective means to pressurise institutions and corporations in order to induce change in the way markets and the society are organised and regulated (Gabriel and Lang, 2015; Bartley and Child, 2011). Since consumption became involved with all aspects of contemporary societies, and companies became very sensitive to their brand reputation (Dubuisson-Quellier, 2009), consumer choice acquired political power. This power is conferred through a subtle blend of the two identities of ‘consumer’ and ‘citizen’, initially separate, giving rise to a hybrid form of identity, the “consumer-citizen” (Gabriel and Lang, 2015), merging economic and political voices and aims (Cochoy, 2008; Shaw *et al.*, 2006; Micheletti, 2003a).

Some of the rather soft forms of consumer resistance mentioned above, such as, creation of second-hand and alternative niche markets, boycotts, and reduced consumption modes, could also be considered to be resisting the market by the market. In these configurations, consumers express their discontent by willingly disfavoured the contested market version and favouring its alternative(s), which represents a less noisy mode of contention, albeit may be on the long term as subversive as more visible actions.

1.1.2 Markets as inherently contentious

Recent studies clearly opened up to new approaches linking the study of social movements to market dynamics and consumption rationalities evolving in multi-institutional contexts (Callon *et al.*, 2009; Van Dyke *et al.*, 2004). In other words, social, economic and political arrangements, and those who enact them, are now understood as evolving in the same shared interdependent multi-dimensional socio-economic environment, and not in separate juxtaposing realms (Caliskan and Callon, 2009; Callon, 2007a; Fligstein, 1996).

Marketplace protests have expanded today to all civic fields, for instance, environmental, societal, ethical, political and ideological (Dubuisson-Quellier and Barrier, 2007), expressing a broad range of concerns and entering into dialogue with market versions and institutional agendas rather than just rejecting them (Cochoy, 2014a). This is well illustrated by collaborative initiatives –*joint certification schemes, labelling & sponsoring plans* (Scarlat and Dallemand, 2011; Bartley, 2007). Actors may

even engage in multiple market versions driven by seemingly contradictory concerns in order to protect their interests at stake (D'Antone and Spencer, 2014). Interestingly, in these cases, boundaries between the 'Outsiders' –*contesting and disfavoured groups, reformers, challengers* -, and their direct targets the 'Insiders' –*powerful market actors, established norms and institutions*- become blurred (Balsiger, 2014), which shows that economic actors are constantly making calculations, changing strategies and far from committing to definite roles (Caliskan and Callon, 2009).

There is also a reflection of this view in consumer research presenting consumers in a dialogical relationship with structures of power rather than purely confrontational or submissive (Holt, 2002; Denegri-Knott, 2004; Kozinets *et al.*, 2004). Consumers are presented as part of market actors, co-producing the market with producers, marketers and institutions. Consumers articulating a body of knowledge and using discursive strategies, actively interact with market actors and products stimulating their transformation and influencing their course. Consumers are not seen here as specifically empowered, nor are they seen as victims. Rather, all market actors, including market designers and institutions, are in constant negotiation, all trying to put forward their own interests and influence market settings in their favour.

Markets would then inevitably rest on unbalanced distribution of resources and power, generating undesired outcomes (King and Pearce, 2010), “*externalities which effect the existence of groups whose interests are not taken into consideration*” (Callon, 2009). This confers an inherent instability to markets, whether we consider their experimental phase of formation (Mallard, 2012), or their on-going activity (Reijonen and Tryggstad, 2012), and presents markets as collectively performed, oriented and shaped

through experiment and practice (Callon, 2009; Callon *et al.*, 2009; Geiger *et al.*, 2012; Calvignac and Cochoy, 2016).

From this standpoint, market uncertainties and controversies could be understood to be part of market regeneration and on-going reformative adjustments, driven by the diversity of interests and concerns, and fuelled by innovation and entrepreneurship (Roux and Rémy, 2010; Callon, 1998c, 2016). Contentious actions are generally initiated by actors who seek a more favourable position by mobilising cultural and material resources in order to undermine competitive advantages held by present powerful actors and invert ‘the game’ rules (Callon *et al.*, 2009; King and Pearce, 2010). Market controversies could also evolve around novel proposals that are still in their introductory stage into the marketplace, or around uncontrollable market outputs producing uncertain effects.

Market controversies are not restricted to specific topics or institutional frames. They expand beyond value and regulation disagreements to include wider strategic, societal, and ethical concerns. This is precisely what diversifies the range of involved actors, attracting unexpected participation and representatives, and what inevitably causes the ramification of debated matters raising the level of contention within a given market. However, despite being inherently contentious, a market would not be continuously in a state of pronounced conflict. Markets observe also cooler temporary⁴ phases. Usually, when the most influential stakeholders at a certain moment reach an arrangement,

⁴ Here ‘temporary’ does not refer to the period length, but to it being ephemeral. Some markets could be stabilized for quite a long time through constant re-framing and renewal by original stakeholders, still, they cannot be everlasting. They would need to re-invent their strategies and processes, and include new stakeholders at some point to survive and persist.

succeed in representing the majority and in silencing or hindering their common opponents (Callon *et al.*, 2009; Callon, 1986).

Hence, there will probably always be unbalanced distribution of power, and fight for leadership and control over resources, however, what characterises this view of markets is its non-deterministic stance. It acknowledges the opposition in hot market phases between advantaged and disadvantaged groups and the relative rigidity of institutions, naturally protecting first the interests of those who shaped them, but it also contends that actors' roles are not definite and frozen, and that institutions are ephemere and do not constitute transcendent structures. While it does not reject totally the dual polarisation of market contention, it expands the span of contention between these poles and exposes the level of uncertainty destabilising initial positions due to the inevitable integration in such circumstances of new matters and concerned groups. Initial opposing poles and their problematisation of the discussed matters at stake are not seen as definite, and are rather expected to be re-shaped and re-framed through the process of contention.

1.2 Research questions & expected contributions

The study explores in particular the following topics.

1.2.1 Shades of agency

Socio-technical-agencements are hybrid networks endowed with agency. The latter is the fruit of continuous efforts aiming at arranging, coordinating, and stabilising the

network (Cochoy, 2014b; Callon, 2016). However, while agency is viewed here as collective, a network effect (Callon, 1986; Latour, 2005), this does not argue for an even contribution of all actors. Some actors would take initiatives, while others would just let themselves be enrolled (Callon, 1999).

Many studies over the last decade aimed at exploring in more depth how these agencies are enacted and connected influencing social, political and market exchange frames and practices (Kjellberg and Stigzelius, 2014; Calvignac and Cochoy, 2016; Chakrabarti and Mason, 2014; Geiger and Finch, 2016). However, focus was more on the diversity and hybridisation of the network, and on what connects socio-technical entities, than it was on shades and types of agencies. Research is still needed to explore in more depth how agencies are distributed in terms of fulfilled roles and contribution amongst different entities forming *socio-technical-agencements*. The *Concerned-markets* configuration around the Rothamsted GM-wheat open-air trials offers an interesting gate for the exploration of different shades of agency by just following concerning processes.

Question1: *How actors actually acquire, share and distribute agency building socio-technical-agencements?*

1.2.2 Stabilising socio-technical-agencements

A *socio-technical-agencement's* performance depends on its capacity to align and coordinate its different entities in a specific way that allows an action to be directed

towards a common set goal (Callon,1986). The fulfilment of this aim depends on the quality of connectors (Cochoy, 2014b), which are the elements sealing the network in this specific form endowed with agency. However, according to Callon (1986), this is not enough, for enrolled entities to remain aligned, links to competing versions should be cut off as well. Thus, stabilising a *socio-technical-agencement* seems to involve *agencing* activities that are of different nature. More research is needed in order to explore deeper intertwining processes sealing concerned actors and different types of boundary works involved in singularising a given market version or configuration of *agencements* (Mallard, 2016). This study aims at exploring in more depth settling and unsettling agencies, trying to delineate both types of activities and to shed light on the dynamic relationship between these.

Question 2: How are socio-technical-agencements stabilised?

During the Rothamsted GM-wheat open-air trials debate, how did actors arrange and stabilise their different roles and enrolled entities, achieving convergence towards a common goal, while simultaneously facing destabilising forces? How did actors deal with or use these unsettling forces?

1.2.3 Matters of concern performativity

Matters of concern are presented in the literature as articulated issues, by concerned groups, for which no solution exists within the existing market frame, and therefore, would get politicised due to them requiring to be discussed publically (Callon, 2009). Matters of concern trigger controversy and allow the emergence and confrontation of a diverse range of interests, values and views of the world, and their supportive networks

(Callon *et al.*, 2009). Some studies have highlighted the dynamic nature of concerning processes and the entangling role of these matters shaping actors practices in specific contexts, such as, retail trade (Mallard, 2016), subsistent markets (Onyas and Ryan, 2014). Matters of concern appear as progressive and performative constructions rather than just a starting point or a mere reflection of actors' worries and demands. More research is needed to explore the dynamic nature of the concerning processes in different contexts (Mallard, 2016).

Since market controversies sprout and evolve around matters of concern, this study aims at exploring in more depth the performativity of matters of concern in controversial contexts, shaping actors roles and competing market versions.

Question 3: How do 'Matters of concern' become performative?

In the studied debate, how did they act as a rallying device, fostering commitment to a common set of interests and values, putting in motion and expanding the scope of competing socio-technical-agencements?

1.2.4 Main contributions to expect

1.2.4.1 Theoretical

The study's main contribution is expected to be within the *Market Studies* research area. By focusing particularly on the relational dimension between expressed concerns and formed networks, and their underpinning references and projected futures, it aims at highlighting the dynamic nature of these relational arenas. It projects to contribute to

our understanding of *Market agencing* by elucidating the mechanisms invested by actors in terms of market representations and anchoring literatures allowing them to seal reliable alliances, to provide anchoring to their claims, to acquire agency, and to favour their market version over competing ones. Moreover, the study aims at providing an in-depth exploration of actors' shades of involvement, uncovering shared attributes and behavioural trends accounting for different *agencing* modes. Therefore, the study is also expected to enhance the understanding of *Concerned-markets* configurations and how these perform market *agencing*, allowing the expansion of a market version or restricting and obstructing the latter. This will be achieved through the analysis of the rallying potency of matters of concern, and the specific concerning process endowing these with a performative power.

Finally, the study aims to contribute to the literature on market contentiousness by presenting *Concerned-markets* as a specific type of contention that is mainly reformative, although could be articulated in oppositional terms rather than explorative. The focus is slightly shifted from situational contention based on opposing contested market versions to a more pervasive form of contention based on the continuous competition of market versions.

1.2.4.2 Methodological

This study uses an original methodological toolbox that favours a predominately relational approach to examine market controversies, by contrast to multiple investigations performed previously through discursive, narrative, strategic, organisational and institutional lenses (Finch and Geiger, 2011; Maguire and Hardy, 2006, 2009; Weber *et al.*, 2009; Bommel and Spicer, 2011; D'Antone and Spencer, 2014; Chiles, 2013; Holt, 2002; Hopkinson and Cronin, 2015). The CC will allow

investigating progressively the dynamics of the studied controversy, highlighting associations between actors, networks, and their underpinning references and projected futures. It will also help exposing at the same time the subtle progression from micro concerns to their wider significance in macro settings.

1.2.4.3 Practical contributions

The study aims at contributing into the understanding of the GM crops market controversy by exploring in more depth what slowed down, and is still complicating, its development. Since controversial periods are hot phases that unveil the diversity of interests and concerns at stake, the full range of actors standing behind these with their underpinning values and projected states of the world, the study aims at sketching out a comprehensive picture of the conflict. It will provide a clearer picture on the underpinning reasons fostering the incompatibility of GM with competing market versions, analysing blocking aspects, but also strengths and weaknesses of both competing perspectives.

1.3 Introducing the context of the study

The selected case, the Rothamsted GM-wheat open-air trials controversy that took place in England between 2012 and 2017, illustrates a socio-technical controversy. An intersection between scientific promises, business ambitions, and assorted safety, environmental, regulatory and ethical uncertainties related to the application of genetic modification to crops destined for human consumption.

In this section, I will firstly introduce the historical background of the biotech industry, and how it turned from a promising scientific revolution to a controversial market. I will highlight the special case of food and food controversies, exposing most discussed reasons attributed to GM foods unpopularity. I will then sketch out the GM crops controversy outburst and evolution, focusing mainly on the European and British national context, and lastly introduce⁵ the specific case of the Rothamsted GM-wheat open-air trials.

1.3.1 The biotech industry: From promise to controversy

The agricultural biotechnology industry has been promoted in the early 70s as one of the most promising scientific revolutions, supporting sustainable agriculture and allowing the enhancement of crop nutritious value and yields. The industry was welcomed by western governments, who saw in the nascent sector an opportunity to prevent future food shortages and to improve national trade competitiveness. This positive appreciation reassured investors and stimulated the growth of the industry, allowing knitting a powerful interested network and having access to funds. Production platforms were quickly established, regulatory procedures formulated, and patents to protect intellectual property of various applications emerged (Schurman, 2004). A whole system of big scale farming from seed production to crop commercialisation, supported by multinational corporations, policy-makers, and some scientific

⁵ The analysis of pre-narratives (Part I -Chapter 4) will also provide an analysis of key contextual elements discussed in British newspapers preceding the Rothamsted's wheat trials series, allowing a better contextualised appreciation of the studied controversy.

communities, was mounted. Yet, what was promoted as the second green revolution turned soon to a series of endless struggles.

Since the late 70s, preoccupations about the risk/benefit appreciation and whether there is an actual need for such crops arose. This questioning tone continued to gain scope and intensity to reach its outburst in ‘the watershed years’, 1996-1999, triggered by the arrival of non-labelled Monsanto GM-soybeans to the European shores (Gaskell and Bauer, 2001). The event caused a *de facto* European moratorium on GM crops commercialisation at the time, which lasted for almost a decade⁶. Since then, the biotech industry started to face public questioning and scepticism about the reliability, safety and morality of its applications, especially those applied to food (Wagner *et al.*, 1996). Threatening cross-atlantic bilateral trade conventions and mutual economic interests, the European controversy quickly migrated to the U.S, causing concerns amongst crop exporters and big agro-businesses, especially that GM varieties cultivation is dominant in the U.S. for key crops traded globally (Norwood *et al.*, 2015).

The situation became more concerning for the biotech industry and main GM crop producers following the adoption by Europe and the World Health Organisation (WHO) of the precautionary principle, which places biotech applications within the realm of scientific uncertainty (Grabner *et al.*, 2001), confirming this way public’s skepticism (Wagner *et al.*, 1996). The economic tension raised between the two sides of the Atlantic, with Europeans claiming their legislative sovereignty, and Americans

⁶ Ending in May 2004 with the authorization given to Syngenta’s sweet maize (BT11) to enter the European food supply chain. Which, was later withdrawn by the company due to strong resistance from European consumers (Ponti, 2005).

demanding free access to the European market, interpreting the precautionary approach as a way to implicitly support protectionist attitudes. In 2003, The United States submitted a complaint to the World Trade Organization (WTO) against the European Commission, arguing for an annual loss of \$300 million on exports caused by unfounded and illegal restrictions on American imports (Panagiotou, 2017). The complaint, of course, complicated further the situation, and despite the WTO ruling against the European Commission in 2006, both sides remained unsatisfied. Pro-GM countries wanted unregulated access to the European market, while Europeans, for the majority, were still highly reluctant to such products and wanted to at least establish procedures that would guarantee effective traceability and appropriate labelling (ibid).

This, naturally spread uncertainty amongst stakeholders and investors, and despite the fact that no major health or environmental disaster stroke the sector, the industry had to consider significant economic restructuring in order to survive the crisis (Schurman, 2004). Over the last fifteen years, the biotech industry re-adjusted strategy, engaging in partnerships with scientists and governments, mainly manifest through the multiplication of biotech councils and joint project funding and patenting with research laboratories. This certainly had a positive impact, mitigating one of the main triggers of resistance against GM crops specifically; concerns related to corporate control over seeds and vital life resources. However, this strategic move did not silence completely resistance, since corporate power has been perceived for a long time to be manipulative and diffuse into political rows, and even into the scientific community, with obvious signs of strong lobbying and corruption outbreaks (Panagiotou, 2017).

1.3.2 Food: An increasingly controversial subject

Interest in food has actually always been a predominant social aspect of our lives (Beardsworth and Keil, 2002). People gather around food, become part of a group, claim their identity, maintain and codify social relationships, take care of their health, adhere to a system of morality, or assume a role through their food choices (Newcombe *et al.*, 2012; Lupton, 2011; Beardsworth and Keil, 2002).

During the 20th century, food became a widespread commodity; manufactured, extended over various categories, globally transacted and advertised, acquiring consequently new functions and dimensions. This mutation from a means to fulfil a basic need to a commodity has changed dramatically people's diets, perceptions and behaviours towards food. We never had so much choice, witnessing an unprecedented outburst of tastes, flavours, textures, ingredients, and origins. Moreover, the marketplace is overflowed by new concepts ascribing to food new functions (Hughner *et al.*, 2007; Bech-Larsen and Scholderer, 2007; Grunert and Wills, 2007; Childs, 1997; BBC, 2010), and incorporating to our consumption choices various motivations and concerns, often hardly reconcilable.

1.3.2.1 Food controversies

Food controversies appear heterogeneous in nature and present a multitude of conflicting causes and motives, making food one of the most politically divisive topics today (Norwood *et al.*, 2015). Food controversies range from classical concerns that were mainly related to hedonic, safety, regulation, and affordability questions, to more contemporary and broad preoccupations (e.g. ethical/sustainable, health maintenance).

Often, boundaries between these different aspects become blurred, what produces a snowball effect piling up different concerns, exacerbating confusion and conflicts of interest. Therefore, contemporary food debates –*meat, sugar, fat, proteins, cereals, probiotic, bottled water, hormones, genetically modified, over-processed, organic...*- appear miscellaneous, multileveled, chaotic, endless, and somehow indifferent to what used to be a cutting argument, ‘scientific evidence’; since even *Science* had embraced the era of pluralism, serving and supporting opposing clans and discourses (Norwood *et al.*, 2015; Attar and Genus, 2014; Callon, 2009).

1.3.2.2 *The specific case of GM foods*⁷

“Genetically modified food can be defined as a food which is, or which is made from, a genetically modified organism and which contains genetic material or protein resulting from the modification.”

(Jones *et al.*, 2000, p443)

Despite huge efforts invested by the biotechnology industry, the scientific community and governments to popularise GM food technologies, venting their potential benefits and ‘scientifically proven’ harmlessness, the predominant opinion about their processes and outcomes is still outstandingly negative around the globe (Bredahl *et al.*, 1998; Huffman, 2003; Wilson *et al.*, 2004) and surprisingly, this includes developing countries too (Zerbe, 2004; Paarlberg, 2010). Although public attitudes varied across countries and over time, applying biotechnologies to crops destined for human

⁷ Previous research showed a significant difference between consumer/public resistance to GM foods and GM crops, especially those grown for animal feed (Durant *et al.*, 1998). However, understanding the two types of resistance is highly relevant for this study, since it revolves around experimental crops that are destined for human consumption. The study will show that resistance to GM foods is explicitly present in actors’ discourses and arguments, considering the tested crops as imminent GM food prospects.

consumption was not welcomed enthusiastically. In Europe, GM foods were judged useless, risky, and unacceptable at their start (Gaskell, 2000). This tendency does not seem to have significantly progressed over the years. GM foods have been subject to controversy in Europe for decades (Attar and Genus, 2014).

Applying novel technologies to commercial foods has raised consumers' worries about food safety and the sustainability of contemporary dominant farming systems, but also, concerns regarding regulation matters and the actual need for such technologies. From a consumer behaviour perspective, research focused on consumers' negative perceptions towards GM foods and their buying attitudes, trying to elucidate the triggers of the observed resistance (Grunert *et al.*, 2003; Scholderer and Frewer, 2003). Most studies on novel food technologies turned around: **(1)** risk perception (Frewer *et al.*, 1997), trying to assess the perceived risks and their triggers and to discover possible correlations between these perceptions and some other aspects involved in consumer decision-making, such as knowledge (Cardello *et al.*, 2007), trust in institutions (Martin *et al.*, 1992; Slovic, 1993; Siegrist *et al.*, 2007), risk control and policy making (Frewer *et al.*, 1998; Phillips and Isaac, 1998) ; or around **(2)** the determinants and effects of the anti-biotech movement campaigns, such as, movements' strategies, representations in the media, political and cultural context, and industry vulnerabilities that fashioned the success of these campaigns (Gaskell and Bauer, 2001; Schurman, 2004; Levidow, 1999).

For quite a long time, interpretations of GM food/crop rejection focused on cognitive biases and policy deficiencies. Most common explanations attributed the rise of public/consumer resistance to such foods to knowledge biases aggravated by the

complexity of the scientific terminology, the “illusion of knowledge”, and the poor communication around the technology’s concepts by scientists (Yawson and Kuzma, 2010; Frewer *et al.*, 1998; Grunert *et al.*, 2003). Many also highlighted the correlation between other food scandals outbreaks contemporary to GM introduction and the difficulties faced by the latter (Jones *et al.*, 2000; Gaskell *et al.*, 2004). While, others accused policy-makers failure in terms of risk assessment and new technologies regulation, which generated mistrust in institutions and their procedures (Wynne, 2002). Policy review initiatives were perceived by GM opponents as siding with the industry and primarily concerned with protecting economic interests at stake (Grabner *et al.*, 1996).

As the following sections will show, numerous factors played a substantial role in shaping the illustrious unwelcoming environment to GM foods in Europe. Safety concerns and cautious regulation approaches were/are not the only barrier to the widespread of such foods. A strong consideration for environmental matters and culturally embedded culinary traditions have also fostered persistent resistance amongst the public and consumer lines slowing down the adoption of foods containing GM ingredients by key market actors, such as retailers.

1.3.3 GM crops in Europe: controversy and regulation struggles

Although the controversy has proven to be contagious and affected all countries across Europe, it was primarily shaped by national contexts, and therefore, it solicited variant views and developed at different paces from a country to another (Grabner *et al.*, 1996). In countries where NGOs networks were powerful and where ‘green food’ advocates

had already infiltrated the market at a great extent (e.g. Austria, Denmark, and Germany), from the beginning, GM foods were unwelcomed and faced market hostilities. The latter manifested in restrictive policies and retailers disengagement aligning their offer to dominant consumers' negative perception of GM foods. While, in other countries (e.g. France, the U.K., Italy and Greece), legislative and business atmospheres were rather favourable, until the unlabelled Monsanto's soya beans import scandal (Gaskell and Bauer, 2001). Supported by a massive NGOs mobilisation, and exacerbated by the announcement of the first cloned mammal "Dolly the sheep", the event marked what Grabner et al. (1996) called the '*U-turn on resistance*'. The media took over the debate and relayed extensively the events marking the start of the biotech opponents' empowerment era. During this era of biotech controversy, ethical concerns about the widespread of GM foods/crops and biotech applications in general occupied a central place in the debate (Durant *et al.*, 1998).

Despite being necessarily influenced by the unwelcoming EU legislation, the British government attitude had still shown clear affinities with the American position, attempting to keep as much as possible national legislation favourable to the development of the biotech sector. The 1980s and 1990s witnessed significant raise of investments injected within the sector by British large and smaller venture-capital companies. Also, interestingly, fruitful collaborations via academic-business partnerships between scientists and the industry were concluded, making the UK bioscience industry second largest in the world after the U.S. (Durant *et al.*, 1998).

1.3.3.1 Public consultation initiatives

Trapped between public resistance and economic interests, several governments

decided then to adopt a democratic participative process and to open the debate over the governance of science and technology to the public⁸ (Elam and Bertilsson, 2003), aiming at confronting experts' knowledge and claims held by contesting groups (Attar and Genus, 2014). However, this initiative gave rise to further critics, some of which were directed to the way these governments managed the whole process, the used methods, the interpretation of the results, and governments' compliance with the industry (ibid). Opening the debate to the public did not then generate the expected outcomes in all countries.

In Britain, the *GM Nation?*⁹ was severely criticised by many academics, journalists and NGOs. Some claim, it remained focused on neoliberal discourses (risk *versus* benefits) and relied mainly on expert views (Attar and Genus, 2014). Others questioned its ultimate aims, since the raised public concerns were not considered seriously and just interpreted as knowledge biases (Gaskell *et al.*, 2004).

1.3.3.2 Attempts to explain public/consumer resistance to GM crops

While resistance to GM foods studies mainly discussed food anxieties and safety matters, resistance to GM crops was however predominantly discussed from an environmental and legal perspective. Research discussed regulatory and organisational

⁸ E.g. Consensus conference on agricultural biotechnology in France (1998), consensus conference on nuclear power in Denmark, "GM Nation?" in the U.K., Royal Commission of Genetic Modification (RCGM) in New Zealand.

⁹ The 'GM Nation?' is not the only public consultation initiative though. In 1994, the 'UK National Consensus Conference on Plant Biotechnology' was conducted. Commissions: in 1999, The Human Genetics Commission (HGC), the Agriculture and Environment Biotechnology Commission (AEBC) and, in 2000, the Food Standards Agency (FSA) (Gaskell *et al.*, 2004).

issues facing the projected co-existence of GM and non-GM farming models and liability issues in case of unintended escape, especially that such eventual damage is understood to be irreversible (Lee and Burrell, 2002; Altieri, 2005). Furthermore, the absence of warranty and the irreversibility of effects in case contamination occurs, are viewed as a constant threat to the wild and to the subsistence of existing farming models, especially the organic sector. The latter relies on a certification system that has very little tolerance to GM interference, which exposes organic farmers to important financial risks, and ultimately, to the extinction of their business model (Bristow *et al.*, 2000; Lee, 2008; Altieri, 2005).

It appears clearly today that concerns about the safety of GM foods/crops consumption have not been, and are today certainly not, representing the only nor the main barriers to the widespread of bio-agricultural applications (Norwood *et al.*, 2015, Panagiotou, 2017; Venturini, 2010). The integration of GM applications within existing market and legal frames, and their impact on society, politics, and the environment, appear crucial to the discussion on GM prospects. In the light of scientific evidence inconclusiveness and ensued uncertainty (Hilbeck *et al.*, 2015), contention over the introduction, cultivation, and widespread of GM crops destined for human consumption is considered by many as representing a *Concerned-markets* version, where ethical and social considerations are brought forward, and a multiplicity of actors and interests have emerged enlarging the scope of discussed matters (Latour, 1994; Callon *et al.*, 2009; Cochoy, 2014a).

1.3.3.3 *Situation of GM crops over the last decade ...*

Despite a constant growth displayed by GM crops by acreage globally, with total cultivated area almost tripling over the last 15 years, 67.7 million hectares in 2003 to 191.7 in 2018 (Fig.1-1), Fig.1-2 however shows rather huge disparities between continents. The American continent, on its head the U.S., represents by far the largest GM cultivated areas worldwide (75 million hectares in 2018). By contrast, European countries are almost absent presenting insignificant contribution, which shows tangible manifestations of the two opposing approaches to GM and explains the pressure perceived in Europe due to interests at stake.

Fig.1-1: GM crops evolution worldwide between 2003 and 2018

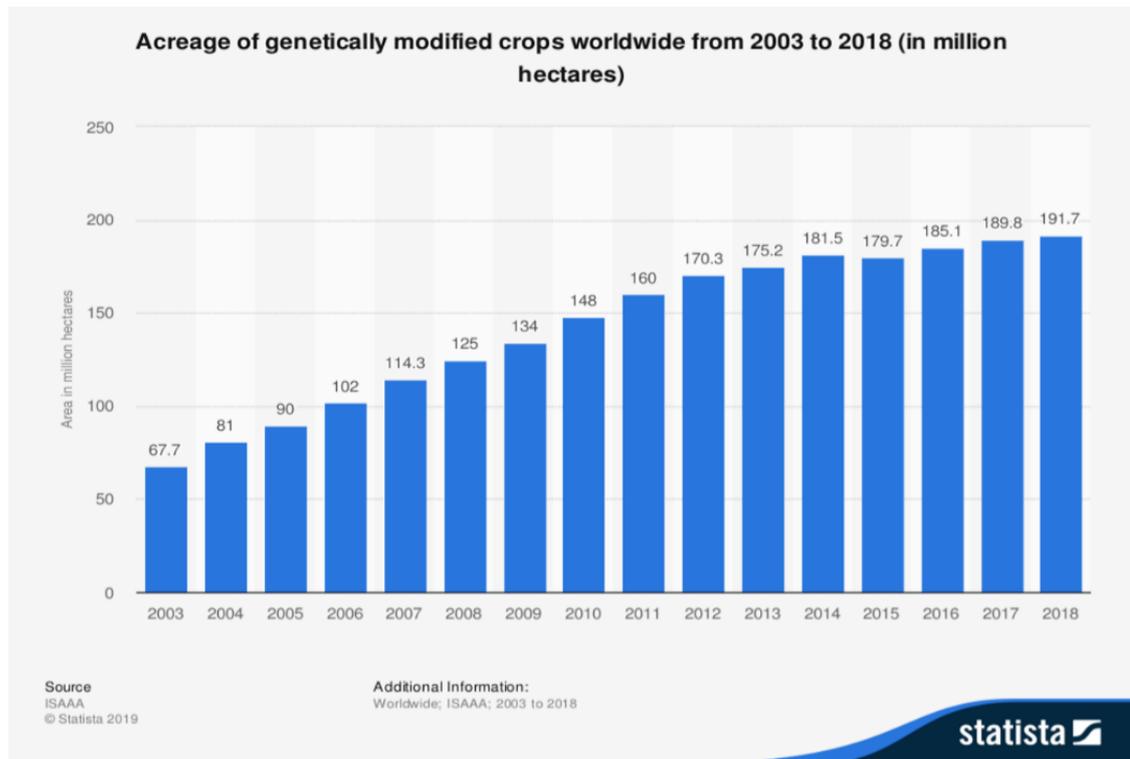
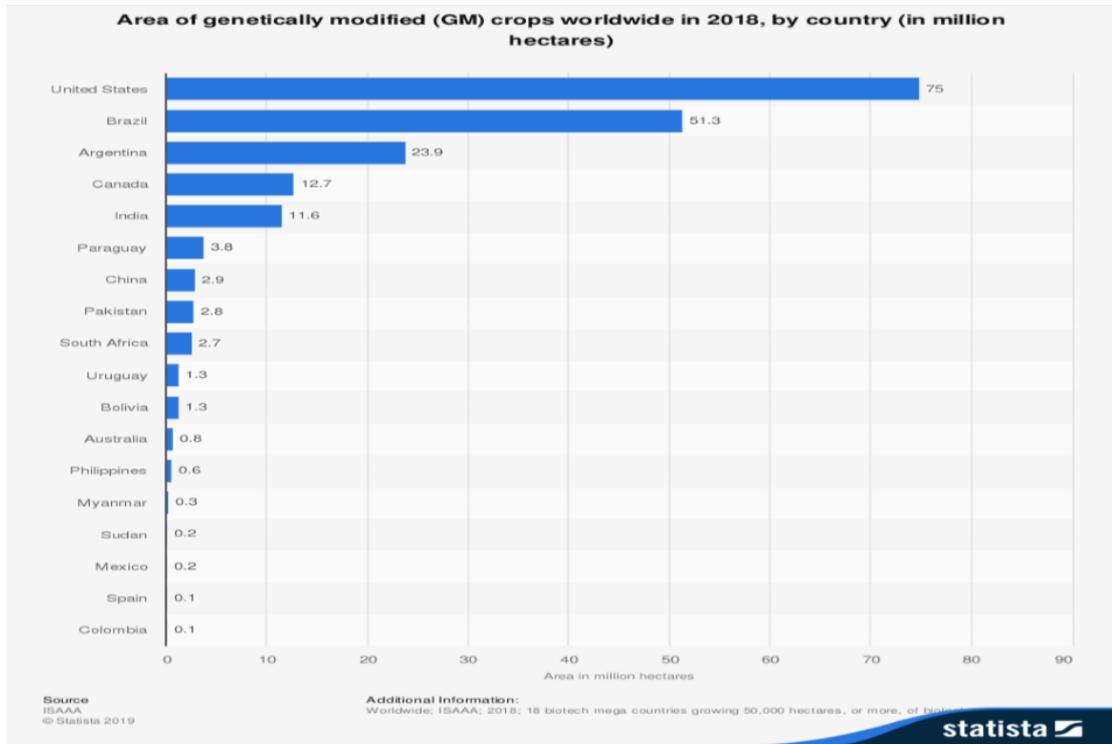


Fig.1-2: GM crops by country in 2018

Succumbing to international pressure of the GM lobby and some European countries requesting a more flexible legislation and shorter regulatory processes on GM applications, the EU in 2015 approved the opt-out proposal allowing country members to take national decisions about banning or growing GM crops. 19 (out of the 27) EU members opted to rule out GM crops, amongst which 16 countries applied a total ban, leaving only the Flemish region of Belgium, England and Romania being open to GMOs (European Commission, n.d.). In the U.K. coalition, only England maintained a pro-GM crops stance. Scotland, Wales, and Northern Ireland opted out, keeping their

GM-free policy, while allowing England to potentially grow approved GM crops in the future.

While the submission of the European Commission to the GM lobby and market pressure favouring such a legislative move could have been interpreted in its initial stages as a significant step towards the victory of the industry over GM sceptics and the precautionary approach, in fact, the results of the vote showed consistency in the EU resistance to GM crops. As Panagiotou (2017, p4) expressed justly: *“This move has been considered as a considerable blow to the biotech industry, as it is estimated that with the new EU rules, around two-thirds of the EU’s population and arable land will be GM-free”*.

As a result, in practical terms GM foods are still very limited in Europe, only a few have been authorised for consumption, and, must be labelled accordingly. This tendency was also encouraged by retailers’ reticence following consumers’ perception about such foods (Jones *et al.*, 2000), which is still predominately negative. Actually, resistance to GM foods/crops appears deeply embedded in the European continent, with a consumer base largely hostile to the introduction of the technology into the food sector. The vast majority of European consumers¹⁰ until recently, in 2018, were still not willing to consume GM foods at any time (Appendix: *Apx. I-1*). However, this does not mean that consumers have full control on their choice, since animals fed on GM do not need to be labelled as such (GeneWatch UK, n.d.), while GM varieties cultivation is noticeably

¹⁰ In the selected samples.

dominant for some key GM crops, such as, soybean, cotton, and corn on which almost all livestock is fed globally (Norwood *et al.*, 2015).

In the specific case of England, there are still no commercial GM crops grown in the country currently, only several experimental varieties allowed by regulators under strict legislation and supervision. However, the post-Brexit period is expected to witness a speed up of approval processes of such crops in England according to government announcements, and considering the favourable tone expressed by other institutions, like Defra¹¹ and the National Farmer Union (NFU). Main supporting arguments revolved around accessibility to a more productive and competitive agricultural technology, and criticism of slow European authorisation processes.

Currently, the controversy is still alive. Although, main environmental and health concerns remaining relatively stable (Greenpeace International, 2015), there is more emphasis on regulatory challenges and issues related to the eventual co-existence of GM crops with other farming systems, especially with a flourishing competing version, organic farming. While GM farming is obviously struggling to establish itself in Europe, organic farming and demand for organic food are thriving (Appendix: *Apx.1-2*). For many, the EU co-existence proposal presents serious inconsistencies and is the fruit of the pressure made on the EU to make the widespread of GM crops legally possible and economically viable (Lee, 2008).

¹¹ Department for Environment, Food and Rural Affairs.

1.3.4 Rothamsted open-air wheat trials 2012-2017

After a 7-year governmental ban on open-air GM trials in the U.K. following the raise of controversy over GM field experiments and prospects, illustrated by Greenpeace anti-GM activists' spectacular action destroying experimental GM maize in Norfolk in 2001, in May 2008, the University of Leeds was granted approval to test over a 3-year period a new variety of Cyst resistant GM potato. This, opened the gate for other field applications to be submitted to Defra, and marked the end of the ban on such experiments.

In 2011, a group of scientists from the reputable Rothamsted Research institute put forward an application to test in open field a new GM-wheat variety commonly called the GM-Whiffy-wheat. In September 2011, approval was granted by Defra for the experimental wheat to be sown in spring 2012 and 2013. Surprisingly, the news did not attract that much media attention at this stage. It is only in spring 2012, when the crops were sown and actual trial started, that opposition to the experiment and GM prospects in general flared up.

“Take the flour back”, a group set up purposely to interrupt the open-air trial, planned and proclaimed a mass protest to be held on Sunday the 27th May, aiming at ‘decontaminating’ the site. The announcement triggered a fierce debate between GM opponents and the supporters of the experiment, which has been related by the media and engaged a diverse range of collectives accounting for the variety of concerns and interests at stake.

The scientists involved in the trials present their GM-wheat prospect as a promising scientific opportunity serving the transition towards more sustainable farming. A revolutionary eco-friendly crop that would enhance wheat yields while reducing the amount of pesticides used to fight aphids. On top of cutting down on pesticide use, which presents environmental, health and cost benefits, this wheat variety is said to prevent damage caused by one of the most dreaded cereal crop pests without killing these, by just repelling them, which preserves biodiversity of natural ecosystems.

Scientists assure that the experimental crop will not present any actual risk to nearby fields. Experimental plots were surrounded by protective planted zones of 12 meters, and all crops involved in the trial are to be carefully destroyed at the end of the experiment, which should provide sufficient guarantee. Especially that, according to scientific evidence, the wheat is self-pollinating, and its pollen is expected to travel 3-4 meters at best. Finally, the scientists claim the right to conduct securely publically funded research backed up by official approval from Defra, emphasising its non-commercial nature.

On the other side of the spectrum, those protesting against the open-air trial claim it to be a premature, environmentally hazardous, and politically irresponsible decision. They view the approved GM open-air trial and its prospect wheat as a real threat for the environment and the existing cereal supply chain, being susceptible of contaminating surrounding wild areas and other conventional crops. They cite previous factual contamination occurrences and studies proving that GM pollen can travel for miles and appear particularly concerned about the irreversibility of GM contamination. Trials opponents also denounce unwise use of public money for controversial projects subject

to manifest public and market rejection, and accuse Rothamsted Research and the scientists involved in the trial of undemocratic conduct, since they had planted the experimental crops before holding a public debate on the question.

Opposition to Rothamsted trials federated GM opponents who do not see in the research centre's project a different promise intending primarily common good and scientific progress in the service of the nation and humanity as the scientists claim. Rothamsted Research is known to be maintaining for a long-time close relationships with the biotech industry and corporate, and its projects are heavily financed by the industry's councils and research funds.

This time events followed an unexpected course, diverting from habitual scenarios with illustrious anti-GM activists' public attacks on GM crops. Considering past spectacular anti-GM campaigns, the research centre took special security measures and sought protection by law from the local council. Experimental plots were protected by a chain link fence 2.4 metres high, and local police has been informed of the plan to plant GM experimental wheat on site. St Albans City and District Council in Harpenden, Hertfordshire, applied to the Home Office to be supported with extra police force and for an order banning activists from the site to be issued, making it a criminal offense to enter the protected zone. A 24-hour security protection was planned to prevent activists from destroying the plants.

The scientists also took the initiative to defend their project. They multiplied their communication with politicians and fellow scientists to ensure sufficient support within the institutional realm. The planned destruction of the site was heavily condemned by

government officials, the British Crop Production Union, the National Farmer Union, and some other scientific organisations and charities, such as *Sense About Science* who organised a ‘Don’t destroy the research’ petition that collected over 4000 signatures.

On the day of protest, heavy police presence and legal advisors warning protesters about the consequences of criminal damage seem to have had a dissuading effect on those who had planned to uproot the plants. Protesters, representing growers, bakers, and concerned citizens about GM from across the U.K. and from abroad¹², just gathered around the secured zone, sung anti-capitalistic songs and expressed their discontent peacefully. This time, the law clearly sided with the scientists. The ‘decontamination’ event was labelled as ‘illegal’, and even described massively by the media as an act of vandalism.

No ‘decontamination’ action or mass protests were planned for the following Rothamsted GM open field trials, the GM-Super-wheat trial. A second type of GM wheat promising higher yield by improving the natural process of photosynthesis through genetic modification, which was granted permission by Defra in November 2016 to be sown between 2017 and 2019. The project derives from collaboration between three research institutions, Rothamsted research, University of Essex, and Lancaster University, and is partly funded by the American government.

GM opponents feel like they have lost institutional support, with the government clearly protecting the industry’s interests against its citizens’ collective will. Despite the

¹² Mainly from France and Belgium.

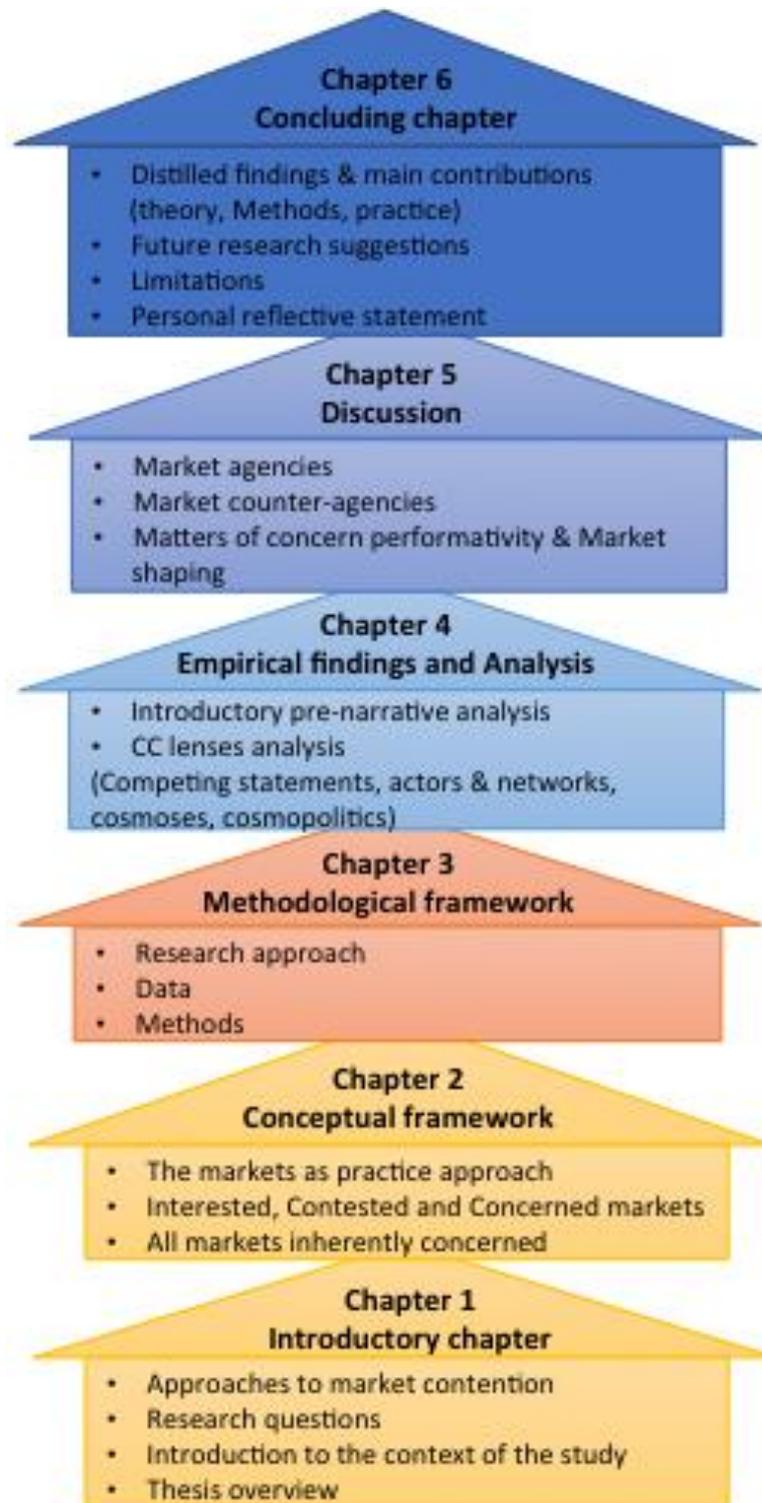
disappointing results of the GM-Whiffy-wheat trials, GM experiments seem to continue being a promising perspective for scientists and politicians. The British government had promised to simplify procedures after Brexit and to go towards a more favourable legislation on GM once freed from the EU precautionary approach measures and laws.

1.4 Thesis chapters overview

This thesis counts six main parts (*Fig.1-3*), called chapters. **This first introductory chapter** was meant to introduce the reader to the broad conceptual and contextual background of the study and presented central research questions and expected contributions. **Chapter 2**, will discuss main concepts characterizing the study's view of markets, and provide main insights from previous research on market agencies. **Chapter 3** will present the study's research approach, methods, and data. It will provide a detailed description of the data collection, codification, and introduce the analysis approach. **Chapter 4** will present 2 parts. Firstly, an introductory section capturing main insights that emerged from the analysis of pre-narratives preceding the actual studied debate within the British press. The second part, which constitutes the core part of this chapter, will present a thorough progressive investigation of the Rothamsted GM-wheat debate and will discuss main insights following the five CC observational lenses. **Chapter 5** will discuss main theoretical insights and developments ensuing from the study's findings around market agencies/counter-agencies and matters of concern market shaping. It will frame most pertinent findings, linking these to existing research and specifying their extension within the market studies literature. And last, **chapter 6** comes as a concluding chapter. It will provide a distilled version of main theoretical, methodological and practical contributions, in line with the aforementioned research

questions, and will attempt to suggest some promising future research perspectives. A last section will discuss briefly main limitations and share my personal reflective statement. **List of references and appendices** will follow.

Fig.1-3: Thesis chapters' flow chart



2 Conceptual framework

This study embraces a view of market instigated by the new economic sociology and anthropology (Caliskan and Callon, 2009; Araujo, 2007), market-as-practice, which has been promoted and shaped by an interdisciplinary group of researchers with a common interest in *Market Studies*. This view defines markets as economic socio-technical-*agencements* (STA) engaged in tireless framings of goods, agencies and price mechanisms (Callon, 2007a).

The following is an attempt to explain how we came to such a view, what concepts it rests upon, and what it entails. Since this study is interested in a specific configuration of markets, those destabilised by matters of concerns, I will also progress in a way that shows the links between the adopted market view and market contentiousness.

Firstly, what is a market?

Markets appear ubiquitous to contemporary societies due to unprecedented widespread of commodities and financial valuation of social activities (Callon, 2016, 2007a), and it is then not surprising that many theoretical approaches to market have emerged and were being discussed. While all tend to intuitively agree that a market is a place of exchange where, mainly buyers, sellers, and products/services could be brought together and transactions could be concluded, all do not agree on how these products/services were valued and made available, nor on how customers and suppliers came together and agreed on transaction rules and modes of exchange. Some would

leave it to evidence, a view encapsulated in the concept of the ‘the invisible hand’¹³, others, observing the entanglement of interests, outburst of different modes of consumption and contention, and the raise of uncertainty, could not overlook anymore the multi-dimensional nature of –*what is involved in-* making possible the performance of markets.

This is not to criticise the neo-classical view of market. For its time, ‘the invisible hand’ played a role in objectivising the economy and purifying it from the political dimension; discursive, passionate, and therefore, necessarily relativistic, and negotiable. Economy was described as material as possible, driven by self-interest and hosted by free markets where immutable natural laws prevail. Economics was practiced as a *constative* science¹⁴ calculating and modelling economy, aiming at having a better control over the latter, in line with *The Enlightenment* heritage dictating a naturalistic and positivist view of the world (Cochoy *et al.*, 2016). Naturally, these calculations and models had to be ‘made useful’, although they were clearly known to offer a reduced picture of market realities. Callon (2016) described this market model as an *interface-market* confronting independent and relatively stable blocs of supply and demand. A model that has regressed but has not disappeared completely.

The post-modern era shook so violently reductionist theories, initiating what Muniesa (Muniesa *et al.*, 2007) described as a “*pragmatic turn in the study of markets and economic activity in general*”. Focus shifted to the diversity of actors, interests, manoeuvres, frames, and to constant adjustments involved in performing markets. The

¹³ Adam Smith’s market self-regulating metaphor.

¹⁴ Struggling to establish itself as a science.

idea simply is, for a market to be and remain operational, it had to be constantly going through some activities involving shaping, framing, designing, legislating and controlling (Callon, 1998b).

This naturally shed light on actors' ability to perform these activities across multiple spaces, and questioned the nature of 'actor', agency, and the pre-assumed stability and extraneous nature of markets. Since then, an increased interest in the study of markets could be witnessed, and the latter has clearly become a multidisciplinary endeavour. Various perspectives emerged attempting to explain how markets are *actually* performed in the view of the multiplicity of actors, interests, ultimate aims, and modes of operation.

Although, later developments marked a clear departure from formalist views that collectively neglected on-going social interactions contributing to shaping markets, this does not mean that they all agreed on a common vision of the latter. Some, while integrating the social dimension, had marginalised the materiality of markets. Others saw the exclusive focus on social interactions to explain markets as a biased approach and tried to address the matter by *re-injecting* market objects and devices into the equation. Views of markets differed, and appeared highly dependent on the studying angle (e.g. Institutional, cultural, industrial...) and the degree to which theorists would adopt 'socialized' or 'materialized' approaches to market analysis (Geiger *et al.*, 2012).

Also, and less obviously, despite multiple approaches attempting to explain how markets evolve and are performed, the definition of what a market is, remains deeply embedded in a neoliberal vision, "...an economic organization revolving around

individuals, the liberation of their creative and productive capabilities and the assertion of their free-will”, accounting for a “*growing ascendancy*” of markets, however, “*we do not really know what a market is or could be*” (Callon, 2016).

2.1.1 The Market-as-practice approach

The market-as-practice approach understands markets “*not as given, but as socio-technical enactments*”, looking closely at those who are performing, including market objects and devices, and at socio-cultural and political interferences (Geiger *et al.*, 2012). This vision of market finds its roots in Callon and colleagues’ famous works extending from the ANT to the anthropology of calculation, performativity of economics, framing and overflowing, to a theory of socio-technical-*agencement* and *agencing* (Cochoy, 2014b). Focus on practices switched attention to the *on-going* ordering of markets, through constant framing and routine reproduction (Araujo and Kjellberg, 2009). This market vision rests on some principles that challenged the *Interface-market* view. The following appear to be the most impacting.

2.1.1.1 Recognising the social dimension of markets

In the view of contemporary settings, the formalist understanding of markets separating the political from the economic, as characterised by Granovetter (1985) being “*under-socialised*” in the way it overlooked enduring markets’ social networking activity, became untenable¹⁵. The first step was to abandon the myths of ‘free’ and ‘self-

¹⁵ (Muniesa, Millo and Callon, 2007, p1) talk about ‘epistemic discomfort’.

regulating' markets (Polanyi, 1957 cited in Callon, 1998b), and to recognise that human economy is rooted in economic, as well as, non-economic aspects of social life, which became famous under the concept of 'embeddedness' (Caliskan and Callon, 2009). As Callon (1998b) brilliantly explains, the significance of Granovetter contribution resides in pushing the concept beyond the mere recognition of the economy grounding in social relationships. It underlined the fact that intertwined entities do not pre-exist out there and just connect to each other forming a network of relations, but it is precisely these relations that shape their identities and ontologies. This takes us to the next point.

2.1.1.2 Actors' unstable roles and identities

Networks are not seen as a locus for actors, conditioning their identities and roles, but as an evolutionary entanglement of interests and relations (Callon, 1998b). This revolutionary vision was motivated by the impasse reached by the concept of *calculativeness* in uncertain contexts. The claimed rationality of agents and their assumed tendency to maximise their utility were obstructed by the lack of information and the impossibility to predict and make well-informed choices. To solve this issue, Callon (1998b) in his anthropology of calculation attributes agents' ability to calculate in uncertain settings to their relations. This idea challenged both, the rationality of agents and its cultural alternatives (Cochoy, 2014b). He highlighted the pervasiveness and multifaceted nature of calculation, focusing on the process of calculation and the diversity of entities and stakes that are involved therein (ibid). Like agency, *calculativeness* appears to be a collective and complex endeavour, which cannot be apprehended by a purely utilitarian, institutional, or cultural theory.

2.1.1.3 Entanglement of the economic and the political: ‘All acting in the same world’

Social, economic and political arrangements, and those who enact them, are understood to be evolving in the same shared, interdependent, multi-dimensional socioeconomic environment, and not in separate worlds (Caliskan and Callon, 2009; Callon, 2007b; Micheletti, 2003b). This does not mean that, at all times, the political with its effervescent reality is shaking the economic, but that its influence on the way the economy is administrated, and markets are shaped, is a fact. This view emphasises the endogenous character of institutions in the economy. Institutions are not seen as external settings regulating and framing market activities, but rather as the result of survival and expansion struggles, negotiated collectively. Their creation is a means by which agents enact their competences in order to solve emerging problems that prevent them from achieving their goals (Caliskan and Callon, 2009).

Also, the degree to which markets mix with politics depends on the level of contention they are experiencing. *Concerned-markets* tend to be highly politicised, where concerned groups seize their democratic rights to denounce unresolved overflows affecting their interests (Callon, 2009, 2007a). In cooler phases, when overflows appear tolerable or could be dealt with and re-integrated into the market agencements, the interference with politics tend to relatively decline.

2.1.1.4 Ending the juxtaposition of Supply and Demand

Unlike interface-market versions, actors’ identities, roles, and competencies are not definite, and thus supplies and demands are indefinite too, and are all interdependent

(Callon, 2016)¹⁶. Supply and demand are not seen as independent blocs where goods are taken for granted, markets appear to be mere interfaces allowing these goods to be matched with appropriate buyers and needs to be satisfied, and where competition is leading the setting of prices (ibid). Customers are not a pre-existing category, nor are transaction rules and institutions; all created and shaped through evolving actions and processes (Araujo and Kjellberg, 2009).

The activities engaged in designing and qualifying goods are integrated into the market; the latter is not just an encounter for the economic transaction. Instead of recording ‘cold’ supply and demand exchanging promptly like strangers, here light is shed on how both are conjointly created, how they evolve, and how they constantly adjust to each other (Callon, 2016). The market picture is expanding, including all activities and arrangements necessary to achieve final transactions and to guarantee the fulfilment of their aim. Callon, Méadel, and Rabeharisoa (2002)¹⁷ talk about processes of qualification through which goods’ characteristics and the profiles of demanders and suppliers are simultaneously shaped and co-produced.

2.1.1.5 Beyond human agents: hybrid socio-technical agencies

The re-integration of ‘things’, in more theoretical terms, of ‘materiality’ into the equation is granted to anthropologists who studied the economy by following the transformation of ‘things’ into economic goods acquiring value (Caliskan and Callon,

¹⁶ As Callon reminds, this has been established through a multitude of empirical studies over the last two decades.

¹⁷ (Callon *et al.*, 2002)

2009). Uncontestably, the ANT heritage in this regard has contributed substantively in taking into account, not only how various objects and devices are integrated into networks making markets, but also their capacity to interact with other entities and perform action (Callon *et al.*, 2007). This however, as I will explain in more detail in the next section on *socio-technical-agencements*, does not entail an even distribution of agency or a mutually exclusive involvement of social and technical forces (Callon and Law, 1995; Cochoy *et al.*, 2016).

2.1.1.6 The central role of Innovation

The shift to a view that sees markets as *socio-technical-agencements* moved focus from price adjustments as the *market prime mover*¹⁸ to innovative processes (Cochoy *et al.*, 2016). The main difference with the interface-market view is that *Innovation* is not considered as a means allowing the differentiation of products by which agents tend to escape competitive pressure, but as the driver and the facilitator of market activity. Successful transactions rest on successful good qualification processes achieving the *singularisation* of goods, since the latter is made possible through innovation; it is then inseparable from market activity (Callon, 2016). Innovation does not appear as an optional and ‘luxury’ choice, but an essential attribute for the survival of a firm within a specific market.

¹⁸ I am making an analogy here with the concept of ‘*Prime mover*’ by Aristotle in his attempt to explain the beginning of the world, which refers to the initial source/move that sets the rest in motion.

2.1.2 From *Market-agencements* to *Market-agencing*

Market-agencement, a concept embedded in the notion of actor-network, refers to the socio-technical arrangements allowing the enactment of economic calculation and shaping consumer behaviour (Cochoy *et al.*, 2016). The concept goes beyond the recognition of the hybrid nature of networks (Akrich, 1992; Latour, 2005), which brought to the fore objects and devices actually involved in a course of action. It additionally sheds light on the careful arrangement of the different constituents of a network, and the flexibility of these arrangements, endowing the latter with multiple forms of agency depending on their configuration (Callon, 2007b). *Agencement* is more powerful than ‘arrangement’, in the sense that it does not give prevalence to human agency over non-humans within a given arrangement (Deleuze and Gattari, 1998, cited in Callon, 2007b), revoking the motionless formerly assumed state of artefacts in favour of a symmetry between human and technical agency. The initial concept of ‘actor-network’¹⁹ finds itself polished giving way to a more sophisticated one, ‘*socio-technical-agencement*’ (Cochoy *et al.*, 2016).

It is important here to remind that *agency* has not been understood the same by all social science theorists, and even represents a demarcating line in social theory (Passoth *et al.*, 2012). While it lays at the heart of humanist approaches ascribing exclusively the capacity to act to human volition and capacity to make choices and to be creative, others²⁰ have criticised the assumed dichotomy between object/subject and

¹⁹ It is worth reminding here that ‘network’ should not be confused with its meaning in sociological studies where it is primarily concerned with mapping social interactions, in the ANT sense it focuses rather on how actors define roles, knit alliances, and incite action (Callon and Law, 1997; Latour, 1996). It is not about the size and power, but about how these are performed and maintained.

²⁰ Often called ‘*Post-humanist approaches*’.

structure/agency highlighting the role played by language, networks, objects, and structures in inducing and performing action.

In humanist approaches, “*agency without humans is meaningless*” (ibid, p1), while for the others, this view of agency is too reductionist, omitting the impact of natural relations and structural forces on the way social life is shaped and constructed. Seeing agency as an assemblage of multiple entities of different nature seems rather well accepted today. However, the symmetry, or not, between these entities is still fuelling fervent debates, although the principle of “general symmetry” seems to be misunderstood by some of its detractors (Latour, 1994).

Agency from a *market-agencing* perspective is understood to be the capacity of an agent²¹, whether human or non-human, to act independently²², which denotes the ability of making autonomous choices, and thus, acting in different ways (Callon, 1998b, 2007b). This draws on the ‘generalised symmetry’ principle, which consists of studying connections between heterogeneous elements using the same analytical frameworks, combining natural facts and social forces (Callon, 1986). Agency here is not linked to intention, like in some other approaches (Pickering, 1993), nor it is claimed to be evenly distributed. It simply follows action where it emerges and goes, with no distinction between social and natural constituents of the world, since a human interaction is necessarily socio-technical (Latour, 1994). Asymmetries in agency are analysed with

²¹ I was attempted here to rather use the term ‘*Actant*’ referring back to the ANT terminology (Latour, 1996), where an *actant* denotes either a human or non-human actor, but refrained from doing so as I have noticed little use of it in the marketing literature, and the heterogeneity of socio-technical networks seems to have become widely accepted over the last two decades as well.

²² This does not deny the respective binding aspect of alliances within a network, but refers to the possibility of an agent to refuse at any time the role that another agent assigned to it/him/her or to revoke concluded alliances.

regards to actors' position and representation within a specific network rather than being automatically assumed to be engendered by a deterministic social/technical dichotomy. Therefore, agency could be simply described as a successful alignment of hybrid entities (Cochoy, 2014b).

In more economic terms, the idea of *Market-agencement* refers to assemblages that consist of specific settings matching particular views of what economy is (institutions, behaviours...etc) with the aim to allow the process of economization to take place, making 'things' economic, and thus exchangeable (Callon *et al.*, 2007). *Market-agencement* focuses on the essence of action and the very pragmatic side of market processes.

An interesting point worth mentioning here is that the concept of *socio-technical-agencements* has brilliantly diverted attention from endless debates on 'individual' agency towards 'collective' agency, distancing the discussion from the controversy around human/non-human agency, since what the concept focuses on is not individual agencies but the collective capacity of acting (Caliskan and Callon, 2010). Agency from this perspective is not limited to an actor, but understood to be generated from the relation and position of actors within a network, thus collectively acquired and shared (Cochoy, 2014b). An isolated actor is an inanimate entity; it only enters into action once related to other entities in a certain way that endows the collective with the capacity to act.

Pushing further the focus on the collective and on market processes, the concept of "*Agencing of markets*" goes even deeper in exploring actual manoeuvres by adding to

the *agencements* dimension of market entities what actually endows these with agency, which means, what puts them in motion (Cochoy *et al.*, 2016). If we come back to the basic definition of an ‘actor’ in the ANT terminology, “*anything doing something*” (Venturini, 2010), *Agencing* activities then are those activities that transform human/non-human entities into actors, which also accounts for the on-going work needed to keep a viable market configuration (Cochoy *et al.*, 2016). The fact that ‘*Agencing*’ (*agencer* in French) is a verb in its progressive form is also representative of *being in action* (ibid).

The ideas represented by the *Agencing* concept are not completely new though. Callon in one of his seminal works on the domestication of Saint-Brieuc Bay scallops (1986) had already described the calculated arrangement of different entities of the described network and on-going efforts invested by the three scientists aiming at stabilising these entities and their assigned roles to achieve set goals. He also highlighted the precarious nature of this endeavour, which justifies the necessity for the depicted continuous adjustment/framing. What Cochoy and colleagues (Cochoy *et al.*, 2016), in my opinion, brought new with the *market-agencing* formulation, is the way it summarises the whole discussion encapsulating both, economic calculation and constant framing/shaping struggles involved in performing markets. When we talk *market-agencing*, we are talking about a bundle of activities aiming at enacting market transactions by aligning and stabilising involved entities that enabled these to take place. This way, the concept also subtly addressed critics about over-materiality in the field’s analysis of markets (ibid).

Finally, Callon (2016) revisiting the concept of marketization through a discussion on innovation and competition, refines a bit further the concept and defines *market-agencing* as a collective action (market encounters framing) performed by a socio-technical arrangement, aiming at securing bilateral transactions, without which, he contends, markets would collapse. This way, *market-agencing* captures marketization and market functioning at the same time, which re-confirms its representational power as a term embracing all core concepts forming this view of markets.

2.1.3 From market *agencing* to market contentiousness

Agencing activities are those activities involved in negotiating, building, framing, and re-framing markets, which allow the performance and expansion of these. It is precisely because markets could only be imperfect, due to them being in constant struggle against each other, that their *agencing* inevitably produces inequalities and overflows (Callon, 2016). These undesirable effects represent externalities that appear overlooked in present market framing they originate within and are affecting other groups' activities and interests. Affected groups find themselves faced with extra monetary and non-monetary costs, while they have no control over these, nor do they, over their causing effects (Callon, 1998a). These situations represent 'market failures', where the best possible results could not be achieved, rendering the market partially inefficient²³ (ibid), hence the need for re-framing.

²³ Or, totally inefficient in some cases.

In this study's adopted view of markets, overflows are considered the norm, and thus, framing is unsurprisingly going to be a temporary fixing, which also entails constant endeavour aiming at absorbing emerging overflows and at re-adjusting markets. Framing permits isolating issues facilitating their negotiation within a limited configuration allowing their resolution through mutual agreement (ibid). This mutual agreement is expected to be disturbed at some point, since it had necessarily excluded some other actors to reach conclusion, but also, because there will be always an action which enactment or impact would transgress the set frame boundaries (Araujo and Kjellberg, 2009). Consequently, framing activities appear to unavoidably produce at least two obvious seeds of contention, although interrelated and may overlap.

2.1.3.1 The exclusive nature of framing

Framing implies excluding in order to allow purposeful and selected interactions to take place independently from the disturbance of their outer context. Naturally, excluded groups' interests would be silenced or overlooked, and their access to resources would be constricted. These inequalities, reaching a certain level, produce contention, where disfavoured groups start to question the legitimacy of the frame from which they were excluded or within which they have not been sufficiently represented (Callon, 1998a; Wilkinson, 2017) (Because markets actually rest on a set of agreed upon rules, which carry the interests and values of certain groups at the expense of others, they are therefore constantly exposed to contention (Fligstein, 1991, cited in Wilkinson, 2017; King and Pearce, 2010b).

It is worth mentioning here though that not all groups whose demands and expectations were overlooked are necessarily enraged or would necessarily voice their

discontentment. Some “*Orphan groups*” (Callon, 2007a, p141) would be silenced, overpowered by the version that prevails, or would simply choose a more pacific option and create other niche markets to express their interests and values, especially if the prevailing version had become incontestable. It appears that “*Orphan groups*” only become ‘concerned groups’ when they have no other choice but to fight for their share and rights to be re-established.

2.1.3.2 Overflows being the norm

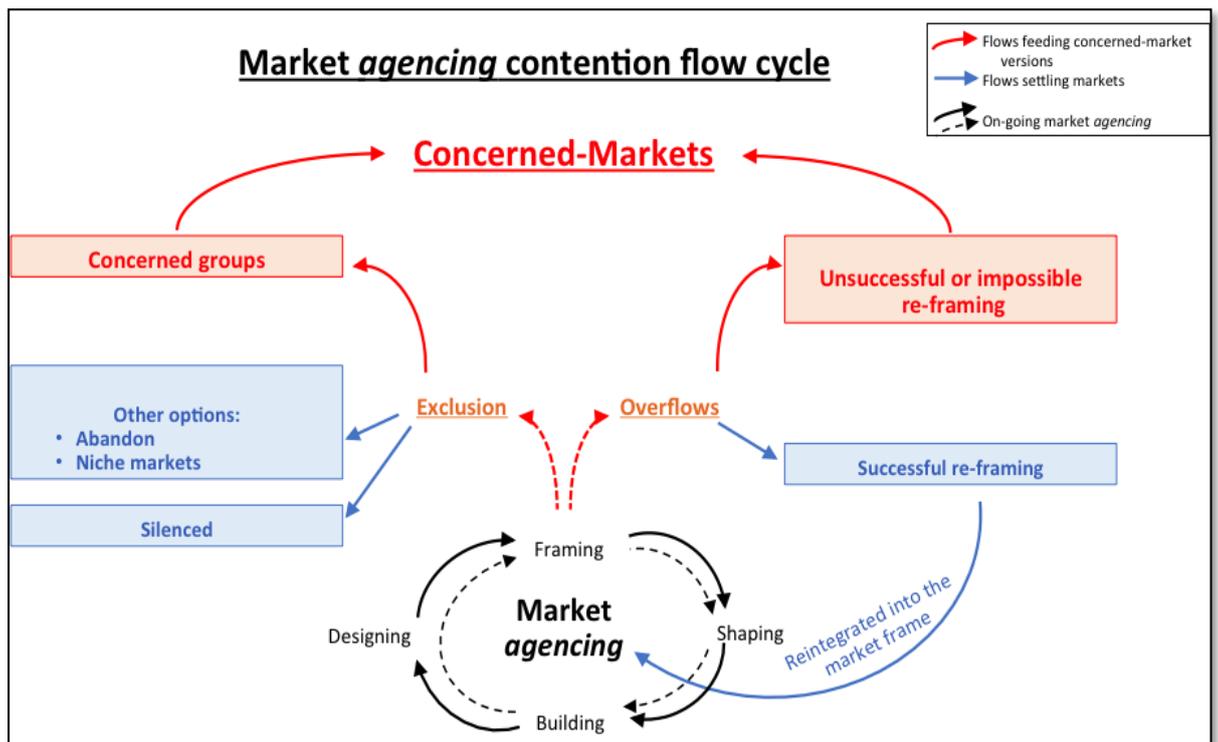
The second type of contention produced by framing activities is the natural and continuous production of overflows since no frame is perfect. In other words, as long as there is framing, there will be emerging overflows. If these persist and could not be contained and re-integrated within the market frame, when the damage reaches intolerable levels, affected groups would ‘go loud’, organise and voice publicly their discontentment asking for their rights and interests to be considered. The market frame becomes then a contested one; matters of concern and concerned groups start to emerge and to infiltrate its space and settings.

These two anomalies naturally produced by market *agencing (exclusion and overflows)* transform at some point an existing market version to a disputed one, where its legitimacy is questioned. Not only. Market contention is also fuelled by the counter-resistance of established institutions and favoured actors, attempting to preserve their privileged position and well-served interests. Established norms and advantaged groups would first try to resist contention and silence it, rather than engaging immediately in re-thinking their market version. This is mainly because framing and re-framing are costly and complex endeavours (Callon, 1998a; Araujo and Kjellberg, 2009), and

sometimes could even cost the decline of the contested version (Maguire and Hardy, 2009).

Fig.2-1 summarises the market *agencing* contention flow described above.

Fig.2-1: Market agencing contention flow cycle



2.1.4 ‘Interested’, ‘Contested’, and ‘Concerned’ markets?

Cochoy (2014a) distinguishes, without claiming a drastic separation, between three forms of markets, *Interested*, *Contested*, and *Concerned* markets. He defines *Interested markets* as those driven by self-interest and focusing on matters of fact²⁴, in line with

²⁴ Referring to Latour’s (2004) famous distinction between matters of fact, naturalised and objectified matters, and matters of concern, described as complex, diverse, contextualised and historically situated matters.

The Enlightenment heritage and modern postulates. *Interested-markets* are those built on a separation between nature and culture, and manifest clearly in the concepts of purely rational and utilitarian decision-making agents and self-regulating markets.

As for *Contested-markets*, Cochoy explains that these are somehow a counter-reflection of *Interested-markets* and relative to these. The way *Contested-markets* are expressed relates back to the dichotomy between the economic and the social, and conveys a worry about the former over-powering the latter. The *Contested-markets* view focuses on negative effects of market proliferation on social life, and specifically on vulnerable populations whose rights are not well protected by legislation in place. *Contested-markets* manifestations seem to bring an altruistic stream into the midst of blind individualism.

Finally, *Concerned-markets* emerge from a confrontation between *Interested* and *Contested* markets, without it being antithetical, but I would say, competitive. *Concerned-markets* are configurations that allow articulating the opposites. Collective interests would merge into concerns and be conveyed by them, and private interests would seek reconciliation with wider considerations and common good, which makes the market a collective “concerned experiment” (Cochoy, 2014a, p246). While describing separately these three forms of markets, Cochoy recognises the pervasiveness of interests to market exchanges, as he recognises that contesting groups may be also concerned if we consider ‘concerned’ to mean ‘dismayed’ and that markets are inescapable.

Now, if we take ‘being concerned’ to manifest through the three states of: to relate to, to be affected by, and to worry about (Geiger *et al.*, 2014), and if we consider that the current context of liberal markets and democracies combines matters of fact and matters of concern (Latour, 2004), and that political expression of contests, whether individual or collective, causes actual disturbance within contested and resisted markets (Kozinets and Handelman, 2004; Giesler, 2006; Hemetsberger, 2006; Friedman, 1985), then the three types of market described above become current, concomitant, and overlapping realities.

Therefore, these three forms should not be necessarily understood as a progression or seen as exclusive configurations, but as ‘market moments’, where one configuration would predominate the others. Moreover, it appears that the *Concerned-market* configuration is the one that encompasses the two other forms, representing the optimum manifestation of the diversity of markets interests, concerns, shapes, entities, and values, some of which may be veiled or latent in the others. All markets could then be said to be ‘concerned’, but at different degrees.

2.2 Markets: Inherently *Interested*? Inherently *Concerned*?

All markets appear to carry concerns related to their functioning and their efficiency. In any given market configuration, there would be on one hand disfavoured actors that are concerned about their rights and the representativeness of their interests, and on the other hand favoured actors that are concerned about losing their advantageous position and the profitability and continuous legitimacy of the norms and practices the latter is

built on. This does not infer that all markets are concerned to the same level, but instead, that all markets are inherently concerned.

The *Concerned-markets* designation seems to represent the ultimate stage of contention, where the intensity would not be measured according to punctual events/actions (e.g. a protest in front of corporate headquarters, calls to boycotts), but to the subversion propensity affecting existing market norms and conventions by making the raised matters actually concerning, and thus, requiring the involvement of politics/institutions and revision of the market game rules.

In the following I will attempt to show how all described market configurations could be understood as being concerned as well, yet in different ways and presenting different levels of contention.

2.2.1 Interested-markets

First of all, interests involved in shaping markets should not be understood as purely monetary or related to tangible gains. Questions of market design and ordaining are also part of actors' interests (Hauber and Ruppert-Winkel, 2014). Since all elements are interlinked in a market, even if we consider interests to be essentially monetary (linked to profitability), these could not be protected without interest in other elements like values and market architecture.

Now, if we consider that market *agencing* necessarily generates seeds of contention (overflows or inequalities), then all types of market become contentious in a way or

another. It is just the form and intensity of contention that differs. Contention is not typical of the postmodern era. The described *Interested-markets* and their modern context had also witnessed the emergence of contesting and concerned groups and resistant forms of consumption, accounting for a fusion of political aims with the economic. Already in the 19th and early 20th century, in the midst of the second industrial revolution, cooperative and consumer movements thrived (Dubuisson-Quellier, 2009). There were already concerns about fair work conditions, equitable access to generated profits, and about firms over-powering consumer choice and the legal system. The raise of these forms of social organisations was a way to express collective concerns and to oppose contested market versions and structures of domination. The development of consumer leagues in Europe was also a means by which women could participate indirectly in politics (Chessel, 2003). What were referred to by *Interested-markets*, are actually far from being solely driven by self-interests or from being devoted from societal and ethical concerns.

Besides, self-interest based considerations have not disappeared in contemporary markets, despite the apparent predominance of moral, epistemic, and political concerns. Markets are mainly, if not necessarily, interested. And, this seems to continue to be the case in *Concerned-market* configurations as well. Onyas and Ryan (2014) in their study of a premium coffee market in Uganda have shown that articulated matters of concern were also driven by self-seeking interests, despite the collective motivation to knit durable relations. Stabilising such relations was made possible through a concerning process that allowed different involved actors' self-interests to be represented. In the end, market agents are calculating agents pursuing their own interests and making informed decisions (Callon, 1999). This does not mean that they are incapable of

altruistic behaviours at the same time. As an example, works on the gift giving forms of exchange and those on Green consumers provide counter-examples to the purely selfish calculative agent, although not all agree it to be a completely uninterested act (Callon, 1998b; Kjellberg and Stigzelius, 2014).

Looking in more depth at motivations behind acts prioritising common good and at their underpinning logics reveals also more subtle intersections with self-interest. Contests and articulated concerns seemingly altruistic and preoccupied with social welfare, vulnerable populations' rights, and the preservation of the environment, appear to some extent motivated by self-interests as well, though not necessarily explicit and tangible/financial ones. Those actors expressing and acting upon concerns presenting a broader scope than the individual self are doing so in support of a specific projected view of the world they believe in, that makes sense to them, and which realisation and prevalence would be rewarding at their individual level fostering a sense of security and achievement. Western ecologists who militate in the Indian Ocean against the extinction of some tuna species, or against children labour in China, or against Nestle acquisition of water sources in Africa, are doing so because they believe in a symbiotic view of human existence and nature, in equal rights to access vital resources, in fair trade and socially responsible business models. Witnessing the opposite would generate cognitive incongruence and feelings of frustration at their individual level, fuelling resistance to the market (Roux, 2007). They militate to help others, but also to value their vision of the world, to be faithful to themselves, and to have a sense of fulfilment. Private interests are represented in the articulated concerns, albeit in a more allusive and collective form.

2.2.2 Contested-markets

Formulated initially by Steiner and Trespeuch (2013), this qualification of markets according to the authors refers to market products/services that are morally contested. The raise of this type of contention is mainly attributed to the proliferation of the capitalistic view of market, irrepressibly increasing individualisation and deteriorating social links, which made a clear rupture with traditional collective ways of care and regard to common resources and rights over these outside market settings. Contemporary markets offer a configuration of markets where powerful actors do not abstain, nor are they legally stopped, from acquiring market rights on any resource that could be monetised and transformed into a commodity, and this includes vital life resources like water and seeds²⁵. Likewise, the acceleration of privatisation of sensitive areas like health and education, creating clusters of knowledge and service, while not regulated enough to preserve access for all, contributed in raising the questioning tone within contemporary markets (Wilkinson, 2017).

Contested goods are those which introduction into the market triggers moral controversies (Steiner, 2015). ‘Contested markets’ are not contested on similar moral basis though. Some are opposed based on what is considered intrinsically immoral due to exploitation *of* and harm made to vulnerable populations (e.g. prostitution, gambling, drugs, pornography) (Wilkinson, 2017). Others are resisted for being viewed as morally flawed (e.g. GMOs, stem cell tech) (Harris, 1994; Robinson, 1999; Anyshchenko,

²⁵ E.g. The controversy around Nestlé buying water rights in America, Africa, and Asia, the controversy around Indian farmers tragedy after adopting GM seeds and losing right over their seeds.

2019), where the activity in itself is not immoral, but it has the potential to serve unethical finalities and it is still not clear how to regulate or frame it to avoid the undesired effect. Some other markets are contested because they would denature and alter the meaning of an exchange spoiling its outcome²⁶ (e.g. organ and blood donation) (Steiner, 2015).

One of the distinctions that Cochoy (2014b) attributed to the move from a ‘contested’ to a ‘concerned’ view of markets is that, in the former opposition is understood to come from outside the market, while in the latter, opposition is not extraneous to the market, and instead of systematically fuelling refusal, it invites us to care about markets. Two things need to be fixed here: the question of extraneous opposition in *Contested-markets*, and that of *Concerned-markets* favouring a collaborative rather than oppositional stance.

The understanding of *Contested-markets* as being attacked from ‘the outside’ seems to me close to the *Outsiders/Insiders* categorisation in Organization and Social Movement Studies, where *Outsiders* are those actors contesting the norms in operation, and *Insiders* are those who have been taking advantage of these norms and have deep interest in their perpetuation. Accordingly, when confrontation between both groups occurs following *Outsiders* contesting expressions and movements, it would be understood as a ‘Outsider-driven deinstitutionalisation’, where those whose interests

²⁶ ‘Contested markets’ are not to be confounded with illegal markets. The former operates within legal boundaries, however denotes a form of moral incongruence. While the latter thrives outside the legal frame, yet could be important in terms of volume of transactions. However, Beckert & Wehinger (2011; cited Wilkinson, 2017) contend that illegal markets should be integrated in the analysis of general market construction

are not represented (enough, or anymore) within the existing frame have taken action and questioned the latter's legitimacy (Maguire and Hardy, 2009). However, this does not mean that *Outsiders* are 'outside' the market. In my opinion, if they (and their interests) were affected by the contested market version, then they are necessarily 'inside' the market. The *Outsiders* seem to be the same 'orphan groups' and disfavoured ones described by Callon (2007a). They are those that are affected by the contested behaviours and overflows, so they cannot in this view be outside the market, but are considered *Outsiders* by the established actors and norms, which is different.

Trompette (2015) tracing the evolvment of the funeral market, and how it succeeded to migrate the question of death from the personal to the public sphere, sheds light on the complexity of *agencements* mounted to legitimise, organise, and regulate a morally contested market. He interestingly showed that contested markets are not settled through the re-integration or stabilisation of moral questions, but rather through subversion and displacement of the contest, and diligent work of market framing. *Contested-markets* seem to be also *Concerned-markets*, with a focus on moral concerns. In the same vein, *Concerned-markets* do not always take the form of (or favour) collaborative and caring exchanges aiming at exploring best ways to tackle raised matters and at reaching most appropriate solutions. This configuration seems to occur when involved parties are willing and have interest in establishing long-term relations and in stabilising mutually profitable modes of exchange (Onyas and Ryan, 2014), and when they show openness to collaborative initiatives - e.g. *joint certification schemes, labelling & sponsoring plans*- (Scarlat and Dallemand, 2011; Bartley, 2007). Involved parties may even engage in multiple market versions driven by different seemingly contradictory concerns in order to protect interests at stake (D'Antone and Spencer,

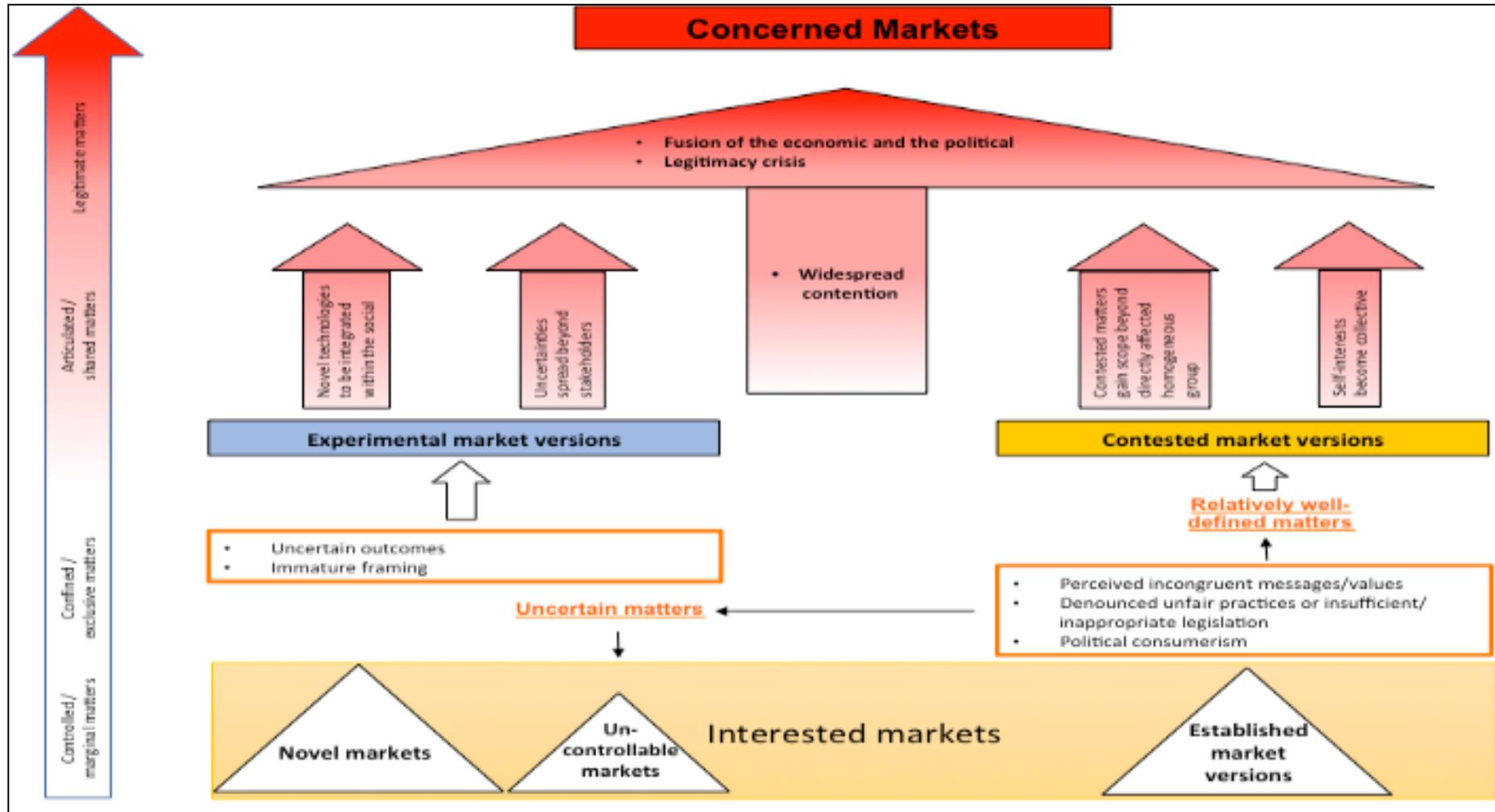
2014). In these cases, the boundaries between *Insiders* and *Outsiders* become blurred (Balsiger, 2014), and the *Concerned-markets* configuration could be seen as offering a rather collaborative and caring face. This seems also to be the case of experimental markets as well, where uncertainty is such, that all are in an investigational mode open to collaborate, while at the same time trying to favour their views of the world (Callon, 2009).

However, there are cases where *Concerned-markets* have no choice but to be oppositional. This is the case for example of the unmanageable co-existence of genetically modified crops with conventional/organic crops, posing an existential threat to the concerned farming versions (Levidow and Boschert, 2008; Lee and Burrell, 2002), and the case of the prospect human organs market that Steiner (2015) called “*a contested paper market*”, blocked at its conception due to it presenting for many actors moral incompatibility with human dignity and medical ethics. In these cases the legitimacy of the existing or prospect market is questioned, and thus, their survival or formation are threatened, and in many cases, it is not about compromise, but about winning over the competing version. All actors become then concerned, and not only those initially disfavoured or experiencing a form of damage. As Steiner explained, contested groups also present themselves as ‘moral entrepreneurs’, thus, concerned about common good, free access to the market and the promotion of their prospect market.

The discussion above shows how the two notions of *Contested* and *Concerned* markets necessarily overlap. Therefore, I present *Contested-markets* as a sub-category of *Concerned-markets*, where the difference would not rest on being outside/inside the

market or on the object of contention, but rather on whether the contested matters gain scope outside the first homogeneous contesting group and become acknowledged as concerning matters for a wider range of actors, or not. *Concerned-markets* start by being contested first, based on some experienced incongruences, inequalities, and damages, some of which may have moral underpinnings.

Fig.2-2: Interested, Contested and Concerned markets co-habitation



2.2.3 Specifying Concerned-markets

While all markets present actors or groups of actors that may be concerned about certain functioning aspects and ethical dimensions of these markets, not all of these could be qualified as *Concerned-markets*, with the latter portraying the culminant point of controversy that necessitates ‘re-shuffling the cards’ and destabilising present organisation. Three crucial signs appear to announce and characterise *Concerned-markets*: widespread contention, involvement of politics, and legitimacy crisis.

2.2.3.1 *Widespread contention*

This describes a situation where marginalised interests gain popularity and become more attractive. Contested matters spreading beyond directly affected homogeneous groups, become contagious. Contested matters become real concerns supported by a large range of actors, forming ultimately what is called ‘concerned-groups’. These concerned collectives are constituted of those who are contesting the market version in place, but also, by those actors who have been benefitting from the latter and whose interests are now threatened.

2.2.3.2 *Involvement of politics*

The widespread of contested matters, involving different sorts of collectives supporting conflicting interests, creates a form of disturbance that cannot be silenced by powerful actors or ignored by the media and authorities in place. Contention here attracts attention, gains popularity, and conflicting views start to rally more matters and

collectives. The expressed matters gain scope and legitimacy, threatening current norms and institutional settings, therefore the involvement of politics becomes inevitable.

2.2.3.3 *Legitimacy crisis*

Concerned-markets are markets where the legitimacy of current norms and modes of operation are not only contested, but are seriously threatened since their questioning has gained scope and has become widely accepted. *Concerned-markets* configurations represent transformative phases of markets, characterised by a fusion the political, economic, and the social (Geiger *et al.*, 2014). These phases are characterised by a high level of uncertainty obstructing the calculative ability of agents, which complicates the process of decision-making lacking key information about possible states of the world (Callon, 1999). Whether they appear more or less collaborative or confrontational, they carry shared concerns for which solutions and compromises are yet to be negotiated. Therefore, they offer a space for hybrid forums to form and thrive, incorporating a large range of concerns, interests, views of the world, and skills. No surprise then that such forums illustrate fights over regulation and legitimacy that may involve in some cases the re-configuration of the whole contested market version.

It appears from this that all markets are inherently interested and concerned, with different degrees and forms of manifestation of self-driven/private interests and concerns. Markets seem to remain primarily interested even when they are heated up by articulated concerns and the formation of concerned groups. Concerns as discussed above, while acquiring a collective and a more socially oriented dimension, remain closely linked to self-driven and private interests as well. Collective concerns despite their widespread acceptance remain exclusive to some other groups, at least to those

supporting competing market versions. Competing groups then may favour more confrontational or collaborative relationships and strategies, and this seems to be influenced by the degree of uncertainty characterising the disputed market (Fig.2-2). The more uncertain the disputed matters are, the more experimental and collaborative behaviours would be favoured. Contested-markets on the other hand, seem to represent an intermediary stage of contention, where the latter is still confined within relatively homogeneous clusters and presenting mainly an oppositional posture. *Contested-market* versions represent generally a preliminary step towards the formation of a *Concerned-market*, although they would not necessarily progress into such a configuration.

3 Research approach, methods & Data

This chapter aims at exposing the overall strategy that led the study, and the rationale behind the chosen design and techniques for data collection and analysis. I will attempt here to reveal the actual course of decisions and choices illustrating the progressive crafting of my research design. Emphasis will be on underpinning assumptions (ontological and epistemic), aptness of the selected case study and data set, approach to data collection and analysis, data codification choices, validation warranties, and ethics. The main aim of the following detailed description is to make sure the reached conclusions are reliable and answer the study's questions (Yin, 2009). It offers a double guarantee. On one hand, for me as a researcher during the research process, highlighting inconsistencies as they arose, and on the other hand, for potential users, enhancing the consistency of the study's outcomes.

Therefore, I will favour in this section a less formal writing style, using intermittently the personal pronoun 'I' to account for personal choices I made as a researcher and how the research was actually conducted, in a semi-autobiographic style. This way, I circumvent the risk of omitting explicating what has become 'obvious' to me over the research designing process (Silverman, 2013, p356), and I open the gate to you (the reader) to step into my lived experience.

3.1 Research approach

3.1.1 A qualitative approach

Favouring a qualitative research approach rests mainly upon the nature of enquiry intended by the study and its ultimate purpose, which can be considered as ‘objective’ considerations, but also, and to a lesser degree, on my subjective preferences as a researcher.

The study aims at exploring in depth intricate agencies, in the midst of a market controversy torn by clashing perspectives and uncertainties. Such an exploding, complex, and chaotic reality naturally conceals its determinants and logics. I am purposefully referring to their ‘hidden’ character rather than ‘inexistence’, admitting that despite its chaotic picture, social reality is governed by an intrinsic order and does have sense for those who are involved in its making (Venturini, 2010; Creswell, 2013). My point here is that, in the context of a controversy, these intrinsic logics are not obvious or straightforward, and therefore, cannot be apprehended through reductionist models and simplistic representations (Venturini, 2010). Controversies embody a faithful representation of the complexity of the social illustrating the clash between different realities, where ‘realities’ stands for different perspectives, orders, or states of the world (Callon *et al.*, 2009).

Investigating disputed realities necessitates a thorough exploration of the logics underpinning actors’ agency; and feeding, assembling, disassembling, maintaining, and disseminating the debated object. In other words, it requires a comprehensive examination of the meanings actors attribute to their agency, the interpretation they

make of other actors' expressions and actions, and how they mutually relate, affect and disturb each other's plans and behaviours (Roller and Lavrakas, 2015). 'Comprehensive' does not refer to 'everything' though, but rather means, instead of merely attempting to represent different facets that social reality may express, the focus would be on unpacking evolving interactions between these different representations and their impact on the 'progressive' course of events. Inevitably then, actors' views, intentions, actions, and the meanings they attribute to these representations, become critical targets for the fulfilment of the study's aim, and need to be empowered and given voice.

Besides, since 'progressive' implies motion, the process through which actors' behaviours shape the features and fate of the debate acquires a central place as well, and needs to be pursued. These two considerations, targeting precisely interaction and motion (Creswell, 2013), constitute the main 'objective' methodological reasons for choosing a qualitative approach to conduct this study.

The other, perhaps less obvious reason, can be attributed to personal inclinations inspiring this moment of my journey as a researcher. Following fruitful interactions with great academics²⁷ during my Postgraduate Management Research Diploma²⁸ intensive-week seminars at the University of Poitiers²⁹ in France, I have developed deep interest in the kind of knowledge generated through qualitative approaches. This

²⁷ I would like to mention specifically: Professor Ewan Oiry (ESG-UQAM), Professor Jérôme Méric (IAE Poitiers),

Professor Amaury Grimand (IAE Poitiers, Lab. CEREGE), Professor Ines de la Ville (IAE Poitiers).

²⁸ Equivalent to a Master of Philosophy in the U.K.

²⁹ Institut d'Administration des Entreprises, Université de Poitiers.

intuitively shaped the nature of my enquiry when I was first intrigued by the phenomenon of market contentiousness and the GM food controversy inspiring later my PhD research project and aided making a timely decision about my preferred methods.

This is said, adopting and assuming a qualitative approach does not mean I would not introduce any numbers and tables in this study based on the alleged dichotomy between quantitative and qualitative methods. Documents produce numbers as well as texts, actors use numbers to illustrate and substantiate claims, and unobjectionably, quantitative estimates help organise and classify the overwhelming amount of data in qualitative studies prior to proper interpretative analysis (Dumez, 2013). In this study, I shall use some quantitative formula following the data codification in order to draw a clearer picture of the distribution of selected codes (e.g. to form a first apprehension of the order of importance of different concerns based on their manifestation in actors' statements). These estimates of course do not constitute a definite arbitration, they simply help organise the material by highlighting redundant or scarce features. Also, the quantitative estimates I am invoking remain unsophisticated and I am not claiming undertaking mixed research methods.

3.1.1.1 Underpinning ontological and epistemic assumptions, and implications

Undertaking research is about producing knowledge, and as Fleck said, "*one must know before one can see*"³⁰. The way this research is constructed and conducted is undeniably

³⁰ Cited in (Gergen, 2015), p23. This supposes, for one claiming doing research, one must specify through which lens he/she will be looking at the world, and establish the criteria by which they can know in order to produce a warranted defensible knowledge that can make a reliable contribution to the broader body of scientific knowledge (Johnson and Duberley, 2000).

influenced by my assumptions as a researcher about: (1) the nature of social phenomena (relations between social facts *versus* meanings and perceptions), and (2) possible ways to investigate these (how are they experienced *versus* how are they constructed) (Silverman, 2013, p104).

In this research, I am interested in how different actors, in the particular context of the studied debate, and based on their interaction with each other and with other contextual elements, generate agency; create, develop, and transmit meanings. This implies stepping back from social reality, to describe and try to understand how it is brought into being. In other words, how actors' reality is negotiated and sustained (Crotty, 1998). The emphasis is on how actors construct reality and its meanings, and not on their experience of reality.

3.1.1.1.1 The voice of the research

The voice of this research can be confidently assumed to have a constructionist stance. It attempts to comprehend how socio-technical-*agencements* are produced and sustained in a specific context³¹, acknowledging the impact of the latter on the subject matter of the study. Additionally, it focuses on how actors assemble and sustain the debated object by interpreting their reality and creating its meanings. So, actors are not simply seen as sources of data (*what they think about the subject*) but are endowed with interpretative capacities and are making sense of their own reality (*how they actually contribute in constructing the subject*). Likewise, documents in this study are

³¹ In controversial settings. England (*by contrast to the other U.K. areas*). The EU (*by contrast to the US*).

considered to be vectors of sense and action, and not as mere motionless depictions of past occurrences. These choices distance the study from naturalistic models focusing instead on factual attributes of the examined object and favouring scope rather than detail (Silverman, 2013, p127).

3.1.1.1.2 The question of ‘Materiality’

The described view does not though infer dismissing objects and assuming a totally subjective interpretation of reality. The world and world objects are considered real. However, meaning, and ensued knowledge, are understood to be generated through the interaction of the mind with its environment, constructed rather than discovered³² (Crotty, 1998). Therefore, reality is neither purely objective, nor subjective. Objects do exist independently from our consciousness, but they only acquire meaning when the mind engages with them and when they enter the realm of our consciousness and are shaped by it (*ibid*).

This joins some interdisciplinary discussions on materiality³³ abandoning the Cartesian dualistic thinking³⁴, and is consistent with the study’s conceptual framework and methods, where materiality is not merely seen as ‘matters’ or natural objects of knowledge disclosed by the mind (Dale, 2005). Materials are considered conjointly

³² As it is assumed in a positivist view.

³³ E.g. works on material culture (Apadurai, 1986), Social Production of Space (Lefebvre, 1991), Phenomenological approaches to Embodiment (Merleau-Ponty, 1962,1973; Williams and Bendelow, 1998, Dale, 2001; Mauss, 1973), Actor Network Theory tradition (Law, 1994,1992; Woolgar, 1991; Akrich and al., 1988; Latour, 1994), and Market Devices and Performativity (Callon et al., 2007).

³⁴ This generally refers to a positivist model of reality, where reality exists ‘out there’, independently from the human mind. The latter, does not interfere in its existence or in shaping its forms, it can only discover it (Johnson and Duberley, 2000). From a positivist standpoint, the natural and the social are two distinct worlds and exist “side by side” (Crotty, 1998).

involved in producing meaning with the human mind. They affect, and get affected by the latter, and participate actively in producing new forms of relationships, knowledge, and social agency, which refutes technological determinism as well (Law and Hetherington, 2000). Likewise, combinations between the social and the material world are accepted beyond objects utility and symbolic function, and as being part of the processes that allow producing knowledge about the environment, our-selves, and others (Miller, 1987).

3.1.1.1.3 Social constructionism or social constructivism?

Finally, I believe it is important here to distinguish clearly what is sometimes called interchangeably a ‘constructivist’ or a ‘constructionist’ stand³⁵, especially that the difference between these two terms seems depending significantly on admitting, or not, a purely subjective interpretation of reality, based on the rejection or acceptance of the discussed materiality (Crotty, 1998; Gergen, 2015). The assumed position in this research confidently refers to a constructionist view claiming a collective construction and transmission of meaning and knowledge, including material aspects of the observed reality, whereas, a constructivist view argues rather for an individual construction of these, primarily based on cognitive processes and individual experiences (Crotty, 1998). The latter represents another important distinction. Constructivism emphasises the unique experience of each individual, while constructionism admits overtly the impact of contextual and cultural factors in shaping our views about the world and what can be held as ‘truth’ (Gergen, 2015; Crotty, 1998). This is crucial in the study of controversies

³⁵ Based on some accounts in the literature that raised and discussed this matter (Schwandt and others, 1994, Crotty, 1998; Gergen, 2015), but this does not claim that these ideas are accepted unanimously.

where actors' constantly refer to cultural and ideological elements to provide solid anchoring grounds for their discursive and argumentative interplays, seeking to influence and question each other's claims and to rally the public to their promoted vision of the world. In constructionism, the focus is on social conventions (understanding actors' views and actions through the examination of the negotiated reality) and not on the interpretation of individual experiences.

3.1.1.2 Epistemic pluralism³⁶ and the status of research outcomes

Following the same perspective, I assume the existence of multiple ways to describe reality, thus, a variety of outcomes (multiple truths), which I consider all legitimate and promising. This assumption has particularly impacted two areas in this study: (1) the data codification choices and analysis approach, and (2) the formulation of the research outcomes.

3.1.1.2.1 With regards to data

All perspectives were valued, and no words were considered more accurate or legitimate than others in providing accounts of the observed reality. As argued by the French literary theorist Derrida (1930-2004, cited in Gergen, 2015), no word has intrinsic meaning in itself, and all words acquire their senses by contrasting with or referring to others. Moreover, what is taken to be 'Real or 'The Truth' appears to be based on social

³⁶ Admitting the existence and validity of different ways for approaching truths about the world and describing reality.

conventions embedded within a specific tradition, culture and history (Crotty, 1998), which refutes the idea of ‘Universal Truths’ and opens gates for numerous interpretations and the existence of multiple realities, all worth considering.

As strange as it may seem at a first glance, this openness towards other perspectives does not nourish subjectivity, rather, it is what challenges our set understandings and values, allowing a more impartial description and holistic comprehension of the observed reality. Multiplying partial perspectives is the way to reach more impartial observations of social realities; what Bruno Latour calls “*Second degree objectivity*” (Venturini, 2011). Unlike “*First degree objectivity*” denoting a situation of stability or consensus³⁷, “*Second degree objectivity*” is obtained by uncovering the full extent of actors’ divergence and incongruity, since in controversial times all views necessarily expose their biases representing a specific position, and therefore, no view can be considered ‘objective’ in itself (ibid). In such cases precisely, talking about ‘objectivity’ in the commonly perceived sense, makes no sense (Venturini, 2010).

Nevertheless, this does not imply all accounts are absolutely equal, but rather means that accounts are not ranked based on pre-determined norms and assumptions. There are certain criteria allowing selecting more from less relevant or irrelevant accounts when examining a specific situation, because it is always about specific situations and enquiries. Crotty (1998) states that, although no interpretation can be approved to be ‘The true’ or ‘valid’ interpretation, there are still useful interpretations, to be preferred to pointless ones. Similarly, Gergen (2015) affirms, some accounts can be given

³⁷ Here, stability has to be understood as temporary and relative, and consensus not to mean exhaustive agreement between all involved actors.

preference based on their quality – *to which extend they fulfil their function of “truth telling” within a certain convention* -, or by considering their consequences – *to which extend they disturb the social order*. In controversial settings, considering the weight given to an actor’s discourses and moves by other involved actors allows differentiating actors and actions based on their impact, and eventually ranking their relevance to a specific question (Venturini, 2012). Equality of accounts is necessarily contextual. These are gauged according to their level of involvement and impact within a specific time and space, and with regards to a particular enquiry.

3.1.1.2.2 With regards to research outcomes

At the end of this study, I will not claim providing any definite interpretation of the studied debate, just offering a new perspective based on a specific choice of methods and research focus. This is primarily based on the recognition that our appreciation of the reality we observe is imbued by taught meanings we conventionally associate with the objects of our enquiry (Crotty, 1998), and whenever we apprehend reality, we do so from a specific standpoint, grounded in a tradition that customs our opening queries and conclusions (Gergen, 2015).

However, admitting pluralism in terms of outcomes does not infer loose commitment *vis-à-vis* research results and conclusions. It simply recognises what I discussed in the previous paragraph about accepting the existence of multiple valid interpretations, considering my work to be providing additional clarification on the studied matter, and not as an annulment or replacement of the existing interpretations. This includes lay ones. It would be arrogant to think that the researcher knows better than the actors themselves and has the ability to provide an ‘objective’ view on socially unsolved

matters (Venturini, 2010). As I tried to explain above, an ‘objective’ view on a controversy can only be reached when the controversy settles. Its settlement means, we can sort out “who’s right and who’s wrong” (Venturini, 2011). ‘Right’ though, has nothing to do with ‘The Absolute Truth’, it will be nothing more than the view of actor(s) who could impose an agreement, and the latter would represent the ‘objectified’ view.

This means, when the controversy is alive, the researcher’s view is no more than a perspective amongst others, and consequently it contributes, as Venturini (2010) metaphorically describes, into the solidification of the social magma, and cannot be attributed a transcendent status. The reliability and ‘*scientificity*’³⁸ of my results and conclusions are principally supported by: (i) a solid methodological and conceptual structure, (ii) a flawless ethical commitment, and (iii) a thorough description of my research process.

3.1.2 A single case study: The Rothamsted GM-wheat open-air trials

By ‘Case study’ I am intending here the object of my research, and a qualitative approach shaping my research design, and not a method of enquiry for data collection (Creswell, 2013). I am considering a single case, which I am examining in detail aiming at gaining insight into a specific issue³⁹: Agencies disputing oppositional market

³⁸ I prefer this term to ‘objectivity’. By ‘scientificity’ I refer to a kind of produced knowledge that is warranted by the existence of a stringent transparent methodology, and a strong ethical commitment throughout the research process.

³⁹ Referring to Stake’s (2000) case studies’ typology, my case would be an ‘Instrumental case’, where the case itself is not the first target of the research, but its in-depth examination would provide insight into a phenomenon that is in focus.

versions. Hence, my focus is not on the case itself, but I am using the selected case as an illustration of the studied phenomenon.

3.1.2.1 Why the Rothamsted GM-wheat open-air trials?

I have considered the Rothamsted GM-wheat open-air trials debate to be my case study for various reasons. Some of these are linked to the core aims of the study, others to practical aspects, mainly free access to abundant data.

Representativeness

Despite it being a ‘niche’ controversy, if we consider the broad and global extend of the GM food/crop controversy, the selected case is amazingly representative of main concerns and arguments fuelling the debate on GM technology and its application to food and crops destined for human consumption. It illustrates the multidimensional nature of these, offering a mosaic of entanglements between economic, institutional, cultural, and ethical considerations involved in designing a market. Naturally, actors and underpinning values supporting these considerations are exposed as well. The case also informs about wider implications of the conflict, presenting a clear illustration of the European/American cleavage on the question, and of the struggle involved in reconciling economic interests with regulatory norms. The case is therefore representative without being boundless and unreasonably complex to be approached for the purpose of this study.

An on-going controversy

The application of GM technology to food and crops is still considered today as one of the major current and ‘hot’ food and techno-science debates (Attar and Genus, 2014; Norwood *et al.*, 2015; FoodNavigator.com, 2016, Anon, 2016), obviously offering ideal grounds for the study of broad multi-layered market conflicts presenting entangled concerns and interests (Cochoy, 2014b; Venturini, 2010; Callon *et al.*, 2009).

Venturini (2010) has warned against mapping controversies during their cold phases, as “*controversies are best observed when they reach the peak of their overheating.....Issues should be studied when they are both, salient and unresolved*” (p264). Although, the GM controversy in general has never settled since its outburst in the mid-90s, it did not attract the same level of public attention over the years. Therefore, it is best apprehended during its ‘hot’ phases, when it manifests fully its contention scope in terms of concerns and networks. The Rothamsted GM-wheat open-air experiment, having witnessed a ‘hot’ phase by triggering a day of massive protest, offers direct access into the full scope of the broad controversy, yet bounded in time and space.

A concerned-market case

The GM food/crop case illustrates the kind of chaotic debates where there is basically nothing upon which actors agree, and every new statement provokes a deflagration of critics, counter-arguments, and protests (Venturini, 2010). It shades a range of multifaceted and dissimilar concerns (*e.g. ecological, economical, societal, ethical, political, gustative*), aims (*e.g. feeding the world, improving yields, producing healthy and nutritious food, preserving the environment, resisting corporate hegemony*),

references (*e.g. scientific, ideological, cultural*), and often many of these elements sum up, overlap and clash, making the terms of the debate look completely messy and ambiguous (Gaskell and Bauer, 2001; Norwood *et al.*, 2015). It also exposes the indefinite roles played by involved actors (*e.g. soliciting consumers' participation through different identities: the consumer, the citizen, the activist, the ethical, the 'universal carer'; confusion between 'the public' and 'consumers'; blurred lines between the 'concerned' and the 'questioned', between 'insiders' and 'outsiders'...*).

The selected case shows clearly challenges faced by new technologies when they quit their 'uterine' phase facing the real world, and how delicate the task could be of integrating these technologies into the marketplace. These challenges include designing a new market in the light of existing competing versions. The chaos engendered by socio-technical uncertainties, goes beyond technical issues, without tracing though a clear border between the technical and the social. This exemplifies the entanglement and interconnectedness of the three spheres, the economic, the societal and the political, and the destabilisation of referential categories, such as 'The State' and 'Science', no longer acting as a unified bloc.

All these features describe what could be referred to as a *Concerned-market*. Therefore, the case study appears perfectly suitable for the study of *Concerned-markets* and types of agencies in controversial settings.

Free and easy access to abundant data

This constitutes a pragmatic reason. The Rothamsted GM-wheat trials' attracting the attention of the media, triggered all sorts of communication around the subject. All main

British newspapers got hold of the debate and offered space for different actors to express their views and respond to each other's claims. On top of offering access to live interaction tracing the progression of the debate, the newspaper articles (forming the main dataset) are easily traceable and freely available online through the university library data bases. Similarly, regulatory and research documentation referred to by actors were easily and freely accessible on The European Union and governmental official websites, or on actors' blogs and official websites.

Finally, the reliance on press data as the primarily data set of the study (as I will explain in more detail in coming sections), allowed immersing into the 'live' debate, following the actual course of events as they were experienced and commented at the time of their occurrence.

3.1.2.2 Unit of analysis

This research analyses market agencies in controversial settings, namely the GM-wheat open-air trials debate that took place in England between 2012 and 2017. The focus of the study is on the relational aspect, aiming at unveiling elements that put together opposing *socio-technical-agencements*, sealed their alliances, and acted as rallying points for broader audiences. The study also follows the dynamic of the studied controversy, on one hand progressing over different phases of the debate (*Problematization*, hot phase, cooling phase), and on the other from micro settings, competing statements formulated by a group of individuals, to a more macro vision of the debated question including rallying ideologies (cosmoses) and projected states of the world (cosmopolitics).

As a starting position, my plan was to follow action, starting from articulated matters of concern manifest in actors' competing statements. Instinctively, I would have taken the trials' opponents *Problematization* and followed the evolution of the latter. But, I have chosen not to choose a focal agent *a priori* as Callon (1986) did by following the three scientists. This is firstly because I am primarily interested in exploring different shades of agency aiming at analysing uneven participation of actors and determining *a priori* the 'main actors' would limit my vision in these regards⁴⁰. Secondly, controversial settings are governed by uncertainty and confusion, and the best way to enable thick meshes of what is at stake and what fosters motion to emerge, is to remove any *a priori* selection and *just* follow action (Venturini, 2010).

Finally, and more importantly, the chosen method of investigation and analysis, the Cartography of Controversies (CC), actually by progressing through five different lenses directs focus from a level to another (competing statements, actors, networks, underpinning values, and projected states of the world). My starting point then was the articulated matters of concern, which mobilised actors, triggered controversy, and thus, appeared to be the initial vectors of action putting the debate in motion and shaping its form. My focus then moved from an observational layer to another, while keeping 'matters of concern' and their agency as my underlying object of enquiry.

⁴⁰ Also, because in Callon's case, the three scientists are the ones who came up with a new project and imposed themselves, at least during the first phase, as main actors. While this case study illustrates an oppositional situation where the instigators of the debate are not necessarily the main actors or most influential to be.

3.1.3 Methods

Consistent with the underpinning philosophical assumptions and research aims outlined in previous sections, the Cartography of Controversies⁴¹(CC) has been the main method guiding my data codification and analysis in this research. The CC provided a quite flexible, but well-structured toolbox to perform these steps efficiently. Additionally, the application of the CC has been strengthened and refined to match more closely the aims of this study in particular, by highlighting its underpinning Actor Network Theory (ANT) principles and by considering some useful proficiencies borrowed from the Documentary Data Analysis (DDA) literature.

3.1.3.1 *The Cartography of Controversies (CC)*

The CC is a pragmatic methodological framework to approach, dismantle, uncover, and understand the complexity of uncertain social phenomena, specifically designed to investigate socio-technical debates (Venturini, 2010; 2012). It was first established in 2009 by Bruno Latour and a team of social researchers through the Macospol (MApping COntroversies on Science for POLitics)⁴² European project and platform, involving eight European universities. Since that time, it has been seen to be a robust method through its applications in projects such as, mapping the controversies of ‘Food Supplements’, ‘Climate Change Skeptics’ or ‘Dying out of Bees’⁴³. More recently, it

⁴¹ Also called, Social Cartography (Venturini, 2010).

⁴² (SciencePo, 2008)

⁴³ (Macospol, 2014)

has been specifically extended in order to allow for analysis of digital representations of the social (Venturini and Latour, 2009; Venturini, 2012).

As for its theoretical background, the CC was derived from, deeply rooted in, and an expansion of the practice of the ANT, a systemic theoretical approach initially developed to apprehend the complexity of evolving technological innovations through the analytical description of actors' interactions and their intended influential strategies (Callon, 1999).

The main advantage the CC brings to the study of social controversies, is that it provides a pragmatic step by step navigating and exploratory lenses allowing a systematic and structured investigation of seemingly chaotic debates, while freeing the manoeuvre from superfluous theoretical discussions around the ANT that appear of little relevance to this specific task (Venturini, 2010).

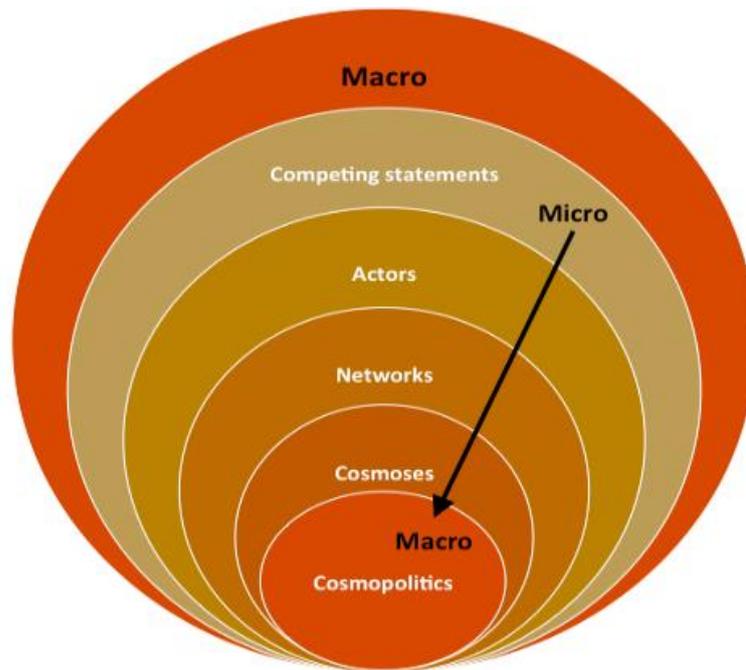
The CC does not claim though producing a holistic view on investigated controversies, but providing a sequential observational tool, highlighting the multi-dimensionality and plurality of perspectives, and uncovering grounds of intervention and prospects nurturing a debate over time. The CC lenses do not dictate specifically what to observe, but rather specify the observational focus for each layer, systematising the act of 'observing', defining the observed material's scope, and opening gates for analytical insight to flow.

3.1.3.1.1 How was it applied?

To apply the CC, I referred to the suggested serial lenses described and explained by Venturini (2010, 2012) as a *Progressive Observational and Interpretative Framework*, where each lens, assisted me determine the specific intended layer of observation/description and refined its unit(s) of analysis predetermined by my research aims. Which, by the same occasion informed data codification and any additional data to be collected and incorporated onto the principal data set.

The CC lenses assured a poised monitoring of the progression of the debate exploration and analysis in such a way that elements of understanding unfolded gradually, highlighting triggers and inflecting points, but also the temporality of the debate. They allowed a sequential progression between micro and macro settings as well (Fig.3-1), where actors' statements and organisation informed about wider underpinning values and aims shaping the institutional landscape and market settings. In this study, I am not extending the utilisation of the CC to digital visualisation.

Fig.3-1: The CC observational lenses progression



The five lenses allowed progressively investigating the whole⁴⁴ scope of the controversy as follows:

From statements to literatures

This first lens allowed defining the full extent of the controversy through the identification of eruptive competing statements within the initial and main data set, the 65 selected newspaper articles, tracing the trajectory of the debate. Statements disturb and reconcile, convince and dissuade, build and destroy, continuously. Capturing these is capturing the essence of the social in the *making*.

⁴⁴ ‘Whole’ does not mean ‘exhaustive’ in terms of number (sources, statements...etc), but means that it multiplies “points of observation” (Venturini, 2010), including various layers of analysis and as much perspectives as it could emerge from these layers.

This first lens's aim is not limited to identifying the conflicting scope and reducing the database to its most significant material. More importantly, it is to reveal shadowed order within the confusion and provide a backdrop for these statements by uncovering these elements endowing them with meaning. As Venturini (2010, p263) says "*We are not saying that social life is inexorably chaotic and therefore impossible to interpret. Nor are we saying that complexity is such that no stability, order, and organisation are possible. Despite all its twists and turns, collective existence does have a sense (even if not straightforward, unique or simple)*"

Organising 'the chaos' starts at this stage, transcending already the purely textual realm, by **firstly**, identifying the thick meshes of relations between these statements linking them to their aims (the core objects they are referring to, gathering around, and may be, they are trying to eliminate, alter and expand), **and secondly**, highlighting the web of their underpinning references (what gives them justification, legitimacy and credibility, called 'Articulated literatures'). These 'Articulated literatures' can be either well-established references (e.g. Sustainability) or new referential constructs (e.g. Second generation of GM).

From literatures to actors

This second lens allowed observing those behind the statements and highlighting their connections/positions vis-à-vis each other, exposing social networks around and opposed to competing perspectives. By 'social networks' I mean connections between humans, and between human and non-human performers, based on their ability to induce agency. As Venturini (2010, p266) says simply, but unequivocally, "*An actor is anything doing something...whenever you wonder if something is acting in a*

controversy, just ask yourself if its presence or absence does make a difference. If it does, and if this difference is perceived by other actors, then it is an actor”.

Accordingly, 'Doing' (Agency) in this study is appreciated simply as follows: Anything/anyone which/whose presence or absence changes the course of action or has an impact of any sort on other actors' strategies and actions, or is related or re-appropriated by another actor(s), is considered to be an *Actor*. At this stage, we move from the competing statements and their associated webs of relations towards those who/which sustain these relations, called 'actors'.

From actors to networks

This lens, beyond the simple identification of network alliances, it aims at accounting for “*the unceasing work of tying and untying connections*” (Venturini, 2010, p267) Beyond convergences and divergences at a specific time, it seeks to capture the evolution and dynamics of the involved collectives (alliances, untie connections, networking adjustments/metamorphosis/change). It supposes an analysis of the relational formations progression over the different sequences of the debate.

From networks to cosmoes

Because collectives form to change rules, and to establish new norms and more favourable positions consistent with their vision of the world, this fourth lens focuses on underpinning aims and values stimulating actors to act in a certain way or to support a specific perspective. It shed light on the meaning's actors attribute to their actions, and on their projected states of the world. At this stage, contrasts between underpinning values/systems of belief and their relation to supported perspectives were appreciated.

From cosmoeses to cosmopolitics

This final lens confronts different cosmoeses identified within the controversy, in order to appreciate collectively produced knowledge and to see whether bridges exist or can be constructed between these different imagined states of the world.

This lens was particularly difficult to apply, requiring abandoning the pursuit of objective truths, those truths that would extinguish a controversy by their unquestionable quality. As Venturini (2010, p267) says: *“If all men could see reality as it really is, they would peacefully and rationally negotiate their collective existence”*.

Here, what is important is not whether an intrinsic objective reality exists or not with regards to the discussed facts and arguments, but whether this reality is perceived and shared as such, because if not, it would not have any substantial impact on the course of events, which would be equivalent to it not existing.

I have deliberately described the five lenses succinctly in this sub-section, due to them offering somehow a loose conceptual framework and being best understood while performed. Therefore, considering rather a detailed description of their actual application within the context of this particular study is what appears to be the most insightful approach, especially that, there is no standard way to apply these lenses. Each ‘user’ needs to think how these can be applied optimally in the context of the studied reality and within the broad lines of their underpinning principles. The data codification and data analysis sections will provide a clear overview on how the CC was put into practice and utilised to fulfil its promises.

3.1.3.1.2 The ANT underpinning values

The CC stems from and is clearly embedded in the ANT approach. Therefore, and unsurprisingly, it espouses the ANT predominant principles guiding the exploration of the social world: Agnosticism, generalised symmetry, and free-association. These principles were discussed by many researchers, the most notorious are uncontestedly Bruno Latour, John Law and Michel Callon. Here, in order to define clearly and concisely these principles, I have chosen to come back to Callon's seminal work (Callon, 1986, p175-177), his article on the Scallops of Saint Brieuc-Bay. It is an incredibly complete and revealing work that posited the main pillars on which the ANT approach has developed.

In the following I am not going to discuss the philosophical roots, but rather focus on practical implications, those that infiltrated the application of the CC as an investigative tool of the social.

Agnosticism

This principle's aim is to prevent reductionism, where social researchers would approach a problem with their own pre-assumptions and end censoring actors' expressions about themselves and their experienced reality. This has some important practical implications. No *a priori* importance should be given to any entity or argument over the others. Actors' contribution, seize, and power are constantly re-appreciated following action.

In practical terms, no point of view in my study was privileged based on the presumed status or authority of its author or system of reference it referred to, unless actors themselves attributed a special position to these⁴⁵.

Also, I tried to my best to account for actors' views before introducing my own appreciation of the situation, not giving any privileged status to my interpretations over actors' ones. Actually, the CC first three lenses are mostly descriptive of actors' interpretations and moves, where I systematically described how actors 'connected the dots' rather than connecting these myself.

Generalised symmetry

This simply means that human and non-human/technical entities, aspects that refer to *Society* and those that refer to *Nature*, should be described in the same terms, using the same vocabulary of translation. This flattens the analytical surface, since no entity would be given prevalence based on some pre-assumptions that confer to it a pre-defined active role or condemn it to passivity. As in Callon's (1986) study, the scallops finally refuted the role assigned to them by the scientists and became dissident, impacting the course of events.

In this study, human and non-human/technical objects were equally apprehended, without any *a priori* importance given to human volition or technical power. Any entity

⁴⁵ For example, a scientific argument is not privileged over a cultural or ideological argument, unless actors themselves favour it. A scientist or a politician is not considered more influential than an activist or a protesting farmer *per se*. It is the import of their action and the role played within their networks that determine their influence.

that had an impact on the course of events was called an actor, and its contribution to action was accounted for through the same interpretative framework.

Free-association

To understand this third principle that comes to consolidate the two first ones, rejecting pre-defined grids of analysis and recommending following actors' choices and associations, we have to understand that, according to the ANT actors do not have an ontological reality *per se*. "*Actors are such because they inter-act, shaping relations and being shaped by relations*"⁴⁶ (Venturini, 2010, p267). 'No impact', means 'no agency'. Action is generated through associations, and thus, actors and their actions could only be appreciated with regards to their associations and the networks they are part of. This implies the unpredictability and instability of actors' behaviours and roles. Admitting free-association also means rejecting dichotomies between the natural and the social, actors and structure, and accepting the world as being an uncertain hybrid socio-technical world.

In this study, emphasis was put on the relational aspect, between actors, human and non-human alike, but also between actors and their statements and underpinning values and aims. Additionally, no a priori role was definitely attributed to any actor or group of actors. Roles were assigned according to observation, and varied.

⁴⁶ For deeper insight on this, see note 30 p185 in Callon (1986).

3.1.3.2 The Documentary Data Analysis (DDA) contribution

By DDA I refer to a specific way of seeing and analysing documents that goes beyond them being considered mere informative artefacts. I see documents as purposefully produced, illustrating specific ways of thinking, doing things, and as embedded in their social contexts and functionalities. As Amanda Coffey (2014) says justly “*they do not exist by themselves*”. In other words, an author, known or implied, with a purpose in mind, produced a document, in a specific style, using a specific language, symbols, references, which are legible in a specific context, by a specific audience, aiming at engendering a specific action or reaction. Documents exist in relation to those who produce them and have their impact on social organisation (Dalbin and Guyot, 2007). The DDA directed my focus to the interactivity, functionality, and performativity of the studied documents, rather than just considering a flat reading of their content.

From a pragmatic point of view, insights from DDA helped me investigate and analyse the gathered documents showing how they induce and carry the components of action, and not a mere trace or testimony of the latter. Hence, the documentary analysis I am intending here overpasses a content analysis focusing on occurrences, styles, and the information contained within them. It extends to the purpose of their production, the authority they claim, their target audience(s), and their connectivity with other produced documents or undertaken actions involved directly or indirectly in the debate. The DDA supported navigating securely from one CC lens to the following.

3.2 Data

3.2.1 Type of data

The research data set is composed of an assortment of documentary data resources, where the main dataset, not in terms of number but in terms of relevance and focus, consists of press articles from British national newspapers. The study's complete database is mainly textual, including some numerical forms, and some audio-visual data, especially promotional videos released by actors in the context of the mass protest and documentaries.

3.2.1.1 Why using exclusively documentary data?

As outlined in the previous section on the DDA, documentary data is charged with meanings and intentions, and should not be considered as 'fossilised' accounts. Many theorists discussed the performativity of language, attributing to discourse a transformative and acting power, and liberating it from being attributed a purely 'constative' function (Cochoy *et al.*, 2015). The traditional reluctance towards the exclusive use of documentary data as the main primary data collection method in management research is unendurable, since our contemporary space has been invaded a long time ago by all sorts of documents, where these are routinely produced and obviously interacting with and co-producing our reality (Coffey, 2014). The last fifteen years have witnessed a boom in defence of the use of documentary data and its relevance for social research, as producing credible and reliable research outcomes (Prior, 2008a, 2008b, 2004).

3.2.1.2 *Why media data in particular?*

Public data in particular offer a spectacular richness, and is freely and easily accessible through many databases⁴⁷. Therefore, it is increasingly used as primary data by social researchers interested in exploring the social in construction or in analysing historical events (Hopkinson, 2017; Elliott and Stead, 2017).

In this study, I have chosen media data to be my primary database for some methodological and practical reasons serving my research aims in particular.

3.2.1.2.1 Offering a more accurate and authentic picture of the debate

Press articles offer access to the shared public space without disturbing the latter, which constitutes an excellent opportunity to observe ‘live’ interactions between different groups of actors and standpoints animating a debate. Media documents allow observing the ‘live’ construction of a studied phenomenon, being themselves devices used by actors to deconstruct and reformulate their social world (Hodgetts and Chamberlain, 2014). Media data could also be considered as ‘spontaneous’ data, since the expressed views and positions were not solicited by a research method feeding a specific research aim. Finally, this kind of data allows gathering extensive amounts of documentary data, however in a more organised and purposeful manner by following actors’ intervention itinerary. Actors’ deliberate participation includes also documents they purposefully generated or referred to in order to support or oppose a particular stance.

⁴⁷ Especially for researchers affiliated to universities and research organisations/centres.

3.2.1.2.2 A wide coverage of perspectives

The research does not aim to study a specific group or organisation (e.g. activists, policy makers, Defra...etc), it rather intends to investigate agencies negotiating and shaping a controversial market, exposed by being subject to a public polemic. So, press articles offer a large readership and constitute excellent witnesses of actors' arguments, interactions and intentions shaping these agencies. Since press articles are purposefully intended for the public sphere, they are vectors used by different actors to convey their views and shape public opinion and perceptions about different aspects of our social life. Venturini (2010) recommends public documentary data to be considered for the study of controversies, as it exposes a large range of perspectives.

3.2.1.3 Why not primary data?

The constructionist focus of the study is on what actors did to put forward their claims and to value their specific standpoints, and not on what they thought about what they did. Even considering the part of the analysis that targets their underpinning values and beliefs, the aim is to uncover those which were expressed within the context of the debate and had affected other actors' behaviours based on how these were understood and perceived.

Also, this study is exploring an on-going controversy, but that is extended in time, presenting different evolutionary phases. It would be naïve to think that people committed to these opposing perspectives could put apart what they are currently experiencing and interpreting, to comment on a punctual past occurrence recalling their exact state of mind and perceptions at the time (for example during the mass protest of

2012). For this reason, I have favoured ‘naturally occurring data’, emerging independently from the object of my enquiry and capturing actors’ live prints, rather than retrospective accounts gathered through made-up ‘artificial’ research settings like interviews.

This choice has additionally the advantage of freeing the data from my unnecessary intervention as a researcher, allowing the emergence of less expected insights (Silverman, 2013). It helped protecting my research outcomes from a huge risk threatening the reliability of qualitative research, called the ‘risk of circularity’ (Dumez, 2013). Reducing my intervention as a researcher prevented me from automatically or inadvertently seeing or chasing in the observed reality my initial assumptions formed by my first investigations on the subject and the literature I have consulted to frame my initial research interests.

Besides, researchers gathering primary data generally have another concern regarding the quality of their data, differentiating truthful answerers from rhetorical ones, and identifying what genuinely relates to reality in the collected accounts (Silverman, 2013). One may argue then, can we consider ‘naturally occurring data’ as ‘neat truths’? of course not. ‘Naturally occurring’ does not refer to the spontaneity or truthfulness of this type of data, just to it being produced independently from the study’s enquiry. Media platforms are ‘informative’, ‘conversational’, and ‘debate’ spaces, where different interlocutors purposefully express themselves, and ‘truth’ is their last concern. What really matters is that their intervention serves their aims and conveys the reality as they see it and want to shape it. In the case of media data, the ‘distortion’ of ‘truth’, if any, is linked to the studied subject and integrated within the debate (part of authors’/actors’

discursive games) and is completely independent from the data collection method, while in the case of interviews for example, respondents may stress or mitigate some aspects for questions purely linked to the state of their personal ego⁴⁸.

Finally, it would be unrealistic to think that within the scope of this study (in terms of time and financial means) all main actors involved in the controversy could have been interviewed for example, and there is no physical common place where the studied interactions could have been observed comprehensively. The media accounts offer a virtual debating space open to public⁴⁹, and by the same occasion, a virtual observation space for me as a researcher.

3.2.2 The study's data set

The data has not been collected through a linear process. The data collection process has rather been a progressive endeavour over several stages separated by steps of data codification and first layers of descriptive-analysis.

3.2.2.1 Phase 1: primordial secondary research

The matter over GM technology and produce has been for decades one of the most hectic globally widespread socio-technical controversies. Therefore, understanding the

⁴⁸ E.g. To magnify personal actions or their impacts, or minimize these, based on one's self-esteem level.

⁴⁹ This should not be taken as an inclusive openness. In practical terms, there are always barriers to platforms. Not everyone who has an opinion on a debated subject would have access to newspapers to express their views, but would probably have as readers, which increases the impact media accounts may have on public opinions and institutional settings.

general terms of the wider debate and its historical and contextual background was considered as a necessary first step, before considering narrowing down the research scope to a single case study reasonably examinable within the scope of a PhD project. At this stage, a diverse range of documents describing the debate's outbreak⁵⁰, its progression over the globe (especially in Europe), the encountered challenges (public resistance and legislative struggles), and ethical concerns have been considered. The following outlines the main categories⁵¹:

Books and academic articles

- Relevant works⁵² analysing the biotech journey and controversy in Europe and beyond.
- Relevant works on the ethics of biotechnology (mainly academic and NGO's studies).
- Academic publications on public and consumers reactions towards novel food technologies and GM public debates.

⁵⁰ The focus was on the GM debate in general, and not on the specific case I have chosen to investigate. The latter has been investigated first through the main research dataset, the selected newspapers articles, avoiding interference with other documents to focus mainly on the actors' statements and interpretations.

⁵¹ This is not meant to be an exhaustive list, but it will mention some of the most relevant categories. All references then, are listed in the bibliography, and via in-text referencing when it is needed.

⁵² I have only considered academic and serious journalistic books in this category. I paid special attention to the works of George Gaskell and colleagues, who were involved in Eurobarometer surveys on biotech sciences, and the work of Guy Cook, which was insightful with regards to the public expression of GM and anti-GM and rhetoric.

Other online resources

- Governmental and EU official websites related to this subject (e.g. promoting or legislating biotech applications, fixing food safety standards...).
- NGO (Non-Governmental Organisations)⁵³ official websites and online press release.
- Online press articles, blogs, and websites of resisting groups (including international publications, especially American ones, to understand the contrast between their approach to GM and the European one, and the entanglement of interests beyond national boundaries).
- Documentaries (mainly those produced by the BBC and ARTE)

This first set of data aimed primarily at tracing the wider controversy over biotech applications to food and crops destined for human consumption, and at investigating causes of public resistance. It uncovered the diversity of stakeholders and interests involved in the debate, and the roles played by the media, different interest groups, and policy-makers in fostering a specific general perception of the biotech industry and its outcomes. Gained insights at this stage also allowed selecting an appropriate niche controversy to be the specific case study of the research. Understanding the wider scope of the controversy helped fixing choice criteria of the studied case and setting its boundaries. Finally, this background information turned out to be highly relevant in the succeeding data codification steps as well, allowing a better understanding of the articulated concerns and defences.

⁵³ These have played a substantive role in raising awareness about the biotech applications and the introduction of GM foods onto the marketplace.

This dataset has not been codified, as it does not represent the main research data. It played mainly an informative function and allowed producing the first descriptive narrative I have provided in the context section earlier. To distil the collected information, I have first proceeded through writing memos focusing on triggering events and main articulated concerns and their rebuttals. These memos then helped delineating the scope and terms of the wider controversy, its temporality, and at a later stage helped also comprehend and analyse the underpinning values feeding competing statements.

3.2.2.2 Phase 2: Newspapers articles (Main dataset)

The selected newspapers articles represent the main dataset of this study. This dataset has been codified in detail. It determined the sequences of the debate, informed the remaining data collection steps, and fed profusely analysis stages.

The dataset was generated through the Nexis⁵⁴ database using the following combination of key words ('GM Wheat' + 'Trial' + 'Trials'), focusing specifically on British national newspapers. After trying several other combinations and comparing the content of the emerging articles, the chosen terms have been selected as the most efficient, excluding low-relevant and superfluous events and discussions⁵⁵.

⁵⁴ Nexis database provides a broad range of business and journalistic sources in different languages, including major international newspapers.

⁵⁵ This is for example when a whole article is selected on the basis of the inserted key word, while the latter has been used in another context or is merely presented as an example without strong links with the studied debate.

Since debates around British GM-wheat prospects are relatively recent, I did not need to choose a starting date. I uploaded all articles that came up through my selective search. However, I decided to stop after the announcement of the GM-Super-wheat trials, discussed over 2016-2017 and not to consider further extensions of the debate, to make sure the timeline of the studied controversy does not go beyond my PhD project period. Articles were generated at two different dates in order to update and challenge the completeness of the selected list, in October 2017 and in February 2018.

The first jet collected 78 articles. Duplicates and ‘imposter’ documents were removed, dropping the number to 56. The second jet added 3 missing articles, raising the count to 59. Also, to determine the *analepsis*, the first 6 articles that discussed GM-wheat, triggered by the first American GM-wheat trial, were added as they provided an insightful account on the British trials background.

Finally, 65 press articles in total were retained to constitute my main database (see Appendix: *Apx.3-1*).

The textual content of the articles was saved in a Microsoft-Word file, examined thoroughly, and annotated. Articles were numbered chronologically and given informative headings (Article number/Date of issue/Source/First line of title) to help navigate easily using the ‘Document Map Pane’ function.

For each article, competing statements, actors, and references were highlighted using different colours. Short memos (150-250 words) describing the main aims, articulated concerns and justifications, and appreciating references and the rhetoric, were added at the end of each article. This step helped me immersing into the articles’ discussions and

appreciating the richness of their content, but more importantly appreciating the sequences the debate went through.

Subsequently, listing the articles chronologically in a Microsoft-Excel file, specifying their source, author, date of issue and their triggering event, has confirmed the sequential progression of the controversy. This file served as a codification file, where all codes were developed and added progressively, and confronted through the Excel sheet filtering options.

This dataset was subject to a meticulous codification.

3.2.2.3 Phase 3: 'Related Documents'

This extra phase targeted documents that had been referred to by actors themselves within the examined press articles, and which played a role in the controversy, called '*Related Documents*' referring to their relationship to the raised concerns.

To start, all documents referred to by involved actors, supporting an argument or a counter-argument, were listed. Then, only the documents that have been re-appropriated by any of the other actors, or which solicited a rebuttal from opponents were considered in this data collection step, since the focus is on the 'negotiated reality' and 'truths' that are considered such by involved actors. Conversely, documents that have been referred to by an actor/spokesman, but have not hooked the attention or interest of any other actor or generated action, even if deliberately ignored, are at this step not collected or analysed.

This choice may seem incongruent with Venturini's (2010) recommendation to gather the maximum of data, but it actually matches the ANT principles and strengthens the CC promises in terms of exploring the 'negotiated reality' rather than pursuing a chimeric 'absolute reality' imposed by the researcher. As the CC is not meant to be a rigid toolbox, I adjusted it to the specific needs of my enquiry. My aim was to follow the 'live' construction of the studied debate, and not to analyse and explain *a posteriori* what happened and why. I had to consider those documents that mattered for the involved actors (re-appropriated as corroborative evidence, refuted, or rebutted), and thus, that intervened in shaping the debate, the market, and its regulation. Examining extra documents that were not relevant for the actors themselves at this stage would have disfigured the picture of the 'negotiated reality', giving a wrong appreciation of the preponderance of certain documents and the messages they carry.

To capture actors' interpretations and representations, and to be able to account as faithfully as I could for these, I had to avoid any subjective selection of references at early stages of my analysis aiming at unveiling actors' views and deliberate choices first. Accordingly, no credibility was given *a priori* to a document over another on any other basis, such as, their origin or their presumed authority, except that they are/have been part of the negotiated reality⁵⁶.

⁵⁶ One may think then, what about concealed truths? I believe, it would be appropriate here to remind that I am not conducting a 'detective' study aiming at digging up what was deliberately concealed by actors, have not been identified, accepted or argued about, and consequently had little or no effect on the exposed audience. Therefore, only 'integrated' material (what concretely constituted material for interaction between involved parties) was retained as a 'related document'.

The selected extra documents were gathered, and organised according to actors who had brought them into the debate, those who re-appropriated, refuted, or rebutted them, the object of their interference with the debate (e.g. wheat is self-pollinating), and their claimed authority (e.g. scientific publication, governmental approval). ‘Related documents’ helped determine the level of contentiousness of different concerns (willingly supported or refuted through extra evidence), and appreciate influential systems of authority and cracks within these.

3.2.2.4 Phase 4: Extra documents

The three first CC observational lenses were focused on investigating in depth actors’ views and organisation (raised concerns, articulated literatures supporting these, networks and speaking potential). During this stage, I minimised to my best ‘extra’ views, whether from extra documents beyond the selected database or from my own interpretation of ‘what may be the case’. However, reaching the two last lenses, because underpinning ideologies and projected states of the world are generally not expressed explicitly, after sketching out actors’ expressions, I had to explore in more depth the symbolic and value dimensions in their articulations to uncover underpinning backgrounds. Therefore, I had to engage in a final stage of research aiming at ‘connecting the dots’. Most documents gathered at this stage were either academic (scientific studies) or institutional (e.g. procedures, official announcements).

3.2.3 Approaches to data codification and analysis

The data codification and analysis were carried out through a progressive and iterative process. Each unfolded layer of observation was codified and described before moving

into the following one. The codification of the data was informed by the CC lenses, my research objectives, and the reviewed literature. Insights were facilitated using different descriptive tools, summary tables and maps for the most, and were captured through concise analytical vignettes.

I have deliberately chosen to use mainly visual representations for the descriptive stage of my data, and short narrative accounts for the analytical stage for two main reasons. The first is that visual representations of the data are sometimes more communicative than pure narratives (Miles *et al.*, 2014; Dumez, 2013). The second, and perhaps less obvious reason, is my aim to clearly dissociate description and analytical account roles, since these can be easily confused if both tasks are carried out through the narrative tool. Descriptions are concerned with punctual, almost stationary objects or ‘states of the world’. Whereas, analytical narration is concerned with existing or possible links between these different described states and objects, focusing on change and attempting to uncover the meaning sustaining processes and evolutions by confronting different perspectives, which ultimately allows to discuss theories (Dumez, 2013).

For each CC lens, **firstly**, unit(s) of analysis was/were specified according to the research aims and objectives. While each CC lens identified the layer of observation, ‘where to observe’, unit(s) of analysis, which were deeply inspired by the aims of the study, determined the focus on ‘what to observe exactly’.

Secondly, data was codified according to selected codes, those that allowed capturing insight and meaning according to the set unit(s) of analysis. Codes also linked back the aims of the study to previous works on the subject explored in the literature.

3.2.3.1 Organising and describing data

Codification results were translated into a set of representations, evolving gradually and iteratively into a polished representation linking more neatly the observed reality to its depiction, based on the selected unit(s) of analysis. These representations organised the chaotic illegible material in legible interpretative frames that captured meaning (Dumez, 2013). Summary tables and relational maps were considered, and represented cuts allowing seizing the essence of the controversy (from the studied angle), and a serialization of different phenomena affecting the debate's progression and trajectory.

3.2.3.1.1 Summary tables

I used summary tables specifically to condense and organise the codified data in order to draw a clearer picture of its distribution, pursuing a more accurate appreciation of the weight that has been attributed within the debate to different aspects represented by the chosen codes.

These tables allowed calculating ratios, which helped drawing more ergonomic maps translating visually the weight of represented concerns and articulated literatures.

3.2.3.1.2 Relational maps

I used relational maps extensively in this study to draw 'miniaturised' depictions describing pertinently the chaotic observed reality. Maps mostly concerned a specific layer of observation and a single chronological sequence at a time (e.g. Actor networks'

distribution during the mass protest phase). However, they were exceptionally powerful in terms of representativeness and in their ability to generate analytical insight.

According to Venturini (2012), considering all perspectives does not imply an even representation of all matters of concern/actors, what he calls “dumb impartiality”. But rather, while opening up to all perspectives, their asymmetrical contribution must be highlighted and their order of relevance to the debate must be contrasted. The represented elements’ respective scope, level of influence, and relevance; were all considered and made apparent on the maps.

Considering this, relational maps, not only linked intelligibly concerns at stake, those actors standing behind, and their underpinning literatures and values, but also provided an instant visual appreciation of the weight of these elements with regards to each other⁵⁷. Likewise, using differentiating colours helped distinguishing opposing perspectives and different symbols, and these were kept the same over the study to enhance the reader’s intuitive comprehension.

Unsurprisingly, rich analytical insight stemmed also from comparing and contrasting maps between opposing perspectives and across different chronological sequences for an observational layer, preparing the grounds for in-depth analysis. For example, competing network maps were contrasted to analyse their evolution, and to underscore new connections and untied relations over the sequences of the debate, but also to

⁵⁷ Sizes (of represented elements) and distances (from focal points) are calculated on a proportionality basis according codes ratios.

compare opposing perspectives' network styles, strengths and performance. Likewise, contrasting maps chronologically, helped appreciating the stability and resistance of a specific viewpoint/matter of concern over time, whether it remained unwavering, it metamorphosed, or it vanished, while visualising other elements that may have contributed to such an evolution.

It would be relevant here to remind the inherent complexity of drawing these maps. While they simplified complex reality and opened amazing gates for analytical insight to emerge, they represented a challenging endeavour. Although, they are considered to be predominately descriptive, drawing these maps necessitated engaging a good step into the analysis of the handled data. The final versions were reached after many adjustments, a reiterative process that assisted my analytical description of the studied debate through the CC lenses and acted as a quality check all over the formulation of my findings.

3.2.3.1.3 Graphs and figures

In line with my eagerness to take advantage of visual representation, some graphs were used to appreciate trends and highlight evolutions (e.g. the level of engagement over the sequences of the debate). Also, in some occasions, I found it helpful to summarise analytical insight into a single figure (mainly in the last two CC lenses and discussion part).

3.2.3.2 Analysing data

The analysis progressed over two axes, up to and including the 3rd CC lens (exploring networks), (1) a chronological axe and (2) the CC progressive three first lenses. A binary sequential analysis was performed. Additionally, both opposing perspectives were systematically contrasted all over this binary progression.

3.2.3.2.1 Chorological progression

The first step in this attempt to understand social dynamics is to establish a chronology of the most significant events impacting the debate's trajectory. Actors' actions and interactions, and ensuing events and their significance, unfold in time forming the dynamics of social life (Dumez, 2013).

The most important determinants of the debate's chronology are those referring to (1) its start, (2) tipping points marking the end of a sequence and the start of the next one, and (3) the *analepsis*, referring to what should be necessarily considered (or be known) from anterior narratives to explain the start of the chain of events forming the chronology (Dumez, 2013). This last point had to be handled with care to avoid taking the wrong track. Not all pre-Rothamsted GM-wheat press articles that could be collected on the subject were considered relevant. Only those, which precisely explain the chosen start, were retained. Establishing chronological sequences allows highlighting 'silent' periods as well, where data seem lacking, showing the inherent deficient nature of the data (ibid).

The chronology of the debate, based on actors' views, was determined by triggering events, reinitiating, resuming, and fuelling discussions around the studied object.

3.2.3.2.2 The CC observational lenses progression

The CC dictated the observational pace, directing attention to one observational layer at a time. This paced framework has guided observation, description, analysis, and even extra data collection phases as explained in the previous section. The challenge was to organise and make purposeful use of extensive information emanating within each lens, especially that concerns and networks configurations showed interesting disparities between different stages of the debate. This was to a great extent simplified through codifying the data per event from the beginning and the drawing of relational maps.

The 4th and 5th CC lenses (and 'Articulated literatures' in Lens 1) did not necessitate a chronological cut, as they investigated more diffuse and stable aspects, namely underpinning beliefs, ideologies and projected states of the world, that appear closely linked to ultimate aims and shared values between a perspective's adherents.

Finally, the CC observational lenses while allowing a progression from micro competing statements to macro projected views of social life organisation; they allowed a thematic exploration of the debate as well. Analytical themes are different though from observational layers. Analytical themes stemmed from the most significant elements in the observed material that show explicative potential answering the posited research questions. For example, observing actors and networks initiated analytical discussions on actors' sorting categories accounting for different shades of agency across the examined networks and the role of spokespersons in sealing these.

3.2.3.2.3 A comparative analysis

Furthermore, for each lens and chronological sequence of the debate, the two opposing perspectives were systematically contrasted. This is what allowed re-constructing progressively the two perspectives' *Expected States of the World* (reached at the 5th lens), and appreciating their main divergences in terms of organisation, underpinning values and ultimate goals.

3.2.4 Data codification

The data codification gave raise to 10 codes (see table *Tb.3-2* at the end of this section), with multiple options each. The final condensed lists are presented in Appendix *Apx.3-2*.

In the following I am going to expose the codes as they were produced, their rationale, and their (expected) utility.

3.2.4.1 The debate's temporality and sequences (C1)

The debate sequences/events were codified according to the following:

(1) The start of the chronology

British articles discussing GM-wheat or GM-wheat trials appear limited, and were produced around specific triggering events. Therefore, I could reasonably consider all

articles where it represented the central subject and had obviously motivated the issuing of press articles. It was thus quite easy to choose the starting point. I simply took the triggering event that instigated the first discussion on a British GM-wheat⁵⁸. The announcement of the GM-Whiffy-wheat open-air trials appeared to me then the most appropriate starting point of the studied debate.

However, in reality, no debate starts without retrospection into *a past* that had provided grounds for its first *Problematization (formulation of its controversial stance)*, this is why reflection on the *analepsis* imposed itself.

(2) The analepsis

In order to determine what pre-narratives supported the British GM-wheat/GM-wheat open-air trials controversy, I collected all British newspaper articles that mentioned ‘GM-wheat’ in general. Then, I selected those articles that discussed it as a main subject. It was already obvious that a major and another minor event were those that provided anchoring grounds for future argumentation around Rothamsted GM prospects. To double check, I looked at the discussions over these articles, and based on a comparison of key concerns and arguments expressed in these articles with those in my main dataset, I have retained the selected articles to account for the British GM-wheat trials pre-narratives.

- The 1st American GM-wheat trial (5 articles)
- The Canadian cabinet paper on GM crops (1 Article)

⁵⁸ Initiated and monitored by a British institution and referring to British regulation and policy.

Although the number of articles appears somehow limited, the relevance of these in terms of impact on the studied debate was determined according to the vast reference to these events and their related concerns and justifications in actors' discourses in Britain. Both events had provided substantiation to some of the most prominent claims that arose later during the British debate.

(3) Tipping points (marking the end of a sequence and the start of the next)

Similarly to the starting point, tipping points were quite easy to identify due to the intermittent nature of the debate. Actually, looking at the chronology of the latter, and specifically at periods of silence, it is obvious that discussions were triggered by the announcement or the occurrence of specific events.

Four triggering events have been identified, delineating the sequences of the studied controversy:

- (1) The GM-Whiffy-wheat trial announcement
- (2) The GM-Whiffy-wheat break-in & mass protest
- (3) The GM-Whiffy-wheat trial results
- (4) The GM-Super-wheat trial announcement

Two additional 'micro' discussions intersected the GM-wheat open-air trials controversy: 'The American GM-wheat escape' (2 articles) and 'The Oxford non-GM-wheat alternative' (2 articles). The 4 articles were also considered due to their obvious link and contribution to the Rothamsted GM-wheat studied debate, and to them being produced within the timescale of the studied debate.

3.2.4.2 *The CC lenses codification*

(1) **Competing statements (C2)**

‘Competing statements’ are itinerant figures tracing the debate’s trajectory. They relate evolving⁵⁹ concerns and ensuing arguments (in favour or against) knitting a web of argumentation drawing the genealogy of the main viewpoints that represent the thick routes through which the whole debate is articulated.

To account for these routes, statements were classified first according to whether they support or oppose the Rothamsted GM-wheat open-air trials or the GM technology as a whole. These may be either direct or reported statements, advocating for or questioning one of the two strong divergent views on GM. They may be expressed explicitly, supporting undeniably one of the main positions, or implicitly, for instance, not opposing frontally one of these strong leading positions, but sowing doubts about its supporting evidence and logics.

It would be relevant to notice here that I do not comprehend the objects of the articulated ‘concerns’ as being intrinsically negative, which means, ‘concerns’ do not always and necessarily refer to negative outcomes. They may refer to the non-desired outcomes that need to be avoided (e.g. gene pollution), as to desired outcomes which attainment needs to be supported and which non-occurrence would represent a loss of opportunity (e.g.

⁵⁹ Once the initial concern(s) were raised and trigger controversy by making these troubling to others (who become “*related* and *affected*”), this ‘relational’ process is likely to dredge up other issues (Geiger *et al.*, 2014, p8).

seizing science to produce food more sustainably). In general terms, matters of concern are expressed mostly through oppositional statements (being against), but not only. GM supporters also seemed concerned about the acceptance of the technology and the integration of new prospect products within the market, which expresses mostly worries about loss of opportunities and hopes of desired effects.

Also, the truthfulness and accuracy of a statement is not a selective criterion. What is important at the selection stage is that a specific viewpoint exists (was expressed, and hence, carried a concern/interest). Ultimately, what makes it significant is its representativeness (how many subscribed to it), and the level of influence it reached (how many adherents holding an influential position or refer to an influential system of representation defended it), not whether it was/is intrinsically true or false. If a viewpoint could not be challenged to the point to be eliminated or ignored, which tangibly means it keeps emerging and soliciting interest (being answered or re-appropriated), it is considered valid⁶⁰.

Finally, some narrative statements describing the triggering events and their circumstantial determinants were retained if they could provide valuable information about actors' power position, underpinning or past references, or policy-making. 'Informative statements' helped appreciating the contextual and circumstantial elements of the study and some underpinning influences, but were not considered main carriers of the debate's concerns.

⁶⁰ I will come back to this point in the analysis section to explain clearly the difference between a 'valid' and a 'true' statement in controversial contexts. Validity draws upon relevance and not on 'mathematical' accuracy.

Statement counts will be provided in the next chapter and commented.

(2) Concerns mobilising statements (C3, C4, C5)

Assuming that statements within a controversy gather around matters of concern, which they make visible and use as rallying points, all statements were codified according to: **(i)** the concerns they refer to, but also according to **(ii)** the '*concerning-concerned*' stage they appeared to support.

The first point gave rise to **two codes**, the exact concern expressed or defended in a selected statement **C3** (e.g. risk of outcrossing, excessive use of pesticide), and the generic class of concerns they refer to **C4** (for the two aforementioned concerns, the classification would be 'Environment'). This second code grouped different single concerns that are of a same nature and generally have identical or very similar ultimate goals. This is even more relevant, since a specific concern may be expressed to support different perspectives or ultimate goals. For example, the concern about excessive reliance on pesticides within the current industrial agricultural system was mainly expressed from an environmental angle, but also expressed by some actors from an economic or health perspective, highlighting the cost of pesticides for farmers and the eventual harm caused to consumers' health. Thus, these two selected codes (Concern + Generic concern) highlighted the relational nature between selected statements and the expressed concerns they carry, but also the ambivalence of some matters of concern and the existence of clusters of concerns congregating around shared ultimate goals.

Then, a third code **C5** accounting for the '*concerning-concerned*' stage (second point above) was introduced. As explained in the 'Methods' section above, a statement is not an independent occurrence. It carries an aim, and therefore, it is there to act. Statements

relate (concerns to each other), rally (actors around particular concerns), influence (translate, convince, dissuade, talk on behalf of others, tie and untie relations), and normalise (integrate and establish new rules).

This third code sorting out matters of concern is meant to track the progression of expressed matters over the controversy, ultimately informing on how far their proponents would be from reaching their goal, where the latter represents the integration of their raised matters. This also helped appreciating and contrasting agencies between different '*Concerned-concerning*' stages.

Accordingly, 5 options were decided:

Initially,

- Selling matters of concern (making them worth discussing)
- Translating concerns (rallying and representing)
- Integrating concerns (normalising)

However, when I started applying this codification, I have noticed that the data itself highlighted another stage, where seeds of concern were being sown but there was not yet any clear form of questioning or clear targeted actors to be related to the expressed concern.

- Sowing seeds of concern

Also, many statements came in the form of a response to the raised concerns. In order to make the correspondence between statements more apparent since we are focusing on the relational aspect, I have chosen to distinguish these and give them an independent code.

- Responding to concerns (presenting 3 options)

The following table (*Tb.3-1*) informs on how the selected statements were dispatched over these codes.

Tb.3-1: C3-‘Concerned-concerning’ stages selection guideline

Options	Dimensions/Stages
<p>Sowing seeds of concern (Testing phase)</p>	<p>Statements which do not express clearly well-defined matters of concern, but express doubts or provide general criticisms about some aspects related to GM food/technology.</p>
<p>Selling matters of concern This corresponds to what Geiger and al. (2014) call 'To relate to', when some actors become 'concerned' relating to and selling 'matters that matter' Latour (2005) (Heating up phase)</p>	<p>Statements problematizing matters of concern and making them audible. Which means, those advocating the expressed concerns as questionable and legitimate objects of debate, requiring justification. Also, generally, promoting new order(s) of worth, which demands also disconnection from a previous state/norm.</p>
<p>Responding to concerns (R1) Response/rebuttal-Level 1 (R-L1) Response/rebuttal-Level 2 (R-L2) (Hot phase)</p>	<p>Statements that answer adversaries concerns (R1), those that refute an answer given by adversaries to one's expressed concern (R-L1), and Rebuttals of adversaries rebuttals (R-L2)⁶¹</p>
<p>Translating concerns <i>Callon (1986) defines translating as 'expressing in one's own language what others say and want'.</i> (Hot phase)</p>	<p>Statements serving rallying and enrolment purposes. Matters are moulded to match target actors' interests, different perspectives are being negotiated, and spokesmen are being appointed. Statements where some actors speak on behalf of others, interpret polls/studies results or an official body's declaration, were placed in this group.</p>
<p>Integrating concerns When matters of concern are recognised as definitely necessitating a solution, and signs of normalisation appear. (Cooling phase)</p>	<p>Statements showing signs of acknowledged matters through higher engagement with the normalisation of the issue. This could be made by change of practice or in present legislation. Actions integrating the 'worrying' element within the market frame as a fully legitimate object that needs to be dealt with and regulated.</p>

⁶¹ E.g. **Concern:** GM food is unhealthy → **(R1)** There are no cases of toxicity after decades of consumption in America, GM food is safe → **(R-L1)** Prof Gilles-Eric Seralini's research showing rats

It is worth mentioning here that overlaps occurred between ‘*Translating concerns*’ and ‘*Responding to concerns*’ categories, since it is common that actors have recourse to a third party’s declaration, research, or support, to respond to adversaries claims. If the involvement of a third party is clear, I would class the statement under ‘*Translating concerns*’ code, since it shows the games of translation actors play to enrol additional actors onto their perspective.

(3) Articulated literatures (C6)

The raised concerns within the selected competing statements were then matched with their articulated literatures. These represent the thick routes that mobilised the statements/actors and endowed them with a rallying or opposing potency (e.g. biodiversity, Frankenstein food, corporate hegemony, democracy-*Right to campaign*). Articulated literatures could represent more or less established constructs, generally drawing on an existing system of reference (e.g. Corporate hegemony drawing on anti-capitalistic philosophies), or referring directly to an established one (e.g. Democratic right to campaign), which endows a statement with legitimacy, credibility, and in some cases even with authoritative aptitude. However, they could be new promoted constructs that aim at challenging existing⁶² ones (e.g. 2nd generation of GM *versus* GM is an unreliable technology; Publically funded research *versus* Corporate hegemony).

developing serious tumours in few months after being fed on GM grains→ **(R-L2)** B bogus research criticised by serious research institutions, unreliable researcher funded by members of homeopathy groups.

⁶² ‘Existing’ could be just older or more developed, even if not well established, it is still representing a threat for competing perspectives if not counter-balanced.

(4) Uncertainty (C7, C8, C9)

Finally, and since controversies are built on uncertainties⁶³, the articulated concerns were then sorted according to their degree of uncertainty. This is important, because the level of uncertainty impacts the resistance of a concern over time and its rallying potency. A concern expressed in *Risk* terms, is a more reified concern than another expressed in *Uncertainty* terms, and it would be more difficult for it to be eliminated by its detractors. Determining the uncertainty level for main articulated concerns then helped appreciating the weight of opposing perspectives and their endurance capabilities. It also informed about the controversial concentration, since, the more statements are expressed in *Uncertainty* terms, the less likely the raised issues could be settled (any time soon), and the more potential they would have to get ramified and expand.

Practically, this necessitated a reflection on different shades of uncertainty and specifically, differentiating the notion of *Risk* from that of *Uncertainty*.

Three codes were defined:

- **C7**: Classification (Certainty, Risk, Uncertainty)
- **C8**: Typology (Positive/negative speculation, unknown)
- **C9**: Basis for classification

⁶³ Not only engendered by uncertainties (both technical and social), but also their fate is unpredictable as they unfold in time and space (Callon and al., 2009).

Due to overlaps between the two terms, and to them being used interchangeably with no consensual definition in the literature, I will describe here precisely what each of the terms (and their different shades) refer to in my codification. I based the following on (Callon *et al.*, 2009) understanding of the nature and levels of *Uncertainty*, which focuses specifically on scientific and technical uncertainties and spares us theoretical ramifications developed in the broad *Risk* literature that appear of little relevance to the object of this study.

Degrees of *Uncertainty* stretch from ‘Radical Uncertainty’ to ‘Certainty’. *Risk* seems to lay in between.

- (1) Certainty: generally refers to actual past or present witnessed effects or occurrences, which are perfectly identifiable and verifiable, although actors may disagree on how these occurrences took place⁶⁴. This sub-code (Certainty) is expected to display low appearance, as controversies do not focus on certainties. What actors dispute is generally not the event in itself, but the re-appropriation of such occurrences to support an uncertain matter⁶⁵. Whatever represents a future projection, by definition cannot be placed under ‘Certainty’,

⁶⁴ E.g. the American GM-wheat escape case reported in 2011 was approved by a recognised research centre and solicited official communication on the part of the American government, yet actors did not agree on the circumstances of the event

⁶⁵ E.g. GM opponents refer to the American escape case to support the concern of ‘outcrossing’. Here, because the raised concern could refer to an actual incident, the re-production of a similar incident becomes an actual risk rather than an uncertain projection. It also weakens GM supporters’ argument about the reliability of security measures they claim.

regardless of the (assumed) accuracy of its probable occurrence or non-occurrence.

- (2) Risk: Generally refers to hypothetical events which constituents, interactions between these, and effects are identifiable, at least to some extent, allowing constructing a plausible scenario of their (and their effects) possible occurrence. A plausible scenario may rest on *Objective probabilities* based on measurable and statistically predictable effects (*e.g. statistical analysis of series of past systematic observations*) or rest on *Subjective probabilities* based on actors' opinions, feelings and convictions (*e.g. a specific vision of the relationship humans should have with nature*). Scenarios issued from both routes, equally, may occur as they may not occur, and this illustrates the 'dark spot' that generates risk. Both types of probabilities in this study are considered a valid basis for constructing plausible future states of the world, and none is given predominance *a priori*. Their respective influence and authority is determined by actors.
- (3) Uncertainty: Refers to situations where, not only the occurrence of the adverse effects (object of the expressed concerns) are subject to doubt, but also the precise nature of these possible effects and their magnitude are unknown as well, which may lead to precautionary decisions/reactions.

- (4) Radical Uncertainty: This refers to situations where uncertainty can only be lessened (or known) *a posteriori*, and after having thought and put in place a whole apparatus monitoring scrupulously effects and systematically analysing these. Generally, this is done when harmful effects emerge and some links to the cause could be established. ‘*Radical Uncertainty*’ denotes a situation where, by no means in the present, the dark spot representing the lack of knowledge could be enlightened nor uncertainty could be lifted before experiencing the object in question⁶⁶. As for ‘*Certainty*’, this code presents very low presence in the data, since most discussed items had been at least tested in laboratories during their approval phase, although these tests do not lift uncertainty. The ‘*Uncertainty*’ code would be expressive enough in these cases.

Both, *Risk* and *Uncertainty*, could express a less or more probable occurrence of a feared undesirable effect or a hoped positive effect. So, speculations could be negative or positive. As noticed in the preceding section, concerns should not be perceived as intrinsically negative.

In the case of Risk/Uncertainty codes in particular, I did not follow actors’ terms, as actors mostly tend to use the term ‘risk’ to describe both categories. Generally, for a

⁶⁶ E.g. GM foods are considered unsafe for human consumption by opponents based on the absence of systematic and prolonged observations allowing ascertaining their safety or identifying precisely possible harm that may occur subsequent to their consumption, and in such case, how to mitigate this. While opponents claim radical uncertainty and the need for more longitudinal studies before introducing GM food on the marketplace, GM supporters claim ‘No risk’ based on the absence of any obvious link to possible toxicity or illness for humans. A completely opposite appreciation.

statement to be classified under *Risk* it has to be built somehow on an element of *Certainty*, whether objective or subjective (e.g. past occurrence, valid systematic observations, common-sense, general widespread opinion), or it has to present an identifiable issue (including its effects). On the other hand, statements discussing an open matter evolving in the dark with no discernible boundaries or reference point, for both, the matter itself and related possible perspectives, are placed under one of the *Uncertainty* codes.

Apx.3.3 provides a few lines as an example of *Competing Statements*' codification.

(5) Actors (C10)

In line with the ANT principles, anything that could be identified to be *doing something* was considered to be an *Actor*, and was recorded as many times as it was involved in an action or depicted in a way that induced action. Therefore, the number of listed actors does not represent the actual number of actors, but the number of actors' manifestations that impacted the debate, even indirectly.

This allowed appreciating engagement variation of different groups throughout the triggering events of the controversy, and also, examining the level of consistency in terms of support given to each of the dominant perspectives.

Identified actors were classified according to: **(1)** whether they support or oppose the (GM) technology and applications, and **(2)** whether they speak for themselves (including those who appoint their representatives) or are represented without a deliberate nomination of those who spoke/speak on their behalf. In the latter case, the classification depends on how they were depicted by their *representatives* or the role

that was attributed to their action, and therefore they may appear more than once and in conflicting positions, supporting and/or opposing any of the two categorical positions.

This gave rise to a 10th code (C10) accounting for actors' contribution to the debate, presenting 5 options:

- Actors *definitely* supporting GM-wheat/plans.
- Actors *definitely* opposing GM-wheat/plans.
- Actors favouring the pro-GM perspective (through the named action)
- Actors favouring the anti-GM perspective (through the named action)
- Indeterminate actors (pending/inconclusive action)

All actors were grouped and codified in a summary Excel table with a brief description of their contribution to action⁶⁷, and related to their source (press article) and triggering event.

Apx.3.4 provides a few lines as an example of *Actors* codification.

⁶⁷ Kept as close as possible to actors' words, mostly copying actors' expressions.

Tb.3-2: Summary of codes

Code	Designation
C1	Triggering events
C2	Competing statements
C3	Concerns
C4	Generic concerns
C5	Concerned-concerning' stage
C6	Articulated literatures
C7	Uncertainty classification
C8	Uncertainty typology
C9	Uncertainty basis
C10	Actors contribution to action

Appendix (Apx.3-2) provides the final condensed list for sub-codes (coding options).

3.3 Validation and reliability

The question of validation⁶⁸ and reliability is at the heart of any research study that has the ambition to claim being credible, and eventually useful. Qualitative studies are not an exception, although the criteria gauging the quality of such studies, and whether these criteria should rest upon an objective appraisal of the used methods or rather on how the findings are judged and appreciated by users, are still a debated question amongst scholars (Roller and Lavrakas, 2015).

⁶⁸ The term 'validation' (and by the same occasion, the term 'reliability') in qualitative research became almost a homonym due to them being synonymous of many terms ensuing from different perspectives and frameworks at the same time, but also to them referring to internal and external validation strategies (some of the most popular: Lincoln and Guba, 1985; Eisner, 1991; Lather, 1991,1993). I have chosen to use the terms 'confirmability/confirmation' presenting these as the most representative equivalent to 'validation', and the terms 'Trustworthiness' and 'Transferability' to define what is meant in general by 'Reliability'.

To understand this disparity, it is important to remember that the matter of assessing qualitative research stemmed from controversy, as a reaction to quantitative positivist critiques towards the claimed quality of such approaches, where the appreciation of rigor does not seem to conform to a set of well-defined and generalised criteria (Morse in Denzin and Lincoln, 2011). This ‘external’ attack triggered resistance, based on the fundamental differences between both approaches (qualitative and quantitative) in terms of the nature of their enquiry and the pursued goals, but at the same time, initiated a long series of approaches to rigor since the early 1980s. Some of these advocating a set of criteria, standards or checklists (Lincoln and Guba, 1985; Eisner, 1991; Lather, 1993; Whittemore *et al.*, 2001), while others took a broader and more flexible view on the matter based on the singularity of qualitative enquiries and their dependency upon the researcher self-reflexivity, understanding, and representation of the material, and the quality of the provided description with regards to research processes and ethical implications (Lincoln *et al.*, 2011; Angen, 2000).

In this study, I am embracing a middle path inspired from these works, not refuting the possibility and usefulness of considering a ‘objective’ appreciation of the quality of my research (in terms of accuracy), nor claiming the absence of subjective⁶⁹ choices throughout the process. These subjective and thoughtful decisions allowed a certain calibration of the methods to make their application more apt and relevant to the specific

⁶⁹ Subjective does not mean unfounded but means adapted to the specific context and research aims of the study in a substantiated manner. There is a very interesting discussion in (Dumez, 2013) about the objectification of qualitative accounts through the distinction between the interpretation of the researcher of the studied situations and the actors’ description of these, which makes the research outcomes open to critique and scientific.

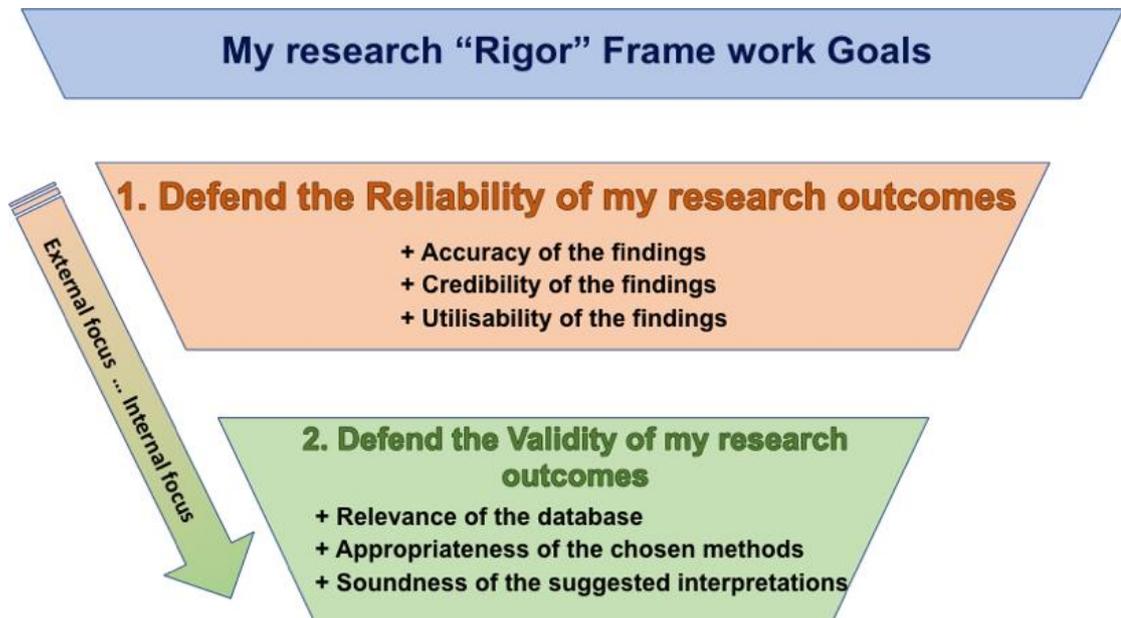
research enquiry and context within which the studied controversy evolved and to which the data referred closely. While it is important to establish some conditions for rigor, these conditions need to be carefully selected and planned all over the research process; otherwise they become inhibitors of quality rather than warranties (JM Morse in Denzin and Lincoln, 2018, p814).

Therefore, based on the literature cited above, I decided to conceptualise my own research '*Rigor Framework*' specifically designed to fit the data, methods, and purpose of my study. Since perspectives in this literature present noticeable overlaps, and many terms are used interchangeably or may embrace different meanings at once (Creswell, 2013), I shall in the following section define my framework terms and strategies and explain how they were implemented and are meant to be understood.

3.3.1 My research '*Rigor Framework*'

Phase 1

To build my research '*Rigor Framework*', I firstly determined its main goals (in terms of reliability and validity) as shown in *Fig.3-2* below.

Fig.3-2: My research ‘Rigor Framework’

The way I set these goals reflects an evolution from an external validation focus of my research outcomes towards and internal validation focus that supports the first, and which also stands as a goal in its full right. This is based on the idea that if a research is not useful or does not have a transformative value, it is considered somehow useless (Creswell, 2013; Angen, 2000). However, in practical terms, most of the actions carried out to fulfil these (externally oriented) goals, as we will see later in this section, are planned at an early stage and carried out throughout the research, and not at the end of the process.

By ‘*Validity/Validation*’ I mean confirmation at each step of the research process establishing credibility and accuracy of the collected data, chosen methods and suggested interpretations. By ‘*Reliability*’ I mean the trustworthiness, authenticity, and transferability of the research outcomes. ‘*Validation*’ requirements aim at allowing a

reasonable appraisal of the quality of my study, by myself first while I am undertaking the research, and ultimately by those who are entitled to assess its quality. Whereas, ‘Reliability’ requirements aim at making my study accessible for other researchers, to discuss, build on, and challenge its methods and results. These two overarching aims (Validation and reliability), in my opinion, provide an answer to the main concerns expressed in respect of qualitative approaches by defending their ‘*scientificity*’ and by inserting them in wider scientific discussions.

Phase 2

After establishing my ‘*Rigor Framework*’ main goals, I reflected on key risks that may prevent the fulfilment of these goals, and then progressed logically towards the possible actions, translated into ‘*Rigor requirements*’ and related these to specific moment(s) of the research process during which they need to be implemented.

‘*Rigor requirements*’ entailed establishing reflexivity and self-examination all over the research process, through critical thinking, systematic justification and thick description of: **(1)** the relevance of the data to the puzzle I am trying to resolve, and its accuracy, **(2)** the appropriateness of the chosen methods, and **(3)** the soundness of the suggested interpretations. These three steps will be given high priority in terms of rationale description and justifications.

My approach to research validation/reliability rests upon sound critiques of the efficiency and suitability of the developed quality assessment standards and checklists

in the case of interpretative studies⁷⁰, but is also based on the fact that qualitative rigor is instable in nature being dependent upon the specific investigated question, and more importantly, upon the intend of the researcher (JM Morse in Denzin and Lincoln, 2018, pp.804-805). This last point is as much important as the former. Clarifying the purpose of each action and choice, and the rationale behind these, appears being a crucial matter throughout the research process. I join those who understand *quality* as being a continuous awareness and observance of selected key rigor requirements building progressively “*certainty, confidence, and solid results*” (Meadows and Morse, 2001, pp.187–200; Denzin and Lincoln, 2018, p803), and not as *post hoc* evaluation, acknowledging however that some externally-oriented actions may be added ultimately to enhance and facilitate the *utilisability* of the research outcomes.

Appendix (Apx.3-5) sketches out the main risks to be managed to achieve the set ‘*Rigor*’ goals mentioned above.

3.3.2 The CC method assisting validation strategies

The CC by its inherent principles also supported validation strategies, and thus, strengthened the reliability of the outcomes.

Since the CC admits a malleable theoretical framework and obliges through its progression considering plural perspectives and contrasting these, it interestingly

⁷⁰ There is a good and succinct discussion in Denzin and Lincoln (2018, p801-803) on the critiques towards the use of standards and checklists to assess the quality of qualitative research, and their political dimension.

protected the research outcomes from three fundamental risks menacing qualitative research described by Dumez (2013) and Creswell (2013).

- (1) Seeing in the collected material/data only what confirms theory (Risk of circularity).
- (2) Favouring one interpretation (and ignoring other possible ones).
- (3) Flat interpretations (failing to interpret the data).

Additionally, and specifically when studying contested realities, more clarification is required about the representativeness of different stakeholders to assure a fair interpretation of their accounts. The CC framework provides clear criteria on how to dispatch representativeness of different viewpoints and actors, based on the effects they generate and the connections they build. A fair representation is a representation that mirrors the inequality of competing perspectives.

Finally, the CC helped organising and simplifying the overwhelming nature of qualitative data collection and analysis, ‘hardening’ the data and providing a well-articulated analytical scheme that specified units of analysis and allowed a fluid navigation between different layers of analysis. This pragmatic fluidity will be better perceived in the next chapter, where the CC lenses were actually implemented.

3.4 Generalizability

I believe the question of research outcomes generalizability is an important discussion in the context of a qualitative study. Not because it needs absolutely to be defended (if we follow the sceptical views seeking hopelessly correspondence with quantitative sampling representativeness), but because, simply saying that *Generalizability* is not an

intrinsic or main aim of qualitative approaches to close the discussion, is similarly not defensible.

The most important thing to clarify here is that, qualitative researchers as well must be concerned with this question of *Generalizability*, although in a different way than a quantitative researcher would be. While the latter would seek to rely on statistical sampling of representative sub-sections aiming at making broader inferences about whole populations; such sampling procedures obviously not available in qualitative settings, qualitative researchers are consequently not being able to claim extending their observations due to the restrictiveness of the studied sample (Silverman, 2013). In this case, *Generalizability* is thought, not in terms of extending observed traits to whole populations or a broader group of subjects (statistical)⁷¹, but in terms of theoretical propositions (Analytical) (Yin, 2009). In fact, through ‘restricted’ samples, qualitative researchers are testing theories and exemplifying social relations (Silverman, 2013).

3.4.1.1 The very special case of ‘Case Study’ Research

Talking specifically about *Case Study* research, critics against the generalizability of its research outcomes had been so harsh that they pronouncedly contributed in supporting attacks against it as a scientific method of enquiry. Namely, that *Case Study* research produces “context-dependent knowledge”, not to be generalised, thus not allowing

⁷¹ This is also consistent with the ontological discussion provided above, this study does not claim discovering ‘Universal truths’. By accepting the existence of ‘multiple truths’, social constructionism admits the right to be different as an individual or a collective and challenges the concept of ‘universal truths’ promoted by the modernists that is meant to be valid for all people at all times.

contribution to scientific development, especially when based on a single case (Flyvbjerg in Denzin and Lincoln, 2018, p304).

I think, one of the most relevant discussions to tackle this issue from its roots, would be the distinction between ‘transferable knowledge’ and ‘generalizable knowledge’. The latter tend to be magnified, being presented as the only attribute that a research outcome needs to possess to be qualified as scientific (shadowing the former), while it is just one way amongst others of legitimising scientific inquiries, even in hypothetic-deductive approaches (ibid). Knowledge can be transferable even if not generalizable. For example, with regards to processes, or when testing theories and producing falsifications through in-depth examination of deviant cases, or when advancing theoretical concepts through analytical generalization (Flyvbjerg in Denzin and Lincoln, 2018).

Likewise, the allegation that *Generalizability* is not possible based on a single and specific case study, is another common quick judgement (if not misunderstanding) of *Case Study* research, making *Generalizability* conditional upon the number of cases (Giddens, Campell cited in Flyvbjerg), while *Generalizability* as intended in naturalistic terms is contradictory with the very essence of *Case Study* research. This is simply because the way *Generalizability* is understood is embedded within a reductionist view of science assuming summarising findings into distilled theories and recapitulating maps, which entails losing essential details capturing the complexity and richness of social realities⁷², which represent actually the quest of *Case Study* researchers. As Yin

⁷² Makes the understanding of ‘virtuoso social acting’ (Flyvbjerg in Denzin and Lincoln, 2011, p312)

(2017, p38) says pertinently, refuting clearly the reductionist approach and the idea of the case study being a ‘sample’, it is about “ *Generalizing from the case study, not from the cases*”.

Although, the first aim of such a method is not claimed to be *Generalizability*⁷³, other kinds of transferable knowledge are produced out of case studies. Case studies are insightful in a way that theories lack to be when it comes to real-life practices, and allow uncovering multiple faces of a studied reality (Flyvbjerg in Denzin and Lincoln, 2018). In doing so, they provide multi-layered nuanced knowledge, and new perspectives to extend the initial inquiry. Case studies provide a virtual multifaceted reality about a question, where different visitors can find different objects and useful teachings as it is judiciously said by Flyvbjerg, (Denzin and Lincoln, 2011, p312) “*the goal is not to make the case study to be all things for all people. The goal is to allow the study to be different things to different people*”.

I understand my case study as an opportunity to describe and understand social life (Byrne and Ragin, 2009). In this research, I am investigating the Rothamsted GM-wheat debate case aiming at generating insight exposing and explaining agencies involved in disputing a controversial market. I am not claiming my results to be representative of all forms of market *agencing*, but I am aiming at unveiling and explicating some *agencing* mechanisms that are likely to be reproduced in controversial markets, and even to serve as ‘stabilisation’ strategies in seemingly cooler periods, since markets reality is intrinsically unstable, animated by competing versions. This study will also

⁷³ In naturalistic terms.

provide a thoroughly described example of the CC application that could help other researchers dismantle methodologically social controversies.

3.5 Ethical considerations

This section on ethical considerations is placed at the end of the chapter, not because it is the last thing to consider when doing research, but rather, because these considerations are present all over the research process and do not concern a specific part of it.

My understanding of a reliable research is that it must be morally sound at the first place. It is commonly understood that qualitative research is even more subject to a scrutinised verification of ethical implications of its methods⁷⁴ and process on involved parties, including the researcher him/herself. This is because in most cases, qualitative research data collection involves interaction with participants (interrogated or observed), and also appears to be the preferred approach to explore sensitive subjects (Silverman, 2017).

Since this research exclusively relies on freely accessible public documentary data, questions of prior consent, confidentiality and careful interaction with participants do not apply. However, the soundness of interpretations of the collected data and its ownership are still to be considered from an ethical viewpoint (Sixsmith and Murray,

⁷⁴ Mainly, data collection and interpretation.

2001). The research needs to be conducted and interpreted in a way that does not harm or cause prejudice to any involved party. Similarly, it must not include or generate any illicit material or outcomes.

3.5.1.1 On-going ethical measures

To insure a sound and trustworthy interpretation of my data, I monitored carefully the three following aspects all over the research process: Traceability, transparency, and trustworthiness. The endeavour was also made possible by integrating these concerns into my research process through my '*Rigor framework*' exposed above in (section 3.3).

Traceability

Traceability was enhanced by a rigorous referencing and a clear communication about main data sources. The study's referencing was done according to Lancaster University-Harvard Style, using the free online referencing software called Zotero. Referencing inconsistencies were resolved through continuous interaction with the online Zotero community and thorough double-checks made by a friend of mine.

The selected newspaper articles forming the principal data set were listed by: date, issuing newspaper, title, and author, which makes them easily identifiable. All illustrative quotes were automatically related to their specific press article, and attributed to their cited author if any.

Transparency

Transparency was already enhanced by the traceability of the interpreted data and observance of rigorous referencing, but also by providing a thick description of

descriptive and interpretative tools used to analyse the collected data and to draw conclusions.

A detailed account was provided in previous sections of this chapter exposing data codification choices, and approach to data analysis and interpretation. Also, the aims of the study were clearly articulated in the introductory chapter. Finally, a personal statement at the beginning of the study and a reflexive statement at the end of it were added to account for challenges and implications of this research journey beyond its purely academic aspect.

Trustworthiness

Extensive quotation was used in the analysis chapter to account faithfully for actors' views, and to prevent any misinterpretation of their discourse by allowing a more holistic understanding of actors' conflicting positions. Main interpretations are derived from repetitive and confirmed views and not from single announcements. I tried to my best to avoid building interpretations on single occurrences, partial or minimised discourses present in the data, since these are traps for data misinterpretations (Sixsmith and Murray, 2001), favouring quick and inaccurate conclusions.

As mentioned above, a careful attention was also given to referencing in order to assign any borrowed ideas and terms to their original author(s).

3.5.1.2 Data ownership

I do not own the data I am using in this study. The data was initially generated for the public sphere, and is freely accessible online. To select and access the targeted newspaper articles, I have used my student access to the *Nexis* database, provided by

Lancaster University. However, I do own my interpretation of the data that will be published in due time as a PhD thesis, and may also appear partly in Journal articles.

3.5.1.3 Formal Ethics Approval

This research was approved by my Supervisor Dr. Gillian C Hopkinson and the Management School Ethics Committee at Lancaster University. Ethics approval referenced FL16217 was confirmed on the 30th May 2017 (see appendix *Apx.3-6*).

3.5.1.4 Thesis over-length approval

An over-length request was submitted in April 2020, received approved raising the word-count limitation to 100,000 words. A copy of the request, exposing the justifications provided to the committee, and a copy of the approval (email) are provided in (Appendix *Apx.3-7*).

3.5.1.5 My personal commitment as a researcher

Last but not least, since ethical considerations are not to be considered punctually but to accompany the research process, I do believe that producing ethical research stems from the researcher's awareness of these considerations and his/her willingness to fix these at the first place. It is a matter of awareness and commitment at the same time. I have personally familiarised myself with research ethics at an early stage of the research, and have checked continuously my interpretations, and even the language I used to account for these, trying my best to avoid minimising or magnifying some

aspects to the detriment of others based on my own judgement or any aspect extraneous to actors' expressions and choices.

4 Analysis & Findings

Introduction

This chapter covers two parts:

- Part 1: Analysis of pre-narratives

By analysing the selected articles that debated the 1st American GM-wheat trial and the Canadian secret brief content, this section will provide a clear idea about the British debate's background in terms of perceptions and opinions held about GM-wheat and technology.

- Part 2: The five CC observational lenses layered analytical description

This represents **the principal part of this chapter**. It consists of a dynamic examination of the debate's progression through a detailed description and a comparative analysis of different stages of the debate with regards to: main expressed concerns, articulated literatures, involved actors and networks, and underpinning ideologies. This part aims at providing a comprehensive comparison of opposing perspectives and their projected states of the world.

The first three lenses will describe the controversy mainly from the actors' viewpoints. While the last fifth lens, which comes in a form of a concluding lens, will expose my summary points as a researcher with regards to blocking and incompatible aspects and possible bridges between the two opposing versions on GM prospects and technology.

Part A: Analysis of pre-narratives - The debate's background

The discussion around GM-wheat prospects was first instigated in Britain by Monsanto's decision to go ahead with the first GM-wheat open-air trial as a means supporting its application to get official approval from the FDA for potential marketization. Procedures, including open-air trials, were meant to take about three years to be completed and for the approval to be granted in the US, still, Monsanto's plans were perceived in Britain as an imminent threat to food safety and consumer rights in terms of choice.

The dissemination of the Canadian cabinet paper forewarning about risk of losing export markets out of fear of potential contamination of conventional GM crops (in 2003) and Monsanto's decision to put halt on its GM-wheat plans for eight years after failing to convince cereal industry stakeholders and wheat farmers (in 2004), reaffirmed the market oriented discussion. At this stage, wheat producers and food processors have seen their commercial interests threatened by the introduction of GM-wheat within the existing supply chain, thinking promised benefits were still unwarranted and could not outweigh the risk of losing actual market shares and secured profits.

Monsanto's decision to temporary withdraw from GM schemes was welcomed by GM opponents, and interpreted by some as a flagrant failure of plans acting against *Nature*. However, five years later, in 2009, Monsanto announced resuming its GM plans, and

even demonstrated its firm commitment by acquiring a wheat-breeding company, WestBred, specialised in wheat germplasm⁷⁵.

A.1 Competing statements & articulated literatures

The following table *Tb.4-1* shows the pre-narrative statements' distribution.

Tb.4-1: Pre-narratives statements' distribution

EVENTS	Informative	Opposing	Supporting	Grand Total
Monsanto's 1s GM Wheat trial (US)	7	42	27	76
Canadian cabinet paper	1	13	2	16
Total	8	55	29	92

A clear dominance of opposing statements within this pool (55 out of 92) suggests that pre-narratives about GM-wheat plans and biotechnology applied to food in Britain were quite negative and worrying, sowing seeds of concern and preparing the grounds for a challenging reception rather than a docile acceptance of the announced GM-wheat prospect.

Opposing statements discussed by North Americans appeared predominately business interest driven, discussing structural market barriers that needs to be overcome. Whereas, those expressed from a British/European perspective had a strong questioning

⁷⁵ Plants genetic material.

tone and interpreted the possible advent of the American GM-wheat as an imminent threat to the local traditional bread loaf, consumer rights, and institutional sovereignty in Europe. As for supporting statements, they were mainly shared between responses to opponents' concerns and GM advocates' worries about opportunity loss (respectively 14 and 12 out of 29).

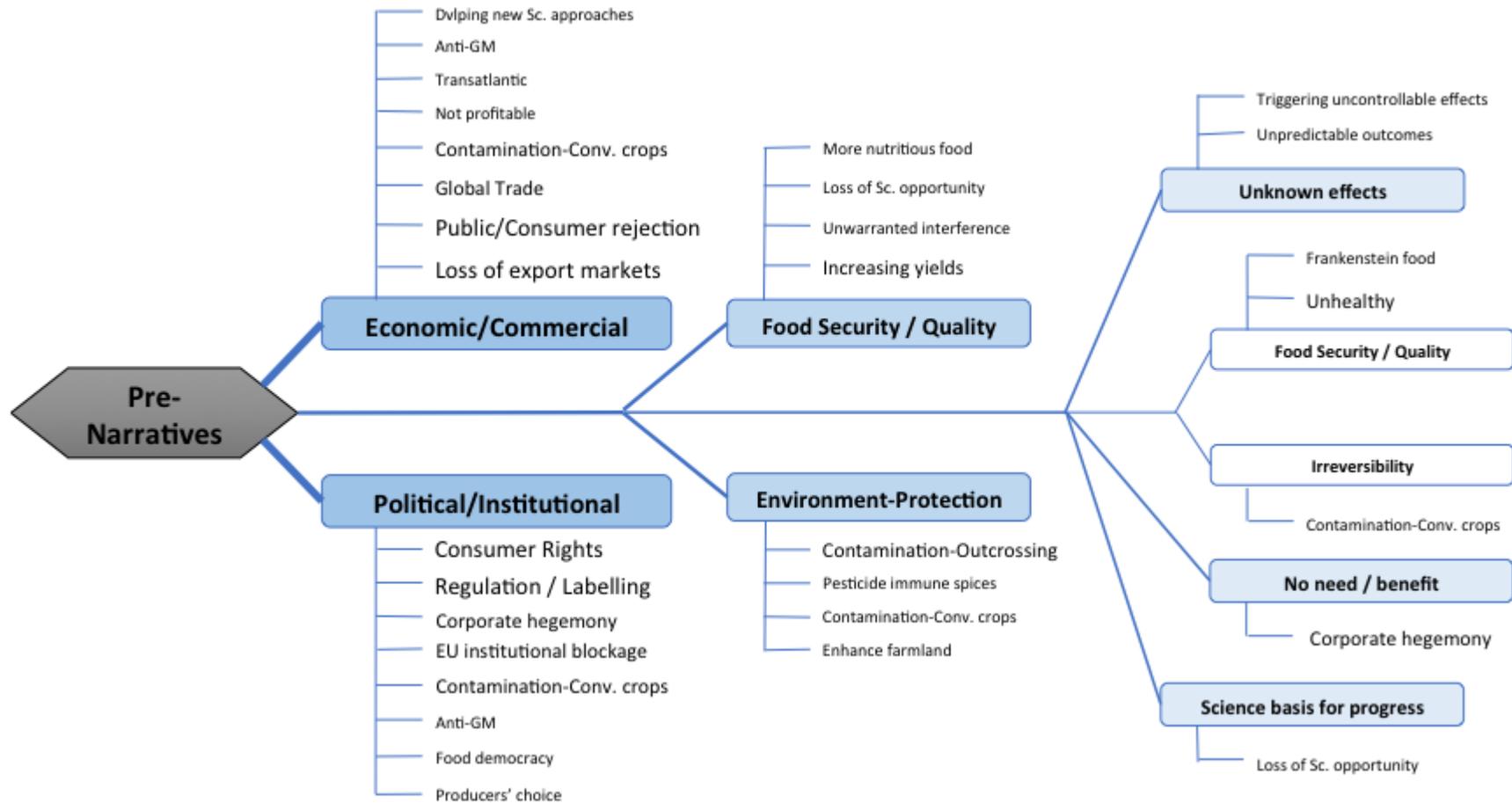
A.2 Main matters of concern

28 matters of concerns were raised throughout the pre-narrative selected statements (See appendix *Apx.4-1*).

Opponents introduced most matters of concern (19 out of 28), with a clear contrast between both sides of the Atlantic. North American concerns were mostly linked to estimated or perceived adverse effects on the local economy and the profitability of the cereal supply chain, while in Europe opponents were mainly concerned about protecting consumer rights and the environment.

The following map *Fig.4-1* illustrates expressed matters and their standpoint.

Fig.4-1: Pre-narrative matters of concern relational map



The map shows that pre-narrative concerns were expressed mainly from an economic/commercial and a political/institutional angle. Questions about the unnatural aspect of GM and unwarranted possible effects did not appear of big relevance for the discussion, especially from the North American perspective.

Market concerns

Market regulation and profitability concerns dominance could be explained by the fact that GM-wheat is in its introductory stage into the market. This introductory stage is generally demanding in terms of market formalities and publicity, aiming at regulating the new product making it ready for consumption, and at convincing business partners forming the supply chain of the product that it is worth the investment. In the specific case of new technologies, this stage could be a very challenging stage, especially if the product cannot be authorised on strong analogy basis with an already existing product. New products must pass safety tests, and get all their features and technical descriptions formulated and communicated to official bodies for approval. Failing to meet any of the requirements would prevent a prospect from entering the market.

Another plausible way to support this reasoning is by looking at the ‘concerning-concerned’ stage(s) most statements referred to, which are in this case, ‘Sowing seeds of concerns’ and ‘Selling concerns’ (88 statements out of 92). At these stages, concerns are still limited, and are mainly expressed by the main instigators of the debate. They have not reached yet the ‘swelling’ phase where diverse actors, including unexpected ones, relate to, extend, and alter these, giving raise to new and extended forms of the expressed matters. Only 4 statements out of 92 could be assigned to translating phase

of the raised matters, and were all extracted from the last article in date (2009) commenting on Monsanto's decision to resume with GM plans. These statements demonstrate that Monsanto's decision was made possible by a move forward connecting and involving existing and new actors, which was illustrated by the emergence of new coalitions that are made public, as shown in the following extracts.

"In 2006, a coalition of US wheat industry organisations called for access to genetically-engineered wheat varieties with enhanced traits" (Art.6)

"A survey released in February 2009 by the US found that more than three-quarters of US farmers wanted access to genetically engineered varieties with resistance to pests, disease, drought and frost. Such varieties are important as plant scientists and farmers continue to battle diseases such as leaf rust, the world's most common wheat disease, which can lead to yield loss of up to 20%". (Art.6)

"The German plant science and chemical company Bayer and Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO) are collaborating to develop wheat varieties with higher yield" (Art.6)

"The agribusiness company not only announced in July 2009 that it would of genetically engineered wheat varieties, it also further demonstrated its commitment by buying WestBred, a Montana-based wheat-breeding company that specialises in wheat germplasm, the plant's genetic material" (Art.6)

Underlined expressions illustrate the formed alliances. More importantly, these first alliances had instigated the enlargement of the scope of interest in GM technology, and precisely in GM-wheat prospects. It could be clearly noticed that agro-food actors allying with scientists and seed breeder companies, and that actors' range has started to broaden.

Market barriers

Market barriers to GM crops, and GM-wheat in particular, appear to be mainly rooted into:

- 1 Regulation struggles
- 2 Not having full control over the technology's effects (or not being able to demonstrate so)
- 3 Public/consumer (perceived or actual) rejection of these novel forms of food.

These generic barriers, of course, may manifest in different ways and overlap.

(a) Regulation matters

"We need a certain number of trials to achieve registration from the US Department of Agriculture and the Environmental Protection Agency,"
(Mark Buckingham, a spokesman for Monsanto's headquarters in St Louis, Missouri, Art.1)

Although the trials appear to be an important step towards the actual introduction of GM prospects onto the marketplace, these do not seem to represent for Monsanto the main regulatory concern⁷⁶. Contrariwise, the European mandatory labelling imperatives, as seen by Americans, represented a far more serious matter, hampering the progression of the whole project.

"However, these visions of the GM loaf of the future will rest on whether American trade negotiators can convince the EU to amend its insistence on the mandatory labelling of GM products".
(James Astwood, director of product safety at Monsanto, Art.2)

"The impasse with Europe over mandatory labelling was having a serious impact on the other side of the Atlantic. It is a huge issue for Monsanto that the regulatory system is completely stalled. It impacts

⁷⁶ Worth mentioning here, trials were not opposed in the US in a way that would compromise their completion but opposed as one of the manifestations of actual plans for GM marketization.

farmers' perception of the market for their products. US farmers value the European market for all their products".

(Mr Buckingham of Monsanto, Art.2)

(b) Not being able to demonstrate full control over the technology's effects

Talking about 'cross-contamination', in pre-narratives, it appears mainly expressed from a commercial perspective, rather than environmental (contamination of the wild). The improbability to reasonably guarantee the separation between GM and non-GM crops seems to be one of the main concerns causing the resistance to GM prospects within the cereal supply chain. It also suggests a lack of control over the new technology from a technical viewpoint. Not only the technology is facing its integration within its social environment, but also it does not seem completely 'ripe' technologically.

*"...However, similar plans to keep GM maize separate from conventionally bred maize **have failed**. Environmentalists demonstrated last year that **a GM variety called Starlink**, which was supposed to be used only for animal feed, **ended up in tortilla chips** sold in American supermarkets" (Art.1)*

*"It is also **very difficult, not to say impossible** (to separate GM-wheat from non-GM-wheat)*, **as we have discovered with canola**, to prevent the spread of GM canola plants into conventional crops".*

*(Mr Robbins, a farmer, Art.4) * Expressed in previous statement.*

Additionally, these statements show that the risk of cross-contamination between GM and conventional crops, if both traded within the same supply chain, is based on past factual occurrences, which makes it a reified risk. This could be perceived clearly in the next extracts below. The risk of cross-contamination is considered by Mr Robbins (a farmer) such a serious matter that he blamed his government for not preventing the introduction of GM-wheat through legal regulation to protect conventional crops, and by extension, farmers' interests, especially that cross-contamination has proven to be irreversible.

*"The Canadian government's problem involves **the lack of legal regulation to thwart the introduction of GM-wheat, prompting the potential for contamination of conventional crops**".*

(Mr Robbins, a farmer, Art.4)

“Cross contamination, it said, was now "irreversible" (referring to canola). Canadian farmers feared the same would happen with wheat, prompting a loss of exports and a crash in prices”.
(A senior civil servant, who drafted the secret paper addressed to the Canadian government, Art.4)
* Expressed in previous statement.*

(c) Public/consumer rejection of GM crops

Pre-narratives talk essentially about consumer/market rejection, rather than public rejection, with an emphasis on macro-consumers (by contrast to individual consumers). By ‘macro-consumers’ I am referring to the big blocks of intervening actors within the cereal/wheat supply chain, whether prospect clients of the technology itself, such as farmers, or prospect clients of the produced GM-wheat, such as agro-industrials. This goes beyond national boundaries, and includes by extension importers of the same genre. Failing to convince these actors prevented the formation and establishment of the required supply chain for the GM-wheat to be marketed.

This was essentially linked to the reliance of the North American cereal sector on exports. The internal resistance from American farmers and producers could be clearly qualified as commercially driven and be attributed to their foreign customers intolerance to such crops, based on lack of warranty.

*“GM-wheat was supposed to be Monsanto's next big thing yet **the company had lost the support of its own customers**” (Art.5)*

*"Monsanto failed to convince even the most die-hard GM supporters that GM-wheat was worth the risk, ... **World-wide opposition from farmers, exporters, and millers** meant GM wheat would have been a bigger white elephant than the Millennium Dome" (Art.5)*

*“...in part because of **opposition from North American grain merchants and growers**, as well as concerns that some **major foreign importers would reject imports of all American wheat** because they could be "contaminated" with genetically engineered varieties. **European countries and Japan**, which*

have traditionally imported about 45% of US wheat exports, have been resistant to genetically engineered crops and food derived from them” (Art.6)

“A secret briefing to the Canadian government has warned that the country's massive food exports are at risk from its continued use of GM crops” (Art.4)

“...producers are becoming worried about losing markets” (Art.4)

As for consumer rejection, it was mainly expressed with regards to labelling, with a more conclusive stance in Europe strongly backed by assumed consumer rights to know what they are eating and the special status attributed to staple foods.

“American government officials, and the biotechnology industry, are nervous that consumers will shy away from products clearly labelled as containing GM ingredients” (Art.5)

“The European Union - and Britain's Food Standards Agency - takes the view that consumers should have the choice and be allowed to make up their own minds about GM” (Art.2)

“If GM-wheat is sold in a mixture with ordinary wheat, consumers may end up eating it unknowingly” (Art.3)

It is interesting to notice here the gap between the American and European concern related to consumer rejection. While in Europe there seemed to be willingness to conform to established consumer rights and a genuine concern about preventing breach of social agreements on such questions, in the US the main concern was actually that informing consumers about GM ingredients would complicate introducing GM products onto the marketplace. There was a clear disposition to avoid labelling and expose consumers to GM without their knowledge or consent from the American side, while in Europe, labelling was viewed as a warranty for consumer rights and choice.

Environmental and safety concerns

Finally environmental and safety matters did not appear to be the most concerning (*Fig.4-1*). Questions around the argued unnatural aspect of GM foods and uncertain unexpected adverse effects appear even less relevant. It would be worth signalling here that this represents largely the matters weighting from the North American perspective, since most statements were commenting their position, although such a unilateral interpretation would be insufficient to make conclusions⁷⁷.

It is also interesting to notice that spurring environmental concerns may be used sometimes to serve other GM oppositional stances, which proves that environmental discourses have become popular and gained the support of the masses in contemporary markets.

*“Fears for the environment could be a useful defence that might provide an escape route for Canada, like the GM field trials have in Britain”
(Mr Robbins, a farmer, Art.4)*

Seemingly shared concerns

Shared concerns represent interesting intersection-diversion points between GM supporters and their opponents, where both groups express matters of concern about a same object, but for totally different reasons. In other words, the pursued aims motivating the discussion around a raised matter would be different.

⁷⁷ As I have explained in the former chapter, to appreciate the weight of an expressed concern, looking at its frequency is not enough. We need to look also at how many actors adhered to it, and their status (in terms of power share).

The following table **Tb.4-2** exposes more clearly the cleavage.

It shows that controversies do not represent clear dichotomies between main opposing blocks, even at their initial stage. It is not black or white, and grey zones are fertile vestibules where creativity, collaboration and comprehension may thrive.

Tb.4-2: Shared concerns cleavage

Shared concerns	Opponents' perspective	Supporters' perspective
Regulation/Labelling	Absence/inadequacy of current labelling. Insufficient regulation.	Requests for excessive/unfounded labelling. Institutional blockage
Public/Consumer rejection No Market	There will be no market for it. Going forward with GM plans would mean consumer/citizen rights are being ignored.	Hampering the introduction of GM crops into the current cereal market. A serious threat for their mid/long-term interests.
Food democracy	Respect of consumers' rights and choice.	Respect of producers' choice to produce what they want.
Contamination-Conv. crops	Reasonably impossible to separate GM from conventional crops, if both crops coexist within the cereals supply chain.	A serious threat for their mid/long-term interests.

A.3 Underpinning references

Most pre-narrative discourses could be gathered under some underlying assumptions, which gave propensity to the expressed matters of concern making them audible, at least to certain targeted audiences. As explained in the codification section, these references are based on commonly accepted concepts, values, and practices, locally (tainted by local customs and cultures) or globally widespread.

5 dominant assumptions and concepts could be highlighted in pre-narratives:

- Operating in a global-free market
- The European-American cleavage
- Laws of market
- Acquired rights
- The special status of ‘Staple food’

Operating in a Global-Free Market

Although the described events did not take place in Britain, many statements showed a direct connection with the British and European market. The advent of GM crops in America was clearly perceived in Europe as an imminent threat for domestic food systems, consumer rights, and state sovereignty. The threat was based on the idea of the market being *Global* (absence of thick boundaries distinguishing domestic from foreign markets) and *Free* (proscription of protectionist measures aiming at defending internal markets’ exclusive interests and regulation), but also based on the recognition of corporate dominance over politics.

*“If the wheat becomes widely grown by North American farmers, as Monsanto expects, **GM might inevitably end up in British bread, whether consumers like it or not**” (Art.2)*

*“The GM-wheat is under development by the American agricultural biotechnology company Monsanto, which **intends to market it aggressively in the face of stiff opposition** from environmentalists and the organic food industry” (Art.2)*

*“GM crops are **designed to make profits for the companies**, while the public and environment take the risks” (Art.3)*

The European-American Cleavage

While main concerns in America focus on business prospects and regulation, in Europe, questions of safety (from both, health and environmental standpoints) and consumer rights preservation, appear central to the process of dealing with novel food technologies, and the politics of food in general. This is due largely to different experience with agricultural and food controversies in both continents, and to the environmental and non-governmental groups in Europe having proven being more influential in the way they pressurise and influence their governments (Gaskell, 2001).

“The European Union - and Britain's Food Standards Agency - takes the view that consumers should have the choice and be allowed to make up their own minds about GM. It is an attitude that evolved out of the BSE crisis, which has hardly had an impact in America where one in three consumers is to this day totally unaware he or she has been eating GM food for years” (Art.2)

*“EU law states that any foods which contain **less than one per cent GM ingredients** are not required to be labelled” (Art.3)*

*“If GM-wheat is sold in a mixture with ordinary wheat, **consumers may end up eating it unknowingly**” (Art.3)*

From a North-American standpoint, commercial and institutional concerns related to the GM-wheat prospects are clearly originating externally (external barriers), rather than internally. Even internal doubts expressed by Canadian and American agro-food

industrials and farmers were engendered by the external rejection of GM by importers, mainly European. North Americans attributed this rejection mainly to the European precautionary attitude adopted towards GM crops, materialised through obligatory and stringent labelling requirements. The latter was perceived by the other side of the Atlantic as a form of regulatory blockage, restraining illicitly free-market agreements and hampering seriously the development of their project.

“The FDA's view is that labelling is only necessary if a product is materially different from a non-GM equivalent. It is the argument of "substantial equivalence" that European greens have rejected in favour of the "precautionary principle", which Americans see as a way of restricting trade under the guise of scientific safety” (Art.2)

*“It is a huge issue for Monsanto that **the regulatory system is completely stalled**. It impacts farmers' perception of the market for their products. US farmers value the European market for all their products,”
(Mr Buckingham of Monsanto, Art.2)*

*“However, these visions of the GM loaf of the future will rest on whether American trade negotiators can convince the EU to amend its insistence on the mandatory labelling of GM products”
(James Astwood, director of product safety at Monsanto, Art.2)*

On the other hand, Americans' insistence on introducing their GM crops on European markets was perceived by Europeans as a form of American corporate hegemony and a coercive interference in their regulatory system diminishing their legal sovereignty. They even see it a plausible cause for reviving the dormant trade war between both continents.

“Any attempt to sell American-grown GM-wheat in Europe could reignite the simmering trade war between the Europeans and Americans over biotechnology and food” (Art.1)

It is interesting though to notice that, while Europeans see in Americans' GM plans a threat to their established consumer rights and sovereign regulatory system, in a *semi-analogical* way, Americans as well consider the EU precautionary attitude to be limiting their producers' choice and their food system sovereignty.

"Producers are becoming worried about losing markets and losing choice over what they produce"
(a senior civil servant who drafted the secret paper addressed to the Canadian government, Art.4)

"But we are not going to not launch a new product because of lack of European approval ... because that would mean that European politicians have a veto on what technology we should make available to North American farmers."
(Mr Buckingham of Monsanto, Art.2)

Finally, the halt put over Monsanto's GM plans was described by the biotech company as a wise decision, acknowledging that the market was not ready yet, while opponents in Europe welcomed the news as a victory over illegitimate coercive plans for forced GM introduction on sovereign markets.

"As part of a commercial "realignment" Monsanto is delaying the introduction of GM-wheat for up to eight years".
(The company's headquarters in St Louis, Missouri, Art.5)

"As a result of our portfolio review and dialogue with wheat industry leaders, we recognise the business opportunities with Roundup Ready spring wheat are less attractive to Monsanto's other commercial priorities"
(Carl Casale, executive vice president of Monsanto, Art.5)

"It was a worldwide victory for consumers and farmers"
(A spokesman for Friends of the Earth, Art.5)

"The decision to halt the development of GM-wheat marked another embarrassing U-turn for the company, which last year decided to close much of its European operation, with the loss of 80 jobs in Britain, in the face of intense public opposition" (Commentators, Art.5).

Market rules/Laws of market

Despite the common acceptance of markets becoming more and more open and global, it is also commonly understood that markets still obey certain *universal* rules and submit to certain ethical codes. Accordingly, products need to meet demand (whether answering a spontaneous or created need), and more importantly, acquire public acceptance (at least, tacit acceptance), to be marketed. Products are not supposed to be imposed by force against consumers' will and domestic regulatory positions, and if they attempt to, this would be judged as an imprudent and unethical behaviour from the acting firm. Many marketing strategies and regulatory frames have been developed to deal with consumer/public demand and acceptance. 'Burning' these steps, was translated as 'going against the market', and was understood to be a pricy strategic mistake.

"Monsanto has run up against the reality of market rejection from both farmers and consumers and they realise that basically no one wanted this stuff. They're in full retreat"
(Joe Mendelson, legal director for the Washington-based Centre for Food Safety, Art.5)

Also, the question of 'profitability' is still clearly at the heart of business alliances and investment decisions. For a new product to be introduced into the marketplace it must interest all stakeholders and intermediaries that need to be involved in the process making it available and consumable. Failing to make a new product interesting for the whole supply chain, leads to the product not being marketable.

*"Food manufacturers **doubted** that the introduction of genetically engineered wheat would lead to a significant improvement in their profits because **the cost of wheat is typically only a small fraction of inputs for most processed food products**, and food processors were **afraid of losing market share** if environmental and consumer activists were to organise boycotts of food products containing 'biotech' wheat" (Art.6)*

Acquired rights

By ‘Acquired rights’, I am referring to those rights that have become widely acknowledged, normalised and practiced. In the context of our discussion, the acknowledged rights for consumers to know what they are consuming and to have the choice to consume a certain product/ingredient or not, and the admitted right to campaign, have played substantive roles in making Monsanto’s GM plans controversial. Have people not been free to campaign, have consumers not been recognised the right to know and to decide about their governmental food policy, and have these rights not been known and acknowledged by social and political norms, there would be no impactful rejection of GM-wheat plans.

In Europe, acquired rights represent a form of social asset that is profoundly valued and needs to be protected. Legislation and freedom of speech are seen as the guarantors of these rights, and should therefore not be overruled by corporate power, which is perceived to be serving the interests of a cluster of privileged groups and being detrimental to the interests of the majority (Quotes above apply).

The special status of ‘Staple foods’

The quote below suggests that the introduction of GM was perceived specifically problematic in Britain because it targeted a kind of food considered to be amongst staples.

“Bread is a staple item in Europe and, unlike maize or soya, the advent of the GM loaf will have a resonance with consumers who may not otherwise worry about GM cereals destined for animal feed or specialised products such as tortilla chips”. (Art.1)

Staple foods are those that represent the most consumed food by people in a specific area⁷⁸, usually serving as a basis for most common foods/dishes. Therefore, staples have always got a special status, embodying food security and authenticity. Since GM technology and GM produce are widely still considered hazardous and not fully under control, it appears quite natural that consumers/the public, and even authorities, would be worried about seeing them applied to primary foods, fearing food scarcity and wide contamination if they turn out to be unsafe. Besides, if unexpected adverse effects arise, this would affect the whole population, and not a little portion of the society, which unsurprisingly incites to more precaution in regulating any innovation related to staples, and therefore complicates the GM-wheat regulatory process.

“The Department of Agriculture and the EPA, the US Food and Drug Administration is following the farm trials closely, sensitive to the potential ramifications of any problems that might arise in a crop used for making a staple food item. It is one of the reasons why the wheat industry is being very careful of this technology”
(A senior official in the US Department of Agriculture, Art.1)

A.4 Actors and networks

At this stage, actors appear limited in terms of number and nature. Most actors who appeared actively involved in the debate were directly and closely interested in or concerned by the GM-wheat project. The supporting stance seems monopolised mostly by Monsanto and its appointed spokespersons (which partly helped identifying the project as being risky and serving primarily the company’s hegemonic plans). The American government through the FDA spoke on behalf of the project when it had to

⁷⁸ Generally due to climate and agricultural conditions.

defend the national food safety, and rarely scientists/universities working on GM prospects intervened. It is not before 2009 that some other actors have started to come into the front of the scene, which suggested that the GM debate entered the stage of *Interessement* and alliances have began to form⁷⁹.

Likewise opponents were limited as well. Pre-narratives mainly referred to The EU (performing a legislative blockage), Environmentalists (The EU Greens in particular), Non-Governmental organisations (namely, Friends of The Earth and Greenpeace), and anti-GM activists (those targeting specifically GM projects).

A.5 Competing statements correspondence

At this stage, pre-narratives being presented in a more informative way and not involving amply local actors, the link between the selected statements could not be established clearly. Statements appear more as suggestive of concerns, than argumentative. Only 17 statements out of 84 referred to the categories ‘responding/Integrating/Translating’. The rest were rather within the ‘Sowing seeds of concerns’ or ‘selling concerns’ categories.

Also, and expectedly, no responses were given to the supporters concerns at this stage. Their market introduction struggles seemed natural as they were running ‘against the reality of market rejection’, and the battle over *Interessement* and enrolment of allies

⁷⁹ (E.g. A coalition of US wheat industry organisations asking for access to GM enhanced wheat varieties, German plant science and chemical company Bayer & Australia's Commonwealth Scientific and Industrial Research Organisation working conjointly on a GM-wheat project)

has not clearly started yet. Responses were mostly given by GM supporters answering some of the raised concerns about their prospects.

Appendix *Apx.4-2* outlines concerns that received a response from GM advocates.

Part B: The CC Layered analytical-description of the debate

In this section, I am following the progression of the CC lenses with a special focus on relational and dynamic aspects. Mainly, comparative maps and summary tables will support the suggested analysis.

4.1 Statements & Articulated Literatures (*CC Lens 1*)

This lens will allow appreciating and discussing the controversial arena of the studied debate through the identification of competing statements carrying the raised matters of concern that motivated actors and thick meshes of relations between these.

Thick meshes of relations will be appreciated through various relational devices highlighting and examining:

- The vantage points from which actors speak (e.g. environmental, institutional, economic...). These generally represent the domains within which actors aspire for change.
- Pervasive concerns, enlarging the concerning scope within a given perspective.
- Statements' correspondence in terms of adversaries' responses and rebuttals.
- *Uncertainty* levels, accounting for the resilience of raised concerns and contention concentration.
- The articulated literatures backing the raised concerns and offering a specific reading of these.

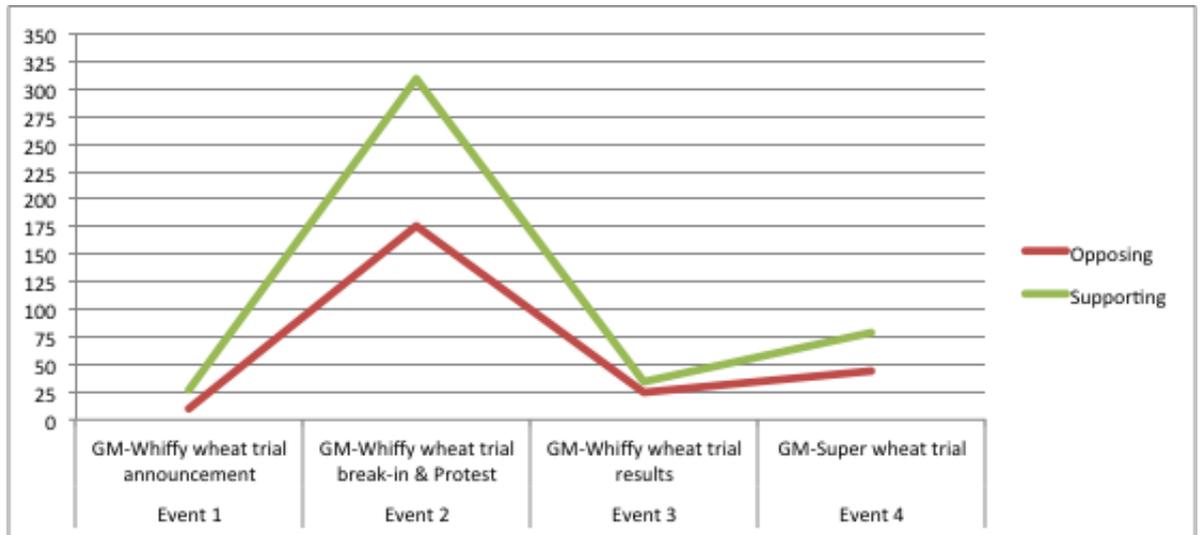
All these discussion items will be constructed on a systematic comparison between the two opposing perspectives, progressing over the different events of the debate.

The following table **Tb.4-3** presents identified competing statements per event. 705 statements in total, with clear dominance of GM supporting statements all over the debate. It also accounts for the level of involvement and the hotness of the debate, distinguishing most conflicting phases from cooler ones.

Tb.4-3: Statements distribution per event

	EVENTS	Informative	Opposing	Supporting	Grand Total
Event 1	GM-Whiffy wheat trial announcement	4	10	27	41
Event 2	GM-Whiffy wheat trial break-in & Protest	32	175	310	517
Event 3	GM-Whiffy wheat trial results	4	24	35	63
Event 4	GM-Super wheat trial announcement	7	45	79	131
Grand Total		47	254	451	752

The first event seems to represent the *problematization* step, defining what needs to be discussed publically. The second event however, clearly represents the most conflicting stage of the debate (**Fig.4-2**). The following events, 3 and 4, appear to be cooler phases, although as analysis will show, this does not denote necessary a settlement of the controversy.

Fig.4-2- Level of engagement over the debate

4.1.1 Main matters of concern (Event 1-4 comparative analysis)

4.1.1.1 Event 1: Problematisation phase?

The triggering event announcing the GM-Whiffy-wheat open-air trial appears here to host the *Problematisation* stage. According to *Fig.4-3* and *Tb.4-4* below, this process appears to be carried out by both sides, and not only based on the complainants' matters of concern. Both groups engaged in communicating a particular concerned stand aiming at shaping public's understanding of what matters.

This suggests a configuration where the introducers of the novelty and those trying to block its access to the marketplace, are in a quasi-similar unsettled situation. None of them represents the established norm, and both fighting for their survival against a perspective that seems incompatible with their ultimate aims and core values. Hence,

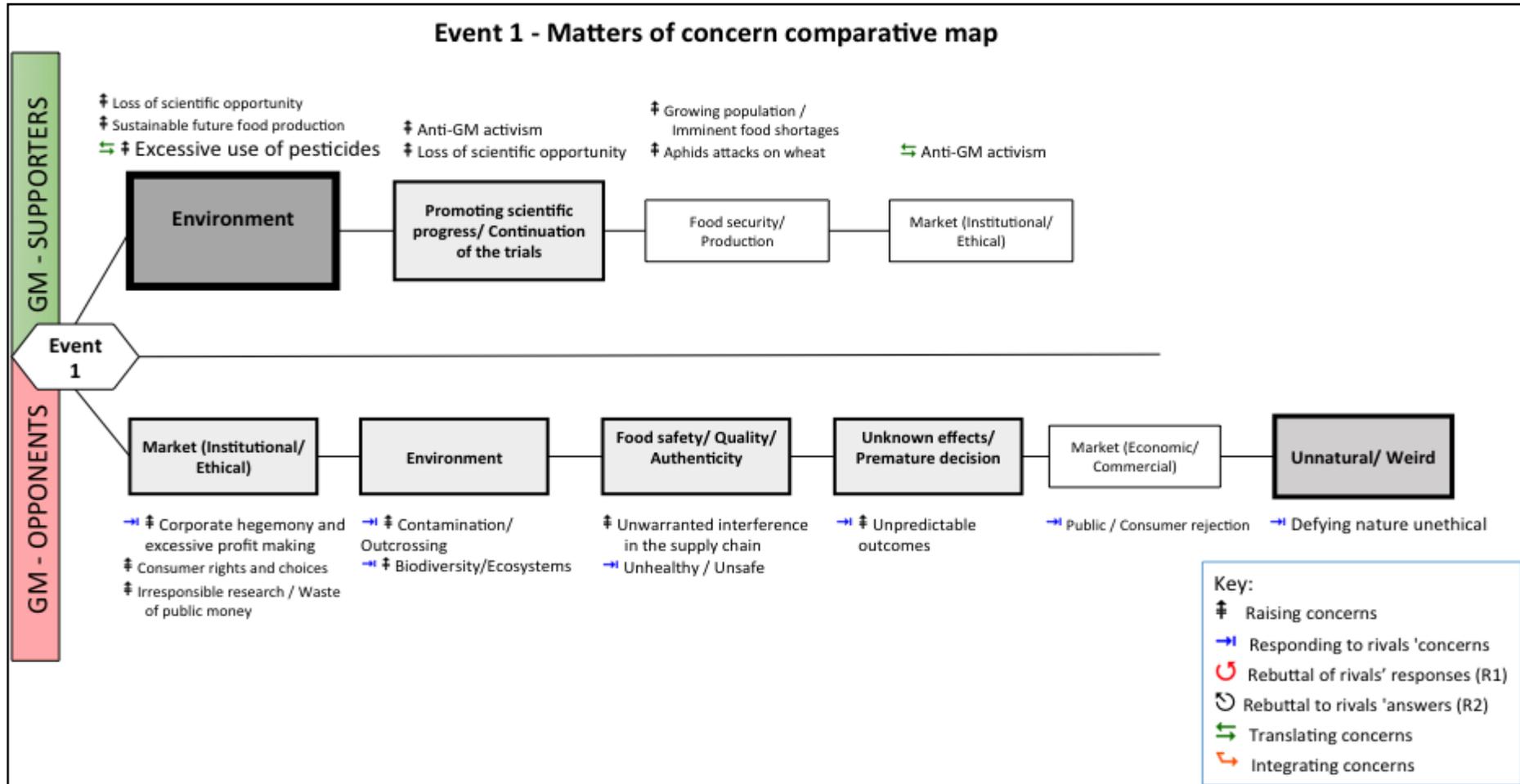
problematization here is not merely about the complainants' first formulation of an issue and role attribution. It refers to the process of defining the object of the debate and expressing the main concerns that put the debate into motion, justifying both groups' actions and choices.

Tb.4-4: Event 1 Statements distribution

	Selling concerns	Translating concerns	Integrating concerns	Responding to concerns	Response rebuttals- Level 1	Response rebuttals- Level 2	Total Count of Concerns' Stage
	GM-Whiffy wheat trial announcement						
Opposing	9				1		10
Supporting	12	2		13			27

This reading of the *Problematization* had an impact on the disagreeing actors' positions to each other and within the controversy itself. Although, the trial's opponents were those who rose first their matters of concern, instigating this debate about GM-wheat prospects in Britain, its supporters did not act from a purely defensive angle. By similarly articulating their communication around matters of concern, they placed themselves in the position of concerned actors/groups as well, distancing themselves from the 'culprit' role assigned to them by their opponents. This accounts more faithfully for the multi-dimensionality of market controversies, which are not built on perfect dichotomies, although a binary polarisation still defines the strong opposing positions (most statements and actors could be segregated into pro-GM and anti-GM, yet they do not express the same level of intensity and commitment).

Fig.4-3: Event 1 – Matters of concern comparative map



Opponents

From GM opponents' side, those who instigated the debate, main concerns seem to lay within a broad concern about the sustainability, fairness and safety of our food system, which combines environmental and institutional positions. In their views, GM prospects are simply incompatible with their wider environmental and ethical market aspirations.

Also main raised issues revolve around unwarranted outcomes in terms of feared undesired effects and expected benefits. Favouring a precautionary approach, GM opponents denounce a lack of information in the trial's application and little certainty from the advocates of the GM technology, which makes these trials risky at this stage.

*"... "Frankenfood" as unwarranted meddling with the food chain."
(Art.9)*

*"There are a lot of unanswered questions."
(Peter Riley, GM Freeze, Art.10)*

This unpredictability of the outcomes was expressed in broad and open terms, implying its enlarged influence within the opponents' perspective, impacting their environmental, safety and economic views. Questions of possible contamination by GM genes/species of the wild and the existing cereal supply chain are amongst top ensuing concerns. The risk of contamination seems even more emphasised due to the trial being carried out in open field.

"They have done this in a laboratory... In the field it is different. The history of GM crops demonstrates that contamination can occur. It can interfere with the ecosystem and send aphids onto other plants".

*"There are a lot of unanswered questions"
(GM Freeze, Pete Riley, Art.10)*

*“The decision to approve **an open-air trial** of GM-wheat is **a big mistake and premature** given the serious **lack of information in the application**”
(GM Freeze, Pete Riley, Art.8)*

From a market perspective, opponents see in GM prospects immature plans driven by the insatiable pursuit of profit by powerful corporations, and as having little to do with beneficial social progress. This does not only represent an economic issue, since it also raises questions about institutional partiality, consumer rights, and the democratic adjudication of food policies and public money expenditures.

*“...it was designed to **maximise profits at the expense of the people** For many people, GM technology was not seen as a socially useful scientific development but a means **for companies to increase their market share and profits**”
(Anti-capitalists, Art.9)*

*“We're concerned that **public money** is being spent on research where there is **no public acceptance or market**”
(Claire Oxborrow, a foods campaigner at Friends of the Earth, Art.7)*

Trials' opponents mainly framed their *problematization* of the GM-wheat case around the risk of contamination, due to the trial being carried in open-air field. However, they have articulated a broader opposition to GM technology and prospects expressed mainly from a market and institutional angle, raising issues related primarily to food safety, corporate hegemony, and consumer choice.

Supporters

The main matter of concern put forward by the scientists to support the GM-Whiffy-wheat project was the excessive use of pesticides within the dominant industrialised

agricultural system. They expressed this issue primarily from an environmental angle and did not stress its impacts on health. The tested GM-Whiffy-wheat was presented as a new eco-friendly generation of GM, which does not need to be sprayed by pesticides to be protected from aphids⁸⁰, but would rather repulse these by naturally emitting a whiff attracting their predators.

*“The idea eventually would be to produce GM-wheat varieties **that do not need to be sprayed with harmful pesticides**. The scientists believe that preventing aphid infestations would **benefit the wider environment**, including the songbirds that feed on aphids.”*

(The scientists, Art.9)

“A new kind of wheat, designed to reduce the use of pesticides”

*“The study of “chemical ecology” is about understanding the substances that are continually being passed between organisms and using them in a way that can control pests in a **more natural way that is less harmful to the environment** than some pesticides.”*

(Rothamsted's director, Prof. Maurice Moloney, Art.9)

Besides, scientists believed the GM-Whiffy-wheat presents an attractive scientific opportunity to introduce new ways to protect yields while having a lesser impact on the environment, and seemed concerned about the loss of this opportunity because of anti-GM activism threats. In line with the main raised concern attempting to justify the trials (excessive use of pesticides), the concern about an eventual loss of scientific opportunity was also mainly expressed in environmental terms, aiming at protecting crop yields to ultimately feed a growing population more sustainably.

“A new, eco-friendly generation of genetically modified crops, ... a scientific revolution in the making”

*“GM technology as a way of extending **the successful “green revolution” of the late 20th Century into the 21st Century**” (The scientists, Art.9)*

⁸⁰ Aphids are a special type of pests particularly damaging to wheat crops.

This *Problematization* by the trial's researchers suggests there was a clear intention from GM advocates to distance this GM-wheat project from the traditional affiliation to corporate aspirations, and to frame it around eco-friendly aims and narratives.

Statements dynamics

During this first stage of the debate, the trial's supporters appeared clearly ahead with their level of engagement (27 statements versus 10 by their opponents), counter-attacking systematically critiques against their GM-wheat prospect. The scientists not only took part in shaping the object of the GM-wheat public case to be discussed, but also engaged in responding to their opponents' concerns as soon as the debate arose. They have even reacted to some concerns that were not specifically highlighted by opponents at this stage (*Fig.4-3*, last 3 concerns on opponents' side⁸¹), which also shows the interconnectedness of GM local controversies and the global dispute about GM technology and prospects, and again, proves the role played by pre-narratives in providing a backdrop for actors' plans and argumentation. This level of response from scientists affirmed their role as the GM-wheat prospect spokespersons and shaped the angles from which opponents' concerns will be read.

The scientists defended their perspective using different communication means, for instance, press, open letters, video release on YouTube, beyond regular platforms such as their official website and social media accounts. They also spoke on behalf of the

⁸¹ GM crops being unnatural, unethical, and unsafe for human consumption, and being rejected by the public/consumers.

public, farmers, and involved the police through their role of public order guarantors, commencing the translation of their matters of concern.

*“I think it will open up many avenues that will allow us to use natural mechanisms and **allow to respond to concerns from the public about the amount of pesticides that are used**”*
(Rothamsted's director Professor Maurice Moloney, Art.9)

*“The scientists say it is a **natural form of GM**, which could stop farmers having to use **toxic pesticides** and could also be used in other plants”.*
(Art.10)

“Previous trials have been attacked by anti-GM campaigners and police have been informed of the plan to grow GM-wheat at the site, which will be protected by a chainlink fence 2.4 metres high”
(Art.8)

This suggests that the scientists were expecting opposition to their open-air trial plans, and thus, had prepared to get immediately involved in answering their opponents' concerns.

4.1.1.2 Event 2: Hot phase of the debate

The second event, commenting over the research centre break-in and debating the mass protest legitimacy and estimated impacts, clearly illustrates the hot phase of the controversy. Both groups showed significant higher levels of engagement (Table: **Tb.4-5**), which makes it appear as a decisive phase witnessing a boom of argumentation and a ramification of main matters of concern raised during the *Problematization* phase.

Tb.4-5: Event 2- Statements' distribution

	Selling concerns	Translating concerns	Integrating concerns	Responding to concerns	Response rebuttals- Level 1	Response rebuttals- Level 2	Total Count of Concerns' Stage
GM-Whiffy wheat trial break-in & Protest							
Opposing	89	39	4	39	4		175
Supporting	140	30	13	122	4	1	310

Over the hot phase of the debate, GM supporters were far ahead in terms of number of statements, which suggests a remarkable mobilisation of their supportive networks and a good re-appropriation of their concerns by the media.

Opponents

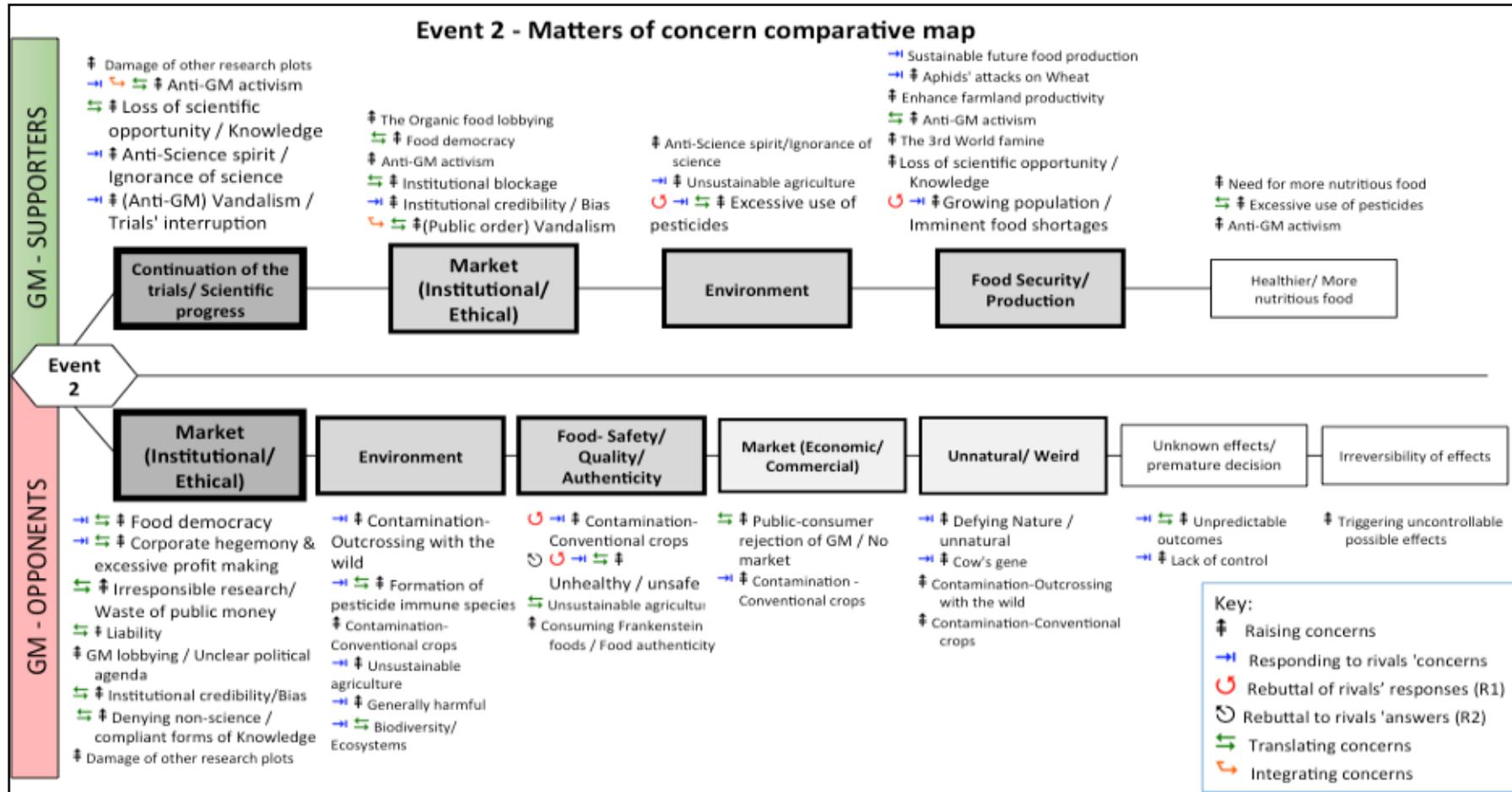
Although GM opponents are predominantly embedded in environmental networks and logics, surprisingly, their top concerns (accounting for about 64% of their expression, see *Tb.4-6*) were raised from a market, political, and institutional angle.

Tb.4-6: GM opponents' matters of concern ratios

GM Opponents' Matters of Concern		
Rank	Row Labels	ratio
1	Food democracy	13%
2	Public/consumer rejection of GM/No market	13%
3	Contamination-Conventional crops	11%
4	Irresponsible research/Waste of public money	9%
5	Contamination-Outcrossing with the wild	8%
6	Corporate hegemony & excessive profit making	6%
7	Unhealthy/unsafe	5%
8	Formation of pesticide immune species	5%
9	Liability	4%
10	GM lobbying/Unclear political agenda	4%
11	Institutional credibility/Bias	3%
12	Unsustainable agriculture	3%
13	Unpredictable outcomes	3%
14	Consumer rights & choice	2%
15	Denying non-sc/compliant forms of Knge	2%
16	Defying Nature/unnatural	2%
17	Generally harmful	2%
18	Lack of control	2%
19	Cow's gene	2%
20	Biodiversity/Ecosystems	1%
21	Consuming frankenstein foods/Food authenticity	1%
22	Triggering uncontrollable possible effects	1%
23	Damage of other research plots	1%

** This table, as a similar one coming for supporters, includes only raised concerns (responses and rebuttals are analysed in the following section- 'Statements' correspondence).*

Fig.4-4: Event 2 – Matters of concern comparative map



At the top of the opponents concerns appear the question of the legitimacy of the open-air trials, and by extension, of the GM technology adoption and introduction into the market and public sphere. Main concerns in this regard question food democracy (including consumer rights and choice), the GM industry hegemony (including GM lobbying power), and the judiciousness of the government's decisions on GM (Institutions' partiality, liability, and waste of public resources).

Breach of the democratic contract & government partiality

From this angle, the central issue with GM plans appears to be attempts to introduce this novel technology despite public and social collectives pronounced opposition. This is quite interesting, especially that the GM-Whiffy-wheat trial had been approved and financed by governmental funding bodies, which should entail possessing a democratic mandate to proceed with the technology. The approval of the trials by Defra did not seem to constitute a 'democratic' endorsement for the GM project, and was even perceived by some as a provocative act ignoring their right to be involved in such impactful decisions.

*"Rothamsted has **no democratic mandate**" to proceed"*
(Liz Walker, a veteran of the 1990s anti-GM protests, Art.26)

*"GM crops are **not backed by the public.**"*
(Peter Melchett, the Soil Association policy director, Art.45)

*"...**campaigners argue that their concerns are brushed aside**, either by the scientists themselves, or by the Department for Environment, Food and Rural Affairs, or its advisory committee". (Art.14)*

*"We're here because **every section of British society has rejected GM technology and this is a deliberately provocative act.**"*
(Theo Simon, a veteran anti-GM campaigner, Art.38)

This point has become even more problematic due to the trial being approved and having started prior to public consultation and consent to proceed with GM food plans. Opponents claim there was need for discussing publically projected benefits versus risks. Therefore, they saw in the approval of the GM Whiffy-wheat trial a breach of the democratic contract.

*“These questions should have been **debated in the public domain before the trial started.**”*
(Citizens Concerned About GM Hungerford, Berkshire, Art.25)

*“ Ultimately, we **need to have a wide debate about the direction of agriculture in the EU.** We've been abusing our soil for 60 years. **We need to move away from monoculture, energy-intensive farming. We don't need GM for a healthy diet. There's no evidence it increases yields. We need a diverse gene pool.**”*

(Pete Riley, a Friends of the Earth campaigner and spokesperson for GM Freeze, Art.26)

This could explain why campaigners asked for an immediate cease of the trial, and interpreted the scientists' call as a 'fake' invite to debate, since they have already applied for the experiment, got approval, and planted the experimental crop.

*“We are really pleased they want to engage in a discussion on this. But we know that **talking to them is not going to change their minds. They have declared their position because they have already put the plants in the ground.**”*

(Lucy Harrap, who is involved with the mass action, Take back the flour, Art.12)

*“ **The scientists had made their position clear by planting the crops.** The group had no plans to cancel the raid”*

(A campaigner, Art.12)

The second prominent ensuing matter raised by campaigners in this regard was the government partiality, succumbing to GM lobbying, which undermined its credibility and trust in its institutions. The government decisions and its institutions, including the media, were perceived as, biased, serving the GM technology interests rather than the people they were meant to represent. The GM lobbying was described in a way that let

it appear as more powerful than the government and its institutions, which engendered an atmosphere of suspicion and mistrust.

“ Alternative technologies such as marker-assisted selection (non-GM genetic mapping) is now overtaking GM, but the immense lobbying power of the industry could still get it back on to the agenda.”

(GM Freeze, Pete Riley, Art.26)

“.....but I'm less clear about the agendas of other people, such as Rothamsted's director, Maurice Moloney, who made his name patenting varieties of GM oilseed rape in Canada and drives a Porsche with a number plate ending in GMO.”

(Art.25)

“No, not protesters trashing crops, but the GM lobby still trying to force increasingly discredited Frankenstein food down our throats”

“Many campaigners don't trust the scientists or have faith in the system's impartiality.”

(Joanna Blythman, Art.41)

“...a trial for blight-resistant GM potatoes was being conducted at the John Innes Centre in Norwich, 60 protesters with signs saying "Stop gambling with our chips" marched through the city, before dumping a load of potatoes at the entrance. But media interest was negligible. Walker admits that there has been a conscious decision by the protesters this time to raise the stakes.”

(Liz Walker, a veteran of the 1990s anti-GM protests, Art.26)

Consequently, some have interpreted even the harshest plan of the protest (the decontamination) as a kind of necessity to make their voice heard, and portrayed it as ‘the responsible act’, inferring that the government and scientists failed to act responsibly towards their people and fellow citizens.

“I hope we won't be forced into removing [the plants] ourselves, but this may be the only course of action.”

(A spokeswoman from Take the Flour Back, Art.18)

“Reprehensible as the destructive approach of some of the protesters might seem, these issues would not have been aired without them.”

(Lawrence Woodward, Citizens Concerned About GM Hungerford, Berkshire, Art.25)

“if Rothamsted presses on regardless, it's no surprise if responsible citizens feel forced to take the only action left to them.”

(Joanna Blythman, Art.27)

“ ‘We're asking the scientists to do **the responsible thing** and stop this trial,' 'If they don't, we're going **to have to do the responsible thing ourselves.**”
(A spokeswoman for Take The Flour Back, who called herself Helen, Art.11)

“These were **not the fanatics of green activism** so luridly portrayed in GM propaganda, but rather **ordinary farmers and concerned citizens** who recognise **the appalling damage** that could result from **GM contaminating the food chain in Britain.**” (Art.41)

This was a quite dangerous turn that went beyond the right to campaign, and implicitly questioned the authority of the state and the need for the latter. It also questioned the effectiveness of the current representative democracy, since representatives were suspected of not representing faithfully the people they were elected to represent, which resulted in an actual gap between the government plans and the position of an assortment of social collectives⁸² on GM prospects.

Irresponsible decision

Proceeding with GM plans, materialised through funding allocation and approval of the trial, was perceived by opposing collectives to be an irresponsible decision. The latter was expressed in two different ways: (1) by disapproving what opponents consider a waste of public money, namely, investing in a highly controversial technology rejected by consumers and current market agents, and (2) by denouncing the under-estimated threat it could represent to the environment based on a prominent risk of contamination and the irreversibility of effects.

⁸² This aspect will be analysed in detail by the next lens.

(1) Irresponsible decision- Consumer rejection and absence of market

The question of consumer rejection, overlapping at many instances with *Public Rejection*, is at the heart of narratives about the absence of market for GM prospects. This is because other actors forming the cereal supply chain, mainly farmers and retailers, were clearly reluctant about introducing GM into their supply chain based on the perceived or explicit rejection of these by their end-consumer. The North American case debated in pre-narratives provided strong evidence favouring cautious commercial attitudes on the European market on top of having a discouraging legislation.

“UK farmers rarely grow the spring wheat used in the trial and already have other well-established ways of controlling aphids. Why should UK taxpayers fund a trial for a product that farmers don't need and consumers won't eat?” (Art.41)

“Consumers consistently reject genetically modified food. This is why Carrefour, the world's second largest supermarket chain, now labels its own-brand meat and dairy as GM animal feed-free” (“Nourri sans OGM”), to give its customers the field-to-fork guarantee they so clearly desire.” (Art.27)

*“The British people are clear that they're not swallowing this technology.”
(Eleanor Baylis, Take the Flour Back, Art.22)*

Consumer rejection seemed also to be triggered by worries about the loss of consumer rights in terms of access to full information and choice. Opponents claim that widespread of GM will leave no choice for consumers who want to continue consuming non-GM varieties due to the proved⁸³ risk of contaminating conventional crops. This represents ultimately one of the most serious matters, since it feeds the incompatibility of the two opposing market versions.

⁸³ This will be demonstrated later in the uncertainty analysis.

“...widespread use of GM would remove choice from consumers”
(Art.35)

“If this wheat goes to commercialisation, there would then be cross-contamination and we would no longer have a choice about GM or non-GM.”
(Lucy Harrap, who helped to organise the event, Art.39)

“The British people are clear that they're not swallowing this technology.”
(Eleanor Baylis, Take the Flour Back, Art.22)

Opponents’ assumption about the absence of market for GM prospects goes even further, beyond consumer and market agent’s reluctance to embrace GM technology and ensuing products. Opponents claim aphids do not represent a major issue, could be managed effectively by non-GM alternative techniques, and that there is no need for increasing spring wheat production in England.

“Why fund the trial when even pro-GM farmers have questioned its need?”
(Lawrence Woodward, Citizens Concerned About GM Hungerford, Berkshire, Art.25)

“Why are we spending about £1m of public money, at a time of austerity, on researching something the public has definitively said it does not want and that Europe is unlikely to approve unless it is starving?”
(Art.15)

They have also raised concerns about liability in case of economic damage in particular. Since GM outcomes cannot be warranted 100%, and since unpredictable effects may occur even if the probability of these happening is said to be very low, the question of ‘who’ is going to be responsible for any possible damage made at any level of the supply chain cannot be left pending forever.

This is crucial from an economic and market perspective. The refusal of insurance companies to back up GM crop risk of contaminating conventional crops makes it a

serious blocking point for GM market prospects, unless actors exposed to this kind of risk would choose to overlook the matter, which appears a bit absurd considering market logics and the existence of actual past contamination incidents.

“When that happens (contamination of conventional crops) it is not going to be Rothamsted who are going to pick the tab up - it is going to be farmers in this country.” (Art.35)

“The experience of GM-contamination incidents, involving long-grain rice in the U.S. and flax in Canada, shows that GM companies refuse to accept liability for their products and are extremely reluctant to compensate farmers and companies in the food chain, without court action compelling them to pay up.” (Art.41)

“...and if there is no compensation, you can be sure no insurance company would be prepared to cover farmers near the site against GM contamination, when the risk of that contamination is so clearly present.” (Art.41)

The liability matter, despite its relevance to the dispute, was surprisingly not discussed enough. Two explanations could be suggested. From opponents side, as the debate turned around a punctual incident, the trial, and aimed specifically at interrupting the latter, communication focused on concerns and arguments that were more closely linked to risks of conducting an open-air experiment and those that could resonate better in the collective memory (e.g. gene pollution, corporate hegemony, waste of public money, unwarranted outcomes...). Complicated questions of financial liability and insurance are not amongst those that would better represent a lay and broad public. From the GM supporters' side, the total absence of comments on the issue supports the idea that it sets amongst these questions that are feeding the incompatibility of GM with existing market versions. Therefore, it seemed wiser not to engage in such discussions, preventing further unresolved questions from spreading across the mass and getting integrated in their understanding of the whole issue on GM prospects.

(1) Irresponsible decision- Risk of irreversible contamination

The risk of contamination is the second prominent concern expressed by the trial's opponents after institutional and market matters. It could even be considered to be an omnipresent concern within opponents' perspective as it was discussed from different angles (**Fig.4-4**: environmental, food safety, economic, ethical) and seems to have substantively contributed in exacerbating other worries (e.g. unhealthy, lack of control).

From an environmental standpoint, the risk of contamination was expressed in cross-pollination terms (**Fig.4-4**, Outcrossing with the wild), and was specifically emphasised by protesters in this context. This is simply because, in this precise case of open-air trial, cross-pollination becomes a more prominent risk. Cross-pollination, which occurs when a plant receives pollen from another plant/species, represents a serious environmental matter that extends in space and time due to the difficulty of preventing the GM pollen from travelling to nearby fields and to the irreversibility of the effects. In case of cross-pollination, the receiver plant's genetic material will be modified forever, and the result is actually unpredictable. This also joins narratives about gene pollution, well established amongst the broader opposition to GM.

*“The trial's opponents claim the crops could contaminate **the surrounding environment, as the experiment is being carried out in the open air.**” (Art.40)*

*“The wheat, modified to repel aphids, **threatens neighbouring fields** with “polluted” GM pollen.” (Take the Flour Back, Art.32)*

*“The **GM-wheat can cross-pollinate** with other non-GM plants outside the experimental site” (Take the Flour Back, Art.18)*

The risk of contamination was also equally expressed in food safety and economic terms raising concerns around the contamination of conventional non-GM crops. The latter was seen as detrimental to the British farming and wheat industry through unwarranted contamination of the food supply chain. Unlike the American case exposed in pre-narratives, there was no clear emphasis on the eventual loss of export markets at this stage.

*“The centre’s wheat is a clear **risk to British farming.**”*
(Nicola Gomez, *Take the Flour Back*, Art.16)

*“We support this action because we believe that the trial is unsafe. **It risks contaminating other crops.**”*
(Organiclea, Art.31)

*“...pollen from the GM-wheat **could spread unwanted genes into conventional wheat and threaten the future livelihoods of the farming community.**”*
(Campaigners at *Take the Flour Back*, Art.12)

*“The trial, at Rothamsted Research in Harpenden, Hertfordshire, **is a threat to agriculture** because pollen from the GM-wheat could contaminate non-GM plants outside the trial boundary.”*
(*Take the Flour Back*, Art.29)

Also, and surprisingly, there was not that much emphasis on the potential risks from a health perspective. Mostly, worries were expressed in general food authenticity and safety terms.

Unnaturalness of GM

Another generic concern amongst opponents’ perspective is the unnaturalness of GM as a technology. Unnaturalness stems from the idea of manipulating life (Dyson and Harris, 2002). The perceived unnaturalness of GM applications makes it plausible to fear unpredictable and irreversible effects, since unnatural implies weird,

uncontrollable, and most probably, harmful. Health concerns seem to derive from these logics, and thus, do not need actual cases of GM related diseases to be reified.

An interesting point about opponents' perspective is that it adopts a more holistic view on the question, which makes many of their concerns overlap in terms of underpinning values and ultimate goals. A simple example is, how they interpret sustainability. Although, they clearly discuss it from an environmental angle, condemning widespread of monocultures and interference with natural ecosystems, they appear deeply concerned about the sustainability of the whole system as well. Thus, the environmental and economic questions fuse at some point. Food safety and quality in their opinion could not be guaranteed through a technology that does not respect the environment and human life and rights.

Supporters

Tb.4-7: GM supporters' matters of concern ratios

GM Supporters' Matters of Concern		
Rank	Row Labels	Ratio
1	(Anti-GM) Vandalism/Trials' interruption	15%
2	Excessive use of pesticides	14%
3	Loss of scientific opportunity/Knowledge	14%
4	Anti-Science spirit/Ignorance of science	13%
5	Anti-GM activism	12%
6	(Public order) Vandalism	8%
7	Growing population/Imminent food shortages	6%
8	Institutional blockage	4%
9	Institutional credibility/Bias	4%
10	Unsustainable agriculture	2%
11	Damage of other research plots	2%
12	The 3rd World famine	2%
13	Aphids' attacks on Wheat	1%
14	Enhance farmland productivity	1%
15	Food democracy	1%
16	The Organic food lobbying	1%
17	More nutritious food	1%

Supporters' main concerns revolved around the trial's continuation and opening access to GM scientific opportunities. These two aims were specifically manifest in the scientists' denunciation of anti-GM activism and the promotion of science as basis for progress in a skilful way that changed their roles and positions as GM advocates, and those of their opponents. The GM experiment became the representative of *Science* and the scientific community, a politically legitimate object that needs to be protected, and consequently, opposing the project became synonymous of anti-scientific spirit, backwardness, and violation of public and democratic rights.

Anti-GM vandalism/activism

The scientists interpreted the call to protest as a real threat to the continuation of their experiment. Table **Tb.4-7** shows that 38%⁸⁴ of their concerned communication served to denounce the anti-GM activism, although in different degrees (**Tb.4-7**, line 1, 5 and 6). This could be understood as being the result of stern past occurrences of crop trashing and vehement opposition to such trials by some NGOs. The crop trashing in 1999 by Greenpeace activists causing a halt on GM plans in Britain for about a decade remained vivid in GM supporters' memories, especially that the court judged the action as having a legitimate excuse.

In the context of the GM-Whiffy-wheat trial, scientists shaped anti-activism threats mainly around questions of civic order, public vandalism, and infringement of rights to conduct scientific research safely. This has contributed to make the protest unpopular and to place the protesters, equated in this scenario to the most vehement activists, outside the legitimate scope of the lawful. The call for the 'decontamination' of the experimental site, although not aimed and supported by most protesters, represented a timely justification for Rothamsted scientists to frame the whole campaign as an illegitimate act, by focusing their communication on the most fanatical proclamations from opponents' side. Besides, the intrusion incident gave even more potency to this interpretation, providing an actual illustration of civil transgression and capturing the public's attention on this specific issue of the site security and legitimacy of conducting approved research safely.

⁸⁴ This does not include statements specifically dedicated to respond to opponents' concerns.

“The 'illegal activity' had taken place despite efforts to hold talks with protesters in the hope of allowing the trials to run their course.”

(Rothamsted's director, Professor Maurice Moloney, Art.23)

*“The demonstrators opposed genetically modified (GM) crops. But **while freedom of assembly is essential, the methods and claims of the protesters were iniquitous and absurd, and should be derided as such**” (Art.37)*

*“Fortunately, the police presence thwarted them from accomplishing what in any normal endeavour would be termed **vandalism in the service of ignorance**” (Art.37)*

*“**This is criminal, and must be dealt with as such, It's worse than that. It is the willful imposition of ignorance, directly comparable to Nazi book-burning in the 1930s**”*

(Peter Kendall, National Farmers' Union president, Art.20)

Since the decontamination threat was emphasised and shaped in unlawful terms, the scientists then could put the first serious barrier hindering anti-GM activists' plans. This barrier was materialised by the involvement of the local council who applied for reinforcement of police presence and for an order making it a criminal offence to approach Rothamsted domain. An exclusion zone around the centre was even ordered by the home secretary at the time, Teresa May. The council also organised a series of speeches by legal observers warning people that they are likely to get arrested and face charges if they attempt to intrude the site.

Moreover, as a clear sign given to protesters attesting the change in politics, siding with the centre's cause, Hector Christie, the sole intruder, was charged with criminal damage, accused of vandalising the experiment. This is what Callon (1986) assigned to the process of *Interessement*, where securing alliances goes necessarily through cutting allies connection with other versions (those suggested by adversaries). Scientists not only allied local power to their rows, which besides accounts for the start of the integration of their concerns, but also by doing so, they barred access to it by their opponents.

“Activists were facing a different situation from that seen 10 years ago. The corporations behind biotechnology were totally unprepared for what happened 10 years ago. They were unprepared for that wholesale rejection by the UK public. They are not unprepared now and what we are seeing is the result of that. We are going to see the state absolutely protecting sites like Rothamsted doing that research.” (Art.35)

Anti-scientific spirit & loss of scientific opportunities

The second prominent concern expressed in relation to worries about the possible interruption of the trial (29%) is the ultimate loss of scientific opportunities and valuable knowledge, which extended in a condemnation of anti-science behaviours as an ensuing matter.

From this angle, opposition to the trial was equated to opposition to *Science* in general, preventing “us” and “future generations” from accessing valuable knowledge and seizing scientific opportunities in the service of social and economic progress.

“GM Vandals are shutting down scientific debate” (Art.18)

*“This act of vandalism has attempted to deny us all the opportunity to gather knowledge and evidence, for current and future generations, on one possible technological alternative approach to get plants to defend themselves”
(Rothamsted's director, Professor Maurice Moloney, Art.19)*

*“Three senior scientists made impassioned appeals yesterday to anti-GM campaigners not to destroy a field trial of GM-wheat **which is the culmination of several years' work** **Why would you want to destroy knowledge?** “ (Art.29)*

As underlined expressions in the quotes show⁸⁵, the illegitimacy of the protest is not expressed in purely institutional rights (not damaging an approved research/not

⁸⁵ See p192

attacking a private property), but also in a way that completely ridicules protesters and their claims by simply assigning these to ignorance. Opponents were accused of opposing progress and promoting ignorance in general. This was mainly summarised in anti-scientific spirit accusations, or descriptions portraying opponents as being ignorant of *Science* and its processes, thus, incapable of understanding the scientists' arguments. The two are slightly different though, as the first refers to an ideology of backwardness comparable to the pre-enlightenment era, while the second refers to a structural misapprehension of GM methods and biotech applications in general.

*"I wonder if the opponents of genetically modified (GM) food **know anything of the history of the issue**"*
(Michael H Gittins, from Brecon, Art.25)

*"**If they understand the technology and they understand what we're doing, then they should embrace it, because really we have the same goals.**"*
(Dr Gia Aradottir, one of the leading figures of the experiment, Art.29)

*"**We have no idea who is advising them scientifically, because it is absolutely incorrect.**"*
(Professor Maurice Maloney, the director of Rothamsted Research, Art.33)

*"**Do you believe eating genetically modified crops is like dining with the devil? GM, of course, remains anathema (abomination) to Greens, who speak of opening a Pandora's Box of possible health catastrophes, so capturing the public's imagination.**"* (Art.47)

The quotes show that structural ignorance accusations have been generalised to encompass all Greens, which means, not only directed to harsh reactions against GM such as the threat of decontamination, but to the rest of arguments as well, which made it a so effective discursive weapon, especially that most GM opponents come from an environmental background. This generalisation to all Greens was even more accentuated by the micro-controversy that occurred within this phase around the Green Member of Parliament (MP) Jenny Jones' tweet heating up the debate. The Green MP Jenny Jones who expressed in a tweet her support to the protest, received an avalanche

of critics accusing her of supporting vandalism against science. The dispute swiftly degenerated uncovering a serious division within the party and a surprisingly hostile tone from the trial supporters' side.

“Don't vote Green until they drop the anti-science zealotry ... How can a serious political party back acts of vandalism against scientific research? Until Jenny Jones and the rest of the Green Party drops this awful, damaging, stupid behaviour, no serious environmentalist should be able to vote for them.” (Art.28)

“That self-same Jenny Jones, recipient of the Chivers vote, is to appear at the "Take the Flour Back" protest at Rothamstead Research, which is intending to "decontaminate" - which is to say vandalise - an ongoing experiment into genetically modified wheat. (Thanks to Mark Lynas for the heads-up.). This is ugly, idiotic Luddism.” (Art.28)

*“But the trouble is that **they (the Greens)**'re scientifically illiterate and have what seems to be a fear of technological process. The one big thing they've got right, that anthropogenic climate change is a threat to human wellbeing, **they seem to have got right by accident.**”* (Art.28)

*“After some well-deserved criticism, **party activists have taken steps to change those stances. Yet some scientists keep attacking them.**”* (Art.30)

This micro controversy questioned the assumed unpopularity of GM plans amongst what is commonly called ‘The Greens’. The way this incident degenerated into a partisan dispute amongst people claiming the same political affiliation, and the gravity of the consequences (actual resignations and threats to disown the party), showed a serious crack within the group and its underpinning values. The following quotes from Mark Lynas and Tom Chivers illustrate the split through the emergence of different categories of Greens, namely here, ‘True Greens’ and ‘serious environmentalists’ (logically versus ‘fake’ Greens’ and ‘unreliable environmentalists’).

*“**True greens** know GM is the answer. The activists who tried to destroy a biotech trial are unscientific hypocrites”. (Mark Lynas, Art.43)*

*“Don't vote Green until they drop the anti-science zealotry ... How can a serious political party back acts of vandalism against scientific research? Until Jenny Jones and the rest of the Green Party drops this awful, damaging, stupid behaviour, **no serious environmentalist** should be able to vote for them.”*
(Tom Chivers, Art.28)

Promoting sustainable future farming

Environmental concerns come at the third position, and are mainly consistent with those put forward during the *Problematism* phase, namely, the excessive use of pesticides, protecting biodiversity, and promoting sustainable future agriculture.

The GM-Whiffy-wheat is presented as a technological alternative approach, a pioneer product that would help dramatically reducing the amount of pesticides usually needed to protect cereal crops from pests like aphids. This specific point was mainly expressed in support of a sustainable future farming.

*“Scientists said the crop, believed to be **the world's first GM strain to repel rather than kill insects**, could cut the use of pesticides.” (Art.21)*

*“Scientists **hope** the crop will repel aphids and so **not require insecticides**.” (Art.12)*

*“The GM-wheat **has significant environmental benefits**, as it will mean **the input of pesticides is considerably lessened**.” (The Scientists, Art.29)*

*“The wheat has been modified to emit chemical signals to drive away aphids, which the institute claims **will allow farmers to use fewer chemical pesticides**.” (Art.23)*

The environmental benefit is further emphasised by highlighting related beneficial effects on biodiversity, since pests will not be killed as per previous methods but simply repelled, and thus, non-harmful insects like bees will not be affected. Also, the fact that the whiff is undetectable to humans and seems to mix harmoniously within the natural

environment is reminded as another positive attribute, refuting the perceived unnaturalness of GM.

“The crop - a form of wheat - has been developed to naturally warn off greenflies and other insects, avoiding the need for pesticides to be sprayed on it.” (Art.33)

*“It is **hoped** that incorporating this whiff, undetectable to humans, would make it unnecessary to spray crops with compounds that kill both aphids and beneficial insects such as bees.” (Art.15)*

“...and has the added benefit of looking after the predators that could have been killed by the pesticides” (Professor John Pickett, the leader of a GM-wheat trial, Art.44)

Imminent food shortages

The last quite important matter of concern expressed by GM supporters regards food shortages, whether current or projected. GM food prospects were presented as the ideal solution that would allow meeting the target in terms of production volumes, considering the global population growing rates. The forecasts supporting the need for increased yields are alarming. There will be two more billions to be fed by mid-2050, which GM advocates claim it to be one of the world’s priorities (the world will be facing imminent crisis if not acting swiftly). The latter was expressed in blameworthy terms, accusing the Greens of blocking the means to produce sufficient and more sustainable food for the current and next generation, linking it back to the anti-GM activism central concern.

“To feed a population projected to exceed 9 billion by the 2050s we will need to utilise every option to keep improving crop yields in line with population growth, while protecting scarce ecological resources such as land, water and biodiversity.” (Art.43)

“ Blanket opposition to GM causes real harm in developing countries. Originally inspired by aggressive campaigning by western green groups, many African and Asian governments still have de facto bans on GM crops. Yet GM opportunities now exist that could revolutionise African farming,

bringing drought-resistant, disease-resistant and nutritionally enhanced crops to the people who most need them.” (Art.43)

*“The world will have to feed **nine-billion people by 2050 - two-billion more than at present.** We're already using pretty much all the available arable land. **We're heading into a crisis. Planting GM is critical** if we are to avert it - offering farmers increased yields, huge reductions in the use of chemical pesticides and crops modified in ways, which will directly improve human health.”
(Professor Moloney, Art.47)*

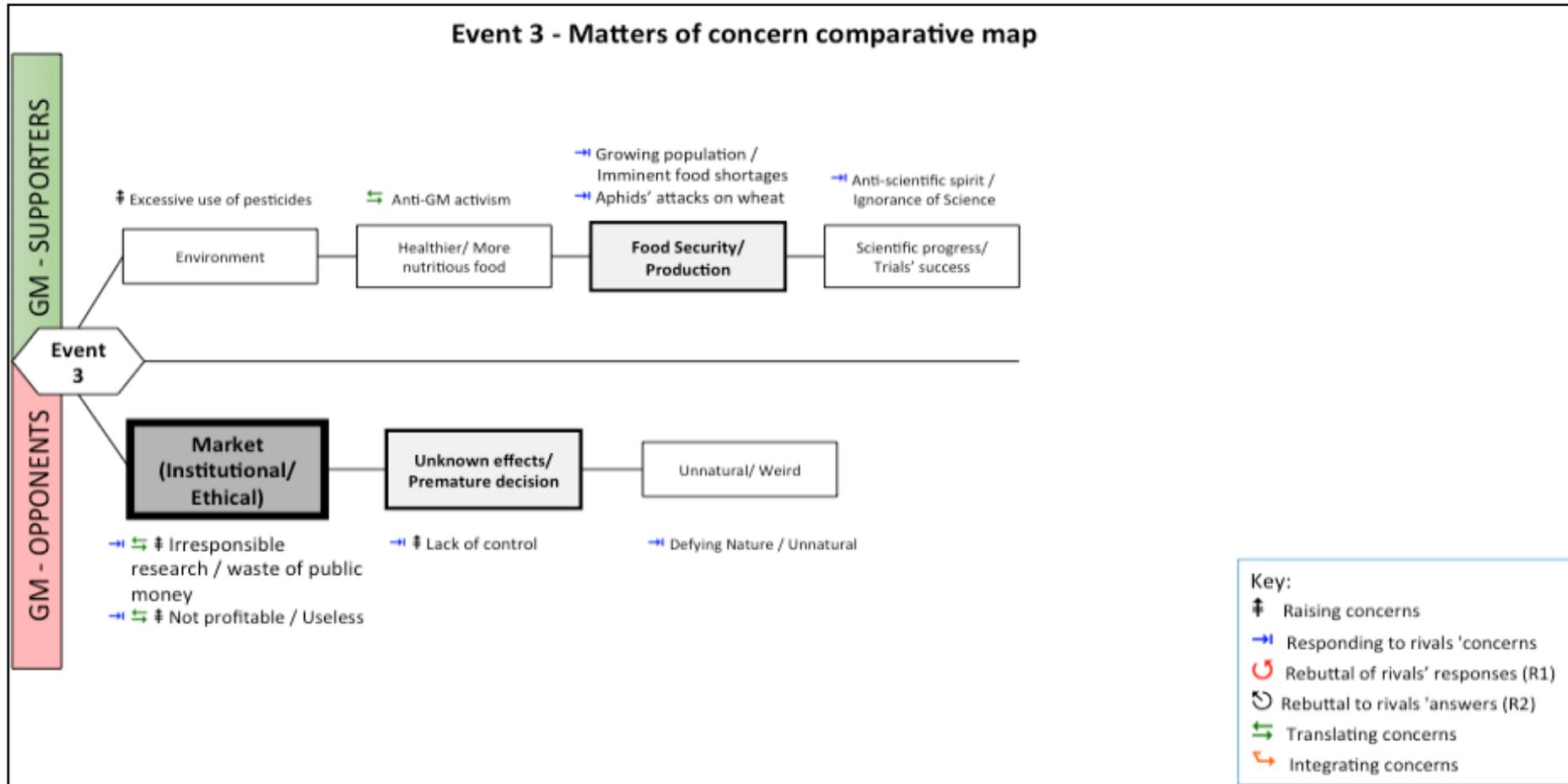
*“**Without a second 'green revolution' achievable through GM,** the world faces a future of shortages, rocketing food prices, severe environmental damage and malnutrition. But his fear is **that green campaigns have made it almost impossible for governments to give authorisation for new GM strains.**”
(Mark Lynas, Art.47)*

Although supporters present GM prospects as a need, they do not claim it to be an exclusive solution. Considering specifically the global appeal to enhance farmland productivity sustainably, they claim other existing farming methods to be insufficient and incapable of fulfilling alone growing needs. However, they imply in their communication GM methods are far more efficient and promising than other means, which are considered to be traditional and limited, while GM prospects benefit from scientific progress and proficiency.

4.1.1.3 Event 3: The GM-Whiffy-wheat trial's results

As table **Tb.4-8** below shows, the level of engagement expressively dropped with contrast to the previous phase on both sides. This triggering event is quite specific as it discusses the GM-Whiffy-wheat trial's results that did not concur with the scientists' promises and expectations. It is not surprising then that engagement from the trial's supporters came almost exclusively in a defensive form, mainly responding to opponents' comments.

Fig.4-5: Event 3 – Matters of concern comparative map



Tb.4-8: Event 3 Statements distribution

	Selling concerns	Translating concerns	Integrating concerns	Responding to concerns	Response rebuttals- Level 1	Response rebuttals- Level 2	Total Count of Concerns' Stage
GM-Whiffy wheat trial results							
Opposing	16	5		3			24
Supporting	1	1		33			35

Opponents

Since the actual results of the GM-Whiffy-wheat trial did not corroborate the scientists' expectations, this gave an opportunity for opponents to reaffirm their position, especially with regards to the unpredictability of outcomes and pointlessness of the project.

As in previous phases, they have expressed their main concerns from a political/institutional angle, however amending their focus. This time their main critics were essentially directed to the waste of public money, accusing the government and scientists of making premature decisions, conducting/supporting irresponsible research, and investing in non-profitable channels. The trial was explicitly qualified as 'a failure' and a waste of several millions of public money that could have been invested in beneficial projects answering other actual and more pressing needs. The newspaper articles' headings were expressive enough.

Examples of newspaper headlines:

"Taxpayer-funded trial of GM-wheat designed to beat bugs and cut need for insecticides ends in a £3million failure" (Art.48)

"Search for Aphid-resistant crop is £3m flop" (Art.49)

*“Field trial of genetically-modified wheat **failed** to show it can repel aphid pests, **scientists say**”
(Art.50)*

The way opponents’ interpreted the trial’s results was not surprising, considering their initial opposition to the project as a whole, and the cost of the experiment. However, their main concern this time seemed linked to conducting responsible and useful research, which they do not think this trial was. They blamed the scientists for having conducted a costly experiment, while a fellow European laboratory had conducted an almost identical experiment, the results of which had been published before the initiation of the British experiment and could have predicted the GM-Whiffy-wheat outcomes.

*“The crop's failure to resist the bugs has not surprised everyone. Jonathan Gershenzon at the Max Planck Institute for Chemical Biology in Jena, Germany, found in 2010 that GM plants designed to release EBF did not repel aphids, at least under lab conditions. The reason, he suspects, **is that the plants released the chemical continuously rather than in short pulses.**” (Art.51)*

*“I would have bet that it wouldn't work based on our published study. **Our major conclusion** was that **this strategy doesn't work in nature** because the aphids get used to the continuous release of their alarm pheromone and thus learn to ignore it. Or, they're programmed to respond only to bursts of it, which would be the natural situation when one of their sisters is attacked. Or both. This was a noble, **but expensive try,**”
(Jonathan Gershenzon from the Max Planck Institute for Chemical Biology in Jena, Germany; Art.51)*

Opponents’ then accused the government of using public money unwisely to support needless unreliable research, and falling into the over-promising approach adopted by the GM industry and its affiliated scientists. They even equated the experiment to ‘bidding’, denouncing the lack of control they think the scientists had on the process.

"The trial was a waste of time and money. Aphids are not a significant problem on wheat crops in the UK."

(Soil Association's Policy Director Peter Melchett, Art.52)

"The trial result was clear evidence of the 'folly' of focusing public resources on the development and promotion of GM crops'.

(GM Freeze, Art. 48)

"The trial was hailed by the former Environment Secretary Owen Paterson in June 2013 'as cutting edge'. But the findings, reported in the online journal Scientific Reports, reveal there was no statistical difference in the number of aphids infesting GM and conventional wheat".

(Sean Poulter, Art.52)

"The scientists had wasted taxpayers' money in a pointless bid to 'outwit nature'."

(GM Freeze, Art.49)

Supporters

It seems quite logical for the trial's supporters to be mainly engaged in responding to their opponents' interpretation of the results of the experiment. The latter must not be perceived as a failure, which would complicate justifying further research in the eye of the public and funding bodies. The scientists have barely reminded the ecological stance of their project and the role anti-GM activism is playing in preventing the world from having access to more nutritious food, and focused on defending the experiment's published results. However, if we consider that most answers to opponents accused their 'ignorance of science', one could take these as a reiteration of the concern the scientists raised previously about *Science* not being understood by those who oppose GM.

"Anti-GM protesters don't understand how science works; Protesters cheering the collapse of a £1m genetically-modified wheat trial seem too dim to realise that progress requires failure" (Art.53)

"The experiment itself was successful, because it allowed us to test the hypothesis of whether the GM-wheat could repel aphids in the field. It provided a conclusive answer that the wheat had failed to repel aphids, but that is not the same as a failed experiment or failed science"

(A spokesperson, Art.48)

"In science, we never expect to get confirmation of every hypothesis. Often it is the negative results and unexpected surprises that end up making big advances"

(Rothamsted researcher Dr Toby Bruce, Art.48)

"If we knew the answers to every question before we started, there **would be no need for science** and **there would be no innovation**. The trial has ended up yielding more questions than answers, but that means we have more work to do,"

(Toby Bruce a senior ecologist at Rothamsted and first author of the study, **Art.50**)

"... Liz O'Neill, director of GM Freeze, **a group which believes in magic not reason**, said on Friday that **the experiment was a 'folly'**" (**Art.53**)

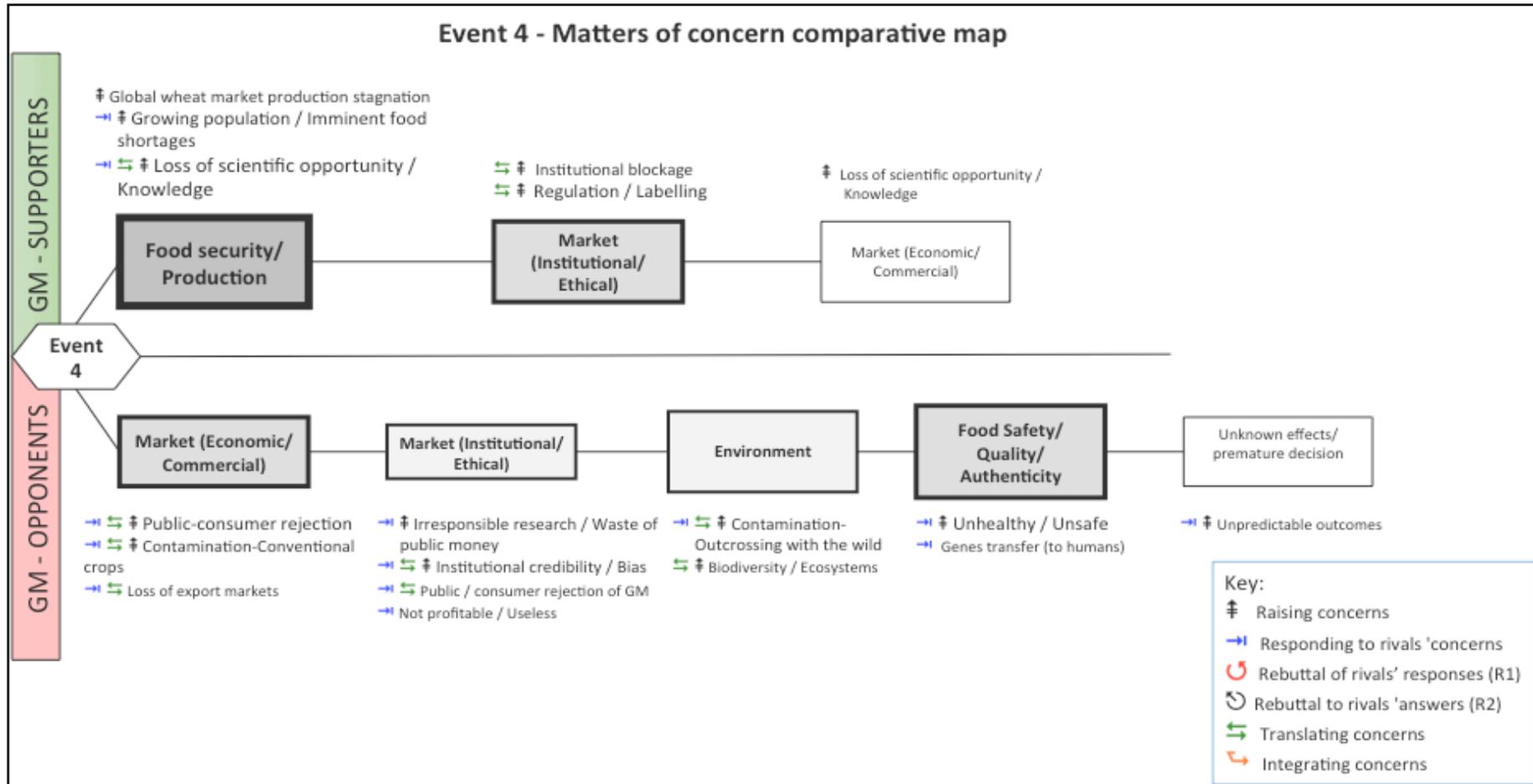
4.1.1.4 Event 4: The GM-Super-wheat trial announcement

Although announcing the GM-Super-wheat trial did trigger the discussion again about GM-wheat plans in general, as table **Tb.4-9** below shows, the event did not stimulate that much reaction compared to the previous trial that faced an actual threat of interruption. The rallying of the government rendering the interruption of trial illegitimate was a ‘fatal blow’ for opponents, proving the integration of the scientists concerns about anti-GM vandalism/activism and the need for supporting scientific research and experiment. As the following will show, this has impacted on the nature of expressed concerns, especially from the trial opponents’ side.

Tb.4-9: Event 4 Statements distribution

	Selling concerns	Translating concerns	Integrating concerns	Responding to concerns	Response rebuttals- Level 1	Response rebuttals- Level 2	Total Count of Concerns' Stage
GM-Super wheat trial							
Opposing	27	11		5	2		45
Supporting	31	10	13	38			79

Fig.4-6: Event 4 – Matters of concern comparative map



Opponents

Although the main expressed concerns by opponents⁸⁶ seem consistent, there is a significant change in their standpoint. Noticeably, worries related to ‘Public-consumer rejection’ and ‘contamination of conventional crops’, were this time predominantly expressed from an economic and market angle. Since opponents have noticed that they have relatively lost the institutional battle on the trials object, they seem to have chosen to highlight rather the economic and commercial risks accompanying the adoption of GM crops in an attempt to rally main actors forming the wheat supply chain. One of the ‘secondary’ triggering events, discussing the American GM contamination discovered in 2013, provided a strong justification for the GM-Super-wheat opponents’ claims.

Opponents claim there is no market for the GM-wheat in general, and for the GM produce planned for the open-air experiment in particular. They point to the resistance to GM along the wheat supply chain, contending that farmers, supermarkets, and consumers are still reluctant to GM foods, which also infers waste of research efforts and funds on pointless prospects.

*“Peter Melchett, policy director at the Soil Association criticised the proposed trial as **“irrelevant”** on the grounds that there was **no demand for the produce.**” (Art.55)*

*“**Most supermarkets ban GM** for their own-brand products.” (Art.56)*

*“**First of all on wheat, we know there is no demand for GM - even in the US, and certainly not in Europe or the UK.**” ‘The claimed potential gains from this trial are achievable through other means and there is **simply no market for the trial's eventual end product.**’ Lord Melchett, policy director for the Soil Association (Art.56)*

⁸⁶ Public/consumer rejection, contamination of conventional crops or the wild, and conducting irresponsible research with public funds.

“But the technology is controversial. American farmers have turned their backs on planting GM-wheat for fear it will be rejected by shoppers.” (Art.61)

For the first time since the debate over the British GM-wheat prospects had started, opponents raised matters related to the eventual loss of export markets if Britain introduces GM crops into its food supply chain, based on the possible contamination of conventional crops. This risk seemed to be justified by the commercial dependence of Britain to a great extent on exchange with the European continent, while Europe is still strongly opposed to GM in the food sector in particular.

“Plans to grow genetically modified crops in Britain could result in the EU blocking imports of the produce after Brexit, according to a leaked report by European parliament officials.” (Art.65)

*“Lowering UK farming standards or relaxing rules on GMOs could make matters even worse, by throwing up even more barriers for the many farmers who rely on trade with Europe”
(Baroness Parminter, the Liberal Democrat environment spokeswoman; Art.65)*

*“If the UK was tempted, after its withdrawal from the EU, to take a different approach to GMOs [genetically modified organisms] or chlorinated chickens, as we have read might be the case, this would considerably complicate its trade with the EU 27.”
(The officials note reports, Art.65)*

“Critics fear British wheat sales and exports will suffer if crops here are contaminated with genes from the GM plants.” (Art.61-64)

Contamination of conventional wheat would engender internal resistance as well from bread makers. As expressed in pre-narratives, GM-wheat is considered detrimental to the authentic British bread.

“If that happens (contamination of conventional crops) here it will threaten the growing use of UK wheat in British bread.” (Lord Melchett, policy director for the Soil Association, Art.61)

The latter represents an emblematic food item that carries meanings of food authenticity and safety, and therefore needs to be protected from suspicious ingredients. Actually, one of the collectives that joined the protest is the *Real Bread Campaign*. Although, they do not advertise explicitly their opposition to GM ingredients, they promote traditional recipes and seem to favour the organic route⁸⁷ and to consider GM as a form of ‘imposter’ ingredient like additives.

4.1.1.4.1 Side-narratives influence

To support their claims, opponents referred explicitly or implicitly to the North American case, revived by the Oregon Monsanto GM-wheat escape outbreak that took place in 2013. Despite the well-known institutional support for GM technology in North America, American and Canadian farmers could not fully embrace the technology due to their foreign customers’ intolerance to GM crops.

The discussion of the case in the media highlighted a lack of control over gene pollution, especially that the US government admitted not knowing how the contamination occurred and Monsanto took refuge in speculative accusations of anti-GM conspiracy rather than taking their responsibilities.

“The news caused shock in America as GM-wheat had not been approved for commercial sale and was grown only on supposedly secure test plots. Officials were unable to discover how the shipment, sent from Portland, Oregon, had become infected but admitted that a small number of acres of GM grain had been planted in the states of Washington, Idaho and Oregon that year.” (Art.46)

⁸⁷ “Their co-founder is Andrew Whitley is author of the seminal book *Bread Matters* set up and run The Village Bakery Melmerby (one of Britain’s first organic bakeries) for 25 years.” (Real Bread Campaign, 2020)

“Monsanto strongly suggested in a conference call with reporters on Friday that the company was the victim of sabotage of anti-GM campaigners.”

(Art.46)

Monsanto’s wheat escape confirmed the inefficiency of existing security measures, and gave a serious shake to the market due to the prompt and intransigent reaction from foreign customers cancelling their orders over an extended time period. Not only, the incident caused the fall of US wheat prices, which had a broader effect on wheat farmers, and revived the question of liability.

‘The discovery rocked international wheat markets. Japan, South Korea and Taiwan suspended imports of US soft white wheat for months, while a Kansas farmer sued Monsanto, saying it had caused the price of American wheat to plunge.’

(Art.63)

“The stakes are high for America's wheat exports, with Japan and South Korea cancelling shipments; for Monsanto, which faces lawsuits from farmers for falling wheat prices and a consumer backlash against GM products; and for the US government, which must shore up confidence in the safety and integrity of the food supply”

(Art.46)

Supporters

Increasing yields & preventing food shortages

Since the main promise of the GM-Super-wheat seems to be its ability to increase yields, the trial’s supporters framed their argumentation mainly around the probable loss of a scientific opportunity that would allow preventing imminent food shortages facing humanity by 2050. They argued that global wheat production reached its full potential with current production means and has entered a stagnation phase over the last two decades, which would logically end in a food crisis due to constant population growth.

To justify the importance of this concern, disquieting gaps between forecasts of population growth and wheat production rates were emphasised.

“The stagnation of wheat yields has raised fears the world's agricultural land will not be able to feed a global population set to reach nine billion by 2050.”
(Art.55)

“By 2050 there will be 34 per cent more people on the planet and we can't just sit back and assume all will be well.” (Professor Christine Raines, Art.56)

“After decades of growth, world-wide wheat production has plateaued. Conventional methods of improving wheat yields appear to have stalled – yet global demand for flour and bread is set to soar”
(Art.56)

“... in 1977 wheat production was increasing by 30 per cent a year while current growth is almost zero. We really do have an impending major food shortage across the globe.”
(Professor Christine Raines, Art.57)

“Wheat yields have stopped rising in recent years, Wheat provides a fifth of the total calories consumed globally.” (Art.62)

The scientists present this GM-Super-wheat as a revolutionary idea, since all other GM-wheat prospects focused on eliminating dangers threatening crops, while this GM-wheat is focusing on increasing the grain yield by improving the performance of a natural plant process, the photosynthesis. This way, scientists attempted to distance their new GM project from former trials and present it as a ‘completely’ new scientific opportunity that needs to be seized.

“To date photosynthesis has not been used to select for high yielding crops ... and represents an unexploited opportunity”
(Professor Christine Raines, Art.64)

“It would be a real pity if we don't embrace the available technologies to try to produce the best plant varieties that we can.”
(Art.60)

“The trial would assess the plants' ability to produce more using the same resources and land area as their non-GM counterparts”
(Rothamsted's Dr Malcolm Hawkesford, Art.64)

The EU Institutional blockage

The second most prominent concern presented by supporters is of an institutional nature. It consists of the necessity to get the government approval allowing the conduct of the open-air trial, while being under the European legislation that has proven hostile to GM crops. Although the British government appears allied to the GM cause, GM supporters claim that Britain is prevented from GM opportunities due to intransigent EU regulation laws and slow processes, and express a relief that this situation is most likely going to change after Brexit.

"Let me put it this way. If we want to exploit GM technology, then it **will need government backing. It's legislation, isn't it?** "I can't just put something in my garden. In order for that to be enabled, **you're going to have to have government support** for that."
(Christine Raines, professor of plant molecular physiology at the University of Essex; Art.60)

"If we are granted permission to perform a controlled experiment it will be a significant step forward."
(Dr Malcolm Hawkesford, Art.56)

“A Currently GM crops must be passed by the European Food Safety Authority and then be approved by the Britain's Advisory Committee on Novel Foods and Processes.”
(Art.56)

“No genetically modified (GM) food is grown in the UK because of stringent European Union regulations...it emerged that ministers were weighing up plans to hold the world's first open-air trial of GM "superwheat". The government has also said it was considering a dramatic liberalisation of GM food laws after Brexit, which would allow farmers across the country to begin planting the crops.”
(Art.55)

“Political opposition to GM foods in several EU states has resulted in only one GM crop being approved by the bloc in the past 20 years.”
(Art.65)

4.1.2 Pervasive concerns

Looking at the degree of diffusion of the expressed concerns within the explored perspectives, it could be noticed that some were expressed from different vantage points and had plausibly provided grounds for other matters, which attests for their relative importance and level of embeddedness within their perspective.

I call ‘pervasive concerns’ those matters that are expressed from different angles within a given perspective, and seem capable of ramifying and duplicating in other sub-issues, enlarging the concerning scope. It is therefore crucial to identify these. Understanding adversaries’ pervasive concerns helps appreciating the scope of contentiousness and envisaging more suitable answers to adversaries’ objections.

The concerns’ comparative maps provided in the sections above would be useful here.

Opponents

Looking at concerns expressed by opponents all over the triggering events, the most obvious pervasive ones appear to be the risk of gene pollution (expressed in contamination terms), and worries about food democracy.

The risk of contamination became a pervasive matter for two main reasons, extending its ability to duplicate into other issues. Firstly, within a GM plan, the risk of contamination appears present from the moment the GM prospect is tested, across the process until its actual commercialisation. Opponents claim GM crops could cross-pollinate with the wild or other planted crops during open-air trials and cultivation, or with conventional crops during storage, transport, and commercialisation phases. Secondly, because they presume this risk of contamination to be inevitable and

irreversible, based on past factual experiences and some scientific assertions (explained further in the next section), it naturally raises practical and ethical questions about food authenticity and safety, consumer choice, liability, and the viability of the method within current market settings.

The second pervasive matter appears to be concerned with the independence and fairness of food politics. Opponents' demands for the wider public to be engaged in food policy making with regards to controversial prospects, their denunciation of GM lobbying and institutional partiality, and the claimed right for pending questions on GM to be answered from different perspectives, all seem to stem from an aspiration for more efficient democratic food system. Concerns about corporate hegemony also seem to have strong roots in this aspiration of a fairer system, where consumers would not be fooled or forced to consume specific products due to lack of labelling or choice.

Supporters

Looking at the scientists' perspective now, two matters of concern could be easily tracked on the maps as pervasive: concerns about losing a scientific opportunity embodied in the GM technology and prospects, and the anti-GM movement, exacerbating the first and expressly extended into worries about the proliferation of anti-scientific spirit.

All those who spoke in favour of the GM-wheat trials did so from an angle predominately promoting *Science* as transcending other forms of knowledge and being the guarantor of progress. GM technology and prospects fused with *Science* and *progress* within supporters' discourses and perspective. Subsequently, any form of

opposition to GM was interpreted by supporters as an opposition to *Science* hindering the voice of research and progress, and linked to backwardness ideas and ideologies. Accordingly, the anti-GM activism, whether adopting the most vehement or most tactful expressions, was associated with anti-scientific spirit and ignorance of science, and was considered to be a serious threat to the advance of the technology and scientific development as a whole.

Considering this, distancing current GM prospects from previous GM versions and the negative perceptions these had generated amongst the public, appear to be another pervasive concern amongst GM supporters' perspective. This is manifest in the way scientists focused on promoting their GM-wheat from a scientific angle and in the way they heavily portrayed anti-GM movement attempts as anti-scientific and driven by ignorance, implying their irrelevance in the specific case of government funded scientific projects. Additionally, they presented their GM prospect as belonging to a second generation of GM.

4.1.3 Concerns resilience and contention concentration

Based on an analysis of the level of uncertainty in which terms most prominent concerns on both sides were expressed, this last section will help appreciate the resilience of these concerns, accounting for the relative strength of opposing perspectives, and the controversial concentration. The latter informs about the contentious potency of the debate.

For the purpose of this analysis I have selected those concerns on both sides of the conflicting spectrum that mobilised about 80% of the competing statements (the 9 first lines on opponents' side **Tb.4-6**, and 7 first lines *-merged into 5 items-* on supporters' side **Tb.4-7**, presented in a previous section analysing Event2-Competing statements). The following tables, **Tb.4-10** and **Tb.4-11** show the proportions in which most prominent concerns were expressed in terms of *Risk* and *Uncertainty*, for both perspectives.

The two tables show that, surprisingly, the majority of opponents' main concerns were expressed in *Risk* terms (except for Liability), while the majority of supporters' main concerns were actually expressed in *Uncertainty* terms (Except for Risk of anti-GM-activism/Vandalism). This is surprising because *Risk* terms, as explained in the codification section, are generally based on more 'accurate' elements, whether arrived at through probabilities based on mathematical models/statistics or based on embedded cultural, customary, and ideological beliefs.

Additionally, if we consider that most commonly *Risk* refers to objective-probabilities, it appears really surprising that those accused of being the 'less-objective' are finally those who based their concerns on more accurate basis. We would normally expect the opposite, where the scientists would communicate in *Risk* terms rather than *Uncertainty* terms.

Tb.4-10: Opponents' main concerns Uncertainty/Risk distribution

1. Food democracy		6. Corporate hegemony & excessive profit making	
Risk	64%	Risk	82%
Others' past factual experience	13%	Present facts/circumstances/Legislation	11%
Local/General past-Factual experience/statistics	25%	Others' past factual experience	11%
Perceptions-Societal	6%	Local/General past-Factual experience/statistics	44%
Present facts/circumstances/Legislation	56%	Past-Perceived experience	22%
Uncertainty	36%	Perceptions-Societal	11%
Controversial	44%	Uncertainty	18%
Lack of information/premature process	22%	Present facts/circumstances/Legislation	100%
Perceptions-Societal	11%	7. Unhealthy/unsafe	
Personal-Groupe opinion/declaration	22%	Risk	63%
2. Public/consumer rejection of GM		Independent research	50%
Risk	83%	Official bodies proclamation	10%
General widespead opinion	11%	Local/General past-Factual experience/statistics	30%
Others' past factual experience	11%	Surveys/polls/studies	10%
Local/General past-Factual experience/statistics	11%	Uncertainty	38%
Personal-Groupe opinion/declaration	11%	Lack of information/premature process	33%
Past-Perceived experience	5%	On-going research	67%
Present facts/circumstances	21%	8. Formation of pesticide immune species	
Surveys/polls/studies	32%	Risk	86%
Uncertainty	17%	Others' past factual experience	17%
Lack of information/premature process	25%	Local/General past-Factual experience/statistics	33%
Perceptions-Societal	75%	Present facts/circumstances	17%
3. Contamination-Conventional crops		Scientific research (confirmed)	17%
Risk	88%	Surveys/polls/studies	17%
Present facts/circumstances/Legislation	9%	Uncertainty	14%
Independent research	5%	Lack of information/premature process	100%
Others' past factual experience	68%	9. Liability	
Local/General past-Factual experience/statistics	9%	Risk	40%
Past-Perceived experience	5%	Others' past factual experience	100%
Scientific research (confirmed)	5%	Uncertainty	60%
Uncertainty	12%	Absence of warranty	100%
Absence of warranty	33%		
Lack of information/premature process	33%		
On-going research	33%		
4. Irresponsible research/Waste of public money			
Risk	77%		
General widespead opinion	4%		
Local/General past-Factual experience/statistics	38%		
Past-Perceived experience	4%		
Present facts/circumstances	29%		
Scientific research	21%		
Social conventions	4%		
Uncertainty	23%		
Absence of Leadership	14%		
Present facts/circumstances/Legislation	14%		
Lack of information/premature process	14%		
Personal-Groupe opinion/declaration	43%		
Present facts/circumstances	14%		
5. Contamination-Outcrossing with the wild			
Risk	95%		
Others' past factual experience	89%		
Past-Perceived experience	6%		
Present facts/circumstances/Legislation	6%		
Uncertainty	5%		
Lack of information/premature process	100%		

Tb.4-11: Supporters’ main concerns Uncertainty/Risk distribution

1. Anti-GM activism/Vandalism		4. Anti-Science spirit/Ignorance of science	
Risk	82%	Risk	31%
Present facts/circumstances/Legislation	6%	Local/General past-Factual experience/statistics	13%
Local/General past-Factual experience/statistics	78%	Past-Perceived experience	25%
Personal-Groupe opinion/declaration	17%	Personal-Groupe opinion/declaration	50%
Uncertainty	18%	Present facts/circumstances/Legislation	13%
Controversial /Multiple Truth paths	25%	Uncertainty	69%
Lack of info/Fallacy	25%	Controversial	11%
Lack of information/premature process	25%	Lack of info/Fallacy	39%
Controversial	25%	No clear basis/Unknown	6%
2. Excessive use of pesticides		Personal-Groupe opinion/declaration	44%
Risk	32%	5. Growing population/Imminent food shortages	
On-going research (confirming results)	20%	Risk	40%
Local/General past-Factual experience/statistics	10%	Future forecasts	88%
Present facts/circumstances/Legislation	40%	Local/General past-Factual experience/statistics	13%
Surveys/polls/studies	30%	Uncertainty	60%
Uncertainty	68%	Lack of info/Fallacy	25%
Controversial	10%	Lack of information/premature process	25%
Hype phase (New tech)	10%	On-going research	25%
Lack of information/premature process	24%	Controversial	8%
On-going research	57%	Present facts/circumstances	8%
3. Loss of scientific opportunity/Knowledge		Unpredictable	8%
Risk	28%		
On-going research (confirming results)	33%		
Local/General past-Factual experience/statistics	17%		
Personal-Groupe opinion/declaration	8%		
Present facts/circumstances/Legislation	33%		
Scientific research (confirmed)	8%		
Uncertainty	72%		
Controversial	6%		
Hype phase (New tech)	10%		
On-going research	77%		
Personal-Groupe opinion/declaration	3%		
Perceptions-Societal	3%		

Opponents’ main concerns rely heavily on ‘*Factual past experiences*’, whether local or abroad. These are actual occurrences materialising an estimated risk, although the probability of its re-occurrence is still disputable. They give resilience to the matter they support, since they provide the counter-example that shakes the scientists’ affirmations of certainty. For example, the risk of contamination appears as a reified risk due to actual past occurrences, where safety measures were considered yet did not prevent the incidents from taking place (e.g Monsanto’s GM-wheat escape and contamination of conventional canola in Canada). The same could be inferred for the concern about investing into prospects subject to public/consumer rejection. This concern is not

merely based on general opinion shaped and valued by the opponents of the trials (as alleged by GM supporters), it is based on actual reluctance from national retailers, on some polls/surveys results, and on the past reaction of the export market to the GM-wheat escape in the US, causing their wheat price to fall and placed orders to be cancelled by regular customers.

On the other hand, supporters' main concerns were not accurately substantiated, as they were mainly expressed in *Uncertainty* terms. Except from the risk of anti-GM activism/vandalism that has roots in incidents that happened in England a decade ago, all other main concerns presented a lack of information, and reliance on unfounded positive speculation. Even their *Risk* appreciation relied on quite subjective elements, positive speculation of their own research, declarations of their own colleagues/expert network, and controversial objects, those that are not widely acknowledged or benefit from scientific corroboration, which shows the higher status GM supporters attribute to their expression over lay/non-compliant expression and experience.

Consequently, opponents' main concerns appear more resilient. This means that they acquired the status of 'matters that matter' and have to be resolved in a way or another to move forward. While, major supporters' concerns are rhetorical, and for them to matter really, they need to have a more accurate substantiation. However, this does not fully determine power distribution between opposing perspectives. As next lenses will show, the quality and organisation of a network, the authority of underpinning ideologies, are crucial to make these elements perceptible at the public level where the battle is held.

Finally, controversial concentration appears more on the side of GM supporters. This is because, the more raised concerns (and answers to opponents' concerns) are expressed in *Uncertainty* terms, the more there is scope for these to multiply and ramify into side issues, which risks to enlarge even more the contention scope and complicate negotiations between opposing groups.

4.1.4 Articulated literatures

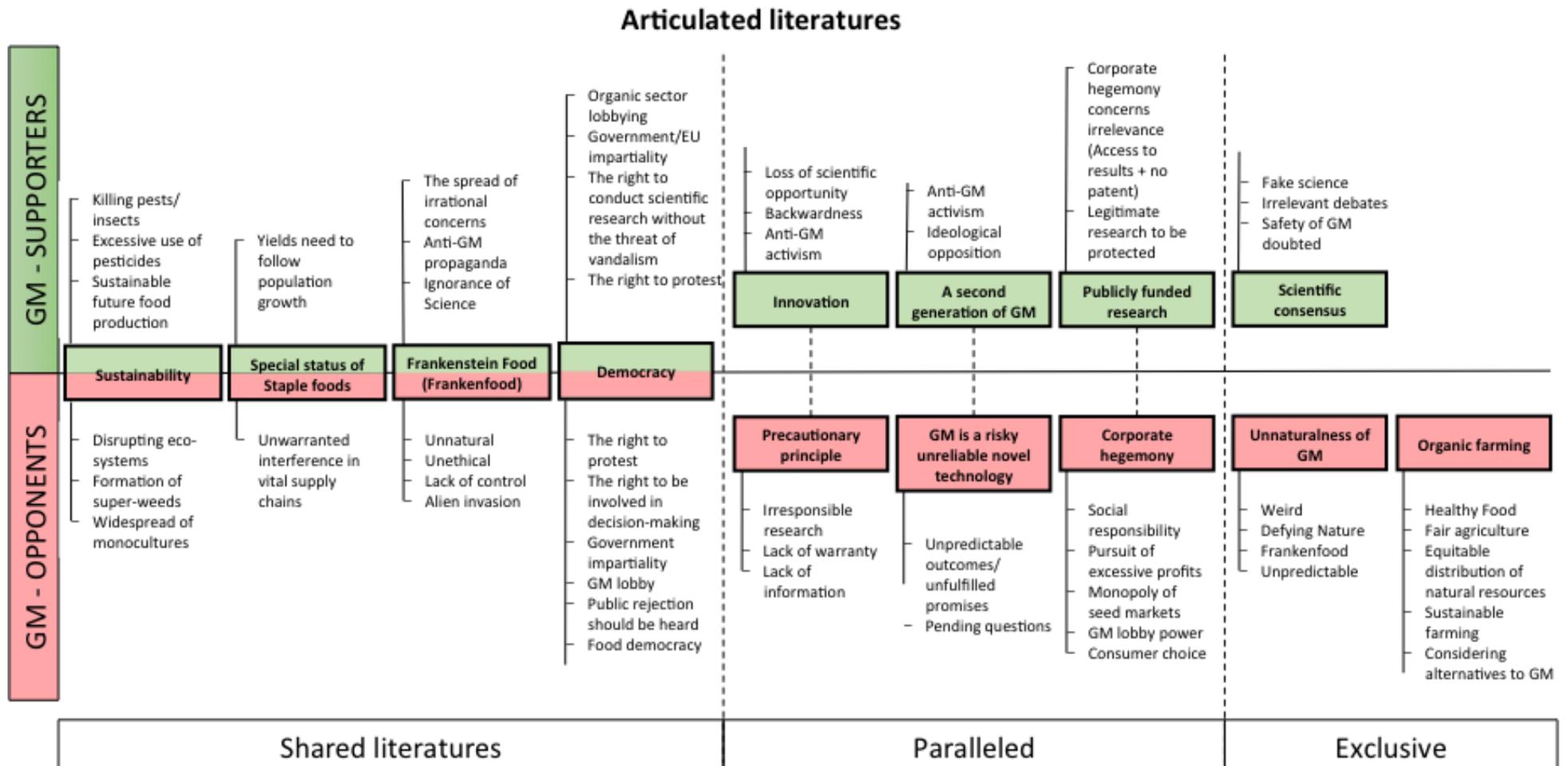
The expressed matters of concern do not sprout inexplicably as punctual isolated claims. They refer to rallying understandings and readings of reality based on shared sets of values and beliefs. Here, one shall not expect only well-defined and bounded literatures. As Venturini (2010) states, “...*actual literatures have nothing to do with the tidy and well-organised images often provided by manuals and anthologies. Especially when they concern controversial issues, literatures are as dynamic and as disputed as controversies themselves*”.

To extend this quote, what makes an articulated literature is the effort invested by different interested actors in defining, negotiating, and extending a matter. Controversies occur when there is a need for shaking existing literatures and their articulation to accommodate new demands and visions of the world, which makes them ideal forums for building new literatures around a specific element of the discussion. Consequently, some of the literatures that I will be discussing in this section may take the form of new constructed associations supporting raised matters (e.g. GM unfulfilled promises). Similarly, some concerns have become so pervasive within the debate that they constitute new articulated literatures in their own right (e.g. Unnaturalness of GM).

The map in figure *Fig.4-7* below shows main articulated literatures giving ground for raised matters from both sides of the controversy. To simplify, only highly impacting backed matters of concern were represented on this map.

It is also interesting to notice that, in terms of literatures, the dual representation of the conflict is not fully supported. Some literatures were paralleled, providing a representation in direct contrast to adversaries, while some were referred to by both opposed groups, although in different terms, and others appeared to be exclusively constructed/mobilised by one side or the other.

Fig.4-7: Articulated literatures comparative map



4.1.4.1 *Seemingly-shared literatures*

Seemingly-shared literatures point to these constructs that are referred to by both opposing groups, yet expressing different meanings.

On the left side of the map (Fig4-7), four seemingly-shared literatures could be observed.

4.1.4.1.1 Sustainability

Both groups claimed being concerned about the long-term viability of the current global farming/agricultural system, the preservation of biodiversity and balanced ecosystems. However, what constituted a solution for one group, clearly represented a matter of concern for the other, which makes these shared references account for highly controversial arenas in the debate's landscape, contrary to what their articulation on both sides may suggest.

The scientists advertised the GM-Whiffy-wheat as an eco-friendly prospect that would encourage more sustainable farming, reducing pesticide sprays and repelling pests rather than killing them. However, opponents claim the same wheat to be detrimental to their sustainable farming projections, encouraging the widespread of monocultures and disrupting ecosystems in surrounding fields.

*“GM has **traditionally been associated with killing something**, either killing the weeds or killing the insects. In this case what we are doing is putting a 'no parking' sign on every leaf of the plant. **It's a very different strategy from what's been done so far and I think it will open up many avenues**”*
(Rothamsted's director, Prof. Maurice Moloney, Art.9)

*“A new, **eco-friendly generation** of genetically modified crops.” (Art.9)*

*"Owen Paterson is wrong to claim that GM crops are good for the environment. **The UK Government's own 'farm scale experiment' showed that overall the GM crops were worse for British wildlife**"*

(Peter Melchett, the Soil Association policy director, Art.45)

*"**The aphids would just head to the field next door**"*

(Peter Riley, of GM Freeze, Art.10)

*"Advocates insist GM crops are beneficial to insects - but **UK trials in 2004 found the numbers of butterflies, bees and beetles in fields of GM oilseed rape and beet were significantly lower than with conventional farming**" (Art.61)*

4.1.4.1.2 The 'Special status of staple foods'

Staple foods are emblematic foods that carry meanings linked to food security and authenticity, and therefore are the first to be protected from plant diseases and contamination.

Being a staple food, GM-wheat prospects appear to opponents even more concerning than other GM crops destined for biofuels or animal feed. Wheat must be protected from unwarranted interference, which may occur through gene manipulation applied to wheat or contamination by other GM crops. This represents a double challenge for opponents, since they seek to prevent the technology from seizing staple foods, but also fight for GM and conventional crops to remain perfectly separate. As pre-narratives revealed, opponents see in GM a serious threat that goes beyond punctual safety questions, raising matters about irreversible contamination of vital food supply chains, which may put future food safety and sovereignty at risk.

*"Given the fact that **wheat is a staple crop**, the development of GM varieties is **particularly controversial**". (Claire Oxborrow, a foods campaigner at Friends of the Earth, Art.7)*

As for GM supporters, this quality of wheat being a staple food justifies even more the necessity of considering GM applications to support a sustainable yield growth protecting it from pests, diseases and climate challenges. The strong correlation they made between the need for increased yields and tackling food shortages would not be defensible otherwise.

"By 2050 there will be 34 per cent more people on the planet and we can't just sit back and assume all will be well. We really do have an impending major food shortage across the globe"
(Prof Christine Raines, Art.56)

"The world's priorities and needs are also fast changing. Issues such as climate change and population rise mean we just don't have the luxury any more as a species to ignore or decry this technology: It is increasingly obvious that unnecessarily ruling out crop-improvement technologies harms the interests of humanity"
(Mark Lynas, Art.26)

4.1.4.1.3 Frankenstein food/Frankenfood

'Frankenstein food/Frankenfood' is an emblematic expression within the GM controversy. Although, the term was first used by GM detractors, mirroring the expression of 'sound science', surprisingly, it has become then "*a shorthand label to refer to irrational, uninformed, media-led resistance to GM*" (Cook, 2004, P96).

For opponents it refers to the irresponsible application of science that ended in Mary Shelley's novel creating a life threatening 'monster'. The GM scientists were compared to Dr Victor Frankenstein, who despite his good intentions, ultimately lost control on his creation, and GM crops were similarly paralleled with his weird and uncontrollable

creation. The appropriation of the term by opponents refers to the weirdness and unnaturalness of the GM technique, altering and combining genetic material in a way that does not occur spontaneously in nature (McGee, 2017). It also represents a clear condemnation of exclusive consideration and reliance on scientific knowledge, overlooking human and social dimensions that determine ultimately the value of the acquired knowledge in terms of usefulness, welfare, and ethical aptness.

Since the term is inspired from a science fiction novel, GM supporters on the other hand seized the term altering its connotation, linking it rather to the unrealistic and inexperienced aspect of the story to belittle opponents' claims in the public eye. The metaphor became then symbolic of the irrationality of opponents' thesis and its reliance on myths spreading propaganda rather than trusting objective facts and science.

"...it was a 'deja vu moment' when he heard about the protest, which 'took me back to all those debates about 'Frankenfood'"
(Colin Ruscoe, chairman of the British Crop Production Council, Art.26)

*"The reason it (Vitamin-A rich Golden Rice) is not is because of well-funded campaigns by anti-GM activists across Asia, who would rather see **poor children unnecessarily blinded** than have **evil 'Frankenfoods' let loose on the world's farms**"* (Art.53)

Bruno Latour (Latour, 2011) defending the innovative thrust, but at the same time reminding our social and ecological responsibility, provides a reconciling interpretation. He straightens up the Frankenstein metaphor, explaining that Dr Victor's mistake was not in his ambitious and adventurous scientific attitude, but rather in failing to be fully responsible for 'his creation', abandoning it to its dark fate. Accordingly, Latour criticises an absolute condemnation of technological progress, while pleading

for a more responsible attitude towards the latter where progress would not be the ultimate goal in itself.

4.1.4.1.4 Democracy

Democracy was expressed from both opposing groups as representing a set of citizen-acquired rights backing up their claims and actions, although contradictory. Disparities in how democracy is understood and should be applied appeared in many ways.

Democratic mandate to proceed with the trials

Protesters claimed the right to be involved in major decisions impacting their natural and social environment and to oppose a trial that has not been granted public consent. Therefore, in their views, the trials have not been granted democratic mandate, being confirmed by the government despite voiced public resistance. Furthermore, the decision to go with the trials in such circumstances meant betrayal of the collective will and undermined trust in government institutions raising concerns about the effectiveness of current *delegative* democratic devices.

“The rest of us are entitled to ask whether the benefits of letting this modified thing - whether corn, sugar beet or mosquito - out into nature, to breed with other things, outweigh the conceivable disadvantages and the aesthetic unnaturalness of it all.” (Art.15)

“Rothamsted has **no democratic mandate**” to proceed”
(Liz Walker, a veteran of the 1990s anti-GM protests, Art.26)

“GM Freeze, representing 30 organisations, had called on ministers to refuse permission for the wheat trial. However, the Government has made clear it is keen to promote GM farming.” (Art. 61)

“many suspect is going on is that a battle to overturn majority opinion is being fought with our money by individuals and institutions, including Rothamsted, that stand to make a handsome profit if GM crops are patented.” (Art.15)

On the other hand, the scientists’ condemned opposition to government-endorsed trials, which had gone through legal procedures and had been granted political and institutional approval to go ahead, and claimed their right to conduct scientific research.

“One of Britain’s leading plant research centres has applied for permission from the government to begin the trial of the GM cropA field trial of an experimental GM-wheat will begin in March next year if government officials give the go-ahead for the crop to be planted.....The proposed trial is scheduled to run from March 2012 to October 2013. Anyone can submit an objection to the proposals up to 19 August this year. (Art.7)

“Scientists have been given approval for Britain’s first trial of genetically modified wheat, the Government confirmed yesterday.” (Art.8)

“As scientists, we do not claim to have all the answers. However, our scientific community must be able to conduct regulated and approved trials and experiments without the threat of vandalism hanging over them.” (Professor Douglas Kell, the chief executive of the BBSRC, Art.35)

“Scientists submitted an application to Defra this week and a public consultation of around six weeks has begun.” (Art.56)

“The trials, which are jointly funded by the British and US governments, have been approved by the food and farming department, Defra.” (Art.65)

Use of public money

Similarly, the public funding of the GM-wheat trials was perceived differently from both sides of the controversy. For the scientists, it meant democratic approval and independency from the feared corporate control over the tested crops. Being publicly funded provided, in their views, legitimacy to the planned trials to go ahead. The cost of the trial was compared to a long-term investment for common benefit.

"Whoever conducted this malicious attack, please respect our wish to give public-funded science information to the public" (Art.39)

"These field trials are the only way to assess the viability of a solution that can bring economic benefits to farmers, returns to the UK taxpayer from the long-term investment in this research, benefits to the UK economy as a whole and the environment in general" XX

On the other side, protesters saw in the use of taxpayer money to fund what they believed to be costly, useless and illegitimate trials, a breach of the democratic contract and waste of public resources.

"Why are we spending about £1m of public money, at a time of austerity, on researching something the public has definitively said it does not want and that Europe is unlikely to approve unless it is starving?" (Art.15)

*" We're concerned that public money is being spent on research where there is no public acceptance or market"
(Claire Oxborrow, a foods campaigner at Friends of the Earth, Art.7)*

The right to protest

The right to protest was recognised on both sides as an acquired and irrevocable right, which let it appear to be one of the emblematic manifestations/acquisitions of democracy.

However, in protesters views it extends to physical actions, which would not be allowed in ordinary contexts, to stop the contested aim/object from being fulfilled.

*"... it's no surprise if responsible citizens feel forced to take the only action left to them."
(Joanna Blythman, Art.27)*

Whereas, the trials supporters seemed to limit this right to its discursive level, and qualified intrusion to the site (a private property) as a criminal offense and a denial of fellow citizens rights. Although the right to gather physically could not be fully withdrawn, the police did prevent protesters from approaching the experimental site through physical and legal distancing (e.g. a buffer zone, and threats of legal persecution).

""We know we cannot stop you from taking the action you plan, nor would we wish to see force used against you". (The letter sent to protesters, Art.11)

"People have the right to make their views known but we deplore those that turn to criminal damage. We will support the police and Rothamsted in ensuring all appropriate action is now taken.
"Professor Douglas Kell chief executive of the BBSRC, Art.19)

"Professor Maurice Moloney called the vandalism **an attempt to 'deny us all the opportunity to gather knowledge** and evidence' on a possible new approach for reducing the use of pesticides."
(Art.22)

"The 'illegal activity' had taken place **despite efforts to hold talks with protesters** in the hope of allowing the trials to run their course." (Professor Maurice Moloney, Art.23)

Government impartiality

Both sides accused authorities and institutions of being impartial in dealing with the GM case. GM opponents denounced the government's GM-compliant attitude, favouring the integration of GM technology and preparing for a widespread of GM farming in England after Brexit despite strong public opposition and accommodating corporate interests.

“Conservatives and Republicans will side with scientists when big corporations benefit (GM foods, nuclear power) and oppose it when big corporates are losing out (renewable energy).” (Art.30)

“Alternative technologies such as marker-assisted selection (non-GM genetic mapping) is now overtaking GM, but the immense lobbying power of the industry could still get it back on to the agenda.” (Pete Riley, a Friends of the Earth campaigner and spokesperson for GM Freeze)

In an analogical way, GM supporters raised concerns about the influential position Green parties occupy in Britain, and in Europe specifically. They attribute regulatory delays to the pressure made by these groups on policymakers, who at the same time are generously financed by European common funds.

“One reason for the inertia is that anti-GM green groups are deeply embedded in the EU policy process. Since 1997, the European Commission has given them about £80million in taxpayers' euros, and they are regularly invited to 'stakeholder meetings' with Brussels agencies and top officials. Effectively, the EU is paying them to lobby itself in order to block GM.” (Art.47)

*“The greens have successfully set public policy on the GM issue in Britain and Europe.”
(Mark Lynas, Art.53)*

Democracy seems trapped in its own imperfections, and the case highlights a real issue of representation, where the represented feel ‘betrayed’ by their delegates, and none of the conflicting groups seem to agree on the way the government and its institutions are deciding and performing food and agricultural policies. Nevertheless, both groups referred and had recourse to their democratic rights to support their respective positions.

4.1.4.2 Paralleled literatures

These are those underpinning literatures that seem to mirror each other, giving grounds for responses and arguments defying adversaries’ proposals within competing

perspectives (see middle section of the map *Fig.4-7*, paralleled literatures are linked with dotted lines).

4.1.4.2.1 The Precautionary Principle (PP) versus Innovation⁸⁸

The battle over GM prospects illustrates a clash between two opposing ways of thinking about novel technologies, which was illustrated by the European-American cleavage when discussing the debate's pre-narratives. On one hand, opponents to GM plans want to favour a precautionary approach based on lack of information and the existence of essential pending questions. On the other hand, pro-GM groups are asking for a less rigid legislation allowing to proceed with GM as long as there is no actual danger or objectively calculated risks directly associated with these.

Despite its notoriety, the PP is a quite controversial concept (Stirling, 2013, 2014) in its aims (does it call for 'zero risk' or reasonable risk?), its appreciation (how to appreciate such risks?), and subsequently, its interpretation (Lee, 2008). Here, I am not interested in discussions assessing the PP logics and implementation, but rather in its basic definition and most shared understandings within opposing groups in the context of the GM policy fights.

The PP appears as a set of approaches, rather than precise directives, which are concerned with decision-making in contexts governed by uncertainty (Weale, 2007),

⁸⁸ Here what is meant is technological innovation, as innovation is a broad term that may include several other forms (social, managerial...) (Henderson and Clark, 1990). Also, the concept of innovation in this context is often equated with scientific development and progress.

such as, favouring preventive action, exploring alternatives, and increasing public participation (Panagiotou, 2017). The European Commission in a brief defending its adoption and implementation of the PP published in 2017, talks about ‘*Scientific Uncertainty*’. The latter is defined as a state of insufficient information, inconclusive evidence, and public controversy preventing reaching consensual needed decision about “a hazardous substances or activities” (European Commission, 2020).

All actors involved in the GM debate do however not appreciate the PP in the same terms. For the EU, the PP is a procedure for more democratic and evidence-based decision-making. GM sceptics are highly committed to the PP (though with shades of strictness with regards to the level of risk that could be allowed), and consider it a protection against uninformed regulation and an essential procedure to prevent unwarranted risks in uncertain settings. In their views, the PP is essential when dealing with novel technologies, as it allows moving a question forward from being uncertain, to being assessable in terms of the nature and probability of expected risks.

On the other side, GM advocates see in the PP an excuse allowing unfounded institutional blockage, which is preventing the advance of the GM technology. While GM opponents condemn the insufficient use of the PP and may even take governments to court for neglectful regulation, the technology supporters criticise its *mis/over*-use, and even accuse it of being anti-scientific (European Commission, 2020). Its opponents articulate the PP as a hamper for innovation, since the latter entails taking risks, and the PP is about risk monitoring and avoidance. The juxtaposition between the two literatures seems quite clear, illustrating clashing visions on what constitutes risk (including *Uncertainty* or not) and how it should be managed.

4.1.4.2.2 GM is a risky and unreliable technology versus ‘A second-generation of GM’

It is not surprising to state that novel technologies, and especially those applied to food, have a history of being associated with high-risk perceptions by the public and consumers (as discussed in the introductory chapter). What is important to highlight here is rather the fact that GM opponents portray novel technologies as inherently risky, which means basically, whatever efforts will be made by scientists and the industry to reduce associated risks will not allow passing safety tests. Of course, not all those who spoke against GM prospects expressed their opposition in these extreme terms, but there is a strong adherence within opponents’ lines to the idea of GM technology and related prospects being unnatural (exposed below), and therefore being fundamentally unreliable.

To answer this representation of the technology GM advocates resort to another concept, which they commonly refer to by “a second generation of GM”. This term aims primarily at distancing new GM prospects from the former cultivated GM crops, which yields and effects have been scrutinised by many scientists and governmental tests showing their average performance on top of better-known serious associated risks (Panagiotou, 2017). The “second generation of GM” is presented as more efficient offering a broader range of applications, which would tackle a diverse range of future challenges by making crops more resilient, increasing yields, and producing more nutritious food specifically conceived to address certain deficiencies (ibid). This new generation of GM is also portrayed in sustainable terms with contrast to previous ‘killing’ versions, and even advertised as initiating ‘the second Green revolution’.

The enthusiastic tone perceived in the scientists' promotion of their GM-wheat versions could be also linked to what is known in technology studies as 'hype' phases. These refer to the launch stages of a new technology/novel product and are characterised by an over-promising tone intended to attract funds and institutional support (Borup *et al.*, 2006). As I will discuss in the 4th lens looking at underpinning ideologies, new technology 'hypes' are not only fed by the necessity to interest potential investors and to prepare for public acceptance, but are also perpetuated based on technological determinism beliefs, giving precedence to technological promise over society, and allowing the promotion of 'endless' new generations of a technology. This over-promising game has however downfalls, one of which, allowing the construct of a new literature around the unfulfilled promises of GM⁸⁹.

*"... findings demonstrate the failure of GM technology to deliver the promises that are frequently made of it in terms of benefits to farmers, consumers and the environment.
(anti-GM groups, Art.50)*

*"With GM crops it's always jam tomorrow and never jam today. We have had more than 30 years' of promises of useful traits but they have not been delivered, despite massive promotion of GM technology by governments and PR agencies,"
(Helen Wallace, director of GeneWatch UK, Art.50)*

⁸⁹ Not only previous applied GM crops did not deliver promised outcomes (Bennet, 2009; Ma and Subedi, 2005), but there are serious reasons to think they have been detrimental to the environment (Nandula et al., 2005; butterflies Perry, 2010 or Perry, et al., 2010); and human health (Eriksson et al., 2008; Axelrad et al., 2003), to cite only a few (Panagiotou, 2017).

4.1.4.2.3 Corporate hegemony versus ‘Publicly-funded research’

On opponents’ side, the idea that GM technology is and will always be controlled by big corporations that do not really care about the impact of their industry on the natural/social environment and appear mainly concerned with maximising profits is a well-established one amongst opponents.

“...it was designed to maximise profits at the expense of the people For many people, GM technology was not seen as a socially useful scientific development but a means for companies to increase their market share and profits.” (Art.9)

*“we feel it's about making money, not about feeding the world and helping UK farmers.”
(A spokeswoman for Take The Flour Back, Art.11)*

This could be easily related to Monsanto’s infamous reputation, especially having been a pioneer of GM crops in the world. Its arrogant behaviour when introducing the first GM food in Britain not minding local legislation and consumer expectations in terms of labelling, cost the company the withdrawal of the latter and darkened even more its reputation (Gaskell, 2001). Monsanto represents today an emblematic figure of the evil side of GM⁹⁰. The association between Monsanto’s dark reputation and GM crops has also become widely discussed by GM supporters (Lynas, 2018; Gash, 2016), who attempt to free new GM crops from negative perceptions about corporate power and conspiracy theories.

⁹⁰ ‘March Against Monsanto’ provides a good example of such a representation.

However, narratives about corporate hegemony within the GM debate seem to have also more concrete backgrounds. The current situation attests for a dominant possession of GM crops patents by big corporations compromising food sovereignty all over the world, which also has been associated with tragic social impacts⁹¹ (Reuter, 2017; Panagiotou, 2017; Fraser and Mittal, 2015). The question of food sovereignty appears a crucial one in the GM debate, and is apprehended by opponents from two angles. The first relates to seed dependency. GM seeds are patented products, and thus, farmers lose ownership on their seeds and incur increasing technology fees over the years (Moore, 2014). The second angle is that the GM technological and market model does not allow for alternatives to survive due to inevitable contamination on the long-term (Moore, 2014; Reuter, 2017; Altieri, 2005; Greenpeace International, 2015).

“The scientists and their supporters are in a massive minority. Concerns about the science of GM, and its corporate ownership, are both key, intertwined reasons for opposing it.”
(Liz Walker, Art.26)

“In the case of GM foods, the industry has become concentrated in the hands of a few companies that have started patenting and exploiting farmers and consumers from developing countries.” (Art.30)

On the trials supporters’ side, the response to this literature came in an emphasis on the publicly funded nature of Rothamsted GM-wheat prospects and the government’s involvement in the process through its institutions. The trials were conducted by a governmental research centre, which is predominately funded by public money, and

⁹¹ Here, the author referred specifically the Indian farmers suicide crisis. According to GM critics, the latter was triggered by the over-promising of GM performance and the sterility of GM seeds plunging a full community of farmers in a state of despair ending in many suicides.

there was a promise for the results to be accessible to the public and for experimented GM crops not to be patented.

“Rothamsted is a publicly funded agricultural research institute whose scientists have pledged that, if it works, their GM-wheat will be available patent-free.”

“The public sector scientists at Rothamsted Research, who are growing an experimental GM-wheat crop with no commercial backing, are a different breed.” (Art.36)

*“It will not be patented and it will not be owned by any private companies.”
(Professor John Pickett, Art16)*

“Before the event the scientists had attempted to persuade the protesters to abandon their action, arguing in a video uploaded to YouTube that they were publicly funded researchers” (Art.35)

This response to concerns about monopoly of bio-agriculture activities and related expertise, and to the suspected corporate over-control on global seed markets, made these concerns look out-dated and even irrelevant in the specific context of the British GM-wheat project. The scientists, main spokespersons defending the GM-wheat project, did not take defence of biotech companies or question past opponents' concerns about corporate hegemony. They rather focused on distancing their project from previous perceptions about GM prospects, presenting it as a national public project with the sole interest to take advantage of scientific opportunities and serve common good. This way, the tested GM-wheat appeared in direct contrast with corporate greed and hegemonic plans that characterised previous GM versions.

“...the opposition to GM is now more driven by ideological than scientific objections. Most of the remaining opposition to GM is really a displaced fear about big corporations dominating the food chain, which is why every argument about GM seems to be reduced down to one word: Monsanto. In which case we should be encouraging publicly-funded, open-source GM such as that conducted at Rothamsted and the John Innes Centre, not threatening to rip out their crops.” (Mark Lynas, Art.26)

“GM technology has moved on a lot in the past two decades. the impression given was of a sinister new technology that would make chemical firms rich and farmers poor is not relevant anymoreOur experiment is not about making money” (Art.18)

However, considering the level of investment by giant biotech companies and the expertise they developed in this specific sector, it would be plausible to presume that beyond the laboratory stage, prospect GM seeds need to be passed on to them for wide scale production and commercialisation. Governments alone do not seem capable of making the most out of the technology, even if the products were originally developed through governmental research centres and funds, which could also explain the persistence of anti-corporate narratives within opponents’ perspective.

Also, corporate recourse to blackmailing and illicit forms of pressure over politics, journalists, and scientists who do not agree with GM expansion plans, have proven the willingness of these firms to engage in any form of action to protect their interests, not mending legal and ethical considerations (Cook, 2004; Panagiotou, 2017)⁹². It would be naïve to think that they have just accepted to ‘share the cake’, ‘a cake’ that they already own somehow.

⁹² To cite only a few examples on Monsanto’s conduct cited by Cook (2004), “Commitment to dialogue does not sit easily with allegations that Monsanto has monitored anti-GM activities through anonymous emails, exerted pressure on Nature to withdraw an article by Ignacio Chapela, contacted the printer of the Ecologist which highlighted ‘Monsanto’s track record of social and ecological irresponsibility, and... its readiness to intimidate and quash those ideas which conflict with its immediate interests, or its 2002 conviction under Alabama law for ‘suppression of the truth, nuisance, trespass, and outrage’ in dumping PCBs” .

4.1.4.3 ‘Exclusive’ literatures

By Opponents

4.1.4.3.1 The Unnaturalness of GM

Statements mentioning Frankenstein/unhealthy food or questioning ethics behind GM promotion strongly relate to this idea of unnaturalness of GM in general, as a tool, a solution, and a product. This seems to me one of the most impacting ideas within opponents’ perspective, as it could be logically inferred that it underpinned main raised worries. Concerns about the contamination of the wild/conventional crops seemed exacerbated by this belief of mixing with an ‘alien’ species, which inspired weirdness and lack of control, and resulted naturally in fearing unpredictable, and specifically, irreversible effects.

“There are also concerns that GM crops may have the same impact as an invasive alien species, damaging ecosystems.” (Art.56)

The unnaturalness of GM seems also to provide a backdrop for criticisms directed to the technology on ethical basis. Collectives, who aspire for a symbiotic relationship with nature, see in GM options a disruptive and unethical form of manipulation of life and the natural world. Whether we consider those favouring a consequentialist approach assessing the technology based on expected effects, or a deontologist one adopting a more categorical view seeing GM technology as inherently unethical (Häyry, 2002), opponents seem to have strong reasons to oppose the diffusion of GM based on it engendering a rupture with nature and its laws. The trials, and engaging in GM plans in

general, are therefore qualified as irresponsible decisions, not only from an institutional angle, but also from an ethical standpoint. This could be perceived in some quotes commenting on the GM-Whiffy-wheat disappointing results, relating these to the fact that it defied nature.

*“The scientists had wasted taxpayers' money in a **pointless bid to "outwit nature"**”
(GM Freeze, Art.49)*

4.1.4.3.2 Organic farming is the most sustainable option

To define simply what organic farming mainly consists of, and by the same occasion show its direct opposition to GM farming⁹³, I have selected the following quote from (Altieri, 2005):

“The most important difference between organic farming and biotech agriculture is that organic farmers rely on the ecological services of agro-biodiversity and thus avoid the use of chemical fertilizers and pesticides in their farming operations.... organic farmers rely heavily on the use of crop rotations, crop residues, animal manures, legumes, green manures, off-farm organic wastes, mechanical cultivation, mineral-bearing rocks, and aspects of bio- logical pest control to maintain soil productivity and tilth, to supply plant nutrients, and to control insect pests, weeds, and diseases.” (p363)

⁹³ Since GM farming relies heavily on synthetic fertilisers and pesticides, encourages genetic uniformity and wide-scale monocultures, and reduces farmers' independency (Altieri, 2005, 2003), the two versions appear completely oppositional.

Organic farming is almost omnipresent in GM opponents' perspective, promoting it as the most suitable and sustainable alternative to the current highly industrialised and intensified form of agriculture (Reuter, 2017). Surprisingly, this comes in a rather subtle way in their discourses, praising its health-conscious and social welfare dimensions. The *Organic* version pervasiveness is however more obvious in GM opponents' networks and the kind of projects they support. Most anti-GM coalitions as next lens will show, come from organisations and collectives encouraging community based and small-scale farming and favouring more natural and traditional means to tackle pests and improve plant strains.

What confirms the importance of this nascent literature, relating sustainable farming to the organic route, is also the war declared on it from GM supporters. Organic farming and foods were mainly evoked by GM supporters, trying to tarnish their 'healthier/safe' reputation and to highlight their incapacity to feed the world on their own.

"The Food Standards Agency says there's no evidence that the organic food is safer - and furthermore, germs from manure create risks of their own: an E. coli outbreak in organic beansprouts in Germany killed 50 people in 2011 and last month in the US 100 people contracted the serious liver disease hepatitis A from organic berry yohurt."
(Mark Lynas, Art.47)

"What are your solutions to how are we going to feed nine billion people? We can't do it by just simple highly-intensive, low-input organic production systems. We have to use lots of approaches."
(Professor Johnathan Napier, Art.29)

GM supporters talk about 'an organic food lobby' that is encouraging activism against GM prospects, and seem aware about the actual threat the widespread of GM represents

to the organic certification. However, they do not expand on it and present it almost as a collateral damage for the sake of feeding the world⁹⁴.

*"There has been a clever, yet misleading use of the word 'contamination' in this debate by the organic food lobby. I actually have a lot of respect for the principles of that form of farming. The best of both worlds would be **a meshing together of the two systems**, with each crop treated on a case-by-case basis, with one shared goal being reduced pesticide use. **This would clearly threaten the organic brand and cause problems for labelling organic foods**. But it would **only cause a contamination of the brand**. We have to be more pragmatic and sanguine about GM"*
(Colin Ruscoe, chairman of the British Crop Production Council, Art.26)

*"Organiclea is a member of the Community Food Growers' Network (CFGN), which **has promoted direct-action tactics among a new generation of anti-GM campaigners**."* (Art.31)

By Supporters

4.1.4.3.3 The scientific consensus on the safety of GM/GMOs⁹⁵

The scientific consensus on the safety of GM foods and crops was expressed by GM advocates, as being widely and universally accepted.

*"This day, green groups such as Greenpeace and Friends of the Earth still refuse to accept **the worldwide scientific consensus that GM food is just as safe to eat as any other**. This denial of science unfortunately undermines the environmental agenda across the board"*
(Mark Lynas, Art.43)

*"**The scientific consensus isn't merely broad, but universal**. In the words of a report last month by the **European Academies Science Advisory Council**, which unites bodies like the Royal Society across Europe: 'There is no validated evidence that GM crops have greater adverse impact on health and the environment than any other technology. There is compelling evidence that GM crops can contribute to sustainable development goals, with benefits to farmers, consumers, the environment and the economy'"*
(Art.47)

⁹⁴ Lens 5 will explain in more detail why the two versions seem inherently incompatible, and expose actual barriers to coexistence plans.

⁹⁵ In this sub-section I will be exceptionally using the acronym GMOs with GM, since GM supporters mostly talk about scientific consensus on GMOs in general. Tagliabue (2016) has severely criticized this usage though in the context of this discussion based on the poor semantic value of the expression that refers to a miscellaneous range of products.

Of course, opponents did not adhere to this idea of consensus, and had cited in return several research studies that doubted the claimed agreed upon safety of GM food/feed.

“Studies in 2011 in Canada revealed traces of pesticides that had been implanted into crops using GM techniques were present in the umbilical blood of 83 per cent of pregnant mothers who were tested. The GM industry had always argued that if these GM toxins designed to kill crop pests were eaten by humans, they would be destroyed in the gut and rendered harmless. But the fact that they had reached umbilical blood meant not only that they survived the gut but could pass across the placenta to the growing foetus” (Art.41)

“GM supporters insist the crops are safe for humans as they have been eaten in the US for nearly 20 years. But in January experts at King's College London linked glyphosate, used to kill wild plants in GM fields, to liver disease” (Art.61)

“In 2013, academics reported that pigs fed a GM diet suffered inflamed stomachs and heavier uteruses, which could be a sign of disease” (Art.61)

For the scientific consensus claim to be credible, given the fact that many scientists had expressed concerns about the widespread of GM foods/crops consumption based on research proving risk of toxicity or possible links with some diseases, these scientists and their research had to be discredited and separated from what is considered to be ‘the scientific community’⁹⁶.

“The author behind the 'bogus' research (GM feed may cause cancer or stomach problems in animals) fuelling this claim, Prof Gilles-Eric Seralini, is closely linked to and funded by leading members of a homeopathy group which believes bone cancer can be cured with water and minute quantities of magnesium. The research has been attacked by every major scientific institution in the field, including the European Food Standards Agency” (Art.47)

“a scientist working at a UK research institute claimed to have shown that GM potatoes were poisonous to laboratory ratseven though the research methodology was widely condemned as flawed” (Art.9)

⁹⁶ As the analysis will show in Lens 4, this strategy had a major drawback, encouraging the dissolution of *Science* as an authoritative system.

These quotes show how relevant this question of ‘scientific consensus’ is to GM advocates, and by contrast, how important it is for their adversaries to fight against the establishment of such literature. I will explain in the next paragraphs what is meant by a ‘consensus’ and what it represents.

‘Scientific consensus’: What is it?

The term consensus is defined as “*a generally accepted opinion or decision amongst a group of people*”⁹⁷. First striking thing when one comes back to the basic definition, is that the concept of scientific consensus as promoted by GM supporters appears in direct contradiction with its literal meaning, and also inherently paradoxical. While it tries to claim ‘unanimous’ agreement, this agreement appears actually to be taking place only between those who are accepted as legitimate participants, excluding non-GM-compliant scientists.

What defines a scholarly consensus is the number and the quality of adherents. Linguistically, a consensus is not synonymous to ‘unanimity’, and it is practically impossible that all scientists/scholars/experts in a field would be unanimously consulted and would then agree on a subject (Mohammed, 2016). However, the proponents hope drawing on the illusion of the two terms being perceived equally, endowing the concept of scientific consensus with a persuasive power. Unanimity is understood to be within a selected group of experts, and may be also perceived to mean the big majority,

⁹⁷ (Cambridge English Dictionary, 2020)

although the defining rate for ‘majority’ may differ from a person to another (Landrum *et al.*, 2019). The quality of adherents is equally important. A scientific consensus is valuable if taking place between those scientists that are supposed to be expert in the field(s) linked to the examined object. The strength of the consensus is then a logical inference, if a specific opinion/conclusion would prevail over the participants differences, this conclusion must be the soundest (Mohammed, 2016).

‘Scientific consensus’: What does it represent?

A scientific consensus acts as a warranty for a specific judgement of a situation under examination. What gives power to an opinion labelled as being granted the consensus of scholars/scientists, is that it does not require any more to be scrutinised, and becomes a proof in itself. The importance of this idea of scholarly consensus is derived from its ability to become an independent authority once the agreement is concluded, and somehow immune to questioning voices and revocations (Mohammed, 2016). Of course, a scientific consensus is not meant to be immortal, since science is by definition progressive, incremental, and is open to refutation, still, a scientific consensus once established around a subject it gives power to the opinion it supports and makes it less vulnerable to opposing versions, at least until a defying consensus is established.

For this reason, while GM advocates are re-assembling proofs and communicating about the existence of a scientific consensus favourable to the widespread of GM foods, trying to build a whole body of literature around it, anti-GM scientists are fighting back to prevent the establishment of the consensus through their participation in this sub-controversy.

'Scientific consensus': A controversy within the controversy!

In 2013, as a reaction to the term being used by seed developers, some journalists and scientists, more than 300 members of the ENSSER⁹⁸ produced a signed statement outlining seven objections to the claimed consensus (ENSSER, 2013) based on a review of the scientific evidence in the literature. The statement concluded that no scientific consensus on the GMOs safety exists outside the inner circle of the GM stakeholders (Hilbeck *et al.*, 2015).

A formalisation of a scientific consensus on the safety of GMOs was then put in motion in May 2016 by the release of the NASEM⁹⁹ report¹⁰⁰, presenting a consolidated 'expert voice' in favour. The report was relayed by the media as a confirmation of the safety of GM crops (Landrum *et al.*, 2019), due to the NASEM being highly regarded within the scientific community and amongst policy-makers (Krimsky and Schwab, 2017). The report was followed in June 2016 by 100 Nobel Prize winners letter addressed to Greenpeace affirming their support as scientists to the GM project.

Sheldon Krimsky and Tim Schwab (2017) examining potential conflicts of interest of the committee members, concluded that, partiality requirements were not met, despite limited access to information on these members. Six of the twenty panelists have financial interests within the biotech industry (through funding or patents), while none of them had any link with the competing versions to GMOs.

⁹⁸ The European Network of Scientists for Social and Environmental Responsibility.

⁹⁹ The National Academies of Sciences, Engineering and Medicine (NASEM).

¹⁰⁰ May 2016: "Genetically Engineered Crops: Experiences and Prospects."

I am not going here to expand on the arguments from both sides. What was important to realize is that ‘scientific consensus’ on the safety of GM appears to be a stumbling nascent literature, due to it not fulfilling for the moment the two fundamental elements that make a consensus. First, there is a fair amount of opposition to it from inside the scientific community, so it is distanced from the perception of ‘unanimity’. Second, it is carried out by scientists that are not necessarily ‘expert’ in the most relevant fields for this specific consensus (biology and agrobiolgy) as it is expected, which makes it less *authoritative* (Landrum *et al.*, 2019).

Experts in these fields maintain that every biotech invention is unique and has to be assessed individually, since production techniques differ (Tagliabue, 2016). However, it remains an actual threat to GM competing versions due to important disparities in terms of funding and access to information between pro-GM and anti-GM scientists, but also due to the discursive power of the term on lay publics who do not distinguish underlying criteria and perceive the dominant voice of the pro-GM scientists as being a sign of ‘majority’ (Landrum *et al.*, 2019). Until anti-GM scientists find a way to make their voice as audible as their opponents, GM supporters will be enjoying the benefit of the doubt.

4.2 Actors and Networks (*CC Lens 2&3*)

It is worth reminding here that *Actor* refers to anything that could be identified to be 'doing something', and actors were recorded as many times as they were involved in an action or depicted in a way that induced action.

Tb.4-12: Number of collected actors per Event

	Pre-narratives		Event 1	Event 2	Secondary discussions	Event 3	Event 4	
	Monsanto's 1s GM Wheat trial (US)	Canadian cabinet paper	GM-Whiffy wheat trial announcement	GM-Whiffy wheat trial break-in & Protest	GM-wheat escape (US) + Oxford non-GM wheat alternative	GM-Whiffy wheat trial results	GM-Super wheat trial	Total
Actors (<i>acting</i>)	160	18	75	1037	59	110	232	1691

As for competing statements, the phase negotiating the mass protest and commenting on the intrusion to the experimental site did represent the most profuse forum of discussion. The figures confirm this stage of the debate to be the main confrontational virtual and material space.

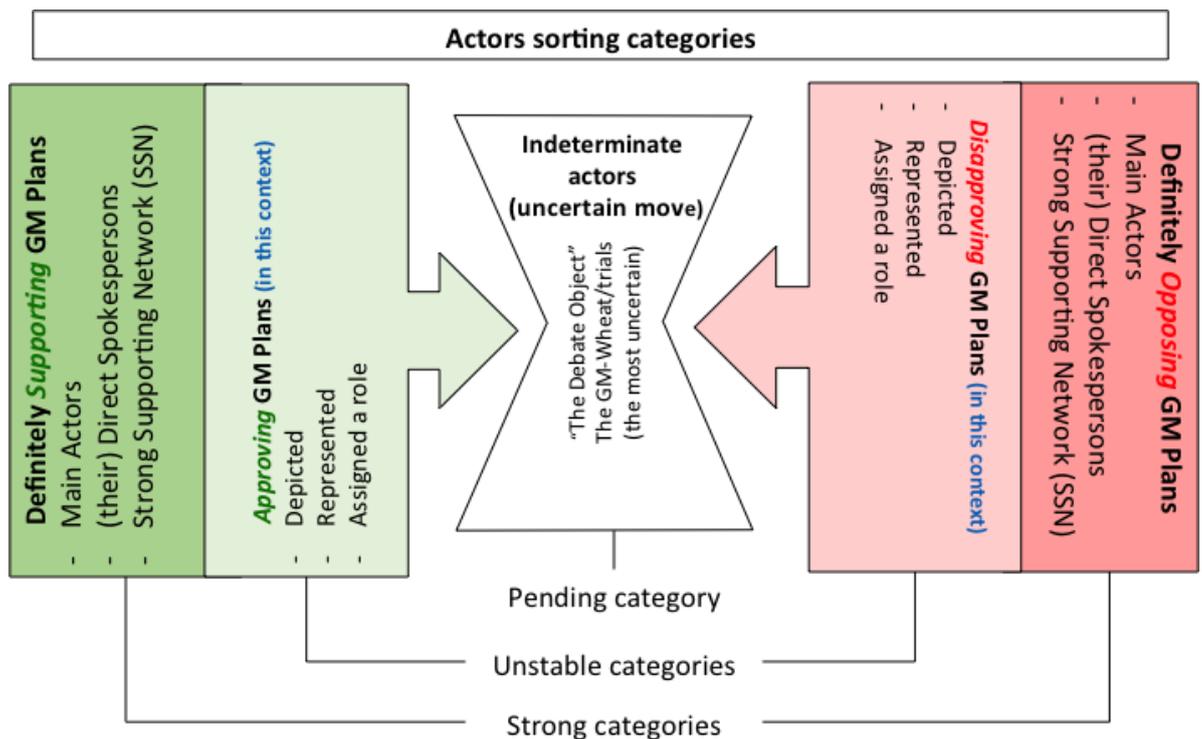
A thorough examination of the collected actors highlighted some shared characteristics and behavioural trends by certain actors, expressing different levels of commitment to the defended perspectives, and a variety of ways to induce action and negotiate competing market versions.

4.2.1 Actors categories

The data analysis highlighted three main broad sorting categories that accounted for different levels of commitment of each of the two disputing perspectives (Pro-GM/Anti-GM):

- (1) Strong categories: Actors *Supporting* or *Opposing*
- (2) Instable categories: Actors *Approving* or *Disapproving*
- (3) A pending category: Actors with *Indeterminate* position

Fig.4-8: Actors broad sorting categories



In the following analysis of actors' categories, I will be discussing the main traits that appear shared by each group of actors and sorting criteria, and the dynamics of these categories throughout the controversy. In this regard, I will be using a 'condensed count'

per event, based on the identity of actors and not on the number of their expressions, unless actors were depicted in a contrasting way by opposing groups, which necessitates displaying them in two different categories according to the depiction that brought them into action. Generally, the latter case occurs within the instable categories, where the classification of many actors depends on how they were depicted by others.

Event 2- GM-Whiffy-wheat trial break-in & Protest:

'Professor John Pickett, the trial's leader and head of chemical ecology' spoke several times to defend the project from different angles. However, he was consistent with regards to the perspective he supported. Consequently, appeared only once in the appropriate category (Supporting) as a Strong Category-spokesperson for Rothamsted Research Centre during Event 2.

Whereas, 'The experiment' appeared in two contrasting positions, depending on actors' depictions:

The experiment (posing a threat to the environment) → Serving the anti-GM position.

The experiment (testing a promising new scientific route to reduce excessive pesticide use in farming) → Serving the Pro-GM position.

4.2.1.1 Strong categories

This first category comprises two juxtaposing groups of actors, on one side those that were definitely advocating for the GM-wheat plans to be developed in Britain, on the other, those who were definitely opposed to these plans (**Fig.4-8**).

4.2.1.1.1 'Main Actors' and their direct spokespersons

The most obvious *Main Actors* are those who appear directly involved in the debated object from the start and engaged in the *Problematization* of the conflict from both sides:

- (a) The complainants formulating the first concerns about the planned open-air trials.
- (b) The charged/accused ones, from whom an answer or action is required.
- (c) Both groups' direct spokespersons (those appointed by them).

The main strong actors display direct interest in the debated object, which represents one of their core projects. Defending or opposing the GM-wheat open-air trials seems to represent a 'survival' struggle for those actors, since the fate of the controversy would have a significant impact on their main activities and goals. They therefore show high level of involvement in terms of argumentation and networking, and long-term commitment to the defended cause, whether acting as a group (*e.g. Rothamsted Research Centre, The BBSRC, The Biotech industry, GM Freeze*) or joining individually (*e.g. Hector Christie, the eco-activist who broke into one of the GM experimental fields at Rothamsted Research labs acting alone; Liz Walker a veteran of the 1990s anti-GM protests now active member of the protest group Take The Flour Back*). They act voluntarily and speak for themselves or through appointed spokespersons, striving to shape the debate in their favour through depictions, role attribution, and unsolicited representation of other actors.

Main actors also include those individual actors/groups of actors that may not project a long-term presence, but were specifically mounted or had willingly took action to oppose or join the mass protest against the GM-wheat project (*e.g. The protest group Take The Flour Back specifically founded to oppose the GM-Whiffy-wheat announced open-air trials; ad-hoc activists that took part in the mass protest*). This is because, it is assumed that the individuals forming these groups or answering a punctual call for protest of this genre, must have

long-term commitment to their stance, although their formation/action may seem punctual.

4.2.1.1.2 Strong supporting networks (SSN)

Strong categories could also display another group of actors; I refer to by *Strong Supporting Networks* (SSN). The latter highlights actors/groups of actors that are not intimately linked to the specific object of the current controversy (the GM-wheat/GM-wheat open-air trials), however, who profoundly support or oppose it, based on shared underpinning values and ultimate aims.

***Pro-GM-Wheat/GM-Trials:** Botanic scientists who have assuredly defended the project, despite the fact that they are not necessarily working on the GM-wheat in particular. They share with Rothamsted' GM-Whiffy-wheat developers the recognition of the authority of Science, and their expertise and research is generally solicited when developing GM prospects.*

***Anti-GM-Wheat/GM-Trials:** Environmentalists/Green groups who firmly oppose GM expansion plans. Contrary to Take The Flour Back group or GM-Freeze coalitions, GM technology and prospects do not constitute their sole or main fight for the environment. It comes within a portfolio of 'warfronts' they are involved in.*

Although, militating against GM-wheat/GM-wheat open-air trials does not represent for these actors a main activity or an existential purpose¹⁰¹ that had motivated the foundation of their group, organisation, or activity, it lays amongst these important routes of action enabling them to reach their ultimate aim. This distinction is highly relevant, as it exposes: **(1)** stable networks around the directly involved actors, and **(2)**

¹⁰¹ In French we talk about 'raison d'être', the reason that constitutes the central purpose of one's existence.

thick routes of shared aims and values/references linking the different entities of these solid and relatively stable networks.

The SSN actors/groups of actors take part willingly into the debate defending the perspective they align with. This last point is important. It differentiates this close direct network, part of the solid heart of opposing or supporting coalitions, from extended networks through unstable categories of actors that appear less reliable, since, may or may not accept suggested representations, and assigned roles and depictions. The SSN, like *Main Actors*, decide and speak for themselves, and thus, expand the pro-active¹⁰² speaking potential¹⁰³ of their defended perspective.

In the case of organisations or collectives, the way I have determined whether they belong to *Main Actors* or to the SSN was based on their official communication, generally the core aims they attribute to their mission on their official website (*e.g. Organiclea, although firmly opposed to GM prospects, defines its mission as promoting sustainable farming and freeing the food sector from being overpowered by hegemonic corporations. Their opposition to GM is based on their interpretation of it being a technology that sabotages their projected picture of how, society, farming and the food system should be. Organiclea was placed in the opposing SSN*).

For those institutional organisations that act from a broader institutional/political position (whether this position is representative or legislative), if their action represents a direct involvement in the trials that suggests a longer-term commitment or if they

¹⁰² The French word '*Volontariste*' would be the perfect word here, as it means 'the action of one who intends to change reality and thinks being capable of doing so', which expresses a strong mode of agency.

¹⁰³ This will be analysed in more depth in the following section.

declare clearly their support to one of the two main competing positions directly or through an appointed spokesperson, in these cases, the actor is placed in the strong category they support by their action. Their level of involvement in the particular object of the debate would determine whether they are *Main Actors* or SSN.

The example of the British government here is interesting. One would instinctively place a GM supporting government in the pro-GM SSN rather than in pro-GM Main Actors, since GM plans are not expected to represent a core/vital activity in this case. However, looking at the amount of investment in GM prospects through the BBSRC and considering Dawing Street recent declarations: affirming being in negotiation with the EU to change rules on GM crops, considering a dramatic liberalisation of GM food laws after Brexit, asserting the need for GM to ensure food security.... All this demonstrates that the government has integrated now GM prospects/produce into its agricultural plans and food politics.

However, if institutions were acting under the umbrella of their function, they would be placed in one of the mid unstable categories depending on what perspective they favour through their action (*e.g. Defra granting permission to the scientists to hold open-air trials*). Of course, a specific actor's position may vary over the events of the controversy, although strong categories are those that seem to present the most stable collectives.

With regards to individual actors, I have mainly considered their communication and actions within the context of this particular controversy, as personal journeys may also shift over time and even take divergent positions (*e.g Mark Lynas a former GM crop vandal in the 90s, who later became a fervent supporter of GM technology and prospects. I placed him in the GM Supporters SSN, as vigorously defending the GM-wheat trials. I have not counted him within Main Actors though, since his main battle has been for climate change and he was not involved in the problematisation of the GM-wheat conflict*). Two cases are to consider though.

Individual actors personally declaring or acting in support of one specific perspective (without a clear mandate from their organisation or political party if presenting a political/organisational affiliation), are classified individually within the strong

category relating to the perspective they support. Depending on whether they are involved in activities that directly and specifically oppose/support the GM-wheat project with longer-term commitment to the defended cause, or not, they will be placed in the *Main Actors* group in the first case,

Theo Simon, a veteran anti-GM campaigner participating actively in the protest was placed in the GM opponents' Main Actors),

...or, in their SSN.

Green supporter Tom Chivers for whom GM crops prospects do not represent a main concern, but expressed his support to GM prospects at the Telegraph when he vowed to stop voting Green following Jenny Jones' tweet that was clearly supportive of the mass protest, was placed in the GM supporters' SSN; Prof. Gilles-Eric Serallini whose research showed GM feed may cause cancer or stomach problems in animals and who was vigorously attacked by GM advocates, yet was not involved directly in the mass protest, was placed in the GM opponents' SSN.

This first selection of SSN, based on direct communication/action, becomes visible in hot phases and extends the speaking potential of *Main Actors* within these decisive phases. However, it does not exclusively compose the SSN category. As the famous Latin dictum adopted by the French say, "*L'argent est le nerf de la guerre*" (Money is the sinews of war), it would be unrealistic to ignore funding bodies supporting financially each of the opposing perspectives. Exploring funding actors actually reveals a deeper layer of the support stratification given to each perspective, and the diversity, or otherwise, of interests behind it.

However, this obvious implication of funding in the conflict equation is not the only reason that made me consider including these shadowed actors. It is more precisely because the question of funding has played a substantive role in the GM-wheat fight augmentation from both sides. GM supporters intensely advertised the publically

funded nature of their research aiming at distancing it from previous negative critics towards corporate hegemonic plans, and accused the lottery fund of allocating charity money to support controversial public protests. On the other hand, GM opponents harshly criticized the use of public money to fund a research that they claim is not backed by public consent. So, it was the actors themselves who first brought into the discussion funding questions. I am just attempting here to expose fully their views.

These funding-actors range is generally not interested in discursive communication and public exposure, but rather offers support through monetary sustenance. Since they do so willingly, and considering funding to be a sign of strong commitment towards funded objects, especially when funding is provided to acting charities and organisations on quasi regular basis or to finance mid/long-term projects, these shadowed actors are counted within the SSN.

For detailed lists of main actors and their SSN, and their status/function, please refer to appendices: *Apx.4-3* and *Apx.4-4*.

4.2.1.1.3 Dynamic analysis

This section relies mostly on comparative relational maps¹⁰⁴ illustrating the evolution of strong categories' networks over the four events of the controversy. I will start by

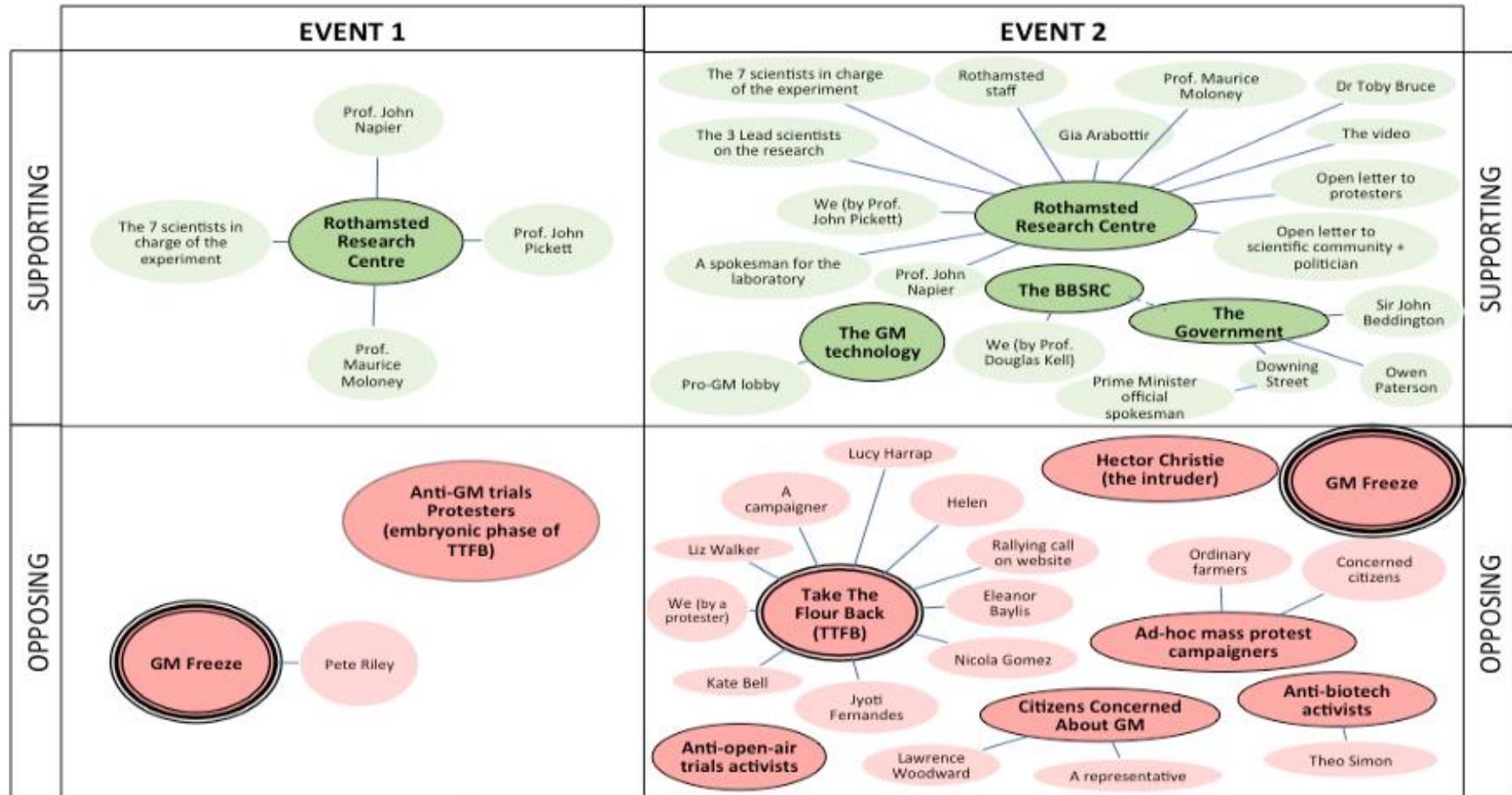
¹⁰⁴ Mapping notes:

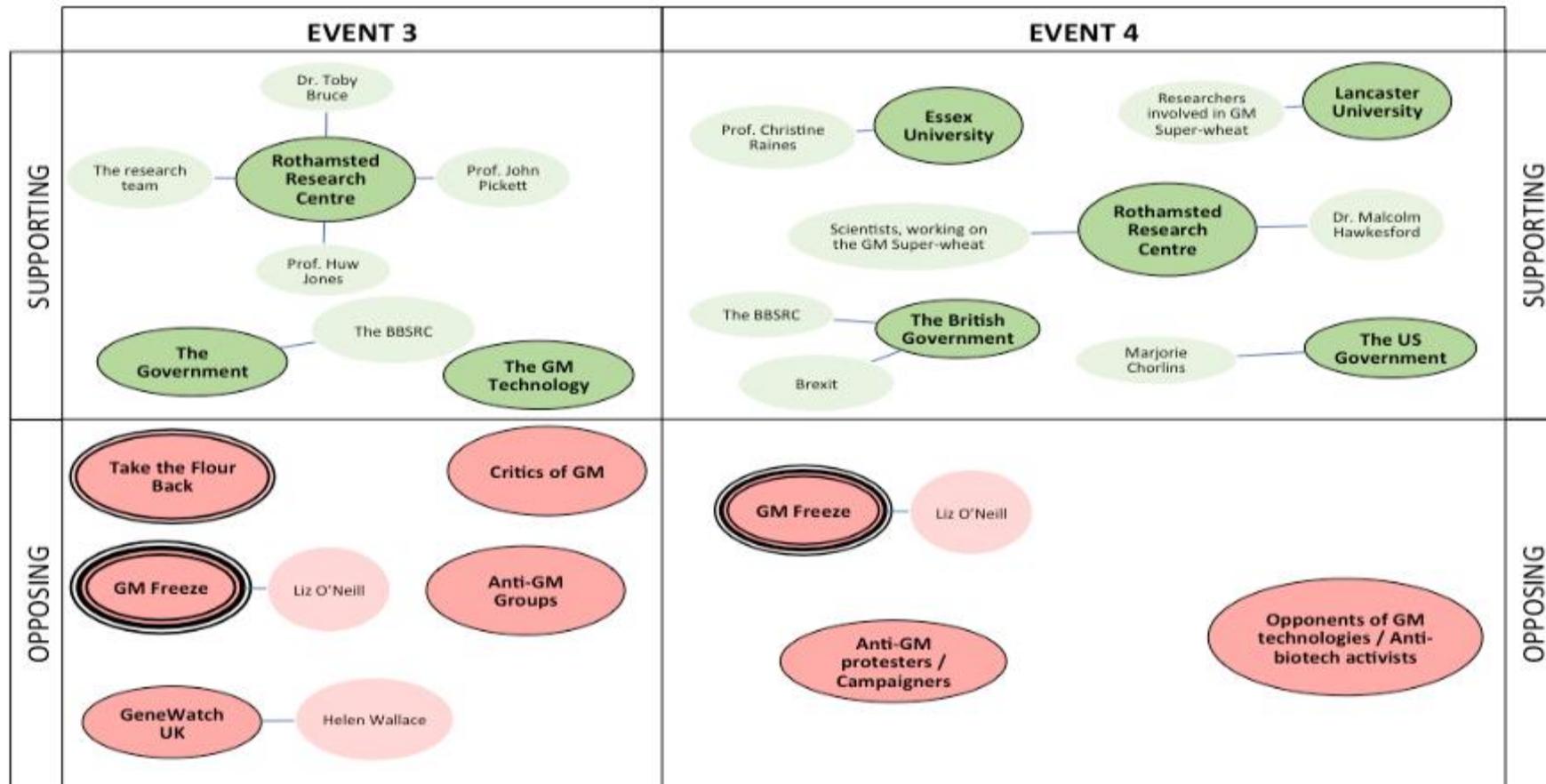
(1) The actors appear on the map with respect to how they were referred to or called by their representatives in the news articles.

main actors and their direct spokespersons, then will consider their SSN in relation to rallying references cementing this strong category of actors.

-
- (2) Individual actors who are talking for themselves were represented first, then at a second degree their institution (if they are affiliated to any). Whereas, if they talk as an assigned spokesperson by their institution, then the latter is represented first and the spokesperson' name appears attached to it.
 - (3) If an actor/group of actors appear directly involved in the opposition to GM-wheat plans with long term commitment to the cause, but do not belong to the British socio-institutional landscape, then they are represented in the (SSN) and not amongst *Main Actors* as one would expect (e.g. French group The Volunteer Reapers-*Les Faucheurs Volontaires d'OGM*).
 - (4) The assignment of an actor/group of actors to a specific system of representation/reference relied on the communication these groups put forward on their official websites/blogs/Social media accounts.

Fig.4-9: Main Actors and their direct spokespersons comparative maps





○ Representing a variety of references ○ Representing a variety of references and organisations

Fig.4-9 shows a relative stability in the nature of actors' status and affiliation within the most concerned actors' lines, which implies a stability of their underpinning values and ultimate goals as well, although strategies may progress and mutate. *Main Actors* from both sides were almost present all over the controversy, with a slight disintegration within opponents' lines losing the voice of *ad-hoc* protest campaigners, although these were largely involved in the mass protest.

Maps show an interesting expansion of GM supporters' scope and number, including other research centres getting involved in GM crop research, and more interestingly, the government, which represents a crucial point towards the integration of GM prospects within the socio-economic landscape. The stabilisation of the government as a main contributor within the GM supporters' clan is a clear sign of the initiation of the GM institutionalisation/normalisation in England. While, from the GM opponents' side, reaching the GM-Super-wheat trials (Event 4), main actors appear rather limited in terms of number (including direct spokespersons) and scope.

GM supporters look advantageous in this configuration, although, there seems no massive difference in terms of the number of main actors (including direct spokespersons) between both perspectives during the decisive phase (**Tb.4-15** coming ahead, 23 for GM-supporters, versus 20 for GM-opponents).

A comparison based on numbers would be of little help here due to disparities in terms of status and some critical structural and organisational differences between both collectives, some of which heavily undermined the opponents' side, namely what I have called: 'Wholesale identities', '*Shadow coalitions*' and '*ad-hoc representation*'.

Disparities in terms of status and ‘wholesale identities’

GM supporters’ main actors and direct spokespersons come mainly from a scientific research background, with established status and networks, increased by the government and its institutions. The Opponents main actors are anti-biotech/GM activists, and coalitions of environmentalists, anti-capitalists, organic food and sustainable farming organisations, and charities militating against GM food prospects, some of which represent prompt combinations of resources (*e.g. The protest group Take The Flour Back leading the campaign*).

Considering direct spokespersons from both sides shows a clear advantage on the side of GM supporters. Their spokespersons are all highly qualified, fitting within the group of experts or official institutional representatives. Almost all their spokespersons are ranked amongst Doctors¹⁰⁵ or Professors, or have an official influential function within the government. Also, most spokespersons are identifiable, named personally, and acting with an uncovered identity. Furthermore, their identity is not merely defined by their name, but through their precise role and function in relation to the debated object.

On the Opponents’ side however, despite an interesting mix of backgrounds (environmentalists, farmers, small retailers, scientists, anti-GM campaigners, sustainable food supporters, anti-capitalists...), which intuitively could be interpreted as a competitive advantage, their spokespersons appear mostly as lay representatives and present often unspecified groups of actors, shadowed behind what I have called

¹⁰⁵ Holding a Doctor of Philosophy (PhD) qualification.

‘wholesale identities’ (e.g. anti-Biotech activists, anti-corporatists). These seemingly homogenised groups labelled wholly, were referred to throughout the debate, nevertheless, they were hardly identifiable in terms of scope and the specific concerns they support. Consequently, declarations and claims that were assigned to them appear weak in terms of influence¹⁰⁶.

Although, many campaigners were named, they remained essentially anonymous in the public eye, since for most, they were given no clear function or status to relate to. Apart from a few members that joined the mass protest who were relatively known by their militating past against GM plans through field activism and different sorts of communication (e.g. *Liz Walker, a veteran of the 1990s anti-GM protests, now active member of TTFB; Theo Simon, a veteran anti-GM campaigner*), the remaining spokespersons appear completely unknown to the public (e.g. *a spokesperson called Helen, Nicola Gomez a member, Kate Bell a spokesperson*). This gave a clear advantage to GM supporters over their adversaries.

The following tables (***Tb.4-13*** and ***Tb.4-14***) illustrate the discussed disparities between main actors from both opposing sides in this regard. I have purposefully referred to the second event (GM-Whiffy-wheat trial break-in & Protest), as it represents the most profuse phase of the debate.

¹⁰⁶ These wholesale identities are even more undermined by the very common use of “anti” in their nomination, which inspires a negative perception. Instead of referring to what they promote, they are constantly linked back to what they oppose.

Tb.4-13: GM supporters' main actors (and direct spokespersons) status inventory

GM Supporters			
(Appointed spokespersons)	Function/Status	Reputation/Status	Stability of their status
Rothamsted Research Centre (one the most reputable research centre in the U.K.)			
Professor Maurice Moloney	Director of Rothamsted Research Centre	Named/Recognised status	Established
Professor John Pickett	The trial's leader & head of chemical ecology	Named/Recognised status	Established
Professor John Napier	Genetics team leader of the experiment	Named/Recognised status	Established
Dr. Toby Bruce	One of the lead researchers	Named/Recognised status	Established
Gia Aradottir	A biologist specialising in insects	Named/Recognised status	Established
The 3 Lead scientists on the research	The 3 Lead scientists on the research	Unnamed /Known/Recognised status	Established
The seven scientists	Who signed the letter sent to protesters	Unnamed /Known/Recognised status	Established
The video	In which scientists pleaded with protesters to reconsider their actions.	Known/Recognised status	Established
We	Used by Prof John Pickett referring to his research team	General/ Recognised status	Medium
A spokesman for the laboratory		Unnamed/Recognised status	Medium
Rothamsted staff		General	Weak
The Government			
Sir John Beddington	The government's chief scientist (food security)	Named/Recognised status	Established
Owen Paterson	The Environment, Food and Rural Affairs secretary	Named/Recognised status	Established
Downing Street	The Prime Minister official spokesperson	Known/Recognised status	Established
The BBSRC	The Biotechnology and Biological Sciences Research Council	Known/Recognised status	Established
Professor Douglas Kell	Chief executive of the BBSRC	Named/Recognised status	Established
The Biotech Industry			
Pro-GM lobby (in the UK)		General/Unspecified	Weak

Tb.4-14: GM opponents' main actors (and direct spokespersons) status inventory

GM Opponents			
Actors/Appointed spokespersons	Function/Status	Reputation/Status	Stability of their status
The protest group Take The Flour Back (TTFB), a broad coalition of bakers, farmers, school workers...			
Liz Walker	A veteran of the 1990s anti-GM protests, now active member of TTFB	Niche reputation and status	Medium
Jyoti Fernandes	A spokesperson, farms a small holding in Dorset and helped organise an organic food week in the county	Niche reputation and status	Medium
Lucy Harrap	A campaigner who helped to organise the event	Named/unknown status	Medium to Weak
Nicola Gomez	A member	Named/unknown status	Medium to Weak
Eleanor Baylis, a member	A member	Named/unknown status	Medium to Weak
Helen	A spokesperson	Named/unknown status	Medium to Weak
Kate Bell, a spokesperson	A spokesperson	Named/unknown status	Medium to Weak
A campaigner	A campaigner	Unnamed/unknown status	Weak
We	(Referring to protesters)- Used by a campaigner (Unspecified)	General/Unspecified	Weak
Opponents of GM technology			
Theo Simon	A veteran anti-GM campaigner	Niche reputation and status	Medium
Anti-biotech activists		General/Unspecified	Weak
Citizens Concerned About GM			
Lawrence Woodward	A citizen concerned about GM, Hungerford, Berkshire	Named/unknown status	Medium to Weak
A representative	A spokesperson	Unnamed/unknown status	Weak
Hector Christie	A lone activist who broke into one of the GM experimental fields at Rothamsted Research labs	Named/Controversial status	Medium to Weak
GM Freeze	An umbrella campaign on GM food	Known/Recognised status	Medium (shadowing adherents)
Ad-hoc mass protest campaigners	Ordinary farmers and concerned citizens	Unnamed/unknown status	Weak
Anti-open-air trials activists		General/Unspecified	Weak

This shows a clear dominance of unknown status and ‘wholesale identities’ within opponents’ lines. Here, status does not necessarily refer to ‘expert’ status, but to a defined status that inspires legitimacy and acts as an anchoring reference for the public. Most Take The Flour Back spokespersons were named, but it was still difficult to relate to any of them beyond the obvious activist role, since no clear backgrounds were conveyed or shared values were promoted clearly.

‘Shadow coalitions’ and ‘ad-hoc representation’

What is referred to in the media by ‘Umbrella organisations’, like GM Freeze, appears on the relational maps as ‘*Shadow coalitions*’. Despite them rallying a diverse number of adherents and interests, these coalitions do not seem to represent fairly and effectively the social diversity they are supposed to account for.

Referring specifically to GM Freeze, it was reported that it represents about thirty organisations and charities from different backgrounds. Yet, in their communication one could not perceive clearly the variety of backgrounds, and by extension, of interests involved in the coalition. The lead was taken by two major organisations, *Friends of The Earth* and *The Soil Association*. Additionally, very limited spokespersons from these leading organisations represented the *Shadow coalition* (GM Freeze), mainly Pete Riley, an active member of the former, and Peter Melchett, the policy director of the latter. And, this was the case even during the hot decisive phase of the controversy (Event 2). The media referred to any communication by GM Freeze using its aggregate name, and sometimes simply mentioned that it represents an umbrella organisation. Since the public was not necessarily aware of this fact, and may not have known who and what it represents exactly, the mosaic of the opposing front was largely overlooked.

GM Freeze, and by extension its adherents' identity and contribution, were unperceivable, if not totally absent, during the decisive phase of the debate.

Similarly, '*ad-hoc representation*', an expression by which I refer precisely to representatives of collectives that work on a prompt (like the collective Take The Flour Back) or quasi-intermittent basis (like the GM Freeze umbrella), prevented these collectives from constructing an established status. Besides, such prompt/intermittent coalitions would generally have limited resources to account for the full range of the diversity they represent in a sustainable way, unlike more established operating organisations like Rothamsted Research or The British Crop Production Council.

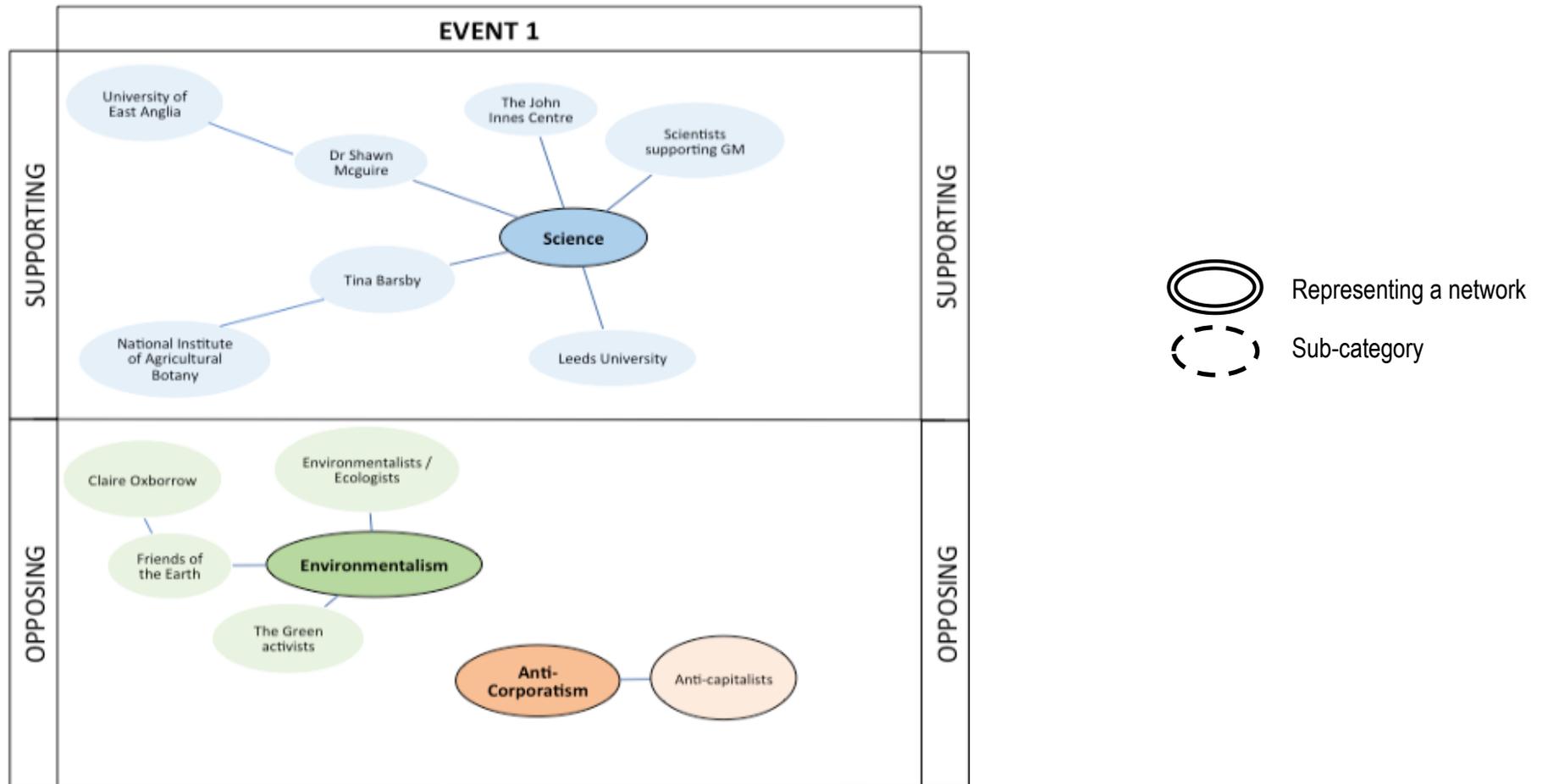
A last point worth mentioning here before moving onto the SSN is the multiplication of direct spokespersons by GM-supporters' main actors. Table *Tb.4-15* below shows that, although GM opponents presented higher numbers in terms of main actors, their adversaries had a better speaking potential through a better use of spokespersons. All over the debate, GM-supporters had more actors promoting their perspective, and this is before even considering SSN. Also, GM-supporters' spokespersons apart from being potentially more credible based on better established status and more efficient communication strategies, referring to the exposed maps above, they have also diversified their spokespersons, involving non-human representatives like video-recorded messages and open letters. This demonstrates a better strategic control of their ultimate aims and an efficient use of their promotional options.

Tb.4-15: Strong category actors' distribution

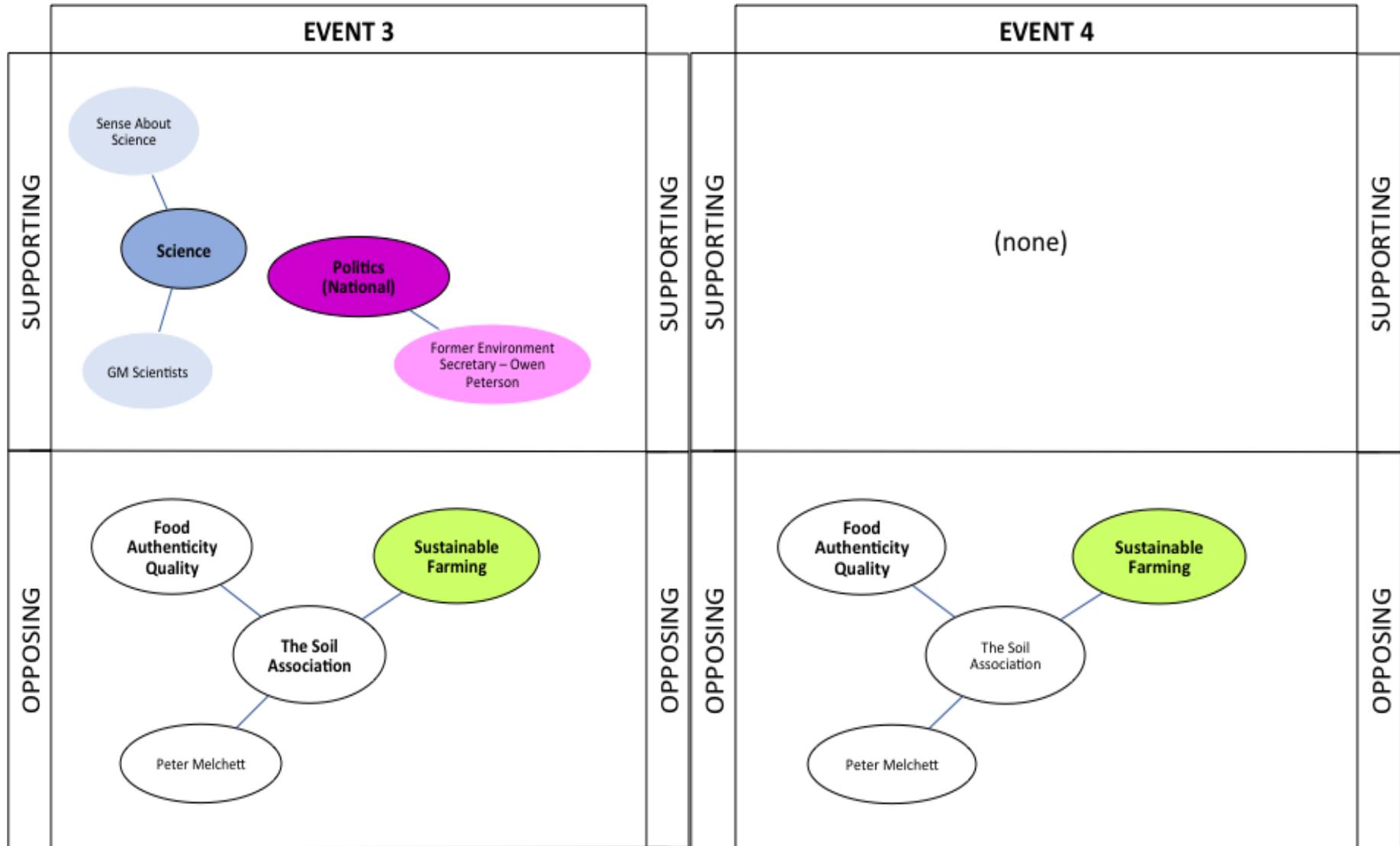
	Event 1		Event 2		Event 3		Event 4	
	GM-Whiffy wheat trial announcement		GM-Whiffy wheat trial break-in & Protest		GM-Whiffy wheat trial results		GM-Super wheat trial	
	Supporting	Opposing	Supporting	Opposing	Supporting	Opposing	Supporting	Opposing
Main actors	1	2	4	7	3	5	5	3
(Appointed) Spokespersons	4	1	19	13	5	2	7	1
Exposed SSN	5	4	28	22	3	1	0	1
Acting potential	10	7	51	42	11	8	12	5

The following maps (*Fig.4-10*) show the evolution of SSN for both perspectives, and their underpinning common references. The latter could be a system of belief or a socio-economic/political affiliation acting as a rallying point around which the network developed.

Fig.4-10: Strong categories SSN comparative maps







The maps presented in *Fig.4-10* show a boom of SSN during the second event. This supports the idea that SSN come into action in hot phases of a controversy, where risks are exacerbated, and the fate of the controversy is being shaped. It would be plausible to compare the SSN to a latent but secure reservoir of action, which only becomes operational in times of need when *Main Actors* and their prospect object or projected state of the world are attacked in a way that threatens the stability of shared values and the pursuit of ultimate goals.

4.2.1.1.4 Speaking potential and representation

The SSN expand the speaking potential of their perspective by relaying and supporting the arguments put forward by *Main Actors*, but not only. Because they come from more diversified backgrounds, they shed light on the full scope of the debated object by exposing veiled ramifications of core concerns and concerned populations behind a defended perspective.

As for *Main Actors* (and their direct spokespersons), the weight of SSN should not be appreciated in terms of number only, but rather in terms of scope and influence based on the status of actors and their spokespersons, the diversity of social interests they represent, and their representation mode. The same conclusion arrived at for *Main Actors* seems to apply for their SSN. GM supporters appear in a more favourable position, with their SSN presenting actors with higher social status, speaking mostly through expert and official representatives, and with identifiable identities. On the other side, GM opponents SSN still suffer specifically from ‘wholesale identities’ (*e.g. Those opposed to Frankenstein food, Green activists, anti-GM activists*), some ‘shadow coalitions’ (*e.g.*

The Community Food Growers Network, The Climate Camp, Organiclea), and a noticeable lack of spokespersons to voice the diversity of interests and concerns they represent.

The maps also show that SSN rely less on spokespersons than *Main Actors*, which supports the idea that they only expose themselves in hot phases. Appointing spokespersons generally does not occur over night, and involves strategic considerations. For *Main Actors*, it appears crucial to appoint enough appropriate spokespersons in order to communicate their concerns, goals, and vision of the world in a sustainable and consistent manner. While, for SSN, despite their support being stable over time, they communicate on a punctual basis, only in times of need. Therefore, appointing spokespersons does not appear as necessary as it is the case for *Main Actors*.

Also, the diversity of both opposing SSN is worth looking at in more detail. Although, both perspectives present diverse SSN in terms of backgrounds and interests, this should not be assumed to imply equal representation of the socio-economic landscape. GM opponents SSN seem to represent more diverse ranges from the general public, as mostly formed by non-governmental organisations and charities that rely mainly on volunteering work and donations (private or public). Hence, they seem to account better for public concerns and represent more accurately the citizen voice. However, they appear less integrated from an institutional viewpoint. Sketched webs show no clear connection to power, apart from the assumed right to exist as a collective and access to democratic expression including the right to campaign, which makes them appear as marginal groups defending marginal concerns.

On the other hand, GM supporters SSN shows a relatively better integration into the institutional realm, multiplying councils and invoking reactions amongst official political lines. The council form permits fostering strong alliances by stabilising networks around collectively produced specialised knowledge and its diffusion. Generally, it operates at expert levels and develops a profuse and well-structured database about their core object, which facilitates access to information and its dissemination. In this regard, councils are a means by which a perspective strengthens its presence and credibility in the public sphere, with better position *vis-à-vis* institutions, since its material is mainly used by experts and officials.

Also, the spectacular rallying of a contesting division of the Green party's adherents against the mass protest supportive tweet by Jenny Jones, while the dominant landscape of opponents appears to lay within *The Greens*, represents a quite intriguing episode. GM supporters' views seem to have started their integration journey towards normalisation, although these views do not seem to represent the majority from a general public perspective.

Rallying references

The SSN relational maps were conceptualised based on rallying references around which SSN actors knitted alliances. The configuration of the maps shows clearly how actors act collectively and purposefully. Even in the rare cases where some actors appear to act individually, they are doing so by taking part in a collectively organised action or by voicing support to its aims and underpinning justifications. As (Venturini, 2010) reminded, "*There is no such thing as an isolated actor*".

A rallying reference refers to the specific standpoint from which a group of actors speak and act, and generally represents a particular concept or set of beliefs. These may be established ones (*e.g. Environmentalism, Naturalism, anti-Corporatism, Democracy*) or new disputed constructs, which actors value and seek to make acknowledged at a larger scale (*e.g. Organic prospects being the winning card of sustainable farming, GM preparing for the second agricultural green revolution*).

Also, analysing the relational nature of SSN has to be necessarily multi-dimensional. Rallying references operate at two different levels within a defended perspective: relating fellow SSN adherents, and connecting SSN to *Main Actors*. Not only. Rallying references themselves are interconnected through constructed meanings reuniting diverse standpoints in a way that they would support shared aims and/or concerns. The more new meanings actors construct to connect as much as possible existing and potential allies, the stronger and more influential their SSN would be.

GM supporters' networks mainly rest on the idea that *Science* is the most appropriate way to acquire reliable knowledge about the natural world and society. By extension, *Science* is the primary basis for human progress, allowing an objective understanding and assessment of the natural world, an informed and efficient use of resources, and the development of useful technological means. *Science* is seen as the ultimate solution for the raised concerns and the optimum way to build a better future. In its critical form, this could be referred to by the term 'scientism'¹⁰⁷.

¹⁰⁷ I have not provided quotes here to avoid repetition, as Lens 4 will discuss in detail underpinning ideologies.

Science appears like a pervasive link within the GM supporters' pool. All standpoints from which actors supported GM prospects acted in relation to *Science* (See table **Tb.4-16** below), expressing meanings referring to a specific understanding of its role within the contemporary socio-economic and institutional context.

Tb.4-16: Science as a rallying reference for GM-supporters SSN

Rallying references/standpoints	Meanings
Biotech Industry (highly innovative sector)	Depending on scientists and scientific research for the development and the defence of their prospects.
Democracy	Defending the legitimacy of the trials as a means of scientific experiment, and condemning the protest as being an anti-scientific act.
Environmentalism (sustainability)	Scientific research is the means by which sustainable farming could be achieved (development of innovative ways to produce more with less environmental impact)
Global food security	Science offers opportunities to develop innovative ways in order to produce sufficient food sustainably.
Current global GM production	Embraced the new technology based on scientific prospects and promises.

Similarly, SSN are linked to *Main Actors* through a belief in scientific primacy, and heavy investments in scientific research and prospects (table **Tb.4-17**).

Tb.4-17: Main Actors relationship to Science

Main Actors	Relationship to Science
Rothamsted research	A dedicated scientific research centre, funded by research grants and operating close relationships with the biotech industry, which constitutes their prospect clients and the producers of their scientific inventions.
The Government (and BBSRC)	Investing in GM as a promising scientific innovation capable of preventing future food shortages, and giving Britain a competitive advantage in terms of crop production globally.
The GM technology	A produce of scientific inventions supported by investors and users who have chosen to bet on its promises.

As for GM opponents, environmentalism appears at first as the main rallying reference linking all concerned groups in some way. Yet, the collectives come mainly from a food interest/concern background, promoting sustainable food production and food quality, and aiming at preventing its supply chain from unwarranted risks. GM opponents experience an intimate connection with the environment, and do not see it merely as a resource to act upon and manage. Nutritious, safe, and healthy food necessarily entails sustainable and warranted production methods.

Their concern about food authenticity and the preservation of a reliable food supply chain provides a systemic critique of our contemporary agro-agricultural organisation that goes beyond environmental impacts, including larger ethical questions relating to social welfare, access to vital resources, and food democracy. This explains the strong anti-corporatism stance amongst GM opponents' collectives. Most of them link

sustainability challenges to the advent of corporate control over the global food system. They attribute intensive monoculture farming, excessive use of pesticides and environmental impacts to corporate greed and misuse of resources and capital. Since GM prospects are and will be essentially produced by these big corporations, it appears obvious that opposing GM entails anti-corporatism and vice-versa.

The other main rallying reference shared by most GM opponents' SSN is the idea that organic farming is the way to achieve sustainable farming and the best substitute for our contemporary destructive food system. Organic food is considered to be the healthiest and most appropriate option re-connecting consumers to fair and environmentally friendly farming, and to the real taste of food.

The Soil Association, which is an organic food certification body as well, is one of the chief members of GM Freeze. Other collectives like The Community Food Growers Network, including Organiclea, present also strong interest in organic and small scale food growing. It is not surprising that many spokespersons come from an organic farming background (*e.g. Gerald Miller an organic farmer, Jyoti Fernandes who farms a smallholding in Dorset and helped organise an organic food week in the county, 'the intruder' Hector Christie An Estonian organic farmer who has campaigned against globalisation*). The organic farming/food alternative appears as a strong affiliation amongst GM opponents, intimately linked to their understanding of what constitutes sustainable and fair farming and food production practices.

This discussion suggests more intricate and entangled links within opponents' exposed SSN, with multi-dimensional and mutual affiliations. This could intuitively suggest stronger alliances opposing GM prospects. However, this may not be the case since

other dimensions enter into play in such evaluation. For instance, the level of investment and its sources is one of these, having a differentiating impact on how interests at stake were fastened within the observed alliances. This aspect was examined by looking at the *Funding SSN*'s nature and rallying references.

As discussed previously, funding partners generally do not voluntarily expose themselves or manifest their support through communication and representation of their partners, but are mostly backstage actors, providing financial sustenance to allow unconcealed frontline actors to act. Since their support is generally stable, and does not represent prompt engagement with the funded cause, I found no need for comparing figures over the events of the debate. I rather drew two single maps exposing the two principal actors' (GM Freeze and Rothamsted Research, who shaped the first *problematization* of the debate) funding partners. Also, for simplification purposes, I have not extended this endeavour to *Exposed SSN*, especially that I have noticed that underpinning references linking *Exposed SSN* and those motivating funding partners tend to be similar and interrelated.

Figure *Fig.4-12* bellow outlines these connections.

Fig.4-11: Funding SSN rallying references



* Individual donations were excluded from the Funding SSN as these may fluctuate depending on the general public reaction to events and waves of communication.

Rothamsted Research's main contributors¹⁰⁸ appear to be the government and its institutions, mainly through its biotech council the BBSRC, Defra (depending on projects), some other unspecified bodies, and the biotech industry. The biotech industry relies mainly on private equity. Consequently, funding on GM supporters side is mainly made possible through research and development grants and investors' *Interessement*. These represent binding forms of financing, which provide a strong motivation for allies to honour their commitments based on mutual needs, accountability to stockholders, and shared interests. Also, the kind of grants and the sources prove that GM supporters benefit from heavy investments, allowing building an operational production chain for GM prospects and initiating its integration within the institutional arena to allow future marketization¹⁰⁹.

GM opponents on the other hand, acting mainly on a volunteering basis and having limited access to funding, with the latter being provided through charitable means, appear less bounded by contractual obligations. They essentially act based on a voluntary commitment mode, and thus, appear to have a higher level of freedom in terms of reviewing their alliances, which could be understood as a weakening factor here.

¹⁰⁸ Of course, this is a simplified picture of Rothamsted's funding structure that is in reality more complex than that, as the centre mainly receives funding per project/application and has a diverse range of projects. However, my aim here is not to unpack the full extent of this structure, but to specifically highlight the main contributors to the GM crop perspectives.

¹⁰⁹ For examples, look at (Rothamsted Research, 2020)

Before I close this discussion, I would like to attract attention to some subtle aspects playing a significant role in destabilising these apparently strongly connected collectives.

There were instances where actors that were supposedly allied seemed to contradict each other, and therefore, to act in a way that favoured their adversaries. This kind of behaviours could be referred to using what Callon (1989) called “*Traduction-Trahison*” (Translation-Betrayals), cases where actors do not act according to the set roles and revoke the suggested *Problematisation* while they have committed to it.

- Strong allies not adhering to set plans or disavowing their representatives

The GM-Whiffy-wheat not repelling aphids effectively as expected, discrediting the scientists’ promise.

The Real Bread Campaign, one of the opponents’ SSN, referring to the ‘decontamination’ promoted by Take The Flour Back as ‘illegal action’.

- Dissonant affiliation to rallying references

Rothamsted Scientists strongly believing in the GM project and claiming it to be safe for human consumption and the environment, while other scientists¹¹⁰ expressed reticence towards GM claiming it being potentially harmful for humans with irreversible unpredictable effects on the environment. Both groups refer to Science as a system of reference.

- Lack of support from influential representatives (adhering to the main rallying references)

¹¹⁰ *Prof. Gilles-Eric Serallini - GM foods are unsafe, Dr Árpád Pusztai - GM potatoes poisonous to rats, Carol Mallory-Smith- GM contamination is irreversible, and other independent scientists.*

Although the GM opposing front represents a strong environmentalist stand, some powerful Green organisations did not get involved in the planned protest

While environmentalism appears to be one of the most prominent rallying references amongst opponents' lines, for example, Greenpeace (who performed the spectacular field trashing in 1999 that motivated a halt on GM for 7 years) and World Wild Fund for Nature (one of the most influential environmental organisations in the world) were missing and did not provide any tangible support to the planned day of mass protest.

- Strong category actors investing in alternatives, which may be interpreted by the public as a weakening of their commitment to the defended GM perspective, and as GM prospects being uncertain.

The BBSRC investing in the Non-GM-Monster-wheat developed by a research team in Oxford.

4.2.1.2 Unstable categories

The two juxtaposing unstable categories (**Fig.4-8, section 4.2.2.1**) comprise actors that are brought into the discussion by strong-category actors' depictions, role fulfilment, and unsolicited representation. They mostly do not speak for themselves, nor choose their spokespersons, but are being represented and depicted by strong-category actors that invited them into the debate.

Referring specifically to their unintentional participation¹¹¹, in the sense that it was not meant to take part in the debate (in most cases, see table **Tb.4-18** below), commitment

¹¹¹ Their action is/was performed independently from *Main Actors* plans.

to the defended cause within these categories appears wavering and vastly dependent on the effectiveness of *Interessement*, *Enrolment*, and communication efforts invested by their supplants. For this reason, I have chosen to describe their contribution using the terms ‘*Approving/Disapproving*’ the GM-wheat open-air trials/GM prospects, rather than ‘*Supporting/Opposing*’, since the latter terms express determination and proactive ‘continuous’ involvement in the debate shaping, which unstable-category actors do not account for.

The selection took the broadest definition of an *Actor*, where an actor may do something without actually even performing anything, “*if you wonder if something is acting in a controversy, just ask yourself if its presence or absence does make the difference. If it does, and if this difference is perceivable, then it is an actor*” (Venturini, 2010, p266).

This embraces the meaning of agency conveyed by *socio-technical-agencements*, where the capacity to act is attributed to the network and not to any individual actor (Callon and Law, 1995; Latour, 2005). An actor could be then participating more or less actively to the collectively performed action. This reading of *acting* allowed a comprehensive selection of actors, highlighting different shades of agency within the described *socio-technical-agencements*.

Tb.4-18: Unstable-category actors typology

		Event 1		Event 2		Event 3		Event 4	
		GM-Whiffy wheat trial announcement		GM-Whiffy wheat trial break-in & Protest		GM-Whiffy wheat trial results		GM-Super wheat trial	
		Serving In-favour	Serving Against	Serving In-favour	Serving Against	Serving In-favour	Serving Against	Serving In-favour	Serving Against
Fulfilling a role	Performing-Knowingly	3	0	35	25	1	0	8	15
	Performing-Unknowingly	11	3	51	41	9	7	19	18
Represented	Opinion/Victims	1	1	27	32	2	1	2	6
Depicted as	Holding/Missing a specific attribute	14	1	44	17	5	1	7	5
	Being a need	0	0	7	5	1	1	2	0
	Being absent/missing	0	2	7	23	1	1	4	4
	Just' being present	3	0	6	12	0	0	3	9
	Interpretations	0	0	10	0	6	0	5	1
Total actors mobilised		32	7	187	155	25	11	50	58

4.2.1.2.1 Fulfilling a role¹¹²

This group of actors appeared in the debate through a role that they had fulfilled/are fulfilling. Not all roles were attributed by strong-category actors though. Some were just re-appropriated by them. What makes these groups of actors mobilised through ‘Fulfilling a role’ appear amongst unstable categories is the fact that they can at any time decide to change their stand or refute the attributed role (whether attributed *a priori* or *a posteriori*).

¹¹² I have purposefully avoided the common ANT appellation ‘Role attribution’, since, as the analysis will show, not all fulfilled roles were attributed by strong actors.

4.2.1.2.1.1 Those acting in-relation to Main-actors' plans

The first line in **Tb.4-18** shows actors who acted in relation to strong-category actors' plans in a way that approved or disapproved the GM-wheat trials, which justifies a role attribution relationship.

Approving-GM

This experiment (is testing a promising new scientific route to reduce excessive pesticide use in farming) → *Scientific experiment tool*
Defra (approved the trials and listed more than 300 varieties of plants in which EBF is known to occur naturally) → *Guarantor of food safety in Britain*
A chain-link fence 2.4 metres high → *Protection from activists*
Police (arrested 50-year-old man suspected of illicit intrusion, and have warned that any-one who enters will face arrest) → *Maintain of public order*
Wild plant called 'stiff brome' (has provided the gene inserted into the GM-Super-wheat) → *Supplying the gene*

Disapproving-GM

The centre's wheat (presenting "a clear risk to British farming") → *The threat*
The event's website (exposing the aims of the protest and appealing for joining the protest) → *Communication*
European Medicines Agency (advice against the antibiotic-resistant marker gene contained in the Rothamsted's experimental GM-wheat) → *Expert advice*
National Lottery (has funded the mass protest) → *Funding*
Calls for those who are anti-GM to take action on a freelance basis → *rallying GM opponents*

Actors acting from an institutional official standpoint

These actors are taking decisions, acting, and may also speak for themselves, but are doing so within the scope of their institutional role. Their support or opposition would therefore be understood to be punctual, and not the result of them being intrinsically concerned about GM-wheat trials/plans. In this case their involvement would be solicited by the strong-category actors and could be understood as a 'role attribution' (E.g. Defra approving the GM-wheat open-air trial following the application put forward by the Rothamsted Research Centre, the Police involved in the protection of the experimental site following the request of the Research Centre for civil protection against illegal intrusion into their site.)

In general terms, support for GM plans within the political/institutional sphere is vastly dependent on the political and ideological affiliation of the government in place and its priorities in terms of funding and food security politics. Therefore, acting from an institutional position does not offer warranty on its own for a long-term commitment, unless backed up by an official declaration of this genre conveying the disposition of changing policy and current norms (*E.g. Downing Street declaring considering a dramatic liberalisation of GM food laws after Brexit*).

Projected promises

These are fictional expectations specifically formulated and communicated by strong-category actors to support and give credibility to their respective perspectives. Fictional expectations are proven to be *performative*, allowing the mobilisation of resources and shaping a projected future state of the world, and have a substantial effect in influencing economic behaviour (Beckert, 2013; Van Lente, 2000, Borup *et al.*, 2006). Despite them providing strong support to their perspective, I have placed ‘projected promises’ in the unstable category due to their potential of disavowing the promise. The analysis of articulated literatures has shown a whole literature around the ‘unfulfilled promises’ of the GM technology. The first generation of GM is portrayed today as disappointing even by GM supporters.

Approving-GM

This GM-wheat variety (would allow wheat farmers to use less pesticide to kill aphids)

The aphid-repelling odour (would allow the wheat to thrive without being sprayed with so much insecticide)

GM crops (that could be climate change resistant, could be both salt and drought resistant, could be enhanced with extra health-giving properties such as omega-3 oils)

A dramatic liberalisation of GM food laws (will be considered by the British government after Brexit)

Disapproving-GM

Organic farming (is the solution for a sustainable agriculture)

Non-GM-Monster-wheat (grown by Oxford could compete with GM prospects)

Alternative technologies such as marker-assisted selection (are overtaking GM and will allow a more natural breeding)

4.2.1.2.1.2 Those acting independently from Main-actors' plans

The second line in **Tb.4-18** represents however actors who, through an action that they had performed (or are performing) independently from strong-category actors' plans, unknowingly approved or disapproved the GM-wheat trials/prospects. Their actions were simply re-appropriated by strong actors from both sides when it served their own perspective, generally to support arguments put forward.

Approving-GM

Aphids (attacking wheat crops, causing loss, and spreading Harmful plant viruses) → *Justifying the GM-Whiffy-wheat investment*

The vitamin A deficiency (killing and blinding millions of children per year → *Valuing the Golden rice solution*)

Blight-resistant potatoes' trials (went well and engendered no issues) → *Supporting trials' safety*

Wheat yields (stagnating) → *Justifying the need for increased yields*

A global population (continuously increasing and set to reach nine billion by 2050) → *(ibid)*

Disapproving-GM

Time of austerity (making the spending of about £1m of public money on something the public definitively does not want highly questionable) → *Waste of public money*

GM Long-grain rice (got involved in contamination incidents in the US) → *Actual risk of contamination*

The jury (on Greenpeace attack destroying GM crop in Norfolk, accepted defence arguments their attack had a 'lawful excuse') → *GM is controversial*

Scientists at Oxford University (developed a spray that could boost yields by 1/3 without genetic modification) → *GM alternatives*

The International Assessment of Agricultural Knowledge, Science and Technology for Development (conducted a UN--endorsed study using the work of 400 scientists and concluding that GM is far from one of the best hopes for feeding the world) → *Irrelevant tech*

The case of ‘Opportunist’¹¹³ actors

These are actors that represent a certain weight in the socio-economic landscape with no precise interest in either perspectives or obligation (even suggestive) to follow one in particular. In other words, while these actors could play a significant role in the controversy by favouring a perspective over another, they are difficult to manipulate by strong-category actors, as they decide for themselves based on a gain/loss calculation of emerging situations, and generally had not made heavy investments in any of the perspectives limiting their choice¹¹⁴. Their position is then revocable depending on the evolution of the debate, thus unstable, yet highly impacting and may threaten the survival of a whole market version (Cook, 2004).

The best examples to illustrate this type of actors appear to be: retailers and the media.

Retailers

Retailers play a significant role in giving support to a food market version over another, since they constitute an integral part of the food supply chain today, while they appear quite independent actors who are predominately driven by their own interests and are difficult to constrain fully. In Britain, but not only, retailers have played a significant role in delaying the introduction of GM into the food market since they sided with the less risky perspective, following their customers’ trends. Some had more drastic reactions banning GM ingredients from their own brands like Iceland and Marks&Spencer, followed by Sainsbury’s, others like Tesco, had adopted a slightly

¹¹³ The word should not imply moral judgment. I have used it to avoid confusion with ‘interested’ as *interessement* is part of the ANT terminology. Here the emphasis is on their independent agency based on self-interest.

¹¹⁴ Once they choose to invest heavily in a perspective, they become part of strong actors.

more liberal approach claiming that what is important is effective labelling so consumers' choice is preserved since *GM-Free* is virtually impossible (Cook, 2004; Jones *et al.*, 2000).

In the studied debate, retailers were only mentioned by opponents to support the market rejection of GM food.

*“And since **no one** wants to buy products with GM ingredients, **retailers have refused to stock them.**”*
(Art.41)

*“**Most supermarkets ban GM for their own-brand products.**”* (Art.56)

*“This is why **Carrefour**, the world's second largest supermarket chain, now labels its own-brand meat and dairy as **GM animal feed-free**, (“Nourri sans OGM”), to give its customers the field-to-fork guarantee they so clearly desire.”* (Art.27)

The media

Historically, passing the first hype phase of biotechnologies in the early 70s, and until early 2000s, the media support to GM was perceived as flawed and dominated by a questioning tone (Bauer *et al.*, 1998). The latter seemed to be influenced by a series of food safety scandals that took place in Britain and Europe during the period, complicating the introduction of GM that were already perceived as potentially harmful (ibid; Jones *et al.*, 2000). The 21st century started on a negative and very controversial tone for GM in Britain commenting on the spectacular experimental GM plants trampling in an operation driven by Greenpeace, contributing to a halt put on GM plans for almost a decade. However, the desire of some British research centres to conduct GM experiments, and some farmers to get the chance to embrace the technology, got GM back on the agenda in Britain.

The media remains divided though, conveying a controversial situation of GM in Britain despite signs of institutional integration. Despite a relatively stable support to opposing perspectives on GM by different newspapers, the media is still perceived in general as an opportunist medium looking for the fulfilment of its own selfish interests (McCluskey and Swinnen, 2011; Cook, 2004).

In the studied debate, both sides expressed the unreliability of media in terms of long-term support, but also saw in it a highly impacting device.

*“The Rothamsted scientists have won public support. **In stark contrast to the 1990s, the media overwhelmingly condemned the campaigners' threat of vandalism.**” (Art.36)*

*“A trial for blight-resistant GM potatoes was being conducted at the John Innes Centre in Norwich, 60 protesters with signs saying “Stop gambling with our chips” marched through the city, before dumping a load of potatoes at the entrance. **But media interest was negligible.**” (Art.26)*

Discredited strong actors

This case concerns the rare occasions where strong-category actors may figure punctually within the unstable category of the opposite side, favouring their opponents' perspective and undermining their own. This point is subtle, since strong-category actors are identified by their own actions and not based on their opponents' depictions and accusations. Especially that, within a controversial context, it is expected that main opposing groups from both sides respectively use negative depictions of each other's intentions, declarations, and actions. This would usually not cause a strong-category actor to be in a position that supports the opposite side, unless the described action/declaration would be clearly seen as acting against their own clan/perspective, illustrated by the three following rare cases with examples:

(1) Discrediting a fellow representative of the strong category

The Real Bread Campaign (TRBC), one of the opponents' SSN, referring to the 'decontamination' promoted by Take The Flour Back by 'illegal action'.

*"We object to the GM-wheat trials and we have some common interests with Take the Flour Back. But we **do not support any illegal action** and we are not interested in supporting or taking part in decontamination." (TRBC, Art.31)*

(2) Commonly understood to be unethical or anti-social even outside the debated object

Entering a private domain and uprooting scientific experimental crops was *problematized* by GM supporters as an act of vandalism. The fact that this *Problematization* was widely accepted, even amongst opponents' lines, rendered the appeal for 'decontamination' appear as an anti-democratic act, and hence blameworthy. Likewise, on the supporters' side, the over-reaction from some scientists to the MP Jenny Jones' tweet, using the latter as an excuse to attack the Greens vehemently, was seen as inappropriate from a collective claiming objectivity and measure.

*"Take the Flour Back talk about 'food democracy' on their website. **Is ripping crops out of the soil democratic?**" (Art.18)*

*"Some scientists **keep attacking** Greens despite party activists have taken steps to change those stances" (Art.30)*

(3) An action contradicting their core mission or presenting a serious lacking in their domain of expertise

Conflict of interest existing amongst collectives claiming rigor and pure devotion to scientific research and common good.

*“But I'm less clear about the agendas of other people, such as **Rothamsted's director, Maurice Moloney, who made his name patenting varieties of GM oilseed rape in Canada** and drives a Porsche with a number plate ending in GMO” (Art.15)*

Rothamsted Scientists engaging in a research that has been carried out by another research centre in Europe and was proven to be unsuccessful, which suggested an irresponsible conduct considering the costly investment.

“I would have bet that it wouldn't work based on our published study. Our major conclusion was that this strategy doesn't work in nature because the aphids get used to the continuous release of their alarm pheromone and thus learn to ignore it. Or, they're programmed to respond only to bursts of it, which would be the natural situation when one of their sisters is attacked. Or both” (Jonathan Gershenzon from the Max Planck Institute for Chemical Biology in Jena, Germany, Art.51)

Punctual participation of individual actors

These are untraceable actors who had manifested a punctual participation, so no long-term commitment to the cause or belonging to a specific involved network could be established (E.g. Claire in the local Oxfam shop concerned about pollen escape if activists break into the experimental plots. Pauline Cheema a local supporting the continuation of the GM experiment as believes it being carefully controlled).

Apart from those actors whose actions were appropriated by strong-category actors and interpreted as fulfilling a role in favour of the perspective they were brought into, the remaining groups appear to be knowingly favouring their perspective, and even speak for themselves. Consequently, one may question their appearance in the unstable category rather than the strong one. What actually differentiates them from strong-category actors is **firstly**, the fact that there would be no clear sign of long-term commitment to the debated object outside the fulfilled role (e.g. the latter being their official role within the socio-economic/political environment, a punctual or a revocable role). **Secondly**, despite them acting willingly, the meaning of their actions is generally defined by strong-category actors' interpretations from both opposing clans, and not by themselves. Hence, their possible appearance in both opposing sides at the same time.

4.2.1.2.2 Unsolicited representation

The difference with *Main-actors* spokespersons is that these were solicited and appointed by the represented actors, while here I am referring to unsolicited representation, which involves representing a person/group/thing without them having solicited or approved the representation.

Representation has to involve 'talking on behalf', and not just depicting or mentioning somebody/something. The former involves highlighting, discussing, and/or defending the represented actor's interests and concerns or presenting them as concerns (e.g.: "*A great number of people sadly, are still too dim to realise the gain from this experiment*", here, 'a great number of people' are merely depicted as dim, holding a specific attribute, but 'the experiment' is defended, thus represented).

Whether these interests and concerns are tangible, projected, or even imagined, does not make a real difference, as all rely on a certain reading of reality that is worth considering from the representative's standpoint. The last two words are important. In this form of unsolicited representation, it is not necessarily the 'represented actors' point of view that is exposed, but the unsolicited-spokesperson's one, attributed however to those they claim representing.

These groups are represented in a way that expresses the need for action in the suggested direction (by the unsolicited-spokesperson).

Most actors that fall under this rubric appear to be either:

- Actual/potential victims of the opposite perspective (dominant part)

Nearly one billion people (are undernourished currently)

Millions of children (could be saved from blindness and death by the cultivation of Golden Rice)

Our World agriculture (risking ruin since opposition to GM-technology is so powerful in the world)

Poor Indian cotton growers (who have adopted expensive GM varieties and were disappointed and pushed to suicide)

Wild plants and commercial crops (in the US contaminated by trials on GM-wheat varieties).

Neighbouring farmers' crops (risking contamination by GM crops)

The public purse (funding this unpopular experiment)

- Actual/potential beneficiaries from the defended perspective (mostly projected)

Crops (will be protected from aphids)

African agricultural productivity (that can be enhanced by 50%, the continent would become a net food exporter).

GM alternatives (would be considered).

- Actors presenting needs

Nature (needs to be altered to produce plants that provide maximum yields with minimal risk of infection from pests and disease)

Over nine billion much richer people (need to be fed by mid-century)

The experimental site (presenting serious threats to the environment and needs to be decontaminated)

This rubric also is the one that represents the higher proportion of indefinite collectives presenting a shared identity (e.g. the public, consumers, Organic farmers, UK farmers, 3rd world countries), some of which appear as duplicitous actors figuring in both opposing sides. Both sides appear highly interested in rallying these ‘masses’ to their cause to give a stronger backup effect to their defended perspectives.

Consumers:

Do not want genetically modified food.

Have been consuming GM for decades unknowingly, and no case of intoxication has ever been raised.

Future generations

From whom we need to leave a safe environment.

Deprived of the opportunity to gather knowledge on one possible technological promising alternative.

The public

Not accepting the technology.

Whose opinions about GM have softened.

UK farmers

Rarely growing the spring wheat used in the trial, and already have other well-established ways of controlling aphids.

Want to have access to a promising scientific technology to improve the quality of their crops.

The Third World's farmer

Exploited by big companies.

Where the lives and sight of hundreds of thousands of children a year could have been saved by the cultivation of the Golden Rice.

The special case of ‘the Environment’: The most impacted victim!

Due to the pervasiveness of environmental concerns in contemporary markets, *The Environment* constitutes an inevitable victim. Both groups had to speak on its behalf, as no market would have the chance to be approved and to expand without integrating sustainability measures.

This is mainly why both groups as explained previously have articulated their first competing *Problematisations* in environmental terms, although contradictory. From GM opponents' viewpoint, *The Environment* had to be saved from the irreversible damage of gene pollution. In GM supporters' opinion, it has to be saved from unsustainable farming methods by the use of novel technologies like GM.

The special case of 'The Public': Indeterminate, yet highly impacting collective!

The public appears to be almost a homonym, expressing multiple meanings and representing multiple collectives at the same time. In the debate, the public seemed to represent consumers when opponents/supporters talk about public rejection/acceptance of GM food. It seemed to represent citizens when GM opponents talk about the public democratic rights to be involved in the trials' approval process or when GM supporters talk about the public condemning vandalism. It seemed also to refer to lay masses that need to be illuminated, warned, and saved from the Dark Age or the conspiracy of big corporations, and it is thus represented. So the public can be everything and anything outside actors that have a well-defined role or attribute.

Because of this multiplicity of meanings, the public represents important masses that need to be solicited for a perspective to prevail, which explains the discourses from both sides attempting to rally the public to their respective causes. An interesting point to mention here though. While protesters presented themselves as part of the public, ordinary farmers, consumers and citizens, GM supporters considered activists and interest groups to be a different category, manipulating the public and speaking in its behalf without legitimate mandate.

Future Generations

Future Generations represent one of these indefinite and elusive collectives that are doing something by being potential victims that need to be represented and considered within current plans, but we do not know that much about them.

*“This act of vandalism has attempted to deny us all the opportunity to gather knowledge and evidence, for current and **future generations**”*
(Professor Maurice Moloney, Art.19)

This group appears also unidentifiable in terms of timespan, as it is referred to in its plural form, which suggests an extended open future.

4.2.1.2.3 Depicted

These are mainly actors brought into the discussion due to them ‘*just being present*’, where their simple presence favours/allows or blocks action, or due to them ‘*being missing*’, while expected to be present.

Actors by ‘Just being present’

These are actors whose mere existence makes the difference, without them performing a specific act. They are acting through their presence that is encouraging or discouraging the process.

Approving-GM

Preconditions (by the Government's Advisory Committee, reassuring the public that the process is in control)

Section 14A of the Public Order Act (Forbidding "trespassory assembly")

Compelling evidence (exist today that GM crops can contribute to sustainable development goals)

A definite gap (existing between the plateau of current wheat consumption and the growing population)

Time (There is still time for protesters to see sense, and realise that vandalism is not the way forward)

Around 85 per cent of all corn crops in America (are now GM)

Disapproving-GM

Varieties of GM oilseed rape in Canada (are patented in the name of Rothamsted's director, Maurice Moloney)

Philosophical, political, economical and aesthetic views on GM (other than scientific, held by those opposing it)

Risk of antibiotic resistance and herbicide tolerance genes (are there and are concerning)

There is enough to eat for generations to come

Other solutions, like organic farming (are available)

Unanswered questions about GM crops (still pending)

Actors by 'being missing'

These are those who became actors by being missing while they were expected to fulfil a specific role for adversaries' thesis to be validated from the standpoint of those highlighting their vacant place. They are revealing actors. Their emergence exposes blocking or justifying points behind articulated concerns, basically, what is lacking to validate adversaries' perspective.

This is different from representing an absent actor that all assume as such, like 'Future generations'. The difference is that 'missing' actors, are those whose absence is controversial.

Approving-GM

A single case of any harm done due to GM generated foods consumption (inexistent)

Conclusive evidence (that the consequences of GM will match the 'unsafe' prophesies)

Hybrids between wheat and couch grass without human intervention (had never developed in the wild, which makes the risk of contamination close to zero).

Patent & Ownership by private companies (of this whiffy-wheat)

Frankenfoods (absent from debate, proof that opinions about GM progressed)

Allergic effects (none have been found to date in GM foods currently on the market)

Disapproving-GM

Market (for this type of GM-wheat in Britain and GM-wheat in general)

Public acceptance

A public debate (asked for by campaigners)

A guarantee (that GM produce will not contaminate conventional crops and will be cheaper to consumers)

Faith in the system's impartiality (lost by many campaigners)

Support or enthusiasm for GM

A body of evidence that people could call on (scientific experiments' records)

Actors by Holding/Missing a specific attribute

These are mainly actors brought into the discussion due to them holding an attribute, whose absence would change the course of action.

Approving-GM

The new genes (are similar to the versions that appear in peppermint)

Oilseed rape and canola (Far more promiscuous than wheat)

Wheat pollen (heavy, travels at most 12 metres and only lives for a few hours).

Innovation (could only exist through Science)

The pheromone/E-beta-farnesene or EBF (being released by more than 400 plant species)

Disapproving-GM

Wheat (being a staple food, development of GM varieties is particularly controversial)

Pests (are very good at adapting to their environment)

Risk of contamination (being beyond control)

Consequences of the open-air trials (being irreversible)

Genetic modification (has proved controversial)

In some cases, it could be actors missing an attribute that they were expected to hold causing them to fail in their attributed role.

Approving-GM

GM (unable to increase yields, despite 20 years of trials).

The study crop (is not particularly vulnerable to aphids)

Borders (unable to stop GM contamination coming from EU neighbouring regions)

The gut (unable to destroy GM toxins made to kill crop pests)

Disapproving-GM

The world's agricultural land (unable to feed a global population set to reach nine billion by 2050)

Those opposing GM (unable to grasp the process happening inside the lab)

The represented actors in the ‘Unstable’ category are necessarily ‘quiet’ actors, whether silenced through: (1) the attribution or/and interpretation of their role, (2) their representation, although unsolicited, or (3) their depiction in a specific way that encourages action in a direction rather than the other. However, they can refute this representation at any time, and decide to speak for themselves or act in a way that betrays their unsolicited representation (*e.g. Public opinion polls or consumers’ organisations could contest Main Actors representation of them, a fictional expectation could prove untrue in some time*), hence their uncertain backing to the perspective they seem to favour.

4.2.1.3 A Pending category

This category comprises what I refer to by ‘Indeterminate actors’. These are actors that are already somehow involved in the controversy, but it is the result of their action that is still pending. In most cases, the latter is imminent, but whether it will make the acting entity join the opposing or supporting side of the controversy, remains hardly predictable at the present time of their appearance, yet revealed later.

Consequently, strong actors could not rally these actors to their perspective through depictions and role interpretation, nor could they represent them, before the conclusion of their action. In meantime, the latter would generally denote either, a ‘*Possibly supporting evidence*’ or a ‘*Threat*’. The Pending-category of actors informs about pending questions and therefore account for the highest level of uncertainty within actors’ lines.

Tb.4-19: Examples of indefinite actors

Pending actors	Involving action	May...	May not...
The experimental wheat	To repel Aphids	Approving GM	Disapproving GM
Unwanted genes	To spread into conventional wheat and threaten future livelihood of the farming community	Disapproving GM	Approving GM
An objection to the trials proposal could be made	To be submitted before the 19 August 2011	Disapproving GM	Approving GM
The start of the open-air trial	Get Defra approval.	Approving GM	Disapproving GM
GM residues	Be found in the surrounding fields flour	Disapproving GM	Approving GM
Force	Be used if against protesters if they decide to enter the site	Approving GM	Disapproving GM
Supermarket chains	To encourage further the proliferation of GM-free products	Disapproving GM	Approving GM
Those who wish	To answer the call and participate in removing the GM crop	Disapproving GM	Approving GM
More than 20 different types of weeds	To become more resistant after the usage of GM herbicides	Disapproving GM	Approving GM
The aphids	Behave differently when faced with a minty aroma on a plant which smells otherwise of wheat	Disapproving GM	Approving GM
Relaxing rules on GM crops	To be considered after Brexit	Approving GM	Disapproving GM
UK trade with the EU 27	To be considerably complicated	Disapproving GM	Approving GM
Cells of the body or bacteria in the gastrointestinal tract	To present genes from GM food)	Disapproving GM	Approving GM
The final report by 18 Department of Agriculture investigators	To find a few grains of suspicious wheat	Disapproving GM	Approving GM

Being an *Indeterminate* actor has to be understood as a temporary position, although time scales of the actions involving these actors differ. The time needed to know Defra's decision on a submitted application (in average 3 months) is incomparable to the indeterminate time for unwanted genes to be detected in nature (or not).

This is why; some actors in this category could be considered as 'imminent' *Unstable actors*, while others are more likely to be 'resident' *Indeterminate actors*. The latter group is the one that informs better about persistent pending questions. These are

serious ones. Due to their lack of ‘fluidity’, if not resolved in a reasonable time¹¹⁵, they tend to become real blocking points.

4.2.1.3.1 The special case of the object of the debate: The experimental GM-wheat

The object of the debate, here, the experimental GM-wheat and the GM-wheat Trials, is certainly a main actor, but where to position it in the suggested categorisation, the answer does not seem straightforward.

Actually, the object of the debate despite it being present all over the controversy and fully involved in the debate, it represents the most uncertain part of it. Its relevance or not, its survival to opposition or not, will only be determined at the end of the controversy. Its fate relies heavily on its strong-supporters level of commitment and ability to value their plans and make them prevail over rivals’ perspectives. Of course, the debated object is not a completely passive object, it sometimes speaks for itself, and could even take position against its supporters’ plans (*Event 3-The published results of the experiment had proven that the GM-Whiffy-wheat did not repel aphids in the field as expected by the scientists*), but it is mainly negotiated, mobilised and displaced¹¹⁶ by its strong supporters. For this reason, I have chosen not to include the debated object within the strong

¹¹⁵ Their resolution does not need to a proper one, it could be just discursive or through over-powering the questioner.

¹¹⁶ Here ‘displaced’ should be understood in its meaning ‘moved’ referring to the French word ‘déplacé’ used in (Callon, 1986), which also accounts for ‘represented’ in the context of such studies.

category actors, but rather to position it at the centre of all categories, based on it representing the highest degree of uncertainty¹¹⁷.

¹¹⁷ If I were to follow Callon's (1986) reasoning, I would place the debated object in the supporting main-actors group, based on it having a strong interest in its own survival.

4.3 Underpinning Ideologies and *Expected States of the World (ESW)* (CC Lens 4)

Beyond concerns, arguments and alliances, this lens goes even deeper in exploring the studied debate, unveiling clashing projected states of the world, triggering controversy. It explores the ultimate visions of society behind actors' endeavour, and their underpinning ideologies. Ideologies as Venturini (2010) explains, should not be underestimated in terms of influence, or disparaged based on lack of objective facts. They are not meant to provide an accurate scientific description of reality, but rather to provide meaning for actors' actions, and as such, they could be more powerful than 'facts'. The full extent of a controversy could not be appreciated without exploring the ideological background of involved actors, especially that often, perceived incongruence with ideological credentials is what stimulates conflict and the need for change of set rules.

Projected visions of the world/society of main opposing sides of the GM-wheat trials debate will be described gradually through the discussion of their underpinning ideologies to appreciate the import of each of these. A concluding section will also provide a succinct summary of both sides' ESW.

4.3.1 Underpinning ideologies

4.3.1.1 *Environmentalism*

Environmentalism as defined by the Cambridge Online Dictionary¹¹⁸ entails a connection between the interest in the environment and the impact of human activities on the latter.

Both opposing groups markedly defended their perspective from an ecological angle and seemed to embrace environmentalism, which confirms the pervasiveness of environmental concerns within contemporary societies. Questions around the sustainability of our modern/post-modern development and the urgency to preserve the environment have become commonly discussed and critical for any market to be widely approved. However, despite seemingly adhering to a shared system of belief, scientists and trials' opponents expressed a completely different understanding of what constitutes sustainable farming and eco-friendly forms of development.

At the heart of this difference is that opposing groups do not seem to maintain the same relationship to the environment. Being in harmony with, and protecting the environment, then necessarily present different meanings for both groups.

For the scientists, the natural environment appears as one of the components of the discussion, a locus for their sustainable GM prospect. In their experimental world, *The Environment* is acted upon, overpowered and controlled by the human mind through

¹¹⁸ “An interest in or the study of the environment, in order to protect it from damage by human activities” (Cambridge English Dictionary, 2020).

the production of scientific knowledge and progress. Equated with nature, *The Environment* constitutes from this point of view a source of insecurity, and science and technology are the tools to conquest and manage natural hazards in order to achieve the survival of our species and to fulfil our needs and desires (Brenton, 1994).

*“Agricultural technology, as led by the father of the **Green Revolution** Norman Borlaug, is credited with **saving a billion lives last century, and GM is just another aspect of that.**”*
(Art.28)

*“Technologies for modifying crops are of immense potential benefit to humanity. They hold out the prospect of developing crops that can **resist viruses and tolerate inhospitable conditions.**”*
(Art.37)

Being in harmony with the environment from the scientists standpoint would be achieved through a better control over natural resources, getting the most of these whilst preventing their extinction for a longer use. Nature is at the service of human development and expansion, and can only be effectively exploited through the scientific method and technological progress. GM is from this perspective just another ingenious way to improve human condition with lesser adverse effects on the environment (Panagiotou, 2017).

*“**For centuries, mankind has been altering nature** to produce plants and animals to provide maximum yields with minimal risk of infection from pests and disease. Modern day opinion is to denounce GM as a dark science that perverts the course of nature, when **it is merely an attempt to get the best out of nature to meet consumer demands.**”* (Art.25)

*“All transgenic technology **is: a tool.** It is not a political ideology”* (Art.18)

*“I think it would be very good (to push the tech forward). It would be a **real pity if we don't embrace the available technologies** to try to **produce the best plant varieties that we can.**”*
(Christine Raines, Art.60)

*“....GM crops can enable you to **intensify agriculture sustainably.**”* (Art.44)

*“There is compelling evidence that **GM crops can contribute to sustainable development goals**, with benefits to farmers, consumers, the environment and the economy.” (Art.47)*

On the other side, GM opponents seem to have a more intimate relationship with the environment, being the source of life, and thus, powerful and having its own logics to be respected. They do not seek to dominate nature, but rather to find optimal ways to live in harmony with the latter, which they consider to be ubiquitous to human existence. From this perspective, nature offers the utmost form of intelligence¹¹⁹ and ‘*Man*’ is one of its wonders.

*“There is also growing evidence that herbicides used on genetically modified crops could increase resistance in more than 20 different types of weeds. The fact is that, for all the blithe rhetoric of the GM companies, **we simply do not know enough about the potential consequences of tampering with nature.**” (Art.41)*

*“But genetic modification has proved controversial with campaigners warning it ^[1]_{SEP} could **disrupt nature** or be toxic to humans” (Art.58)*

*“Rothamsted Research has already shown a cavalier **disregard for both environmental safety and democracy.**” (Art.41)*

*‘We know that pests are **very good at adapting to their environment** but, like the aphids in the trial, those promoting GM as the first-choice solution to our food and farming needs **stopped listening to nature’s alarm signals** as soon as they became inconvenient. (Art.48)*

GM opponents see themselves part of their environment, and not at a superior position having complete ownership of the latter. They seek to share it with other species, and

¹¹⁹ The experience of fungus serving as an *Internet* web for plants in the forest to communicate, offers one of the most fascinating examples of how nature is far more superior in terms of intelligence, mastering life and its challenges better than the human brain and its products (largely inspired by *Nature*) (Aberkane, 2017)

have a strong awareness of the scarcity of some resources and irreversible damages that may be engendered by over-exploiting these, thus, aspiring for a less greedy and abusive economy that would necessarily oppose a frenetic race to technological innovations (Rabhi, 2010).

“We've been abusing our soil for 60 years. We need to move away from monoculture, energy-intensive farming. We don't need GM for a healthy diet. There's no evidence it increases yields. We need a diverse gene pool.” (Art.26)

“...with an open field experiment that has the potential to contaminate neighbouring farmers' crops and trigger unpredictable impacts on other species?” (Art.27)

“But in using our countryside as an open- air laboratory, this trial could trigger dire and irreversible consequences for other crops and species” (Art.41)

It appears obvious that these two opposing versions of environmentalism are fed by other deeply rooted ideologies providing a specific understanding of nature, culture/technology and society, and the epistemology of knowledge.

Opponents

4.3.1.2 Anti-capitalism/Anti-corporatism

Some of the most widespread ideas about GM technology mobilised by its opponents express strong anti-corporate sentiments and denounce GM lobbying power, which in

their views is detrimental to consumer rights, the fairness of our institutions and general social welfare. These ideas could be easily linked to anti-capitalistic thought¹²⁰.

Anti-capitalism refers to a variety of movements opposing “...*the form of ownership, economic relations, and systems of reward and entitlement associated with the post-feudal, mercantile order that emerged in Europe over the course of the eighteenth and nineteenth centuries.*” (Tormey, 2009). In its most contemporary forms it condemns boundless pursuit of economic growth to the detriment of ecological balance and social welfare (Dubuisson-Quellier, 2009).

Anti-capitalistic ideas were mostly prominent in opponents’ statements denouncing corporate hegemony, which attests for anti-corporatism, a sub-movement of anti-capitalism. Concerns about corporate hegemony are embedded into capitalistic societies, and contrary to what could be commonly believed, find their roots far before the ‘No Logo’¹²¹ generation. The late 19th century had already witnessed anti-trust laws that had to be legislated to allow a fairer competition within liberal markets. Besides, since the mid of the last century, big corporations were in the midst of many controversies¹²² questioning their integrity and social responsibility, and the series of their scandals is continuing¹²³.

¹²⁰ Here (following Tormey, 2011) I am deliberately avoiding the word ‘ideology’ as capitalism (and by analogy anti-capitalism) present a set of movements and concepts that are difficult to gather under a single ideology. However, many refer to capitalism as being an ideology (Rabhi, 2010).

¹²¹ Referring to a best seller and one of the most influential books published in 1999, criticizing capitalistic globalization by the Canadian author Naomi Klein.

¹²² E.g. Nike’s sweatshops scandal 70s-90s, Nestlé baby milk scandal 1977-1980.

¹²³ E.g. BP deepwater horizon oil spill in the Gulf of Mexico 2010, Volkswagen emissions scandal 2015, Shell corruption scandal over a Nigerian oil license 2018, Monsanto’s glyphosate legal cases 2019... these are a few examples that may recall easily what a corporate means in anti-capitalistic minds.

Referring specifically to the GM-wheat/crop project, anti-corporatism amongst opponents' lines seems to be triggered specifically by worries about corporate over-control over our global food system. These worries are even more exacerbated due to the affirmed lobbying, pressurising politics and compromising the natural democratic flow at national and European levels, and to private ownership plans (Cook, 2004; Rabhi, 2010; Saporta, 2011).

“The scientists and their supporters are in a massive minority. Concerns about the science of GM, and its corporate ownership, are both key, intertwined reasons for opposing it.” (Art.26)

The latter appears particularly concerning due to the commercialised GM seeds being patented and owned by a few companies globally, putting at risk food security and independency, and by extension, nations' sovereignty. This is even more problematic when it comes to staple foods like wheat, as discussed in previous sections. The frequently cited case of Indian farmers suicide waves linked by anti-GM commentators to Monsanto's GM cotton introduction increasing unreasonably their debt levels and dependency, provides a clear illustration of these ideas.

“Poor Indian cotton growers who have adopted expensive GM varieties often find that they do not perform as advertised, even after investing in extra pesticides. For many this is too much to bear and suicide has become a common escape for indebted farmers.” (Art.27)

There is a deeper connection to broader anti-corporate and anti-capitalistic ideas that could be perceived in mission descriptions and web articles by most protesting

collectives¹²⁴. Criticisms include ownership of food production means, lack of social corporate responsibility, selfish aims/greed, denaturalisation of our food through over-processing, over-use of chemicals for the sake of increasing profits (Norwood *et al.*, 2015; Rabhi, 2014; Saporta, 2011; Castaignède, 2015).

4.3.1.3 Environmental romanticism

Some have argued that GM opponents are inspired by romantic visions of rural life (Lynas, 2018; Gash, 2016; Venturini, 2010).

“Jyoti Fernandes, who appeared recently on the BBC’s Newsnight on behalf of Take the Flour Back, is an American hobby farmer who lived for years without electricity in a Somerset eco-commune and now fancies herself as a real life “peasant”. Hector Christie, charged with causing criminal damage after breaking into Rothamsted’s wheat trial site two weeks ago, is an Old Etonian who joins anti-capitalist protests in Europe and opened his stately home at Tapeley Park in Devon to wandering hippies.” (Mark Lynas, Art.43)

Romanticism refers here, but not only¹²⁵, to a nostalgic critique of modernity, with the sentiment that something is lost or being alienated (Lowry and Sayre cited in Gash 2016). It was interpreted by many as a reaction to the advent of subversive industrialisation, aiming at re-valuing emotional experience and its aesthetic aspects in contrast to the rationalism promoted by The Enlightenment.

¹²⁴ E.g. Organiclea, GM Freeze, Greenpeace.

¹²⁵ Romanticism goes beyond the desire to fuse with the beauty of nature and to restore social bonds, threatened by the advent of the industrial era. It criticises the de-naturalisation of human societies, submitted to the laws of brutal facts and abandoning their aesthetic and sensibility.

Links between social movements, and more precisely, environmental activism, anti-capitalist movements, and the romanticism thought were highlighted in some literatures (Hunt, 2013; Sayre and Löwy, 1984; Gash, 2016). Gash (2016) contends that anti-GM movements are mainly driven by a worldview of romanticism, predominately aiming at opposing capitalism and its instruments. He argues that anti-GM opponents are little concerned with scientific facts and arguments in general, and represent rather a case of ‘motivated reasoning’, which is described by Kunda (1990) as being a state of refuting any evidence that does not match one’s prior beliefs. According to Gash, this is proven by GM opponents’ consistency in terms of argumentation over time and space, and their exclusive attitude towards GM, pushing for complete bans and incurring heavy legal proceedings to defend their cause, which he judges among others as a dogmatic position.

Referring specifically to the GM-wheat trials case, I have not found reliable echoes of environmental romanticism in its emotional and nostalgic form in opponents’ discourses and projections. Most prevalent concerns raised by GM opponents were discussed from concrete angles, focusing largely on actual market and institutional issues. As the uncertainty analysis (Lens-1) showed, unexpectedly, these concerns were for the majority based on objective risks inferred from past factual occurrences and actual legislative circumstances, and not on purely subjective and unfounded allegations, as often suggested by GM advocators. Also, as Eckersley (1992) shows, environmentalists are far from forming a homogeneous group. Not all of them categorically reject progress but seek development models that could accommodate human activities impact on the natural environment. Benton (2007) discussing the work

of Arne Naess who studied the ‘deep ecology’ movement, assigns rather this particular form of radical environmentalism to the influence of romanticism¹²⁶.

This is said; it could be argued that anti-corporatism may be fed by romanticism in some aspects, hoarding a long history of hostilities against corporate power. Since, romanticism also criticises the denaturalisation of human societies through a blind submission to brut facts encouraged by the Enlightenment ideas and ensuing philosophies (Berlin, 1988, cited in Gash 2015), I could see some reflections of it in the criticism of the scientists’ attitude with regards to the transcendence of empirical evidence by opponents.

*“...don't expect politicians and the public to formulate policy **merely on the basis of scientific evidence.**” (Art.30)*

*“Increasingly, GM looks like a discredited technology, one that is being superseded by skilled conventional plant-breeding methods and more advanced but **less arrogant scientific approaches.**” (Art.41)*

Supporters

Supporters articulate a ‘cocktail’ of systems of belief that could be easily linked in a way or another to scientific materialism and the Enlightenment influence.

4.3.1.4 Technological determinism (TD)

The way GM supporters relate to the environment and articulate ideas about the role of innovation in allowing and stimulating social progress, suggests a strong technological

¹²⁶ Namely citing the American romantic environmentalists H.D. Thoreau and John Muir (Benton, 2007)

determinism. As for the *Precautionary Principle*, the term may inspire different meanings, but is commonly understood to revolve around the idea that, technology is shaping society and not the opposite. Technology from this perspective transcends society, and appears as unstoppable.

“...whether the protesters like it or not, GM crops are already heading towards Europe, insists Ruscoe. “Eventually, due to their use in neighbouring regions, we will get GM crops blowing into Europe over borders. There will be leaks in the dyke. We need to accept and prepare for this, not fear it.” ^[1]_[SEP]

As Benton (2007) describes succinctly, “*technological determinists tend to see scientific and technical innovation as an autonomous process that drives ‘progress’, and to which the rest of society must adapt*”. Those who oppose technology are described as ‘*technophobes*’.

“But the trouble is that they/(the Greens)’re scientifically illiterate and have what seems to be a fear of technological processActual supporters of environmentalism, as opposed to kneejerk technophobes, should support the efforts.” (Art.28)

This explains the primary and faithfully reliance on technology, namely the GM technology, in the scientists discourse as being the optimal solution for environmental and food security challenges.

“This denial of science unfortunately undermines the environmental agenda across the board.”

*“If the green movement is to recover its place as a guardian of the environment, it will have to rediscover the value of science-based policy and stop ignoring inconvenient truths.”
(Mark Lynas, Art.43)*

“We think this should be based on the science and we need to ensure public safety...” (Art.45)

The determinist view adopted by GM supporters has a huge impact on how technological overflows are seen and managed. While Green activists are primarily concerned with the impacts of human activities on the environment, technological determinists consider these as part of the process, equated with inevitable ‘collateral damage’ or ‘drugs side effects’. They seem to exclusively rely on a material risk/benefit analysis, overlooking subjective risks (in terms of nature and level of tolerance) and perceived benefits. Even if we consider those technological determinists who adopt a more caring and socially responsible attitude, what Rothamsted scientists strive to show, they still see that technology overflows could only be mitigated through more technological proficiency (Panagiotou, 2017). This is what Benton (2007) qualifies as ‘technical-fix’, a term that appeared in the trials’ opponents’ discourse.

*“Techno-fixes like GM wheat won't change that because they don't address the real problems.”
(Art.53, Liz O'Neill, director of GM Freeze)*

4.3.1.5 Scientism (Scientific materialism)

Scientism presents a relatively extreme version of logical positivism/empiricism, the latter accounting for a philosophical movement promoting scientific method as the only way to produce valuable knowledge¹²⁷. It finds its roots in the *Renaissance* period, where natural sciences started to flourish giving a taste of emancipation to the society, finally accessing a toolbox to dominate nature and break free from the Church’s domination. With the advent of industrialisation and its promises, The Enlightenment

¹²⁷ (Duignan, 2015)

thinkers embraced scientific materialism, and many even used it to substitute science to religion. The latter naturally was judged regressive and irrational by contrast to science that brought progress and freedom.

“Science is not magic. It is better than that. It is the reason we live in the world we do, rather than the world of a thousand years ago which was a horrid place.”
(Art.53)

“The opposition to GM is now more driven by ideological than scientific objections”
(Art.26)

Scientism claims that the only reality is material, denying traditional metaphysical routes to knowledge, and only acknowledges the scientific method as a valuable one capable of generating reliable knowledge (Meister, 2009). Accordingly, scientism appears as dogmatic as other ideologies it harshly criticises¹²⁸. Because such affirmations appear to be more philosophical than scientific, scientism is often criticised for its dogmatic stance (ibid).

“ The blanket opposition to GM per se as a technology is obviously untenable in any scientific sense” (Art.26)

“ Naturally, they (the scientists) believe science is the answer.” (Art.42)

This aspect can be easily perceived in the GM scientists discourses, dividing the world into the scientists/expects community, producer of reliable accurate knowledge, and lay/non-expert audiences to whom reality needs to be exposed and explained in order

¹²⁸ A good example of this is the well-documented creation-evolution controversy (1860) rooted in the illustrious confrontation between Bishop Samuel Wilberforce and the biologist Thomas Huxley. Scientific materialists adopting exclusively the evolutionary account, are finally accounting for a similarly exclusivist attitude as scriptural literalists they criticize, who claim that sacred texts provide an accurate account of creation that does not need any further additions. (Meister, 2009).

to be freed from their irrational fears and inhibitions (Gash, 2016; Callon *et al.*, 2009). Cook *et al.* (2004) showed how naturalistic scientists view themselves as a separate group, possessing an understanding of scientific method inaccessible to outsiders, the latter including social scientists.

4.3.1.6 *The Enlightenment heritage*

The Enlightenment refers to a period of time (17th and 18th century) that fostered a radical shift in the West¹²⁹ in the way society thinks about itself, and the place mankind occupies in the universe and its role. One of the most impactful ideas was that reason is given precedence over any other form of consciousness, dominating nature and challenging traditional intellectual forms. This raised the status of science, judged rational and objective, and devaluated other forms of knowledge, considered by direct contrast irrational and subjective. Hence, any opposition to a ‘scientific’ project would be interpreted by those adopting such views as opposition to reason and a result of ignorance.

“The ‘GM-free’ tag is not only a betrayal of the values of the Scottish Enlightenment, but also an active hindrance to scientists in Scotland who want to use modern agricultural technology.”
(Mark Lynas, *Art*, 43)

In its softer form, the scientists’ responses to their opponents refer to the misunderstanding of science as being almost a ‘legitimate’ barrier for opposing GM prospects.

¹²⁹ Then propagated to the rest of the world with the generalization of industrialization, and the advent of international trade and globalization.

“As a former GM crop vandal myself, I can vouch for the fact that anti-GM protesters don't understand how science works”

(Mark Lynas, Art.53)

[11]
[SEP]

“We have no idea who is advising them scientifically, because it is absolutely incorrect.”

(Art.33)

However, in the trials' supporters, The Enlightenment symbolism seem to have served mostly in feeding an ideological attack on opponents. Many quotes referred to The Enlightenment's most popular representations, denoting a formal break with former dark ages governed by religious absolutism and superstition.

“I sometimes feel we are heading back into the dark ages.”
Rothamsted's director (Professor Maurice Moloney, Art.16)

“Destroying scientific research is the 21st-century equivalent of burning witches”
(Lord Willis, the chairman of the Association of Medical Research Charities, Art.31)

“Threats to destroy GM crops amount to vandalism in the service of superstition” (Art.37)

“This seemed to be a case of thugs burning books, or in this case stopping the book being written.”
(Art.15)

“Yet the green groups apparently claim infallibility like a medieval pope. Human society - and the Earth's environment - deserve better.”

“Take the Flour Back is entirely misguided. Its opposition to biotechnology is ideological: no amount of scientific evidence can shake its near-religious conviction that anything GM must be intrinsically evil” (Art.43)

The underlined quotes express the conflicting view of science and religion promoted by The Enlightenment thought, with religion incarnating absolutism, irrationality and backwardness. It is worth signalling here that, despite this view being dominant within precursor philosophic accounts and The Enlightenment rhetoric itself, it appears more as an emotional anchoring than an objective reality. In fact, non-conflicting views about science and religion have been developed by many schools of thought, mainly Protestant neo-orthodoxy and linguistic analysts favouring an independent approach,

and by process philosophy and natural philosophers adopting an integrative framework¹³⁰ (Meister, 2009).

4.3.2 Worldviews & ESW

Based on the discussion above, it becomes obvious that there are some serious ideological divergences between the two strong opposing perspectives on GM technology and prospects. The most impacting differences in this regard appear to be an opposition between a holistic, comprehensive worldview on one side, and a reductionist, non-comprehensive one on the other side.

A *worldview* according to Carvalho (2006) is “*a belief system concerning the nature of reality and how one acts a subject in reality*”. In other words, a *worldview* allows a certain reading of one’s context and interactions with the latter, based on a specific set of beliefs that determine the nature of reality and what constitutes a sound comprehension of the latter. An *Expected State of the World* is, however, the projected representation of how the world/society should be based on one’s worldview. This is not to be confused with what Callon et al. (Callon *et al.*, 2009) call *Possible States of the World*, which account for the different possible scenarios for a given matter knowing the causal chains that could produce these.

¹³⁰ The Independent approach mainly claims that science and religion present completely different forms of thought with no possible interaction. The former is concerned with the exploration, description, explanation and prediction of the natural world, while the latter revolves around a transcendent reality and aims at providing meaning and life ultimate purpose.

The integration approach claims existing interactions between science and religion, where God’s existence is inferred from evidence in nature (e.g. the design argument for God’s existence) (Meister, 2009).

4.3.2.1 A holistic systemic approach versus a reductionist approach

It was clear that while GM supporters' were trying to keep the debate around the specific case of the trials, their opponents were talking from a more general standpoint and did not treat trigger events of the discussion as a separate issue. In the scientists' logic, the GM question cannot be addressed as a whole. Each project or component of the debate must be looked at separately, and then added to the sum. There were instances where the scientists criticised opponents who denounced the risk of developing super weeds, highlighting their misunderstanding of science since the GM-Whiffy-wheat cannot generate such an effect. However, opponents were speaking from a general opposition to GM position, in which context super weeds are still a problem.

Scientists do not understand why the trials have triggered so much opposition, while the product is still in its experimental phase and quite far away from its actual commercialisation.

Contrariwise, from the GM opponents' standpoint, the world cannot be cut into separate components. Each element constitutes a part of the whole and interacts with other elements forming the latter (Gash, 2016). While the scientists see technology inevitable, necessary, and following an independent course. For opponents, it must be envisaged within its wider social context, which implies interacting with cultural diversity and involving affected communities in the decision-making process (Benton, 2007; Callon *et al.*, 2009). Similarly, progress is not an exclusive category, but must be appreciated in the light of other constituents of the social.

Consequently, GM opponents adopt a more holistic, systemic view on the question, which explains why many of their concerns overlap in terms of underpinning values and ultimate goals. Accordingly, environmental questions, food authenticity and quality, sustainability, social welfare and democratic institutions are all closely interlinked in a way that none of these could be realised interdependently from the others. The aspiration for a more sustainable agriculture means for GM opponents' healthier food, fairer food politics, and less waste, all at the same time. When they critique corporate hegemony, they critique partial institutions, and unequal access to and excessive exploitation of natural resources, which all damage the natural and social environment. From their standpoint, all these matters are intertwined. Which also explains the diversity of collectives amongst opponents' lines, compared to GM supporters who mainly come from a scientific background. Therefore, a successful laboratory experiment cannot be simply reproduced in the open-air realm before examining all areas it could affect. Such a decision in opponents' view cannot be purely based on scientific projections and measurements.

4.3.2.2 A non-comprehensive worldview versus a comprehensive worldview

Rothamsted scientists' and their SSN adopted attitudes towards the trials' opponents claims attest for their exclusive adherence to a scientific worldview. This is manifest in their total reliance on scientific evidence and calculated probabilities to ascertain the technology is safe and will bring its fruits, and their refutation of any other proofs emanating from a different route to knowledge. The issue is that opponents are requesting a more comprehensive study of the question of GM, including the multi-dimensionality and diversity of concerns, the need for the technology and its ethical value.

4.3.2.2.1 GM supporters ESW

GM supporters aspire for a world governed by science and its logics, where science would be, not only the key driver of innovation and progress, but also the primary source of objective appreciation of possible future states of the world, allowing the establishment of legislative aptness. This could be referred to as a scientific worldview.

Carvalho (2006) describes the scientific worldview as being naturalistic¹³¹, focused and non-comprehensive, compared to “broad-based” worldviews with “far-reaching aims” integrating philosophical and theological inputs¹³². The scientific worldview appears limited in terms of aims and methods. It relies on two dominant methodological approaches (the hypothetico-deduction and the statistical-relevance)¹³³, and is concerned with the exploration (universal laws of correlation/causality) and verification (confirmation/refutation) of observable natural phenomena. It cannot provide an answer to the greater purpose of the sum of reality. Hence, a complete picture cannot be reached through the sole scientific enquiry, although the latter has an important role to play in building a comprehensive view of reality (Carvalho IV, 2006).

GM supporters aspire for a relaxation of legislation to allow seizing opportunities offered by the GM technology, and for risk assessments to be purely based on objective probabilities. Uncertainties would be considered as unconfirmed risks, rather than

¹³¹ Referring to naturalism that sees the world as material, which logics could only be unveiled through scientific enquiry.

¹³² This does not deny the scientific method roots in philosophy.

¹³³ As recommended by Carvalho (2006), for a detailed account on these methods see Salmon and al. 1992.

incalculable risks, and until proof of actual (objective) risk or damage, there would be no reason for interfering with innovative processes and institutionally slowing their course. In the name of democracy, the scientists also demand a better institutional support protecting their research projects from the ravages of activism. They do not consider activists' voice to be the voice of the public, but a passionate marginal view contaminating the public sphere.

As for harmony with nature, and by extension environmental sustainability, this would be established by a better control over the natural world and a better understanding of its laws through experimentation and enhanced technologies.

4.3.2.2.2 GM opponents' ESW

GM opponents aspire for a more holistic approach on novel and subversive technologies, allowing a comprehensive examination of their risks, expected benefits, and integration process within the socio-economic environment. Beyond the material realm of feasibility and profit, they demand the integration of other dimensions, such as, sustainability, ethics, social welfare, and culture.

For GM opponents, the scientific approach to knowledge is an element of the equation, but cannot apprehend to it alone the full complexity of socio-technical problems. Opponents do not denounce recourse to numeric/experimental evidence in itself, but rather the exclusive reliance on such evidence for political decisions and policy-making that have wider effects on societies and future generations. In their view, legislative aptness and institutional partiality is established through a higher engagement of the

public in important decisions and the prevention of overwhelming lobbying activities and manipulation of power.

This necessarily goes through a better appreciation of multiple routes to knowledge, and a better democratic representation, where governments would serve first their citizens' interests rather than economic and financial goals shaped by corporate influence. This is partly why GM opponents claim representing the large public's voice, by contrast to their adversaries who appear dependent on corporate funding and chasing first ascension in their personal careers (e.g. having shares in patented crops).

As for harmony with nature, this would be achieved through a fairer exploitation and distribution of natural resources and the censure of wasteful lifestyle and unsustainable and perpetual pursuit of economic growth.

4.4 Cosmopolitics (*CC Lens 5*)

This final lens appears like a concluding one, aiming at exploring whether some bridges could be envisaged between the described worldviews, which would allow building a collective shared world with regards to the GM crops question. Logically, in controversial situations, this would first mean looking at inhibitors preventing the establishment of such rapprochements¹³⁴. In this regard, I will particularly focus on inconsistencies feeding incompatible market versions. Most of these points overlap and mutually interact, as analysis will show.

4.4.1 Blocking points

4.4.1.1 *Expert knowledge versus lay knowledge*¹³⁵

The previous lens has already prepared the path for this discussion, highlighting ideological divergences, which I will show, had exacerbated the gap between the scientists, forming ‘the expert’ group, and their opponents viewed as lacking expertise on the discussed topics.

¹³⁴ The CC, as explained in the methodology chapter, provides a flexible framework, which means, this is not the only way to use this lens (same applies to previous ones). Each researcher needs to find the most appropriate way to take advantage of this tool. Therefore, and after deep reflection on what this lens could offer in the context of this study, I came to the conclusion that providing an analysis of those elements that appear to represent main barriers towards a common understanding of the conflict would be the most valuable outcome, highlighting the scope of contention and incompatible aspects of opposing market versions. Formulating a reconciling proposal to the conflict is beyond the scope of this research.

¹³⁵ Extensive research has been done on this topic in different fields, which I will not outline here. I will only be discussing this object in the context of a scientific controversy around socio-technical innovations, and in particular in the GM controversy.

The GM scientists displayed a binary view of the debate, differentiating those who know and could claim right to knowledge from those who do not know but rather ‘feel’ (Cook *et al.*, 2004), a term that denotes a subjective, and sometimes, unrealistic interpretation of the world. Considering the proved commitment of the scientists (and their SSN) to scientism and technological determinism, this presumed gap between both opposing groups seems to repose to a great extent on disparities with regards to the epistemology of knowledge. The latter is defined as “*the theory of knowledge, the philosophical study of the nature, origin, and scope of knowledge*” (Moser, 2010, p1). In other words, it defines what constitutes valuable and reliable knowledge, and how it could be reached and assessed.

While the trials’ opponents were requesting to debate societal, ethical and aesthetic implications of the GM implementation, the scientists deemed empirical knowledge acquired through scientific methods the only form of knowledge worth considering for decision-making. Accordingly, the scientists are upholding their affiliation to a “secluded” community, where knowledge becomes more “*remote and out of reach of amateurs and laypeople*”, and a manifest “*uprooting from the world*” plunging the scientists in “*a blind belief in scientific progress*” (Callon *et al.*, 2009). The *Secluded Science* model offers privileged access to instruments and laboratories, and subsequently confines the right to answer questions, but also to pose the right questions, to a favoured distant community.

The Enlightenment heritage is not though the only culprit to blame for supporting this divide between experts and non-experts. It was also encouraged by the current form of

Delegative Democracy, aiming at producing a form of knowledge that is purified from uncertainties to be presented to laypeople and citizens, preventing disagreements to go public (Callon *et al.*, 2009). Current institutions have constantly promoted the supremacy of science¹³⁶ to maintain the monopoly of knowledge and protect the functionality of the delegation by the people to the (selected) scientists to deal with uncertain matters (*ibid*).

All this resulted in a sort of denigration of other forms of knowledge, and subsequently, the tendency of ‘experts’ to assign public’s concerns about new technologies to irrational fears and anxieties rather than social and political problems, which besides, has motivated the raise of some extreme reactions calling for absolute relativism and the abolition of reason (Gash, 2016; Callon *et al.*, 2009; Cook, 2004).

The GM scientists go even deeper in this dichotomy by rejecting varying degrees of knowledge and interpretations of it within the scientific community itself. Their group of ‘experts’ does not tolerate scientists whose research outputs do not comply with the GM agenda (Cook *et al.*, 2004). Those scientists were clearly discredited and excluded from the group. They were accused of incompetency and of presenting conflicts of interest, and thus, not conforming to methodological or deontological criteria federating the scientific community and supporting its credibility.

*“We have no idea who is **advising them scientifically**, because **it is absolutely incorrect**”*
(Professor Maurice Maloney, Art.33)

¹³⁶ E.g. *Science* shows and expositions, laboratories and research councils’ open-days.

“The author behind the 'bogus' researchProf Gilles-Eric Seralini, is closely linked to and funded by leading members of a homeopathy group which believes bone cancer can be cured with water and minute quantities of magnesium. The research has been attacked by every major scientific institution in the field, including the European Food Standards Agency” (Art.47)

This is not to undervalue scientific input to the question. The GM scientists do have a better understanding of the GM engineering and processes, and are better placed to evaluate expected risks and benefits, from a biological/genetics viewpoint. However, this refers to the conceptual and experimental phase of a novel product, related to its technical development. As Callon and al. (2009) explain, a novel product does not reach a final and definite shape in terms of design and functionality in the laboratory. It is not before a novel product interacts with its socio-economic environment that it starts its way to maturity, an iterative adjusting process (Callon *et al.*, 2002; Dubuisson-Quellier, 2009), taking place between the real world and the laboratory. A product may be scientifically validated, which accounts for its theoretical validation, however this is not enough to be called a ‘final product’, at that stage it is still a proposal. A final product is that which had passed successfully theoretical and practical tests, allowing its integration within its social environment, basically, *“when criticism come to an end - for it may be that it is diffused and fails to find anything wrong- agreement is established within the collective”*(Callon *et al.*, 2009).

4.4.1.1.1 The decay of ‘facts’

4.4.1.1.1.1 What is a ‘fact’ and how it is understood in the GM controversy?

A *fact*, as defined in the dictionary, refers to something that is known to be true based on some evidence. A fact then conveys the idea of something proven to be true, which makes it immune to questioning.

Woolgar and Latour's (1988) definition of *a fact*, although philosophical, offers a close description of how it has been commonly understood since The Enlightenment era¹³⁷. A *fact* is subject to an independent objective entity that, due to it being extraneous to the subject, cannot be altered by the subjectivity of the latter, and therefore *facts* offer immutable truths. This "out-there-ness" (p178) necessarily brings us back to tensions existing between two opposing paradigms about reality and knowledge, reality 'out there' versus 'constructed' reality, and '*a priori*' knowledge versus knowledge 'created by the subjects/researchers'. But also, implies that extensive reference to and reliance on *facts* expresses a dominance of the naturalistic philosophy, while the negotiation and refutation of these may express change in paradigms, for instance towards a more constructivist view of nature and society.

In the GM debate, from both perspectives, *facts* referred principally to scientific evidence, invoking incontestable truths, which would allow producing evidence-based arguments. This attests for a positivist dominant understanding of the term. However, unexpectedly, statements did not stimulate responses based on their truthfulness or their ability to be verified, not even on the strength of their scientific evidence.

¹³⁷ Classical and contemporary epistemologists have been debating knowledge nature, components and value since Plato's Theaetetus, which generated a variety of conceptualisations of knowledge and epistemic paradigms feeding endless controversy around the subject (Moser, 2010). However, despite this tireless competitiveness between these paradigms, there were times where some could become dominant and shape the 'common' understanding of 'true' knowledge and its status.

There was an evident unwillingness to verify facts or to assess the quality of arguments. Results from polls and studies were the less re-appropriated and discussed from both sides, while these generally provide a good numerical evidence for argumentation. Facts did not seem to fulfil their function by providing conclusive evidence; rather their different interpretations prevailed. This could be related to several overlapping factors, though I believe the split of *authoritative* categories to be the most impacting.

4.4.1.1.1.2 Inconclusive ‘Facts’ as facilitators for contested market versions

Uncertainty feeds controversy, and by the same way blocks conclusive informed actions to be taken. In the case of GM crops, considering the slow but consistent progression¹³⁸ of their introduction in the EU zone despite a historically hostile regulatory system, controversy does not seem to have stopped the GM project but to have allowed its progression instead, since no conclusive evidence could support a definite ban. In the context of conflicting incompatible scenarios, controversy seems playing a facilitator role, supporting the most contested version, allowing therefore the continuation of planned actions heading towards a non-return point. The latter represents a level of investment and involvement of institutions that secures the viability of the most contested version despite persistent social resistance.

¹³⁸ Slow establishments are not to be underestimated. They are made possible through research and investment commitments that are difficult to reverse, providing an integration space for some GM versions.

4.4.1.1.1.3 'Facts' lost in games of representation and *Interessement*

Callon (1986) discussing representation forms in the context of the domestication of the St Brieuc Bay scallops attracts attention to some unquestioned aspects that seemed being accepted without recourse to thorough investigation. Involved collectives did not question the main hypothesis proposed by the researchers, nor the representation of the silent larvae by them. Callon explains, this was one of the effects of 'partial' representation, where selected representatives get interested (referring to the *Interessement* phase of the ANT) in the name of the rest of the group they are meant to represent or pretend representing, and thus, the systematic questioning of suggested roles and assessment norms seems to become unnecessary.

By extrapolation, in times of uncertainty and confusion over a matter, adherence to a system of belief and to 'the group' seems to inspire credibility more than facts. Accordingly, ideologies mend broken links that 'facts' failed to maintain in such circumstances, and thus, provide certainty, although subjective and opinion-based. Consequently, there is need in contexts of uncertainty to integrate subjective-probabilities in risk calculations (Callon et al., 2009).

4.4.1.1.1.4 Ideologies replacing facts to cope with uncertainty

Previous sections showed how GM supporters used science in the debate more as an ideology to seal alliances and establish an *authoritative* voice than an approach to knowledge aimed at providing evidence-based arguments.

“ Ideologies are not meant to be descriptions of the world as it is, but visions of the world as it should be. While collective life is chaotic and erratic, ideologies are orderly and harmonious. They are not universes but cosmoses. As such, ideologies can be more influential than any realistic calculation ”

Venturini (2010, p267).

Ideologies have the power to provide meaning within confusion, to reunite in times of dissonance, and thus, to facilitate and strengthen alliances around a shared goal¹³⁹.

Ideological discourses could also be used effectively to conceal wide divides in paradigms (Panagiotou, 2017), and other methodological and ethical deviations versus declared norms that were assumingly acting as a warranty for reliability. The declared war by Professor John Pickett and GM supporters SSN (The Royal Society and the BBSRC) in 1997 on the study about to be published in *The Lancet* showing GM potatoes were poisonous to rats¹⁴⁰, illustrates the degradation of standards, and especially the non-scientific, interest-based, ideology-based nature of the GM debate. Evidence of laying, strong suspicions of blackmailing and emotional harassment by reputable scientists and researchers, were involved in the ‘Pusztai affair’ (Rowell, 2013). In such regards, the ideological belief in the transcendence of *Science* was used to mask these inconsistencies, however, not at a negligible cost, creating serious divides within the scientific community itself and threatening the claimed authority of *Science*.

¹³⁹ The nature of the study’s main dataset may also have played a role here. Both, GM opponents and supporters may have favoured providing ideological rather than factual anchoring to their arguments considering the lay and broad audience targeted by national newspapers. But I personally do not think this was the main reason for the absence of ‘facts’.

¹⁴⁰ A research paper by Pusztai and Stanley at the Rowett Research Institute.

4.4.1.2 *Split of 'Authoritative referential categories'*

By '*Authoritative referential categories*' I mean those systems of belief that acquired large recognition amongst the public and became an authority in themselves (e.g. dominant paradigms). These, play an important role in creating zones of 'compromise' between different collectives within a given society, allowing a fairer and regulated 'living together'. Since they rest on acknowledged, and thus, some shared conceptualisations of what a society should be and how it should be governed, when they disintegrate, landmarks are lost and collective debates turn into a sort of '*Un dialogue de sourds*' (Dialogue of the deaf)¹⁴¹ (Callon et al., 2009). These categories are not supposed to erase all disagreements and debates, but provide anchoring references, preventing the endless questioning of the discussed proposals.

The GM-wheat trials debate visibly illustrated a split within some modern referential categories that used to provide acknowledged rallying points and foster what we call 'common-sense'. The most obvious ones are *Science* and *Democracy*. Previous CC lenses showed clearly how both were not similarly understood by opposing groups, nor did they attest for an unquestioned authority as it was expected. Scientific evidence did not shut down controversy, and the fact that the trials were funded and supported by the government and its democratic institutions did not appease opposition to GM plans. Both did even give rise to other sub-concerns and fervent discussions about the assumed legitimacy and representativeness of these systems.

¹⁴¹ An idiom describing a situation where all talk but none is able to align on a shared frequency by their interlocutor so they may understand each other and negotiate a deal.

The split of *authoritative categories* could be noticed at two different levels: (1) Questioning of dominant paradigms, and (2) Internal divide in these dominant paradigms, a far more problematic issue as it contributes in aggravating the former.

In the GM-wheat debate there was clear questioning of the dominant positivist paradigm adopted by the GM scientists and their SSN, a form of epistemology embedded in modern empiricism. Modern empiricism supposes the existence of objective mind-independent knowledge leading to common-sense uninfluenced by philosophy and theology, which makes truths and their describing *facts* transcendent over experience, conferring to *Science* a definite epistemological authority (Moser, 2010). Moser explains that questioning such an assumption becomes an urgent matter for those who developed scepticism about the reliability of *Science*. This scepticism has philosophical and methodological basis, essentially the incapacity to prove the transcendence of scientific-based truths or to ascertain the definite reliability of the scientific ‘common-sense’, but is strongly influenced and aggravated in the postmodern period due to an inherent crack within adherents’ lines.

GM opponents clearly questioned recourse to pure facts for decision-making on the GM question. They demanded equal consideration of societal and experiential elements to assess the relevance and safety of GM plans. From their perspective, *Science* cannot decide on its own whether these plans are worth pursuing, since these would have an impact on people’s diets and ethical commitments, and on food politics. These are not purely realistic and numerically estimable matters. They entail a level of subjective estimation due to their interaction with the subjects and contextual elements. However,

GM opponents did not reject the role scientific-based evidence plays in building an ultimate reasonably accurate view on the question.

“ The challenge for scientists isn't to merely focus on what the evidence says. It is also to convince the public that their suggested course of action is the right one, even when the public is sceptical for perfectly valid reasons. Ignoring those concerns and calling them "luddites" just doesn't work. Perhaps this is why scientists are failing to get faster action on climate change.” (Art.30)

The issue is not solely the incapacity of these ‘ previously well-established’ systems of reference to coalesce ‘the mass’ because of some recent questioning of their roles and import, but more critically, being inhabited by internal divisions accounting for intrinsic inconsistencies, which represents the second point advanced above.

Within those claiming referring to the authority of science, different groups mutually questioned each other’s credibility and allegiance to science. As discussed in the ‘Articulated literatures’ section, while GM scientists claimed a scientific consensus on GM, other scientists holding equivalent degrees, affiliated to equally recognised institutions and research centres, were speaking out against GM (Panagiotou, 2017; Cook, 2004). The fights over the claimed and rebuked ‘scientific consensus’ on the safety of GM crops just made it worse, illustrating an evident and serious disagreement on the question, since these fights had mobilised a substantial number of scientists from both opposing perspectives. Rosenow (2017) commenting on two equally involved but opposed scientists on the GM question explains, this quarrel implies that *“Science can be done in the right or wrong way, resulting in facts or false claims”* (p22), an understanding of *Science* that the author attributes to modern colonial thought separating nature and culture and obliterating non-binary ways to knowledge. Recourse to public denigration and unfounded accusations of opposing scientific reports, their

authors and institutions, raised suspicions about the whole scientific edifice credibility and integrity¹⁴². The underpinning values, the authority of *Science* draws its legitimacy on, were shaken.

Likewise, some governmental institutions contradicted or questioned in their proclamations and actions official political declarations about GM plans¹⁴³. The government decision to go ahead with GM plans despite some governmental studies proving GM crops are unsafe and irrelevant to British farming and a strong resistance amongst the public, is another example of inconsistency within the democratic apparatus. If we add to it the proliferation of corporate power within the institutional and political network through funding and foundation of councils, the credibility of the *State* and trust in its institutions look seriously at risk.

The State, which used to be the entity centralising ultimate civic authority, seems to offer today a controversial, corrupted for some, hesitant, and ambiguous governance over some subjects that are seen as having grave impact on the common future of citizens, and consequently appears incompetent to fulfil delegated responsibilities. Activists' statements about the need to do 'the responsible thing' them-selves because the State failed to do so are expressive enough. Fractures are not only between the people and the State, but also within political lines forming the government. The Jenny Jones tweet incident provided a spectacular illustration of an inherent crack within the

¹⁴² Scientific controversies had always existed. The issue does not come from the fact that scientists disagree, but from it being made public (Callon et al., 2009).

¹⁴³ One of the illustrious past cases is the opposition between Prince Charles and Princess Anne within the royal family on the question.

Green's party lines, attesting for different political affiliations to the environmental cause.

The clash between equally strong reports, contradictions and mistrust laying between political lines, and ensuing perceived incongruence in terms values and common-sense, undermined the pertinence of facts and their capacity of resolving controversial matters allowing giving preference to a scenario or an interpretation over the other. This demonstrates that 'facts' in their absolute meaning do not exist as unquestioned realities. No matter how *realistic*¹⁴⁴ they could be, they require reference to a recognised system of belief that gained authority to acquire significance and become widely accepted. Hence, post-modern controversies are more likely to persist due to the loss of shared *authoritative* systems, and subsequently, the notion of 'unquestioned facts' as well.

4.4.1.3 “The limits of Delegative Democracy”¹⁴⁵

Representative democracies, although precious and necessary, have proven ineffective in dealing with situations of uncertainty, such as the wide adoption of GM crops. It specifically presents two big issues: (1) the exclusive delegation of such matters to specialists/scientists who are charged to produce the only “certified knowledge”, and (2) the broad delegation of the power of judgement by ordinary citizens to a limited number of representatives. *Delegative* democracy therefore operates according to a form of reductionism that is improper to controversial matters, exacerbating the

¹⁴⁴ Being accurate and derived through a sound methodology.

¹⁴⁵ (Callon et al., 2009)

dissonance between the represented people's expectations and their delegates' choices and votes, reaching untenable levels.

Delegating the production of "certified knowledge" to specialists within modern democracies has been a way to keep trials, errors and divergent interpretations out of reach of public controversy. Here comes the role of *Science* (as an *authoritative* system) in masking these uncertainties and promoting the chosen version by specialists and delegates as the confident one. A mechanism that frees politics from public intrusion (anyone outside the selected/approved specialists and politicians), and unfortunately at the same time imposes on people/citizens decisions that are not necessarily compatible with their ultimate aims and visions of the world. What is interesting is that this *delegative* exercise is what has created the population of non-experts/lay people, and prevented them gradually from their right to be involved and to decide for themselves.

The Mexican GM maize case analysed by Carro-Ripalda and Astier (2014) exposes how smallholders farmers and their concerns were excluded from the debate and regulatory processes, which ended in a controversy and unequal access to power and resources. The authors attract attention to more heavy consequences of silenced voices, "*more worryingly, in the move towards agricultural 'optimization' it is not only the voices of farmers which are being suppressed. It is also their access to land and resources, their chosen modes of life, and their citizens' rights that are being slowly eroded*" (p658).

4.4.2 Incompatible points preventing coexistence

These are those aspects that are representing (currently) an actual barrier to an eventual co-existence compromise, a form of deadlock, due to an inherent incompatibility between the promoted versions.

4.4.2.1 The irreversible nature of GM contamination coupled with absence of warranty

This issue I believe is the main factor stopping negotiations from proceeding forward, and halting the termination of severe opposition to GM plans. Its importance comes essentially from the fact that this issue of irreversibility of gene contamination and the current impossibility to prevent it fully, represents a pragmatic and logical blockage to co-existence plans of GM and conventional crops, coupled with an incapacity to predict long term impacts of wide deployment of transgenic crops (Altieri, 2005). A contaminated natural genetic material will be altered forever, while the science of genetics is still at its first steps, and too young to provide any conclusive guarantees (McGee, 2017).

From an ecological angle, the projected damage linked to a widespread GM farming scenario appears evident, since it does not need cases of inadvertent contamination to be confirmed. These would only worsen the situation and speed up the enlargement of affected areas. Many studies had already highlighted inherent damages to the cultivation of GM crops (Altieri, 2000; 2004). Those concerned about the preservation of the natural environment and its biodiversity see in this inevitable wide scale and irreversible effects an incompatible technology with natural life and society.

Similarly, from a market perspective, if contamination occurs, the introduction of GM crops into the food supply chain would be irreversible and uncontrollable. This would be at the detriment of consumer rights and choice, whether additional unexpected effects take place or not. Also and more seriously, due to the absence of warranty, it would initiate the progressive extinguishing of other forms of crops and traditional agrobiodiversity (Panagiotou, 2017; Cook, 2004; Altieri, 2005; Lee, 2008). Hence, GM crops farming, in its present form, appears ultimately exclusive, favouring the disappearance of other form of farming.

The systemic juxtaposition of GM and *Organic* farming in discussions on coexistence plans should not be naively regarded as purely ideological. Actually, the survival and thrive of the organic food sector is directly threatened by the development of the GM bio-agriculture and market version. For organic farmers, the risk of contamination means risks of facing heavy financial costs, and even, of losing their certification (Bristow *et al.*, 2000; Lee, 2008). Ultimately, they will have no choice, and will have to abandon the organic option due to impossibility of keeping contamination levels below the line decreed by certifying bodies (Ponti, 2005; Lee and Burrell, 2002). In opponents' holistic view, such a scenario could be disastrous, as it would impact different levels of our socio-economic existence and prevent farmers and consumers alike from choosing what to grow, how to grow it, and eventually what to eat.

GM supporters responded to the risk of contamination in terms of re-enforced security measures, mainly by isolating the trials'/cultivation plots through the proliferation of buffer zones. But, actual past occurrences, for instance North American escape cases

often referred to by opponents, suggest the inefficacy of these initiatives and measures, proven insufficient in resolving such a serious matter.

Over the 65 articles, I could not identify a single answer from GM supporters regarding these factual instances. No definite warranty could be given either. At the time of the wheat trials DEFRA was still unable to figure out a reliable proposal for GM coexistence with the wild and other crops in England, and had even recognised in some report the impossibility to fully protect other agricultural systems from GM contamination (Lee, 2008). Similar acknowledgement by the National Standard on Organic and Bio-dynamic Produce, the reference agency for The Australian Quarantine and Inspection Service (AQIS) on organic labelling, had been formulated (Bristow *et al.*, 2000). This logically directs the discussion to the next point on liability.

4.4.2.2 Absence of liability

This point is also a pragmatic one. Markets are not built on pure price calculations and exchange of goods and services, but also on a set of regulations and conventions that allow and facilitate these exchanges (Fligstein, 2001; Caliskan and Callon, 2010).

Liability is one of these important devices that permit the performing of markets. Liability refers to a loss that an agent incurs due to an extraneous act for which another agent is responsible and bound by the law. Generally, the prejudiced agent obtains compensation or a court decree preventing the continuation of the prejudice (Bristow *et al.*, 2000). The issue of liability is a sub-matter of the greatest concern inhabiting the GM conflict, which is an uncontrollable unwarranted risk of contamination. The latter is ubiquitous to the cultivation of GM crops, threatening coexistent conventional crops

at all levels of the supply chain and the environment, which makes the risk of liability for contamination actual and boundless (ibid.).

The issue represents a case of judiciary complexity based on the difficulty to identify the liable actor amongst those involved in the affected supply chain, the difficulty to proof damage (type, scope, causation, mitigating effects, and exemptions), and the huge disparity between both sides' interests and expectations (Lee and Burrell, 2002). Moreover, the issue cannot be fully framed according to national rules of liability, as the GM crops supply chains are global, and may involve international legal disputes.

In 2004, the International Court of Environmental Arbitration and Conciliation (ICEAC) after examining thoroughly international and traditional liability rules acknowledged that traditional liability concepts are inefficient with regards to risks of co-existence of GM and other organic/conventional crops, and pointed out to new GMO liability laws that have been adopted by some countries and seem more appropriate (Rehbinder and Loperena, 2006). However, this does not completely resolve the issue, as it is still far from being generalised and widely integrated within the GM legal and business practices.

The discussion on irreversible damage and liability uncovers serious blocking points feeding two incompatible market versions. Considering additionally the diametrically opposed ontological and ideological visions of the world promoted by GM opponents on one side and GM supporters on the other, their perspectives appear mutually exclusive.

Currently, co-existence plans seem to be utopic, due to a seamless opposition on all levels of the negotiation (safety, ecology, usefulness, ethics, legislation, liability). However, due to the level of propagation of the GM agricultural model and its increasing tendency, adversaries will have to sit on the same table and negotiate the preservation of other farming options on a global scale to avoid fatalistic predictions from becoming self-fulfilling prophecies or an unexpected widespread wave of opposition to GM that would be more destabilising than abandoning the promises of the biotech industry. Despite the noticed unbalanced distribution of power in terms of funding and rallying of some political lines, both perspectives in my opinion appear to be equally threatening to each other, based on more diffuse elements, such as the proliferation of de-growth movements, the persistency of modern food related anxieties and diseases, and the spectacular coming back of nationalist thinking across the globe rejecting firmly what is viewed as economic forms of servitude.

5 Discussion: Market agencies, counter-agencies, and matters of concern performativity

The study's findings had highlighted sorting categories of actors, accounting for different levels of agency within the studied networks. Although, the focus from the chosen methodological perspective is on collective agency, this investigation does not contradict this principle. It does not aim at exploring individual agencies *per se*, but at uncovering common attributes within networks constituents aiming at understanding their internal logics and how *socio-technical-agencements* produce collective agency.

Cochoy (2014a) in his attempt to summarise Callon's works on what he called the *Theory of Agencing*, explains that a successful 'translation', which puts a *socio-technical-agencement* in motion, is one that promotes and supports the 'convergence' and the 'irreversibility' of the network. The first endeavour is achieved through an effective alignment and coordination of the network's elements, while the second is reached when reverting to a situation of multiple choices for enrolled entities is obstructed. In other words, this would mean stabilising the network. In more practical terms, 'convergence' entails acting according to *Main-actors'* plans, and 'irreversibility' entails blocking the means of dissociation for enrolled entities.

From a slightly different angle, considering that a *market-agencement* is built around a purpose, and is in constant struggle against competing formations, trying to establish

bilateral monopolies with its sources of provision (in supply and demand alike) (Callon, 2016), its survival depends in one hand on its development and rallying forces, and on the other on extinguishing these possibilities for competing versions. Therefore, ‘convergence’ efforts invested by networks in my opinion go beyond arranging and coordinating, to include expanding strategies. Likewise, efforts sustaining ‘irreversibility’ go beyond the elimination of internal dissociation forces to include preventing competing options extraneous to a given *agencement* from accessing its enrolled entities. I have grouped activities feeding and achieving ‘irreversibility’ under the term *counter-agencies*, which I will expose in detail in the second part of this discussion.

I would suggest here to follow this outline, and discuss how networks’ entities organise, relate, and ‘translate’ to achieve these two vital functions that are: convergence and irreversibility. While I am discussing these I will highlight the key role played by matters of concern, their articulated literatures and underpinning ideologies in connecting the whole apparatus. I will close the discussion by a section on the performativity of matters of concern and *Concerned-markets* nature.

5.1 Convergence

Convergence means putting in motion while at the same time orienting all entities towards a specific direction, since a network is a compound formation. For this to be made possible, entities need to be aligned and coordinated in specific ways that allow the move towards set goals, but also for these to be stabilised enough, so the apparatus does not fall apart in the move. Thus, building a network that is endowed with agency

depends on the quality of connectors sealing its disparate elements (Cochoy, 2014a), and its capacity to grow through recruitment of more peripheral entities.

In the following sub-sections I will discuss the main steps that allowed the studied competing perspectives to form their *socio-technical-agencements*, and will also try to expose what I believe played the role of connectors between their different elements, favouring the arrangement, coordination, and expansion of these and endowing them with agency.

5.1.1 Reassembling of *Necessarily-concerned* actors

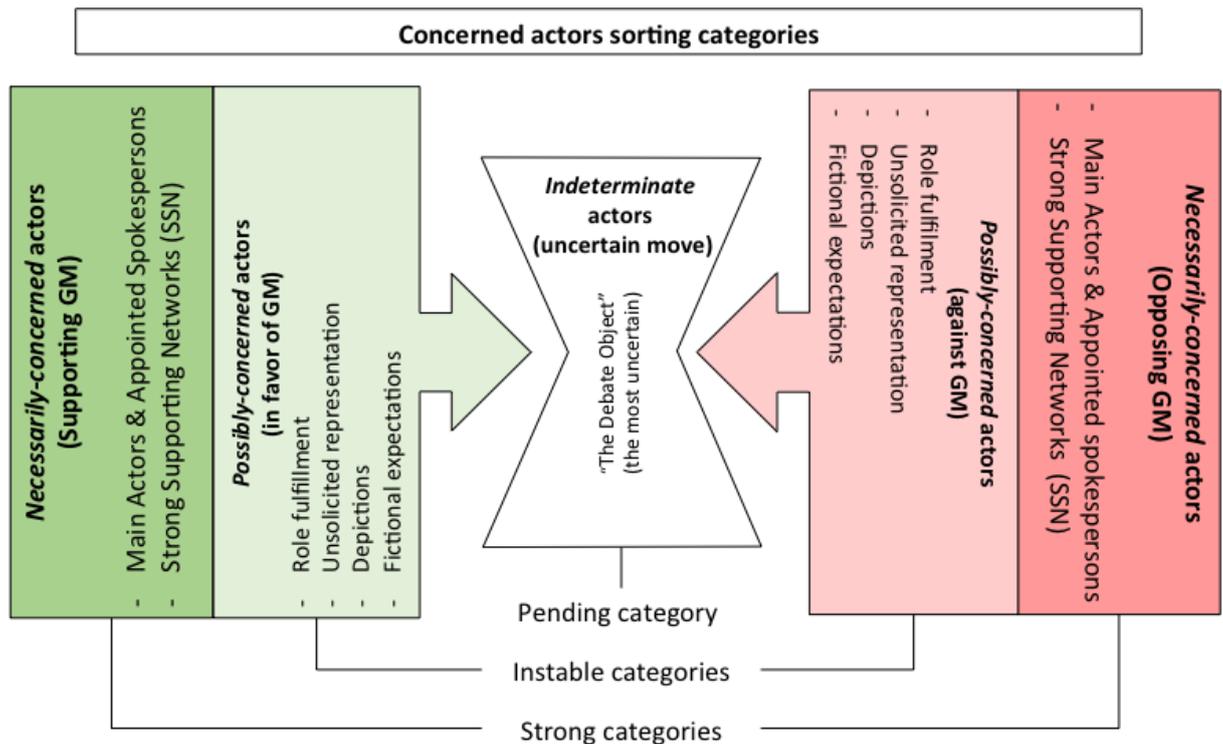
Matters of concern are those issues affecting a group(s) of people and for which no suitable current framing exists so they could be contained within the present market settings (Callon, 2009). They become visible only if the affected people succeed to relate to each other and formulate these issues in the form of concerning objects that need to be discussed and negotiated collectively (Callon, 2016). Thus, ‘being concerned’ is the first rallying force.

However, if we consider ‘being concerned’ for an actor is to be ‘related to, affected by, and worried about’ (Geiger *et al.*, 2014), then actors who took part in the debate did not seem equally concerned. Some were definitely concerned, while others were possibly concerned, depending on them revoking or not roles, depictions and representations by those who formulated the first *Problematisation* of the raised concerns. A third group of actors were brought up into the discussion without them presenting a concerned condition, yet had a relationship of some sort with the raised concerns.

Based on this observation, I have chosen to call actors belonging to any of the sorting categories identified in the analysis section as follows¹⁴⁶.

- (1) Strong categories: *Necessarily-concerned* actors
- (2) Unstable categories: *Possibly-concerned* actors
- (3) Pending category: *Indeterminate* actors

Fig.5-1: Concerned actors sorting categories



¹⁴⁶ This appellation is inspired by a categorization established in theists' theological discussions concerning the difference between God and creation. God is posited as the *Necessarily-existent* being, since without Him existing, nothing would exist. While creation, is defined as *Possibly-existent*, referring to the contingent character of created matters/things, they may or may not exist depending on The Creator's will to bring them into existence or not (Maghnisawi, 2007).

These suggested categories express to what degree different actors were concerned, which accounts also for their level of commitment to the perspective they defended or seemed favouring. The relevance of this categorisation to our discussion rests on a clear correspondence noticed between the degree to which actors were concerned and their active involvement into the debate and thus, their contribution to collective *agencies* animating competing perspectives.

In the following I am not going to discuss these groups of actors in a linear manner, but each under the *agencing* activity they specifically took part in. This way, I keep the discussion dynamic, in line with the active and in-progress nature of the discussed item: *agencing*.

The study's findings highlighted four main *agencing* phases that allowed the formation and expansion of both perspectives' networks, putting them in motion and stabilising enough their entities.

5.1.1.1 Coalition of first concerned actors and Problematisation

As Callon (2007a) explained, not all affected groups by market externalities would necessarily become concerned actors. Some would abandon the perspective and turn to completely different options; others would not succeed to get out of silence and would be ignored. That is why the appellation of *Necessarily-concerned* appears even more pertinent, in the sense that, to open a *Concerned-market* breach, affected actors had to be concerned to a level that they could only get together, formulate their concerns, and

voice these. It had to be a vital move; it had to involve full commitment to the defended cause.

The come-together of this initial group of *Necessarily-concerned* actors is a condition for matters to become legitimate objects and publicly concerning. They form the solid heart of the defended perspective; they take the lead and are expected to be present from the beginning until the end of the debate they had initiated, since defending their respective perspectives is a fundamental matter. Their number tends rather to expand, which would be a sign of gain of scope and power.

Likewise, the success of their *Problematization* is crucial for the network identity to be articulated and for its development through recruitment of other concerned entities to be initiated. It is precisely through this initial coalition and formulation of matters of concern around a specific object, that they offer an opening space for marginal voices to be expressed and hybrid forums to be formed, and thus, destabilise the questioned market configuration (Callon *et al.*, 2009).

These are actors who present long-term interests into the defended object to be preserved, and the fulfilment of their ultimate goals, ultimately their survival, rests upon the ability to drive the course of events towards a specific direction that favours their position. It is not a surprise then that this category of actors is the one that shows: (1) full commitment to their respective perspectives, (2) speak for themselves (or through appointed spokespersons), and (3) sets the plan for other actors joining their rows through role shaping, depictions, and representation. This naturally gives them, and their strong associated allies, the lead in terms of *agencing* within the forming *socio-*

technical-agencement, attempting to expand the latter, arrange and coordinate its entities in a way that it is set in motion according to their plans.

The main *Necessarily-concerned* actors alliance is sealed by their direct interest in the debated object, which generally represents their core activity/mission. This direct interest is materialised by important material and immaterial investments and risk-taking, sharing the most important risks inherent to the uncertain progression of the debate.

5.1.1.2 Sealing strong alliances between Necessarily-concerned actors

The *Problematization* stage, which allows issues to be formulated into legitimate matters of concern ready to be discussed publicly, is also the phase where adherence of strong allies is confirmed. These are those actors whose core values and ultimate goals would be affected by the fate of the debate, despite them not being directly linked to its main object. Therefore, they generally present flawless loyalty and high commitment to the defended cause.

These latent, yet readily supporters, appear also *necessarily-concerned* due to them presenting shared interests, ultimate goals and values with *Main-actors*¹⁴⁷ who formulated the first *Problematization*. Latent, yet *necessarily-concerned*, they are those actors who will form the first strong strip around the raised concerns and their initial representatives. I have called these actors the *Strong Supportive Networks* (SSN). SSN

¹⁴⁷ Main-actors refer to those first *Necessarily-concerned* actors who formulated initially the raised matters of concern.

offer stable and continuous support to the defended cause, however, only expose themselves in hot phases when serious attacks are directed towards their shared interests and values, threatening their ultimate goals.

SSN comprise also a hidden group that generally avoids public exposure and involvement in discursive communication at all times, but rather provides support through stable funding offering consistent financial sustenance to the defended perspective (Funding SSN). With the first actors problematizing the issues to be raised, SSN represent the strong front of a defended perspective.

SSN would not make the initial move to challenge the current market configuration. Likewise, they would not engage actively in defending the raised concerns, unless the controversy reaches a point where it is threatening the values and ultimate aims shared with *Main-actors*. They only expose themselves and involve in action if necessary. During cold phases, they focus on their core missions, which are different from the debated object.

SSN are sealed to the instigators of the raised concerns through a common interest in driving the debate according to the set direction. The fate of the controversy would have a significant impact on the status of their shared values and the fulfilment of their ultimate goals, which give them a strong self-motivation in the alliance. They are also linked to the authors of the *Problematization* they have joined, and to each other amongst SSN, through a set of shared references (systems of belief and articulated literatures) that give strong grounding and meaning to their collective action. It is these strong, sealed alliances, based on shared interests, underpinning values, and ultimate

goals that provide stability to this central collective at the heart of an acting network. It may seem paradoxical, but the more a network achieves stability, the more agencies it could generate. Agency is dependent first on strong and reliable alliances, where strong means aligned and coordinated, and reliable means commitment and stability. This allows duplicating and converging forces.

Finally, SSN do not necessarily come from the same background, and because they are not intimately linked to the specific object of the debate, their alliances with the instigators of the raised concerns expand the scope of the perspective they join in terms of number, subject matter, and resources. They contribute in the ramification of core concerns, linking them to more peripheral ones and giving them a stronger grounding. The diversification of matters entails also an exponentiation of communication devices and actions, which naturally increases the network *agencing* capacity.

5.1.2 Developing a Perspective Speaking Potential (PSP) and Broadening the concerning scope

One of the differentiating attributes of *Necessarily-concerned* actors is that they speak for themselves or through appointed spokespersons. This is a sign of strong agency, since they have full control over their message, which cannot easily be altered or re-appropriated by others through unsolicited representation of their concerns, aims, and values.

As I have explained above, SSN naturally expand the communication capacity of those who formulate the first concerns to go public, while at the same time, diversifying this

communication in terms of content and mediums/devices. Therefore, I prefer to talk about a *Perspective Speaking Potential (PSP)*, rather than spokespersons.

5.1.2.1 Giving consistency and backup to Main-actors claims

SSN appear independent actors who decide and speak for themselves and have voluntarily joined the debate to defend common interests and values. Their adherence to the perspective they defend is strategic and ultimately essential. They are not represented, but rather contribute actively to representing the aims of their defended perspective, so the risk of withdrawal is low, their commitment and contribution tend to be stable and generous.

5.1.2.2 Reaching distant connections

SSN play a vital role in expanding the PSP because they allow forming and fostering weak ties, enabling a more comprehensive coverage of the raised concerns and the reach of broader audiences. The more a network diversifies its background, and accordingly its modes of agency, the more control over external elements it has, although, there is always a risk of divergence from initial set goals from within that could be caused by diversity. But, this is like the risk of investment, which cannot be fully annulled unless the agent chooses not to act, however it could be mitigated.

SSN due to them allowing the development of weak ties, expanding the network beyond the strongly allied entities of the network (Granovetter, 1983), they have a better potential to bridge ramified concerns and far reaching collectives to the defended cause. Moreover, they also have a better potential to recruit high-status individuals and knit

strategic power alliances (Lin and al. 1981, cited in Granovetter, 1983), since these would generally not be available within first concerned-groups that formulated the *Problematization* aiming at shaking the *statu quo* supported by power in place.

5.1.2.3 The diversification of the concerning scope: a concerned-concerning dynamic

For a controversy to take place and allow the full exposure of raised matters and their negotiation it is not enough that some concerns are formulated and are proposed to be discussed publicly. These still need to interest enough people and convince them to join the debate, and thus, to become actors. These actors come with their nuances and expectations, which are generally not identical at all points with the initial proposal, the *Problematization* that put the debate in motion. That is what Callon and al. (2009) refer to when they talk about controversies “*unfolding in time and space*” (p26).

To join a cause, newcomers need to re-appropriate the matters that hooked their attention and interest, and would naturally attempt to shape these in a way that represent them and their interests better (Onyas and Ryan, 2014) Therefore, a controversy necessarily enlarges the concerning scope by integrating these nuances of interests and demands, generally through the ramification of initial concerns, sometimes even by their mutation. Take for example the palm oil controversy. The debate was initiated by environmental groups defending massive deforestation in lead producing countries, and went global, making pressure on main clients of this market (agro-food and chemical

industries) leading to the RSPO certification¹⁴⁸. However, in 2012, the controversy took an interesting turn in France, being re-appropriated by groups primarily concerned with the effects of over consumption of palm oil on public health. Senator Yves Daubigny put forward what was labelled the ‘Nutella tax’ on palm oil imports. The debate switched from its environmental focus and became a health and dietary one at the first place.

The development of a rich SSN, as it allows the diversification of the defended perspective’s backgrounds and interests, it naturally encourages the ramification of main raised concerns which allows other collectives to find an anchoring contact point and develop a motivation to join. The ramification of initial concerns could be included in the *Interessement* phase, as it provides an assortment of interests that has a better rallying potential, which also by the same occasion narrows adversaries’ reassembling capacity. However, what is important to remember here, is that this proliferation of concerns, although necessary for a perspective to gain scope and to develop a rallying potential allowing it to ultimately prevail over competing versions, it cannot be completely controlled by the initiators of the debate (Callon, 1986; Venturini, 2010). An element of ‘surprise’ and unpredictability needs to be included in the equation, which explains the need for constant framing and re-shaping to maintain the convergence of all enrolled elements.

¹⁴⁸ The Roundtable on Sustainable Palm Oil was established in 2004 to promote sustainable production.

5.1.2.4 Role of appointed spokespersons

As explained above, *Necessarily-concerned* actors speak for themselves, which includes appointed spokespersons. This is an important aspect, since this representation is solicited and controlled. The principle mission of appointed spokespersons is to convey their perspective's position, values and prospects. They reiterate these and provide backing up information to strengthen their credibility. They speak and act according to set plans by *Necessarily-concerned* actors who appointed them (generally from amongst themselves), and constitute the facade of the perspective they represent, thus play a significant role in rallying the crowd to the concerning proposal and in establishing the legitimacy and imperative stance of the latter. Their communication is specifically directed to collectives extraneous to the *Necessarily-concerned* actors, aiming at enlarging the public¹⁴⁹ base of their perspective.

I suggest that we keep the appellation of 'spokesperson' to refer only to appointed representatives. When representatives are not appointed by those they represent, it is a case of *unsolicited-representation*, which I am going to expose later.

The findings showed that several aspects enter into play to endow spokespersons with rather weak or strong agency and confer to them a certain rallying ability.

¹⁴⁹ Public here does not essentially mean lay masses, but rather means outside the *Necessarily-concerned* actors.

5.1.2.4.1 Their number & exposure

It appears obvious that the more spokespersons a perspective employs, the more potential it would have to fill up the public space with its concerns, aims and values. The reiteration of these messages is important to keep them apparent and dominant over competing versions communication. Also, an increased number of spokespersons raises the coverage in terms of subject matters, time, and space; and helps diversifying enough communication devices and strategies to reach larger audiences. Yet, the question of number is far from being sufficient.

'Shadow coalitions'

By this term I refer to coalitions, which despite them rallying a relatively diverse range of adherents and interests, do not seem to represent fairly and effectively the social diversity they are supposed to account for. This is mainly due to a limited number of spokespersons. In the studied debate, GM-opponents presented many coalitions uniting diverse social and concerned backgrounds (amongst which, ecology, organic farming, food authenticity, anti-corporatism) under their umbrella (e.g. GM Freeze, Organiclea, The Community food Growers), however Most of them presented a single spokesperson, and not even identified by a clear function within the organisation. GM Freeze, who was one of the opposing coalitions taking the lead against GM plans, had only two spokespersons all over the four phases of the debate.

Social and voluntary coalitions are a sign of substantial public support to the perspective they represent in principle. However, in the field, for a successful representation to take place, they need to appoint enough spokespersons to account fairly for this diversity and keep it connected to the defended cause. A lack in spokespersons, is automatically

translated in a lack of representativeness and scope, and subsequently, implies weaker chances to recruit more supporters and to sustain the defended perspective. Not only concerns need to be exposed, but also all supporting networks behind these concerns as well. Strong direct networks may act in a latent mode during cold phases, but have to be exposed in hot phases to account for the represented socio-economic landscape.

'ad-hoc representation'

Similarly, '*ad-hoc representation*', an expression by which I refer precisely to representatives who work on a prompt or quasi-intermittent basis (like the collective Take The Flour Back in the first case, and the GM Freeze umbrella in the second). These regimes entail fewer resources, and it becomes obviously more difficult to form and invest in permanent spokespersons. Most of those who spoke during the hot phase of the debate on behalf of the lead protest group Take The Flour Back, were referred to by 'spokesperson', which does not confer any credibility or special identity, except from the obvious 'activist' identity. Additionally, the latter was not helpful, due to the successful *Problematization* of the protest by GM-supporters around questions of vandalism and civic rights, which demonised the 'activist' role. Ad-hoc representation undermined the capacity to appoint the most suitable spokespersons.

5.1.2.4.2 Their status

As Venturini (2012) explains, actors' position in terms of influence is to be considered seriously, as actors occupying influential positions have more potential to shape a controversy.

In this study, status does not necessarily refer to an ‘expert’ or ‘powerful’ position in its classical understanding. As findings have showed, what makes the difference is a recognised status that allows a spokesperson to be perceived as a legitimate representative for what they claim representing, rather than referring to a specific function or qualification. An acknowledged status may emanate from a confirmed political/institutional position (e.g. Prime minister, The Pope), an established system of reference which authority is largely admitted (e.g. Scientists by reference to Science); like it could rest on a nascent articulate literature (e.g. Organic farming, Global warming) or an established legitimacy to talk on behalf of collectives from a specific standpoint (e.g. Consumer associations).

In practical terms, a recognised status requires that spokespersons are known (or become so), named personally and acting with an uncovered identity. For this to be achieved it is not sufficient to provide a name, their precise role and function in relation to the debated object have to be specified as well.

‘Wholesale identities’

By this term I refer to seemingly homogenised groups labelled wholly, and whose scope of concerns and specific angles of involvement in the debate are difficult to identify. These ‘wholesale identities’ generally reduce collectives to one attribute, shadowing the diversity of claims and arguments within the represented groups. Generally, the single attribute that is carried by the wholesale identity ends being the only spokesperson for the collective. The findings highlighted how ‘wholesale identities’ were detrimental to GM-opponents’ perspective. Mostly, communication of opposing groups’ joining the protest was attributed to such indefinite identities like, anti-GM technology, anti-trials,

which only informs about them being anti something in general. For a message to reach its target, the emitters need first to be discernible through well-defined identities and goals. This identification is what acts as an anchoring reference for the public, conferring legitimacy to the speaker and their claims, and inspiring credibility.

5.1.2.4.3 Clear definition of roles, and represented concerns and values

Another aspect that appears as important as establishing a clear status when it comes to the effectiveness of spokespersons role is a clear articulation of what they represent. This supposes unambiguous definition of their roles, and especially, of the concerns and values they are promoting. A lack of clarity in this regard reduces the appealing and federating potential of spokespersons communication, as anchoring information is overlooked or lost in the fumes of the debate.

Here ‘role’ does not refer to their role of spokespersons, as this is obvious if they are talking on behalf of an organisation or a collective. The role they need to define is rather that which précises their connection to the discussed object and its related matters. In other words, how are they related to these. Most trials’ supporters were defined by their precise link to the experiment or the experimental GM-wheat (*e.g. Prof Maurice Moloney, the director of Rothamsted Research, which has applied for permission to conduct the trial, Art.7*). While, on the opponents’ side, most of those who spoke on behalf of their perspective were just defined by their obvious role of spokesperson, which does not add any valuable and anchoring information, or by the blemished (in this context) role of ‘activist’.

We have to remember that a controversy while offering a public physical and virtual space for hybrid collectives and the diversity of their concerns and interests to be confronted to each other, it is also necessarily chaotic and confusing (Venturini, 2010). The role of spokespersons is precisely to highlight thick lines within the ‘mess’ so those who are susceptible to join the represented perspective see signposting flags. The common mistake noticed during the GM-wheat trials debate, is that many spokespersons engage in argumentation without reminding the reason for it or its function. They assumed that the public was aware of or necessarily remembers all their previous communications.

As a starting point on the process of achieving convergence I have presented the state of ‘being concerned’ as the most fundamental aspect. This emphasised the rallying potency of matters of concern to open a breach in a contested market version. What applied to the first *Necessarily-concerned* actors, also relatively applies to potential actors and supporters. It is important for the establishment and growth of a perspective to articulate clearly and unremittingly the matters that legitimised its endeavour at the first place.

Likewise, the findings highlighted the relevance of underpinning values and ideologies as rallying devices *per se*, but also their role in constructing new federating literatures supporting new constructs in competition with the contested ones. This makes it crucial for spokespersons to communicate clearly enough about shared values to allow moving forward the recruitment task and stabilising enrolled entities.

5.1.3 Expanding through role fulfilment, unsolicited representation and depiction of *Possibly-concerned* actors

“...without weak ties, any momentum generated in this way does not spread beyond the clique Social systems lacking in weak ties will be fragmented and incoherent subgroups separated by race, ethnicity, geography, or other characteristics will have difficulty reaching a modus vivendi ”

(Granovetter, 1983, p202).

As I have attempted to demonstrate in the previous section, strong ties are crucial to a network as they foster commitment to the cause, which makes timely resources available (human and material) and allows establishing convergence towards set goals. Strong alliances are stable and reliable, and almost *auto-* arranged and coordinated through self-motivation and deep commitment to the shared values and goals. They are essential for a *socio-technical-agencement* to exist at the first place, and then to subsist. However, as Granovetter (1983) explains, a network that relies exclusively on strong ties is going to be limited in many ways. This is essentially because strong connections are always to be found between actors that are alike, which reduces access to information from distant parts within the social, generates inflexibility, and encourages a sense of superiority *vis-à-vis* others outside the group.

Therefore, it appears vital for *Necessarily-concerned* actors to rally other troupes, more diverse in nature and interests to strengthen the position of their defended perspective. The study's findings confirmed this idea showing that most actors involved in the debate, in terms of number, are *Possibly-concerned* actors belonging to the instable

category of actors. However, since it is reasonably difficult to rally broad troupes through strong and shared interests and values, *Necessarily-concerned* actors needed to have recourse to other, more elusive, forms of recruitment.

Possibly-concerned actors are brought into action through:

- (1) An action that they have fulfilled, which *Necessarily-concerned* actors asked for or simply re-appropriated in a way that favoured their plans.
- (2) Unsolicited representation by *Necessarily-concerned* actors, talking on their behalf in a way that favoured/approved the latter's perspective.
- (3) Depictions by *Necessarily-concerned* actors in a way that favoured the latter's perspective.

What makes them instable actors?

Possibly-concerned actors' instability comes from the unpredictability of their next move due to a lack of commitment, which is due to lack of constrain and weak links to the *socio-technical-agencement* they are made to join.

Possibly-concerned actors are not directly interested in or associated to the central object of the debate (or key concerns). The fate of the controversy will not have an immediate and decisive impact on their core activities and interests. They were brought into action by *Necessarily-concerned* actors, without them showing long-term commitment, if any, to the perspective they were made to join. This is the reason why when I discuss this category of actors, I do not use the words supporting/opposing, but favoured/disfavoured or approved/disapproved, avoiding at the same time the

progressive form of the verbs that imply continuous engagement, which does not seem to be the case of these actors. It is then quite obvious that *Possibly-concerned* actors mostly do not speak for themselves or choose their spokespersons, which is already a sign of low commitment. The significance of their acts within the context of the controversy, namely having approved or disapproved any of the perspectives, was determined by *Necessarily-concerned actors'* interpretations.

They also have fewer constraints to leave a perspective, since they are these actors that had not considered any substantial investments, if any, even in the case where they have favoured the perspective they figured in knowingly. The heaviest constraint keeping them within a perspective is for the majority of these actors, the effort needed to withdraw the unsolicited representation and depictions or to refute the role that was assigned to them by *Necessarily-concerned* actors.

However, this risk to leave the perspective at any time does not purely rest on choices and acts that would be performed willingly. The same risk is present with non-human *Possibly-concerned* actors, although in most cases, it is not expected that non-human actors rebel against an assigned depiction or unsolicited representation¹⁵⁰. What actually represents the most threatening risk of withdrawal within this unstable category of actors is the fact that competing perspectives are investing similar efforts to rally them to their own cause. *Possibly-concerned* actors are precisely instable because they are kept under the umbrella of a perspective through diligent *interesement*, *enrolment*, and communication labours by *Necessarily-concerned* actors, which are in constant

¹⁵⁰ But it could happen. Example of scallops' larva in Callon's study (1986).

competition with competing versions' incentives and similar communication and representation strategies. *Possibly-concerned* actors could be re-appropriated at any time by competing versions through a better representation or a more articulated depiction. Expanding the network is then one of the most demanding and consuming tasks in terms of agency.

5.1.3.1 *Role fulfilment*

Role fulfilment does not necessitate the assignment of a role in relation to the central object of a debate or the main aim of a set *socio-technical-agencement*. Under this rubric specifically, when an actor fulfils a role in direct relation with the debated object, it is understood to be within their socio-institutional function (e.g. Defra authorising the trials, The Police protecting the experimental plots) or part of *fictional expectations* formulated to support the projected states of the world.

However, the study findings showed that role attribution could also occur *a posteriori*, through a re-appropriation of an act that had been performed independently from the central object of the debate, but could be interpreted in a way that it approves/disapproves GM by *Necessarily-concerned* actors from the opposing or supporting side, or both.

It appears that roles fulfilled through a priori attribution denote a stronger agency, since performing actors did so while they were actively engaged in the process and entangled to the object of the action and its purpose. While fulfilled roles that were re-appropriated a posteriori, present a weaker link to the subject matter, since it rests in most cases purely on an interpretation of the act by *Necessarily-concerned* actors. However, in both

cases actors fulfilling roles, whether attributed or interpreted as such, are susceptible to change position, disavowing their present support.

5.1.3.1.1 Fictional expectations feeding projected future states of the world

An interesting group of *Possibly-concerned* actors appears in the form of speculations and projections into the future, formulated to support a specific project/market version.

The performativity of fictional expectations was discussed lengthily in several literatures¹⁵¹, and especially in the Science and Technology Studies literature. Fictional expectations allow bridging the present and near future by reducing uncertainty and therefore facilitating decision-making (Beckert, 2013). They support present actions by giving them legitimacy, and mobilise resources by stimulating investors' interest, which allows the actual performance of technologies (Borup *et al.*, 2006). Fictional expectations encourage also shaping a collective positive appreciation of the technology endowing it with credibility and facilitating its acceptability (Van Lente and Rip, 1998). Moreover, the more they are shared, the more agency they acquire by embodying promissory commitments that require action (Van Lente, 2000; Borup *et al.*, 2006).

Any defended perspective whether aiming at supporting or opposing a project/market version is supported by fictional expectations contributing in portraying a target projected future state of the world. Those opposing GM are doing so because the way GM would develop and the resultant kind of farming and food system, in their views,

¹⁵¹ See Beckert (2013).

is incongruent with their projected state of the world. They desire a more intimate relationship with the environment and a fairer socio-economic system, which the image of GM sullied with corporate greed, irreversible ecological damage, and social injustice could not sustain. Likewise, GM supporters desire a world based on pure science, favouring human volition and domination over nature, and free from environmental romanticism. These projections and expectations as the findings showed rely heavily on underpinning ideologies and articulated literatures mirroring these in a more customised and contemporised terms.

Although, these fictional expectations seem to be strongly affiliated to their market version, as specifically generated to support the latter's aim, I have chosen to keep these in the instable category of actors. This is because fictional expectations prove to have a good potential to disavow their prophecies once the hype phase is over, becoming unfulfilled 'retrospective prospects'¹⁵² (Borup *et al.*, 2006; Brown and Michael, 2003). Take for example the promise of pesticides reduction associated to the widespread of the second generation of GM crops. At the time of its formulation and communication, this future projection is clearly siding with GM plans to go forward. However, this support is not definite. The claimed decreased reliance on pesticides could prove untrue in the future. This does not affect their *acting* ability though. What makes fictional expectations performative devices is precisely the difficulty or impossibility to prove the contrary at the time of their communication.

¹⁵² Past projected futures.

5.1.3.2 *Unsolicited representation*

Necessarily-concerned actors in many occasions have talked on behalf of other actors, generally collectives linked by an attribute (*e.g. consumers, next generation, people of the 3rd world*) to give perspective to their concerns and support their arguments. This representation is unsolicited, since there were no signs of delegation, and this is precisely why the same collectives often find themselves represented by antagonist groups and thus, favouring and disfavouring the same object at the same time.

What is expressed through this particular form of unsolicited representation is the speakers' views and not the represented actors' ones. Those who interposed themselves as spokespersons, re-appropriated the actions of those they are representing in a way that serves their aims. Similarly, what is in competition are not the (represented) actors, but the representations of them by competing clans.

Most *Possibly-concerned* actors that were brought into the discussion through *Unsolicited Representation* were those who appeared to be potential victims of adversaries' plans, whose rights needed to be defended and restored. This was by far the dominant portion. The rest of actors were those who were presented as potential beneficiaries of the speakers' plans, whose potential gains needed to be protected from loss, and those who appeared in need of something that is in line with speakers' plans.

Also, some represented groups in this sub-category appear more elusive than others. *Necessarily-concerned* actors spoke on behalf of British farmers, food processors, African countries, young people...etc., which appear to be more identifiable groups through their profession, main activity or a intelligible common attribute. While other

represented groups appeared broad and indefinite, sometimes reunited through illegible attributes, like, next generations, 3rd world people, poor countries, those anti-science, consumers, the public, citizens...etc. Both opposing groups, particularly coveted the last three though.

Finally, this form of *Unsolicited Representation* highlighted a quite enigmatic type of actors, those taking part in action despite being inexistent at the first place, such as *Next Generations*. Despite them not being tangibly existent, they were made to contribute through them being portrayed as potential future victims and the representation of their rights by *Necessarily-Concerned* actors.

It would not be reasonable to discuss all cases here, however, some deserve to be highlighted. In the following paragraphs I am going to briefly discuss the special cases of: The Public, The Environment, and The Next Generations.

5.1.3.2.1 Speaking on behalf of indefinite collectives: ‘The Public’

“Who are the people, this demo, this elusive character of every democracy that everyone talks about but no one ever sees” (Callon et al., 2009, p110)

‘The public’ tends to be apprehended as an indefinite and homogeneous group at the same time. It may include, users, electors, professionals, and even virtual populations like ‘next generations’ and ‘collective consciousness’, but it is considered by experts and policymakers as a lay non-expert collective, and often lacking understanding, prey of powerful actors’ manipulation and incapable of knowing what is good for them (Callon et al., 2009; Cook et al., 2004). The findings showed that GM advocates and

opponents alike, considered the public as a large collective in need of being awakened, represented, governed, and protected. However, this ‘irrational’ crowd is endowed with an oppositional potency due to its number and acknowledged democratic rights, therefore, it was important for both sides to talk on behalf of the public and rally it to their respective sides.

In the studied debate, there were clear signs of competition on the representation of the public that confirmed some analysis in the literature. While protesters and GM opponents presented themselves as part of the public; ordinary farmers, consumers and citizens, and thus, having full legitimacy to speak on its behalf, GM advocates considered activists and interest groups to be a different category and contested their representation (Lynas, 2018; Callon *et al.*, 2009; Cook *et al.*, 2004). In the midst of the GM controversy, the GM scientists’ viewed what is called ‘public rejection’ as being the media and NGO’s opposition and not a spontaneous public expression as pretended by GM opponents (Cook *et al.*, 2004)

The public is considered by some as a muted collective, until mobilisation around a common cause becomes necessary (Arvidsson, 2013; Callon *et al.*, 2009). Concerned groups emerge initially within broad backgrounds, when some become affected by others’ activities overflows in a way that they cannot ignore anymore (Callon, 2007a). The collectives that would contest current market settings and voice their concerns, and those who would join the call, are pretty unpredictable and may change roles (Callon *et al.*, 2009). Also, as discussed in the political consumerism literature, the public could be equated to consumers, who could be equated to citizens when they seize consumption

to promote political action (Dubuisson-Quellier, 2009; Micheletti *et al.*, 2004; Gabriel and Lang, 2015).

This depiction of the public as an unpredictable base, changing shape and roles depending on circumstances, makes the question of its representation even more complex, while it remains important for opposing versions to consider it seriously. It appears more plausible to think that those emanating from the indefinite mass, speaking against established norms and institutions supported by the power in place, would be more identifiable to what is referred to by ‘The Public’, and hence, would have more legitimacy to speak on its behalf. The fact that ‘The Public’ is commonly linked to ‘lay people’, makes it more difficult to imagine ‘experts’ representing this lay mass without assuming the latter to be manipulated by the former. This is one of the reasons why the representation by experienced activists and ONGs is open to criticism.

Whether NGOs should be considered as legitimate representatives or not of public concerns is most probably still an open question. Callon *et al.* (2009) seem to include NGO’s in the public voice, while Cochoy (2008) questioned their legitimacy to engage into politicised actions on behalf of the public and appeared concerned about the power gained by some of these groups competing with democratic institutions in place. D’Antone and Spencer (2014) showed on the other hand the role some NGOs played shaping markets and initiating new collaborative forms bridging concerned collectives and the contested market version. If we consider that NGOs are in most cases initially formed by responsible citizens aiming at promoting social welfare and addressing issues that were overlooked by institutions in place, they appear then operating as a medium

between people and their governments¹⁵³, and then as legitimate representatives from the ‘base’. For a market to be stabilised and to flourish, it appears then necessary to rally or silence ‘the public’ with all its dimensions.

Finally, the public is not always perceived as source of instability, and a latent contesting base. It can also contribute in more collaborative ways in market shaping and framing. Public consultations, poll and survey analysis, votes, played obvious roles in adjusting marketing strategies and in testing phases preceding the introduction of new technologies. Concerned-groups and their matters of concern are also viewed by some as contributors to market shaping, rather than mainly disruptive, helping the market to reach maturity (Callon, 2009; Giesler, 2008). Also, many studies have shown how consumers could be equally involved in shaping and building markets through co-production, re-appropriation, and creation of alternatives (Thompson, 2004; Thompson and Haytko, 1997; Cova and Dalli, 2009; Guiot and Roux, 2010; Guillard and Roux, 2014).

5.1.3.2.2 Speaking on behalf of ‘The Environment’, the ultimate victim!

This is quite a new phenomenon from a market perspective, where nature shifted from being a reservoir of unlimited resources put at the disposition of human volition and technological growth, to precious and limited resources that need to be utilised wisely and fairly. Wisely, realising the scarcity of natural resources. Fairly, realising the extent of inequality created by the spree of pure capitalism and the raise of anti- speciesism

¹⁵³ (Sociology Group, 2017)

movements defending the rights of other species to have access to natural resources and environments. The level of damage done to *The Environment* is such that questions of sustainability and preservation of natural ecosystems and biodiversity became pressing matters, and gained widespread coverage, making the environment an undeniable victim. Recent crisis, like the global warming one, urged considering repairing actions to be agreed upon and adopted globally, leaving almost no choice for agents who still prefer to ignore it¹⁵⁴. It is then natural to see everybody competing to talk about and on behalf of *The Environment*.

From a market perspective, due to the predominance of environmental issues being mainly associated with market functioning and development, it appears impossible today for a market to establish itself and strive while ignoring such matters in its framing, planning, communication and growth activities. That is why, all must get involved in the environmental struggle and to talk on behalf of *The Environment* favouring the solutions that are in line with their underpinning values and ultimate aims. The study's findings have shown how nature, the environment, and questions of sustainability could be apprehended in completely different ways. GM supporters adopting technological determinism, argue for more technology to contain environmental issues, while GM opponents plead for a slowing-down of mass production and consumption and for a return to simpler and more natural ways of farming and food processing.

¹⁵⁴ Here I am not supporting a particular thesis but recognizing that the one attributing global warming to human activity is dominant at the moment, although other views exist, including those attributed to skeptic groups.

We must keep in mind that, engaging in different ways of production constitutes a heavy investment for those agents who had established their core activities on contested models. Although, they recognise the need for new ways of doing things, they have interest in delaying the switching process in order to encourage a gradual depreciation of previous investments that have not yet paid back fully, and to allow a more progressive evolution that does not overwhelm their financial and organisational capacity. For this reason, they need to get involved in representing *The Environment* in a way that favours their interests as well, and not leave it completely to those actors who have all to gain or not that much to lose in switching to a new mode immediately.

5.1.3.2.3 Speaking on behalf of virtual actors: Future Generations

This may seem unreasonable at first, however most of what is represented and mobilised to sustain economic activity is mainly expressed in fictional terms, based on future fictional expectations (Beckert, 2013).

It is not a surprise then to see virtual projected actors being involved in the debate. *Future Generations* were represented by both opposing groups alike, mainly as victims. GM opponents defended their right to a clean environment and to a share in natural resources that are being abused by the current generation. While, GM supporters defended *Future Generations'* rights to be fed properly, having enough and more nutritious food, but also their right to decide. The latter is an interesting point, as it questions the unsolicited representation by their adversaries, and shows the competitiveness nature of these representations.

5.1.3.3 Depictions

Those made actors through *Depictions* are those entities that were brought into action through an attribute highlighted by *Necessarily-concerned* actors. Unlike, *Role Fulfilment* or *Unsolicited Representation*, they had not performed a role that could be re-appropriated, nor do they need to be defended or their rights need to be re-established. It is rather, their mere presence, or absence (when expected to be present), or a specific quality they possess (or not, when supposed to), which has an impact on the course of action. This impact becomes reified when the attribute is highlighted and integrated by *Necessary-concerned* actors into the discussion.

5.1.3.3.1 Actors by ‘being missing’ while they were supposed to be present

These actors are interesting, since their appearance sheds light on blocking points, those aspects that are missing to make a perspective appear reasonably viable in critics’ views. These are like gaps in the way of a perspective undermining its overall coherence. Their effect could be more tangible than present actors. The absence of conclusive proof of harm done to human health following the consumption of GM food is what prevented a full ban on it for decades in Europe despite very hostile legal environment. The absence of large public acceptance, and consequently the absence of a prospect market for GM food is what made retailers choose the safer option promoting non-GM options and blocking the free adoption of GM ingredients by food processors. Agency is not dependent on physical presence. Moreover, this ‘active’ absence moving masses is essentially hypothetical and projected.

5.1.3.3.2 Actors by “merely being present’

Some entities entered the course of action not through engaging *a priori* in a specific act, but just by their presence, actually, highlighted or not by *Necessarily-concerned* actors, blocking or allowing action. Their involvement in action could materialise by just strengthening an argument that supports its author’s rallying ability, thus, his/her/its agency.

The fact that a gap exists between crop production and population growth projections, it made the issue of feeding future generations more tangible. The fact that the Section 14A of the Public Order Act Forbidding "trespassory assembly" exists in the text of the law, it made entry to the experimental plots being qualified as a legal transgression. Had varieties of Canadian rapeseed not been patented at the name of the Rothamsted director Professor Moloney, opponents would not have found a valuable excuse to accuse him of presenting a conflict of interest. Had alternative solutions to control pests not been available, GM would have been seen more as a unique solution... and so on. Texts of law, patents, alternatives, calculated previsions, all acted through their presence blocking or allowing an act that strengthened or weakened theses against or in favour of GM plans and prospects.

5.1.3.3.3 Actors by “holding’ or ‘missing’ an attribute they are expected to possess’

Some entities entered the course of action by an attribute, which presence or absence favoured a perspective over another. Of course, these attributes may be actual (verifiable) or projected, and in the context of a controversy, we have seen that this

difference has little impact, if any. The fact that wheat pollen has been scientifically proven to be heavy, travelling at best 12m, played a role in the approval of the open-air trials. The risk of contamination being uncontrollable, it prevented co-existence plans from reaching a compromise. Pets being very good at adapting to their environment, gave an excuse to the disappointing result of the GM-Whiffy-wheat trials. Weeds being very good at adapting to herbicides, gave excuse for accusing herbicide producers of creating herbicide tolerant super weeds... and so on.

Some may criticise the last two examples, thinking that, pets and weeds simply adapted, and thus, performed an act or adaptation, which is true in some cases, but not in all of them. In the debate, these actors were sometimes brought into the discussion through the precise action of ‘adaptation’ they had performed, but also other times by simply referring to their adaptability that is speaking against GM plans, whether they would actually perform or not the action. As the study exclusively followed actors’ expressions and interpretations first, I have considered both options, and have not reduced it to the most obvious. Therefore, pets and super weeds were found in two different categories, ‘fulfilling a role’ and ‘depicted’ as holding an attribute.

5.1.3.4 The very specific case of ‘Indeterminate actors’

These are actors whose move (imminent or not) towards approving or disapproving one perspective or the other is still unknown and conjectural. Yet, they are already actors, being involved in the debate through a role attribution, but it is the result of their action that is still pending. I called them *Indeterminate* actors.

This indeterminacy as I will show, does not refer to their *agencing* capacity, but to the pending question of the beneficiary of their ultimate support. In some cases, the completion of their action is imminent, however which clan it would favour, remains hardly predictable at the present time of their appearance, yet revealed later. This part of *Indeterminate* actors cannot be rallied immediately through any of the means explained above.

Indeterminate actors despite them presenting the most uncertain actors, could be highly impacting in terms of agency. Take the example of the application put forward for the trials to take place. During the assessment process (that took about three months), the application was an indeterminate actor. If it had not been approved by Defra, the scientists would not have been able to plant the experimental crops, and this would have changed completely the course of events. Another example to illustrate the difference in time spans within this category of actors is the GM-wheat pollen contaminating surrounding fields. If it does, and it is proven at some point (not an easy task though), then it will disfavour GM plans. If not, the question would presumably reside for a long time in the pending category of actors.

Fictional Expectations articulated by proponents of new technology generally rest on a montage of scientific evidence and models, but not only. Risk calculation and perception could either be based on objective probabilities or suggestive ones (Callon *et al.*, 2009). Therefore, those risks which do not have an ‘objective’ excuse, if not accepted widely, are susceptible to fall under the ‘Indeterminate’ actors category and lose their *agencing* potency. Hence actors resort to underpinning ideological and

cultural values to articulate literatures that would hold firm such risks endowing them with a rallying capacity.

5.1.3.4.1 The object of the debate: The most ‘Indeterminate’ actor or the ultimate promise?

The object of the debate appears to be the most mobilising entity. On one side it represents the central expectation, around which all other promises revolve. On the other, the utmost culprit that needs to be fought and eliminated. While it appears central to both clans’ endeavours, it is the most uncertain object, since its fate will only be known at the end of the debate.

It could be argued that the object of the debate should be amongst *Necessarily-concerned* actors, necessarily concerned about its survival. This is what, I guess; Callon (1986) would go for, comparing the experimental GM-wheat to experimental scallops fighting for their existence. Some may argue to consider it a *Possibly-concerned* actor, considering it being the central fictional expectation of the whole debate. I have chosen however to place it at the heart of *Indeterminate* actors based on the fact that, once it is decided which side it favoured, the controversy should reach an end¹⁵⁵. The object of a controversy represents the culminant point of uncertainty. The whole apparatuses set around, is precisely to reduce this uncertainty. Once The debated object becomes

¹⁵⁵ Here, one should not expect the whole GM crops controversy to reach an end based on the GM-Whiffy-wheat trials results being published and discussed, since in this case, the GM-Whiffy-wheat debate represents only a ‘niche’ discussion in a much broader controversy.

certain/integrated or abandoned, there should be no need for further support or opposition.

5.1.4 Rallying strategic allies

Strategic allies are those actors who represent a certain weight in the socio-economic landscape with no *a priori* existing interest in either market versions, or any constraining enough reason to join one of these in particular.

These actors are strategic because their choices and actions appear highly impacting. They play a substantive role in the establishment and survival of a market version allowing it to engage in the integration of its matters of concern towards a relative stability of its network. So, strategic actors need to be rallied by a way or another.

The *interesement*, *enrolment*, and *mobilisation* of such actors do not constitute an easy task though, since strategic actors decide based on self-interest first, and act quite independently. They are not easy to rally by constraint or without their explicit consent through unsolicited representation and re-appropriation of their acts. The challenge comes precisely from the fact that they speak for themselves and have independent agency, while their agency must be aligned and coordinated with other entities of the *socio-technical-agencement* soliciting their participation.

Also, generally, they are those who do not need to massively invest in a market version to have access to its network and join its transactions. So, not only they would only join a perspective if it maximises their gain and appears most aligned with their ultimate

aims, but they can also keep a relatively good flexibility allowing them to change clans more easily. For this reason, I have placed them in the Instable category amongst *Possibly-concerned* actors based on their lack of commitment. One of the strategic moves in a *socio-technical-agencement* is to rally its strategic targets while attempting to convert these into *Necessarily-concerned* actors to reduce the risk of withdrawal, for example through vertical enrolment or exclusive agreements.

Rallying strategic allies becomes easier when a market version starts to gain scope through the multiplication of its spokespersons, the enlargement of the concerning span, and the actual or perceived rallying potential of masses. This is one of the reasons *Necessarily-concerned* actors have to consider expanding their *socio-technical-agencement* through the integration of unstable category of actors to give volume to their market version.

The most obvious and common strategic actors appear to be those who play a specific role within the supply chain without the need of massive investment in its central product, those who have privileged access to the public, and those who represent the power in place and its institutions.

Referring to the GM-wheat studied case; I am going to discuss *Retailers*, *The Media*, and *The Government & its institutions*.

5.1.4.1 Retailers

Retailers became powerful market actors capable of changing a market configuration, pressurising suppliers and affecting consumer choices (Clarke, 2000). In Britain, but

not only, retailers have constituted a serious barrier to the introduction of GM food onto the food market. Being highly sensitive to consumer and public opinion, in a state of doubt (which is naturally the case with controversial items), they tend to side with the less risky perspective. This is even easier, since they are not the actors investing heavily in R&D facilities and programmes, production means and regulatory frames, although the GM avoidance also appeared relatively costly, especially in terms of traceability and labelling requirements (Jones *et al.*, 2000).

Most supermarkets in Britain adopted re-assuring communication and actions as a response to their costumers concerns and indecision about GM, and engaged in the limitation of GM ingredients or GM-free plans for their own brands, albeit some took more explicit and drastic measures than others (Cook, 2004; Jones *et al.*, 2000). They do not appear ready to invest in changing consumers' tastes in contexts of consumer resistance. However, this should not be understood as a long-term and definite commitment, due to the self-interest pursuing attribute, but also due to GM being more and more difficult to trace and to avoid concretely (Lee and Burrell, 2002; Jones *et al.*, 2000). We should expect a shift, once the public opinion shifts or the market reaches a point where talking GM-free becomes untenable.

5.1.4.2 *The Media*

The media accompanied the biotech journey since the early 70s, however coverage varied in terms of intensity and focus. Until mid-80s, media coverage was low with a positive tone focusing on the promise of progress and the medical front. However, a spectacular interest in biotechnology could be noticed from early 90s enlarging the scope of discussed matters by including regulation matters and economic and ethical

frames (Bauer *et al.*, 1998). This latter evolution was characterised by a questioning tone, conveyed by risk- danger and non-utilitarian discourses, and driven by the introduction of NGOs, consumer organisations and commentary on public polls (*ibid*). A series of food scandals, some highly impacting like BSE¹⁵⁶ crisis and the E.Coli food poisoning outbreaks, with the raise of other non-sanitary issues linked to food production like sustainability and animal welfare, encouraged the alarming tone in the media and anxious reception of GM food plans (Jones *et al.*, 2000).

The 21st century although starting on a negative and very controversial tone for GM in Britain commenting on the spectacular experimental GM plants trampling in an operation driven by Greenpeace, things seem to have changed over the last decade. The media seems to be more divided, which reflects the highly indecisive and indeterminate situation of GM in Britain despite signs of institutional integration. Now, whether the media looks supportive or not to GM, it is not completely clear. The media was generally perceived as an opportunist device, double-faced, and driven by selfish interests and not by a genuine quest to understand and uncover reality (Cook, 2004; McCluskey and Swinnen, 2011). Still, it is a strategic actor that needs to be involved in a matter to make the latter visible to large audiences.

The findings showed that from both sides of the debate, main actors did not consider the media to be a trustworthy ally. This is intriguing when most newspapers remained loyal to their stance on GM, although the split right/left wing proves irrelevant in such complex controversies (Cook, 2004). However, what seems to have impacted their

¹⁵⁶ Known as ‘The mad cow disease’.

reliability is mainly their inconsistent coverage, and may be to some extent the scientists' highly rallying concerning formulations of the matters, like the one shaping the mass protest in vandalism terms, where newspapers hostile to GM plans were almost constrained to abandon the 'culprit' side even if they did not specifically support the opposite perspective.

5.1.4.3 *Actors representing power in place*

Here, I am referring to politics and institutions involved in allowing markets to be functional.

Politics are naturally involved in markets, although the work invested in separating which is economic and that which is political is a continuous struggle, aiming at stabilising markets (Callon, 2009). Since market framing and expansion necessarily produce misfires and overflows, controversies about what can be left to the market and what should be taken to the political arena arise, allowing objects of disagreement to be discussed (Callon, 2010). Therefore, politics contribute at the same time at shaking markets, by allowing raised matters to go public and to be discussed, but also at stabilising markets through the creation of institutions and procedures capable of containing the raised issues.

Institutions allow value creation by setting rules organising and regulating competition between market agents (Caliskan and Callon, 2010). This does not argue for institutions to be *a priori* set apparatuses regulating markets from 'the outside'. Institutions are shaped by market agents and reflect an agreed upon set of rules and values, between

powerful agencies¹⁵⁷ in place (ibid). Therefore, the distribution between the economic and the political in stable periods should be understood as temporary, prone to constant questioning, reviewing and re-negotiation (Butler, 2010). That is why marketization (economisation) and politicisation tend to be concomitant processes that are intimately linked (Callon, 2010), which market versions (especially new ones) need to lever skilfully in order to subsist.

For a new market version to develop, it must find a way to penetrate the institutional arena and get integrated into it in order to gain legal legitimacy to operate within the framed *Market*¹⁵⁸. Integration here does not mean to take the exact form compatible with existent institutions, as reasonably there would be no ready formula for new concepts and innovative products, but rather entering into negotiation with institutions aiming at co-producing a suitable new version of the existing legal framework. Sometimes, a completely new framework must be imagined and crafted, like in the case of GM coexistence with other crops.

We need to remember that established institutions present a form of rigidity that gives them stability, but at the same time complicates the path for new entrants. Current institutional forms are also sustained by current market versions that would foster resistance towards new prospects threatening their privileged position (Maguire and Hardy, 2009). That is why, new market versions need to ‘enter from the back door’, seizing even a tiny entrance opportunity to get into the negotiation process and start

¹⁵⁷ Those who could value best their version and make it prevail over others.

¹⁵⁸ This does not deny less regulated forms of market exchange, although they appear marginal, they generally have a basic legal form that allows their existence within the institutional frame. Here, I am not tackling illicit markets.

shaping and altering procedures in their favour. Similar to the case of retailers, the more a new market version gains scope, even through unsolicited recruitment of *Possibly-concerned* actors that are presented as actually concerned, and the more from these actors are enrolled on more durable basis and ultimately mobilised by *Necessarily-concerned* actors, the more institutions would be constrained to look seriously at the raised matters and invest efforts in finding ways to integrate these. Legal frameworks could thus, either enhance or inhibit agency of a *socio-technical-agencement*, depending on the level of integration of the latter's matters of concern and translations within the socio-economic environment.

5.2 Irreversibility

As introduced at the start of this chapter, by *Irreversibility* I refer to these *agencing* activities that aim at stabilising the network by eliminating internal and external dissociation forces susceptible of giving enrolled entities the choice or the temptation to contest their participation in their current *socio-technical-agencement*. I have chosen to group these activities under the term *counter-agencies*.

The expression was already mentioned in the literature to describe counter-productive agencies, described also as ‘*counter-performative actions*’ (Cochoy *et al.*, 2016). There were also other terms that emerged to describe similar effects, which seem to include unexpected events inhibiting courses of action and market failures. MacKenzie (2004) talks about *Counterperformatives* to refer to self-undermining and negative effects generated by performed actions, suggesting considering what Callon describes as *overflows* amongst these. In the same vein, the rapprochement by Butler’s (2010) of McKenzie’s *counterperformatives* to misfires, in line with an Austinian¹⁵⁹ qualification of market failures. All these terms seem to express a ‘*non-aboutissement*’ (miscarriage, mischief) of agency, some of which are uncontrollable and unpredictable. While, what I am interested in is precisely induced *counter-agencies*. The ‘*countervailing forces*’ (Araujo and Kjellberg, 2009) appears the closest depiction to what I intend to develop here, referring to forces that produce an opposite and unsettling effect.

¹⁵⁹ (1962).

In this discussion section I propose to distinguish *agencing* and *counter-agencing* activities with the latter referring to acts opposing an-other agent(s)' agency, aiming specifically at mitigating or annulling its effects¹⁶⁰, excluding counter-performative effects that occur by accident. It supposes also a distinction between counter-performative effects (perceived a posteriori), and counter-performative actions (intended a priori to be such). This of course does not suggest linking action to intentions in the absolute, which does not fit with the performativity conceptual framework of the study, but simply to separate a specific type of agency generated by socio-technical agencements. My purpose here is to refine and re-define *counter-agencies*¹⁶¹. I intend to do so by firstly explaining the relationship and differentiating properties of *agencing* and *counter-agencing* activities, and secondly by showing how the latter manifested their effect in the studied debate.

Agencing and Counter-agencing

From a practice approach to markets, networks are instable by nature, since the associations they are built on are ultimately fragile and revocable (Callon, 1986). This is explained by the enduring diligent work needed to stabilise relevant networks, long enough in order to fulfil set aims, while at the same time the instability of actors' roles and the unpredictability of associations seem to be quasi-inherent qualities of networks that are formed by actors who are endowed with agency (Araujo and Kjellberg, 2009).

¹⁶⁰ This becomes specifically manifest in some particular market configurations, like *Concerned-markets*, where some collectives start to act in a way aiming at dismantling contested *agencements*, and others *re-act* in return aiming at muting or attenuating contesting voices.

¹⁶¹ Drawing an analogy on natural sciences (mechanical physics), stating that when two opposite forces are applied to the same object the resultant force is the difference between both potencies, a network agency should be appreciated with regards to agencies, but also counter-agencies performed to stop unsettling effects or those diminishing the network's abilities by blocking its agencies.

Considering *agency* from a *Callonian* perspective (Callon, 1998c, 2007b), being the capacity of an agent to act independently, which denotes the ability to make autonomous choices, *agency* appears somehow paradoxical in the way it animates networks, allowing simultaneously their stabilisation and destabilisation. Actors forming a network attempt to stabilise the latter through continuous engagement in multiple *agencing* activities. Similarly, those actors destabilising a given network through the revocation of their alliances or defined roles within these, can do so due to them being endowed with agency. Moreover, and since any performing network is in constant competition with other competing *socio-technical-agencements* trying to reduce its motion through their agencies, it appears clear that *agencing* activities necessarily involve *counter-agencing* to eliminate competing destabilising forces amongst the former.

5.2.1 Counter-agencing activities

Counter-agencing activities aim at the first place at stabilising the *socio-technical-agencement* in question by protecting its strong and strategic alliances and its access to market. Such activities therefore include blocking the means to market and power for competing versions, seeking the settlement of what Callon (2016) calls bilateral monopolies that secure for a firm its market share. *Counter-agencing* activities do not constitute a definite category, and are part of the *Agencing Theory*. “*Framing is always liable to be disrupted by the actions of entities on both sides of the intended boundary*” (Araujo and Kjellberg, 2009, p13). They could be defined as ***any action or set***

apparatus aiming at mitigating, hindering or annulling oppositional or competing agencies, whether internal or external, unsettling a set agencement.

Counter-agencing activities manifest in two different forms, one directed to internal potential ‘betrayals’, and the other to external incentives from competing versions. The first form aims at stabilising a socio-technical-*agencement* from inside by constraining enrolled entities to remain aligned and coordinated according to set plans, the second at preventing competing market versions from attracting and recruiting enrolled entities. This second form of *counter-agencing* (directed to competitors/adversaries) appears to be the most prevalent though, since knitting alliances is aiming at the first place at reducing *counter-agencing* towards the host *socio-technical-agencement* in question, which already stabilises it from inside and reduces attempts of betrayal. The stability, and the ‘*aboutissement*’, which is the achievement of the set goal pursued by a specific *socio-technical-agencement*, are then dependent on *counter-agencing* activities, where some are directed to inner destabilising forces and others to external ones.

5.2.1.1 ‘*Interposition*’ Manoeuvres

Callon (1986) explains a very interesting phenomenon that takes place within a successful *Interessement* process, highlighting the competitive character of different *Problematizations*, (here could be said market versions), which makes these inevitably oppositional and necessitates a ‘*interposition*’ manoeuvre to settle one’s promoted version.

The ‘*interposition*’ needs to be understood in this discussion in its most simple and literal meaning ‘*inter-position*’ that I translate from French as ‘place oneself in between’

or ‘stand between’¹⁶², which conveys obstructing and cutting links. The ‘*inter-position*’ manoeuvre consists of agencies that aim at cutting links between allies and competing versions to secure own alliances and allegiance to own perspective/project. An association to a perspective or a network entails by definition *being dissociated* from competing perspectives and networks. *Dissociating* requires, while strengthening internal ties, simultaneously preventing and revoking competing versions’ *interessement, enrolment* and *mobilisation* efforts, knowing the inherent instability of alliances due to actors’ roles and interests variability. *The ‘Inter-position’* manoeuvre performs counter-agencies that are directed to inner and outer destabilising forces.

Considering that *Interessement* entails ‘imposing’ on targeted entities a specific ‘translation’ defining what is at stake and attributing corresponding identities/roles to other entangled parties, it involves necessarily restricting the scope of action for some. Expressed by Callon (1986, p183) via the phrase “*Points de passage obligés*” (obligatory passageway), ‘Imposing’ necessarily entails preventing free choice, thus inhibiting the agency of enrolled entities.

Also, because the whole process of ‘translation’ aims at sustaining the irreversibility of the network set in motion towards a fixed goal by cutting links to any other option, a successful ‘translation’ must then cut competitive proposals’ access to enrolled entities, eliminating the possibility for these to revert to initial state of multiple choices (Cochoy, 2014a). This is fully achieved when *Main-actors* within a network/perspective acquire the status of representatives beyond *Necessarily-concerned* actors, by *inter-positioning*

¹⁶² The English dictionary would give words like ‘intervene’ or ‘interfere’, a more elaborate translation that masks the most relevant meaning used in this context, which is shading and cutting contact.

themselves between represented entities and competing *interessement* apparatuses preventing their association. In this case, it is competitors' agency that is inhibited. It appears plausible then to present '*Inter-position*' efforts as *counter-agencing* processes aiming at inhibiting enrolled and targeted entities capacity of acting independently, as well as competitors' agency aiming at reaching these.

5.2.1.2 Singularization processes and establishment of bilateral monopolies

Callon (2016), discussing the impact of the new view of markets as market *agencements* through an analysis of competition and the role of innovation, explains that a marketable good (that which could/had find a customer) "*is a good that has been singularised*" (p26).

In order to survive, a firm needs to differentiate its products/services in a way that prevents its customers from seeking competitors' alternatives, which means, establishing bilateral monopolies. This process entails a *singularization* of supply and demand that entangles specific suppliers and customers around specific goods that become through these entanglements singularised, and thus *temporarily* immune to competition. From this perspective, *singularization* processes seem to include *counter-agencing* activities. These may manifest in different forms. For example, in the way a firm may interest strategic resources' suppliers blocking them from transacting with competitors (e.g. taking shares in suppliers companies, concluding exclusive agreements), or in the imitation of certain customer loyalty programmes (e.g. Tesco was the first supermarket in England introducing the loyalty Club Card allowing customers to access special savings and rewards on their spend level. Rapidly, after Tesco took this initiative, other competing supermarkets introduced similar incentive schemes, which mainly aimed at preventing their customers from being attempted to

switch to competition, especially that the grocery sector cannot play that much on the differentiation of the offered goods themselves).

Bilateral relationships, on which firms' survival depends, could only be secured for a firm if the latter engages in specific activities that singularise their offer. This *singularization* does not regard purely the characteristics of the transacted good, but also the relationships that allowed its design, production, qualification and commercialisation. These relationships are crucial and need therefore to be also singularised through activities dissociating this specific collective and good from external incentives and alternatives. Then, singularising a good (and its entangled entities allowing it to be specific) necessarily entails *counter-agencing* activities aiming at annulling competitors' incentives, imitation and substitution attempts.

5.2.1.3 Externalities and Market framings

Another aspect that in my opinion could explain an intimate interconnection between *agencing* and *counter-agencing* is the question of externalities and market framing.

Callon (1998c) defines externalities as impacting effects generated from outside the scope of relationships a company/agent operates in, on which it has no way to intervene, as not involved in the negotiation/transaction generating the effects or was not initially interested. Externalities could be positive or negative, although the latter is more prone to occur, since market agents tend to make their positive outcomes economic (monetised). In the first case, externalities discourage private investment by making a resource available for some without them bearing associated costs. In the second case, some find themselves in a situation where they need to bear costs generated by other

agents' activities. Here, those whose interests are compromised are compelled to consider extra costs and activities to mitigate, stop, or annul the damage. These activities therefore appear as a reaction to other agents' *agencing* activities. Not only. There is also an element of compulsion, where *agencing* activities producing negative externalities are limiting affected agents (by these externalities) free and independent course of action. From these two perspectives, *agencing* activities producing externalities are at the same time, countering affected parties' agency (1st form of counter-agency) and compelling these to engage in *counter-agencing* activities (2nd form).

Besides, keeping markets functioning requires constant framing attempting to integrate produced externalities. However, framing activities in return, as Callon (2007a) explains, necessarily produce exclusion in two ways. Firstly, by favouring some market versions over others. Although this is not meant to be permanent, it represents a survival threat to excluded versions. Secondly, since framing activities are 'crafting/experimental' ones and thus, never perfect, they also inevitably produce overflows, if not re-internalised through on-going *agencing* activities, they end spawning matters of concern and triggering the emergence of concerned groups. For these concerned groups to voice their matters, oppose and challenge current questioned frames, they need to set up collective investigations and come up with clear formulations of their matters in the form of a counter-proposal to adjust denounced effects. This is because, existing institutions tend to ignore unresolved questions by reinforcing existing framings (Barry, 2002, cited in Callon, 2007a), and established market versions tend to use their dominant position to eliminate 'outsiders' to the frame.

Maguire and Hardy (2009) in their study of the deinstitutionalisation of the DDT¹⁶³ showed how the DDT network produced texts and engaged in actions aiming at supporting their version calling into question their detractors' logics and taking refuge in the 'scientific evidence' controversy.

Here again, *counter-agencing* is performed in two opposing ways. Market framings by constantly producing asymmetries and overflows, they naturally engender counter-agencies. *Couter-agencing* manifests in the way concerned groups - when excluded groups could relate and resist, Callon (2007b) - set up specific *socio-technical-agencements* to mitigate and annul those agencies producing the impacting overflows. Likewise, counter-agencies are manifest when more established *socio-technical-agencements* tend to inhibit excluded groups' agencies, and resist emerging concerned groups setting up specific actions to inhibit their disruptive agency.

5.2.1.4 “Traduction-Trahison” (Translation-Betrayals)

This refers to a state of *Dissidence* (Callon, 1986), with emphasis on its meaning conveying opposition to set rules or authority. *Dissidence* in the context of this study refers to opposition within a set *socio-technical-agencement* supporting any of the competing perspectives (e.g. withdrawal from one's role, criticising allies' methods). *Dissidence* is particularly impactful when it occurs within the *Necessarily-concerned* actors, as these are those who represent the strong front for a defended perspective and who support its credibility and act as guarantors for its viability. A crack in this strong

¹⁶³ “Dichlorodiphenyltrichloroethane”, one of the former top-selling insecticides in the world, that was wildly used on crops after the Second World War.

block necessarily undermines in some way the success of the whole endeavour within the affected perspective. Since acts of *Dissidence* undermine the agency potency of the affected *socio-technical-agencement*, I have chosen to include these within *counter-agencing* activities.

5.2.1.5 *The ‘black swan’¹⁶⁴ impact*

A special attention should be given to the re-appropriation of ‘past occurrences’ providing ‘the’ counter-example(s) undermining a position’s strong assumption(s).

As explained in the last section, one of the most performative entities appear to be *Fictional Expectations* that contribute in shaping, holding, and promoting a projected state of the world. These projections are so efficient because precisely they are difficult to prove wrong. Generally, it requires long time spans and complex *agencements* to prove in a conclusive manner whether they are objectively reliable or not. They do not need to be ‘objective’. Their power is encapsulated in the following quote “*the willing suspension of disbelief*” (Coleridge, 1817, cited in Beckert, 2013). They are made to surpass reason in contexts of uncertainty (and the future is by definition uncertain), allowing stabilising enough elements to allow decision-making. However, this works perfectly until a concrete counter example emerges and takes these expectations to the realm of ‘objectivity’ and tangible reality. Thus, factual occurrences refuting *Fictional Expectations* produce a *counter-agencing* effect over these.

¹⁶⁴ The exception to the norm. The example that proves a theory inconclusive.

5.2.1.6 Counter-agencing in the GM-wheat debate

In the studied debate *counter-agencing* activities could be identified in several occasions and in different forms. Main activities of this genre involved: cutting adversaries' access to strategic allies, constructing *paralleled* and *shared* literatures, feeding dominant ideologies, denouncing *Fictional Expectations* based on refuting factual occurrences, acts of betrayal, and occupying a *concerned* position.

5.2.1.6.1 Counter-agencing through 'Inter-position': Cutting access to strategic allies

A decade earlier, in July 1999, Lord Melchett Greenpeace executive director at the time and 27 other green activists conducted an action against experimental GM T25 maize developed by AgrEvo in a family farm in Lyng, Norfolk. After a judicial process leading the conflict to be judged by a jury, the latter issued a non-guilty verdict that separated opinions, but nevertheless gave advantage to activists based on 'lawful excuse'. Green activists saw in the verdict a clear message to the government that people do not want GM in Britain. While, GM supporters saw in it the legal system's incapacity to protect public rights and impose its authority.

10 years later, Rothamsted scientists have understood that, for their trials to carry on safely, they would need to rally authorities to their cause. Since GM is a controversial matter, they had to come up with a *Problematization* that could overcome controversy and bar the way to any potential 'lawful excuse'. Their *agencing* activities during the decisive phase of the debate as analysis has shown, did not focus mainly on justifying the need for the trials and potential benefits of the GM-wheat prospects. They focused

rather on knitting and securing the government's support by calling them to their legal protective duty of science and rights to conduct research, and on framing their opponents' mass protest from a legal and democratic angle, portraying it as an act of vandalism by unlawful means.

In these precarious times, they had to secure their existing alliances with the rest of the scientific community, to knit strong ties with power in place, and at the same time, to counter attack their opponents plans. They secured their alliances by multiplying communications and reiterating the relevance of their work for the future of the nation and its competitiveness on one hand (Letter sent to MPs, letter sent to the scientific community), and by re-insisting on the government's role in assuring public order and protecting civic rights on the other hand (recourse to the local council and police). They also addressed an open letter and a video to protesters to ascertain their good intention and willingness to discuss, placing themselves in the heart of the civic society, while expulsing their opponents by portraying their planned action outside the law.

What is interesting here, the scientists not only cared about strengthening their own supportive networks, but also invested specific *counter-agencing* efforts aiming at cutting protesters' access to the experimental plots and to a potential 'lawful excuse' that would legitimise their plans, which not only made the 'decontamination' impossible due to heavy police presence, but also inhibited any other strong demonstration due to 'the law' this time siding clearly with the scientists. Actually, the solitary intruder, Hector Christie, was charged with criminal damage this time despite very little damage caused to the plots. The scientists formulation of their matters of concern around citizen rights and questions of vandalism and public order also refrained

the media support to protesters, even from historically anti-GM newspapers, whose expression appeared more reserved despite them not embracing the pro-GM arguments.

5.2.1.6.2 Counter-agencing through seemingly-shared and paralleled articulated literatures

CC-Lens1 (section 4.1.4) showed clearly the instable and dynamic nature of underpinning literatures backing up actors' concerns, claims, and argumentation. Most identified literatures though appear to be shared or paralleled literatures, where adversaries' meanings are altered or juxtaposed.

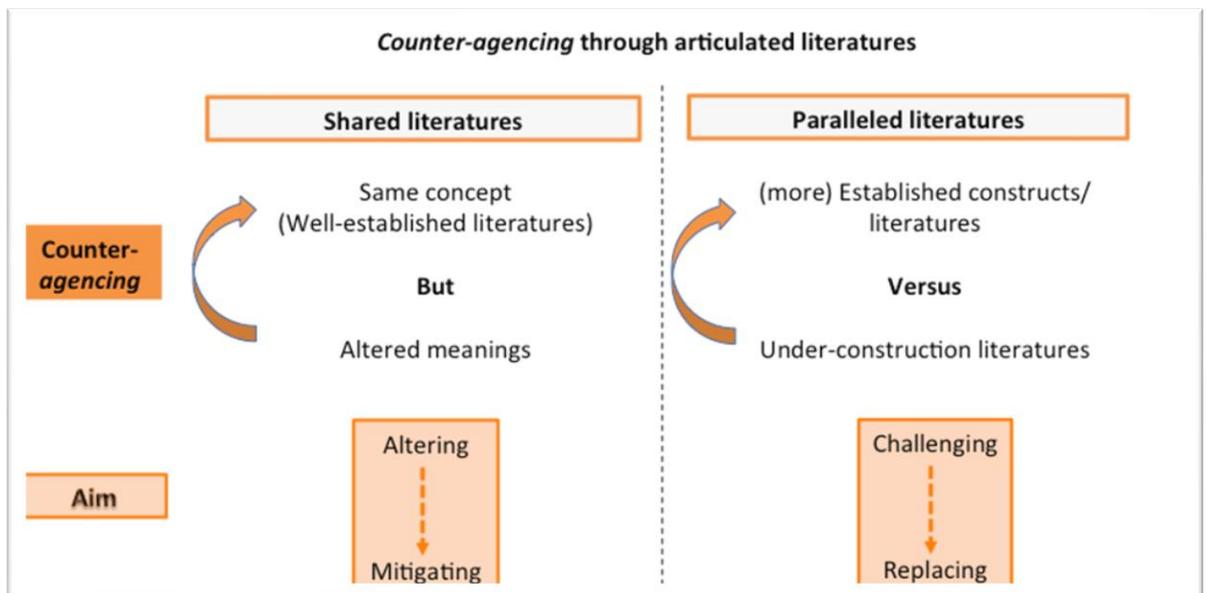
In the case of shared literatures, as explained previously, the term 'shared' could be quite misleading, however I have chosen to keep it while associating it with the term 'seemingly' for it embodies the confusion within the outwardly common affiliation to the concepts in question. The broad frames of the supposedly shared concepts are kept, while associated meanings are distorted. It is an alteration rather than a perfect disapproval of literatures backing adversaries' claims.

When scientists talk about sustainability, they do not reject the concept, however they articulate the latter through different representations and expectations altering its meanings as understood by the Greens. In promoting a new reading grid for sustainability, they were weakening at the same time the scope of their opponents' conceptualisation of it. This process is even more dangerous for established meanings, since it creates confusion that prevents a clear demarcation of the opposing/supporting line, and permits a discursive distortion that benefits generally the new comers'

perspective. When the public is exposed to a group of scientists talking sustainability, they generally recall the established meaning of it (from a Green’s perspective) and not the newly constructed one, which helped the scientists in rallying sustainability sensitive publics.

In the case of ‘paralleled literatures’, which are juxtaposing articulations giving ground for responses and arguments that defy competing proposals, competing anchoring literatures are not altered but challenged with different literatures, generally new constructs that aim at replacing the existing or more established ones.

Fig.5-2: Counter-agencing through articulated literatures



Both, ‘shared’ and ‘paralleled’ literatures present vehicles for *counter-agency*, allowing diminishing the grounding of adversaries’ concerns and arguments. It appears that when a concept is widely accepted, like in the case of well-established literatures such as sustainability or democracy, it would be difficult to replace it completely by a new one.

Also, if it had additionally been appropriated by the opposite perspective, this would represent a competitive advantage for the latter. ‘Seemingly-shared literatures’ represent then a subtle way to undermine the anchoring advantage an established literature is giving to competing concerns and arguments. While in the case of ‘paralleled literatures’ the literatures do not mix up but represent an alternative to each other.

5.2.1.6.3 Counter-agencing through dominant ideologies

Dominant ideologies that are deeply embedded in collective consciousness are so difficult to uproot that they continue to resonate even in their antagonists’ approaches and discourses. Rosenow (2017) demonstrates this phenomenon through an analysis of environmental activism. While environmentalists try to oppose the modern/colonial paradigm by criticising neoliberal structures of domination and promoting alternatives, they have not succeeded to abandon completely modern/colonial binaries. These continue to be operative in the background, and are manifest for example in the anti-GM activists/environmentalists reliance on the scientific argument and reiteration of internal/external divides, where ‘external’ represents Western dominant unfair ways, and ‘internal’ represents traditional, local, and indigenous agriculture.

In the GM-wheat debate, despite discourses denouncing the transcendent status of scientific knowledge, asking for other types of knowledge to be considered and promoting alternatives to GM farming, *Science* seems to still have the last word. The distinctive and honourable status of *Science* is embedded in people’s consciousness so deeply and for so long (since The Enlightenment) that it became a system of belief, an ideology, and thus more difficult to uproot through cognitive argumentation. Not only

institutions are built on such a vision of the transcendence of scientific arguments¹⁶⁵, but also those demanding for other types of knowledge to be integrated into the equation are engaged in producing and formulating counter-scientific arguments. This was obvious in GM opponents multiple references to scientific studies discrediting GM crops performance or highlighting potential risk to human health and the environment.

Scientists seized this opportunity to undermine protestors' plans. They portrayed their opponents as anti-*Science*. Projective images about coming back to the *Dark Age* and *Burning Witches* eras reified worries about backwardness and lack of control. This has played an important role in allying the government and its institutions to the scientists' cause, but also in attenuating past perceived opposition to GM amongst the general public. What proves even more the use of dominant ideologies to undermine opponents' agencies, is how GM supporters made their GM-wheat prospect the representative of *Science* and the Scientific community, making it a 'hero' rather than a 'culprit' in the public eye, and using it as efficacious seal for their strong alliances.

5.2.1.6.4 Counter-agencing through the emergence of a 'black swan'

One of the most pervasive concerns as analysis had shown in the GM controversy in general, is the risk of contamination. GM supporters claim that this risk is scientifically controllable and virtually inexistent, based on scientific hypothesis. However, past escapes have provided concrete evidence (versus assumed assumptions) of the contrary, reifying the risk of contamination and undermining GM supporters' credibility on this

¹⁶⁵ Reliance on studies, research, surveys, metrics and economic models...etc.

point. Actual past occurrences that discredit *Fictional Expectations*, despite the possibility to attenuate their effect through discursive means altering their interpretation and perception, exercise a strong *counter-agencing* force mitigating, and in some cases, annulling the performative momentum of these expectations.

Likewise, data gathered on the actual performance of the first generation of GM crops allowed constructing a new literature around ‘GM Unfulfilled promises’, undermining the reliability of the technology, and compelling it to acknowledge the low performance of previous GM crops and to advertise new GM prospects as ‘The second generation’ distancing it from discrediting past experiences.

5.2.1.6.5 Counter-agencing through acts of Dissidence: “Traduction-Trahison”

Dissidence could be noticed on several occasions in our debate. The provided examples below should not be considered as exclusive, however they summarise all noticed forms of *Dissidence* in this particular case study.

- Strong allies not adhering to the set plan or disavowing their representatives

The GM-Whiffy-wheat not repelling aphids effectively as expected, discrediting the scientists’ promise.

The Real Bread Campaign, one of the opponents’ SSN, referring to the ‘decontamination’ promoted by

Take The Flour Back as ‘illegal action’.

- Dissonant affiliation to rallying references

Rothamsted Scientists strongly believing in the GM project and claiming it to be safe for human consumption and the environment, while other scientists¹⁶⁶ expressed reticence towards GM claiming it being potentially harmful for humans with irreversible unpredictable effects on the environment. Both groups refer to Science as a system of reference.

- Lack of support from influential representatives (adhering to the main rallying references)

Although the GM opposing front represents a strong environmentalist stand, some powerful Green organisations did not get involved in the planned protest

While environmentalism appears to be one of the most prominent rallying references amongst opponents' lines, for example, Greenpeace (who performed the spectacular field trashing in 2001 that motivated a halt on GM for 7 years) and World Wild Fund for Nature (one of the most influential environmental organisations in the world) were missing and did not provide a tangible support to the planned day of mass protest.

- Strong category actors investing in alternatives, which may be interpreted by the public as uncertain prospects and a weakening of their commitment to the defended perspective.

The BBSRC investing in the Non-GM-Monster-wheat developed by a research team in Oxford.

¹⁶⁶ Prof. Gilles-Eric Serallini - GM foods are unsafe, Dr Árpád Pusztai - GM potatoes poisonous to rats, Carol Mallory-Smith- GM contamination is irreversible, and other independent scientists.

Most cases refer to cracks within the lines of groups that are supposedly allied. These configurations increase uncertainty by shaking set commitments and warranties. Warranties could refer to official and contractual promises (in terms of prospects or representation) as it could refer to shared and acknowledged systems of reference/belief rallying networks. In the studied debate, both clans have been affected by these uncertainties, which would distance the debate from a settlement point and increase its conflicting propensity.

5.2.1.6.6 Counter-agencing through matters of concern

As the findings demonstrated, the scientists seemed well prepared, expecting opposition to their projects. This was clear in the way they had skilfully problematized their case, but also in the diversity of communication modes and devices they mobilised timely.

Traditionally, in GM controversies, GM advocates took defence positions, and were therefore trapped in the obligation to respond to their opponents' accusations. They accepted the 'culprit' role, playing those who need to account for their acts, and acted mainly on a re-active mode. The studied controversy displayed an interesting turn in the GM debate, at least in Britain. The scientists from the start rejected the 'culprit' role and presented themselves as 'concerned groups' as well. This had an immense impact on the course of the controversy, since it put them at the same position as those concerned about GM plans and prospects, and not at a disfavoured position from the start.

The scientists did not leave the *Problematization* of the case to be fully shaped and controlled by their opponents. By raising their matters of concern as well, which carry

their interests and represent their view of the world; they have contributed in shaping the terms of the debate, and thus undermined the sharpness of their opponents concerns and their rallying potency. Firstly, the scientists grounded their *Problematization* in environmental concerns, presenting their GM prospect as an eco-friendly solution and a new generation of GM. This placed them at the same socially and ecologically responsible level as their opponents. Then, they articulated matters of concern around their citizen-acquired rights allowing them to conduct scientific research and be protected from vandalism. And lastly, they raised concerns about the loss of scientific opportunity and backwardness thinking threatening social progress and freedom. Noticeably, all these concerns have strong anchoring and high receptivity in broad audiences.

The scientists succeeded in distancing their GM-wheat prospect from past infamous reputation of GM crops and to invert role through the articulation of matters of concern and 'being concerned' as well. The scientists' matters of concern not only acted as counter-agencies to opponents protest and decontamination plans, it also acted as a legitimating device. 'Being concerned' reflected ideas of social responsibility and ecological awareness, which changed tremendously how GM crops and their advocates were perceived, at least in this specific case.

5.3 Concluding section: Matters of concern performativity and market shaping

5.3.1 Matters of concern are not performative *per se*

To induce action matters of concern need to be able to relate, affect, and worry (Geiger *et al.*, 2014). It is not enough that some actors or public representatives appear being preoccupied by and express worries about a specific object, for the latter to become open to public discussion and review. The expressed matters need to become “*matters that matter*” (Latour, 2005, p6), which means, legitimate and rallying matters. It is only then that they become *performative*. For matters of concern to become such, this implies entering in relation *-being connected to what gives them voice and legitimacy-*, and rallying *-connecting collectives and interests*.

The study showed that the performativity potential of the raised matters of concern rested upon three main elements: (i) their strong networks, (ii) speaking potential of the latter, and (iii) their anchoring within the wider socio-cultural environment. Matters of concern become *performative* only if the first concerned actors who formulated these matters succeed in sealing strong alliances, build a *Perspective Speaking Potential* around raised matters, and ground these into *relatively* established cultural or belief systems, which allows them to gain scope and challenge current market configuration. Therefore, matters of concern are performative, only in relation to other entities forming their supportive *socio-technical-agencement*, otherwise they remain just as background contesting voices with no substantial pressure on contested frames.

5.3.2 A ‘concerned-concerning’ process

The case study underlined the state of ‘being concerned’ as one of the most prevalent sources of agency within the examined networks. Not only. The level to which actors were concerned appeared a crucial factor, which initiated the formation of the studied competing *socio-technical-agencements* and determined the degree of their involvement and commitment to the object of the debate, accounting for different shades of agency.

Mallard (2016) analysing urban market *agencements* described ‘concerning processes’ as a dynamic journey involving raising awareness, the rallying and mobilisation of concerned actors, and organisation of political action. He also highlighted boundary works involved in the process that allowed specifying the frontiers between supermarkets and small retailers and controlling interactions between different markets. What particularly caught my attention in Mallard’s narration of the process is, how the first phase in this *concerning process* that raised awareness about the matter in question amongst the political sphere and public had involved some vigorous protests and rebellious actions, some of which even engendered legal persecutions. This supports this study’s findings arguing that, for matters of concern to become legitimate objects for public debate and political intervention, they need to become for some, necessarily concerning¹⁶⁷.

¹⁶⁷ However, this does not mean it has necessarily to manifest through strong rebellious actions.

For this reason, I have chosen to call the process allowing matters of concern to be shared, go public, and acquire an acknowledge “*matters that matter*” status, a *Concerned-concerning* process, alleging that without being *necessarily-concerned* first, displeased actors would be just raising issues in general. As explained in chapter 2, matters of concern are not stem issues, but elaborated forms of expressions carrying interests and views of the world (Callon, 2009; Onyas and Ryan, 2014). It is precisely their elaboration, which is part of the *Concerned-concerning* process that shapes initially their rallying potential, attracts strong allies, and allows broadening their affecting scope.

5.3.3 ‘*Concerned-concerning*’ processes are necessarily subversive

Concerned-markets are subversive and reformative ‘moments’ of markets. They account for hot phases of a market’s existence, initiating and framing, or questioning and re-framing markets. This hot phase is characterised by the fusion of the economic and the political (Geiger *et al.*, 2014), where markets appear in short of readily frames to absorb emerging *concerned-groups* and their issues and cannot stop entering in a politicisation phase (Callon, 2007a). *Concerned-concerning* processes cause markets to become politicised, highlighting the need for procedural adjustments or new legislation to cover new prospects, and thus, could only be unsettling.

In the case of experimental markets, such as, testing a novel technology, qualifying a new product, or framing and integrating a complex and uncertain issue, *Concerned-markets* allow contrasting possible states of the world and discussing different options based on projected/imagined risks and benefits (Callon *et al.*, 2009; Azimont and

Araujo, 2014; Callon, 2009). These options and possible/imagined¹⁶⁸ worlds account for the mosaic of social fabrics and are necessarily in competition. In contested markets situations, where matters are built on experienced inequalities and damage, *Concerned-markets* offer a configuration that allows calling into question contested norms and market boundaries and engaging in collective works aiming at re-shaping these. As for experimental markets, this would also entail competition between different market versions, the contested one and its alternatives. Both forms of *Concerned-markets* appear then unsettling, since they would necessarily alter present legislation and forms of exchange once the raised matters were integrated within institutional frameworks.

Concerned-concerning processes appear mainly reformative (Cochoy, 2014a), but not essentially. ‘*Mainly*’, because they allow a more ‘caring’ approach to markets (ibid), and offer a space for hybrid forums to form, diverse interests to be represented, and the confrontation and discussion of possible states of the world to take place (Callon and al., 2009). ‘*Not essentially*’, because once the *Concerning-concerned* process is initiated, current settings and market boundaries are necessarily going to be altered, however, the survival of contested versions or the inclusion of all proposals within the market version being framed, are not guaranteed. Some market versions may disappear at the end of the process (Maguire and Hardy, 2009), some proposals will be overlooked and being ignored in the constitution of the new frame (Callon, 2007a). *Concerned-markets* include matters of concern built on contested aspects (e.g. ethical, environmental), but also some others that are built on worries about loss of opportunities

¹⁶⁸ Here ‘possible’ refers to a projection based on objective probabilities (mathematic calculations), while ‘imagined’ refers to a projection including suggestive probabilities (cultural, ideological). From this study’s epistemic standpoint, both are equally worthy.

or lack of representativeness of self-interests (e.g. the scientists concerned about the loss of scientific opportunities offered by the GM technology, organic farmers concerned about the survival of their sector). In all cases, the ultimate survival of a market version (even if it is still at its hypothetical/experimental phase) rests on the competitiveness of its concerns.

5.3.4 ‘Concerned-concerning’ process: To rally, to expand, and to integrate (Fig.5-3)

5.3.4.1 Phase 1: First Necessarily-concerned actors coalition and Problematisation

The case study showed that the first phase in the *Concerned-concerning* process is the come-together of *Necessarily-concerned* actors, who, for some reason (could be financial burden, moral incongruence, threat of interests), would reach the point where they could not manage or ignore the impacting ‘issue(s)’ anymore. The *Necessarily-concerned* actors coalition, then decision to take initiatives and *Problematisation* of the case, is what will cause the latter to go public. Their ‘pitching’ actions may involve public demonstration, but not necessarily. When they start interacting with other actors/collectives, promoting and arguing their case, *Necessarily-concerned* actors inevitably become visible, attracting the media and political attention. However, at this very first stage, the articulated matters of concern, focused and limited, are still in their emergence phase being publicized, and still look pretty marginal to the public and to institutions. The most important outcome of this stage is giving credibility to the raised matters.

5.3.4.2 Phase 2: Sealing strong alliances & developing a Perspective Speaking

Potential (PSP)

The second crucial phase in the *Concerning-concerned* process consists of sealing strong allies with other potentially *Necessarily-concerned* actors and developing a PSP in support of the raised matters. This is beyond merely appointing spokespersons. A PSP supposes an alignment of claims and communicated values across the strong supporting network first. This phase is to provide the raised concerns with reliable support, expand the scope of their representativeness, and affirm their status of ‘concerning matters’.

5.3.4.3 Phase 3: Expanding through Possibly-concerned actors

A third phase consists of expanding and diversifying the concerning scope beyond *Necessarily-concerned* actors through weak connections and elusive forms of representation. At this stage, the raised matters become established matters that need to be fixed and start their dialogical journey negotiating and gaining space into the contested market version, or dominating other proposals in the case of experimental markets. The market appears unpredictable, ‘infected’ by a diverse range of *concerned-groups* (more or less concerned), matters of concerns, and their ramification. Market boundaries become porous and fragmented, displaying a double-way movement, allowing new entrants to join and outgoing players to exit, evolving towards a new configuration.

This phase appears to be the most chaotic, but decisive one. Its main challenge is to expand the scope of the raised matters in terms of nature and supporting publics and

literatures, while at the same time trying to prevent a complete transfiguration of the controversy and the dissipation of ultimate aims set initially. There is always a risk that the debate gets appropriated by joining collectives who divert it completely from its initial targets. Thus, while *Necessarily-concerned* actors need to focus on interesting strategic allies and converting the maximum of *Possibly-concerned* actors into *Necessarily-concerned* during this phase in order to prepare for the integration of their matters and claims, they also need to preserve the lead role by continuously shaping the concerning process around their definition of the raised matters. Failing to do so, convergence would be compromised and uncertainty would rise further due to the explosion and unpredictability of new ramifications and claimers, which Callon (2007a) describes as an acceleration of the proliferation of the social.

5.3.4.4 Phase 4: Rallying strategic alliances and Institutionalisation

The last phase represents the integration stage, and appears to be a cooling phase. This phase starts by the rallying of strategic allies forming a market versions' supply chain (including regulatory bodies). Then, it expands to the media (in terms of coverage) and institutions, starting the negotiation of a procedural process. At this stage, the raised matters of concern that prevailed are getting contained and normalised, and market framing is getting more precise and re-centred, excluding what is judged outside the market. Once an approved legislation (between prevailing groups and institutions) is stabilised, a dissociation of the political and the economic re-appears, and the prevailing market version enters a state of stability. Of course, this 'stability' is understood to be relative and temporal, until silenced and excluded groups, or new affected groups by naturally emerging overflows, reach the state of being *Necessarily-concerned*, unite, and decide to act collectively.

To conclude, not all contested market versions would enter a *Concerned-market* phase, and end being altered or disintegrated. As the case study has attempted to demonstrate, this would depend on how successfully the first concerned actors would articulate their concerns, seal relevant alliances, and manage connectors of action, endowing the raised concerns with a rallying potential. The latter requires a diligent *agencing* and *counter-agencing* works attempting at achieving the convergence and irreversibility of the enduringly evolving supportive *socio-technical-agencement*.

Fig.5-3: Concerned-concerning process summary table

	1 st Necessarily-concerned actors coalition+ <i>Problematization</i>	Sealing strong alliances & Developing a <i>Perspective Speaking Potential (PSP)</i>	Expanding through <i>Possibly-concerned</i> actors	Rallying <i>Strategic Allies</i> , and institutionalisation
Market configuration				
Raised matters	<ul style="list-style-type: none"> - Limited - Focused - Marginal - Going public, denounced - Opening a breach in the contested market 	<ul style="list-style-type: none"> - Diversified - Ramified (explode + mutate) - Negotiating space - Legitimate concerns + resisted - Fragmenting the contested market 	<ul style="list-style-type: none"> - Diversified - Thickened (increase arguments and adherents) - Gaining space - Established matters, need to be fixed - Infesting the contested market 	<ul style="list-style-type: none"> - Re-centered, aggregated - Framed, Integrated - Recognized status - Normalized/ contained/ Integrated - Altering the market -> shaping new version
Actors & Networks	<ul style="list-style-type: none"> - Necessarily-concerned (Main-actors only) - Indeterminate actors (The object of the debate) 	<ul style="list-style-type: none"> - Necessarily-concerned (Main actors + SSN) - Indeterminate actors 	<ul style="list-style-type: none"> - Necessarily-concerned (Main actors + SSN) - Possibly-concerned actors - Indeterminate actors 	<ul style="list-style-type: none"> - Necessarily-concerned (Main-actors) - Strategic actors
Connections	<ul style="list-style-type: none"> - Strong connections 	<ul style="list-style-type: none"> - Strong connections 	<ul style="list-style-type: none"> - Strong + weak connections 	<ul style="list-style-type: none"> - Strong connections
Form of representation	<ul style="list-style-type: none"> - Self-representation + appointed spokespersons 	<ul style="list-style-type: none"> - Self-representation + appointed spokespersons 	<ul style="list-style-type: none"> - Self-representation, unsolicited representation, role fulfilment, depictions 	<ul style="list-style-type: none"> - Self-representation, delegation
Exposure	<ul style="list-style-type: none"> - Main-actors (+ appointed spokespersons) 	<ul style="list-style-type: none"> - Main-actors (+ appointed spokespersons) + SSN (except Funding-SSN) 	<ul style="list-style-type: none"> - ALL (except Funding-SSN) 	<ul style="list-style-type: none"> - Main-actors (+ appointed spokespersons)
Agencies	<ul style="list-style-type: none"> - <i>Agencing</i> - <i>Legitimising</i> - Active - <i>Problematization</i> 	<ul style="list-style-type: none"> - <i>Agencing + counter-agencing</i> - <i>Stabilising</i> - Active - <i>Intersement + Enrolment</i> 	<ul style="list-style-type: none"> - <i>Agencing + counter-agencing</i> - <i>Stabilising + expanding + competing</i> - Active + passive - <i>Intersement + Enrolment</i> 	<ul style="list-style-type: none"> - <i>Agencing + counter-agencing</i> - <i>Stabilising + expanding + competing</i> - Active - <i>Mobilisation</i>
Connectors	<ul style="list-style-type: none"> - Affecting matters - Shared vital interests 	<ul style="list-style-type: none"> - Ultimate goals/Fictional expectations - Underpinning ideologies - Articulated literatures 	<ul style="list-style-type: none"> - Ramified concerns - Articulated literatures 	<ul style="list-style-type: none"> - Accepted matters of concern - Agreed upon norms
Market boundaries	<ul style="list-style-type: none"> - Thick, pretty definite - Contested/experimental 	<ul style="list-style-type: none"> - Fragmented, porous - Concerned 	<ul style="list-style-type: none"> - Indefinite - Concerned 	<ul style="list-style-type: none"> - Adopting a new configuration + re-firming new boundaries

6 Concluding Chapter

This concluding chapter focuses on main contributions, and attempts to project these into promising future research routes, preparing the continuation of my work, and hopefully, inspiring other social researchers.

I have purposefully not considered an independent *Findings summary* section, as this would be mainly repeating what was described, analysed, and discussed over the extended previous chapters 4 and 5. I have constructed this thesis in a progressive form (building-up model), where each part provided the essence that made the following. The *CC-Lens 5* and the *Discussion*, in my opinion, have provided a distilled expression of the findings showing the connectedness between these and their implication. Initial, isolated findings have no relevance anymore at this stage.

Therefore, I propose to move a bit further in this chapter and refine even more some discussed items with the aim to highlight main contributions and propose plausible routes for future research.

To conclude this chapter, I will discuss main limitations and provide a brief reflective statement.

6.1 Thesis main contributions & Future research suggestions

6.1.1 Theoretical contributions

This thesis opened gates for more than one possible theoretical contribution. However, and aiming at being consistent with the aforementioned research questions defining the

goals of this research, I am going to focus here specifically on shades of agency, counter-*agencing*, matters of concern performativity and market shaping.

The following ensue directly from the discussion presented in chapter 5.

6.1.1.1 *Shades of agency and counter-agencing*

The study suggests discerning different shades of agency in order to understand better the dynamics of socio-technical-*agencements*. *Agency* appears dependent on the level to which an actor is concerned, and by extension, on the degree of commitment to the supported cause. The latter links *Agency* to *Matters of concern*, which explains the performativity of these.

It appears that, for socio-technical-*agencements* (associated, coordinated, and aligned entities endowed with agency) to exist and endure, they must involve leadership, continuous *agencing* activities, as well as, *counter-agencing* endeavours acting against destabilising effects and favouring the network expansion at the expense of competing formations. Understanding both, shades of agency and counter-*agencing*, appears crucial to comprehend the dynamics of socio-technical-*agencements*.

6.1.1.1.1 *Shades of agency*

This study sheds light on an extremely important aspect, which appears to provide additional insight on how agency is acquired by a network, transforming the latter into a socio-technical-*agencement*. It is precisely because a socio-technical-*agencement* presents uneven distribution of agency across its network that it is actually capable of agency. In other words, it is because some actors have weaker agency than others, and

could even present passive agency through the fulfilment of pre-determined roles or by allowing being represented and depicted in a certain way that serves the purpose of the *socio-technical-agencement* they were brought into, that agency becomes possible.

A *socio-technical-agencement* is not only a hybrid arrangement in terms of human and non-human entities, but also in terms of strong and weaker, active and passive agencies. This is a condition for the whole *agencement* to acquire agency, since the collective could only move forward converging towards a (seemingly) shared ultimate goal if some actors present this flexibility of being moved around and ‘submitted’ to *Necessarily-concerned* actors’ plans. If all actors were to present strong and active agency, then the process becomes too complicated and the clash of equally strong agencies would prevent harmony¹⁶⁹.

Furthermore, the study showed that *Possibly-concerned* actors, those that were mostly acting through a passive mode (being attributed a role, being represented without clear mandate, and being depicted) present actually the larger group of actors. They form an impacting controllable ‘mass’, as long as they do not decide to speak for themselves and switch to an active mode of agency. The more *Necessarily-concerned* actors could rally from this genre of actors to their cause (through representation and discursive strategies), the more agency their *socio-technical-agencement* would acquire through the mobilisation of these *passive* actors despite their unreliable commitment in the long-term. Actually, the long-term commitment of unstable actors is not a target for

¹⁶⁹ In theology studies, this is known as the principle of ‘*Mutual hindrance*’. *Mutual hindrance* occurs when two entities that possess equal power would oppose each other’s will when the desired actions by each happen to be contradictory. (Maghnisawi, 2007).

Necessarily-concerned actors, except from strategic allies (presented in chapter 5). Once the raised concerns reach the integration/normalisation stage, the dependence on such unstable collectives drops naturally.

This is to say also, the way agency is understood should not be limited to '*performing*', but should extend to '*allowing/inducing action*'. The study illustrated how, for example, by being '*missing*' when expected to be '*present and fulfilling a role*', an entity could influence the course of events and induce agency.

6.1.1.1.2 Counter-agency

The study showed clearly that agency could not be appreciated appropriately without looking at counter-agencies, these protective actions permanently dismantling internal, and more specifically, external destabilising forces. *Counter-agencing* appears at the heart of action and does not present a punctual effort.

Similarly to *agencing* activities, which are understood to constitute on-going tireless efforts, *counter-agencing* appears to be an essential and continuous endeavour, preventing internal and external hindering effects weakening *socio-technical-agencements'* commitment to set goals. When internally directed, *counter-agencing* activities can be seen as maintenance activities keeping the network entities perfectly aligned and isolated (from external *Interessment* attempts). When externally directed, they act like an *Immune system* preventing the misalignment or disintegration of the collective due to external attacks on its alliances and values. This is what allows achieving convergence and irreversibility, inherent aims for a *socio-technical-agencement* to be effective.

Bringing counter-*agencing* activities to the surface highlighted an interesting link between uneven distribution of agency throughout an acting network and internal counter-*agencing* activities. In fact, these activities are meant to ultimately weaken the agency of enrolled entities to unable or reduce the risk of potential dissidence and disavowal (Callon, 1986).

Unravelling counter-*agencing* activities also helped appreciating better the contingent and competitive reality of markets. *Socio-technical-agencement* emerge and evolve in the midst of struggle¹⁷⁰, and their trajectory is one of perpetual fight against destabilising forces, whether these manifest in the form of internal dissidence or external threats propagated by competing versions. What differentiates counter-*agencing* from *agencing* though, is that the former is generated with regards to another action, and intends specifically to attenuate its effects or annul it.

6.1.1.1.3 Moving forward

These contributions aspire interacting with the broader social theory literature on agency, inviting future research to shift attention from human/non-human debates, to rather explore in more depth passive/active and weak/strong agencies. The pervasiveness of objects and devices in human environments¹⁷¹, obviously accentuated in contemporary societies, makes it appear a vicious circle to come back tirelessly to discussions about intentionality and human volition. Human volition is known and

¹⁷⁰ Promoting a new concept/product, defending a condemned/controversial one, fighting to preserve acquired advantages...

¹⁷¹ I am deliberately not restricting it to 'contemporary' here, as devices/objects have always been annexed to humans, establishing their status/function and allowing them to act, since humans learned to use tools and live in society (e.g. the warrior's sword, the soldier's uniform, the monk's outfit, the king/queen's crown)...

acknowledged, and the issue is not about equating humans to non-humans, but about identifying the trigger or facilitator of action (Latour, 1994).

Also, despite the fact that market studies recognised uneven distribution of agency across acting collectives, the commitment to a collective form of agency, where an actor is understood to be acting only in relation to a network and action can only be the fruit of *pluri-efforts*, seems to have prevented somehow the exploration of elementary parts within the whole. Differentiating socio-technical *entities* and exploring shades of agency, as this study showed, does not deny the idea of *Agency* being a collective construct. Without strong and weaker, active and passive forms of agency being purposefully related within a given *socio-technical-agencement*, the latter would not exist. In the studied case, collective agency was constructed through rallying and federating elements (e.g. ‘matters that matter’, pervasive concerns, rallying literatures and underpinning ideologies), but also through a certain configuration of ensuing networks (e.g. leadership, representation, depictions, proximity to power). These aspects need to be explored further, namely in cool phases, to determine their weight in stabilising *socio-technical-agencements* and in performing markets.

6.1.1.2 *Matters of concern performativity and market shaping*

I have discussed thoroughly in chapter 5 how matters of concern become performative, highlighting the *necessarily-concerned* stage making them first ‘matters that matter’, and the ‘*concerned-concerning*’ process endowing them with a rallying potential enlarging their scope of influence. I have also emphasised on the key role played by SSN, developing the *Perspective Speaking Potential*, and the rallying of *Possibly-concerned* actors/masses. These aspects represent some of the key contributions of this

research. In this section I intend attracting attention specifically to two aspects related to *Concerned-markets'* dynamics that could constitute interesting routes for future research:

Unsolicited representation of indeterminate masses

The study discussed multiple modes of representation, beyond the notion of spokesperson. Actually, I have reserved the latter to appointed spokespersons, in order to underline the predominance of unsolicited representation. The latter appeared even more prevalent when it comes to the representation of indefinite large groups holding a quality that matters for their (unsolicited) representatives, like consumers (buying power) or citizens (voting power), especially that these collectives tend to merge and be merged into one of their multiple identities, when it appears profitable to do so. Consequently, although unstable, these collectives arouse keen interest of both opposing perspectives alike.

It would be interesting to understand better how competing versions succeed in legitimising themselves as *spokespersons* for such broad collectives, speaking and acting on the public/consumers/citizens' behalf, and the weight of these unstable rallied group in subverting markets. It would be equally relevant I think to explore what favours their silence and what would trigger their dissidence.

Ubiquity of self-driven interests & matters of concern legitimising role

The findings showed how the initial *Problematisation* was actually shaped by both opposing clans, where the scientists did not accept the 'culprit' role from the beginning

and consequently intervened in shaping the public case of their GM-wheat prospect. This was different from previous configurations, where biotech companies' response was mainly guided by their opponents' *Problematisation* and took (publically) a 'defensive' position, although varying in aggressiveness.

Beyond the performative role of matters of concern discussed in chapter 5, rallying actors and federating alliances around and within a given perspective, it appears that their role included legitimising the latter, freeing it from reproachful labels. By presenting themselves as '*concerned-groups*' as well, the scientists clearly fought back their opponents' accusations from a legitimate position and could have recourse to institutional support and use the 'law' at their advantage.

This confirmed the ubiquitous nature of self-driven interests to market reality. Actors may be concerned about the profitability of the market they are operating within, the survival of their market version, as they could be concerned about general public interest and social wellbeing, such as social equality, environmental and ethical matters. Also, noticed similarities between disputing actors contentious expression (e.g. both voicing discontent and denouncing prejudice) suggests that we cannot logically reserve the concept of '*being concerned*' and the attribution of '*concerned-groups*' exclusively to ethical or common-good oriented concerns. The study and other examples provided in chapter 2 showed that *Concerned-markets* carry profitability and self-interest concerns as well, and criticised actors may also present themselves as '*being concerned*'.

However, the links between private interests (whether individual or collective) and articulated concerns are still to be explored in more depth. While *Concerned-markets*

were presented often as an opportunity to democratise markets, it is still not very clear whether this would be the case, noticing the re-appropriation of the ‘*concerned*’ status by those actors that were supposed to be taken responsible for the emergence and proliferation of disturbing matters (whether actual or projected). The studied case also resent us back to *Power* questions. Proximity to power through a successful *Enrolement* of politicians, obviously gave the scientists a competitive advantage, preventing their opponents from institutional support and initiating the integration of their raised matters at the expense of competing ones.

6.1.2 Methodological contribution

6.1.2.1 A relational approach

Although the discursive aspect could not be completely removed from the picture, this study by mixing principles embedded in the ANT and the DDA provided an original example of a ‘relational’ approach in application. A ‘relational’ approach is an approach that looks specifically at links between different components of a studied reality, rather than principally focusing on the meaning carried through discourse. Meaning is sought by examining first the purpose of discourse, its originators, its audiences, its underpinning values, and how it links these different items. A ‘relational’ approach does not study static statements, but statements on the move tracing the trajectory of a story, another way of telling stories than narration.

6.1.2.2 *Introducing a ‘new’ method for the study of market contentiousness*

This study used an original method, the Cartography of Controversies (CC), which to the best of my knowledge, was not applied in management research previously. First reviews were rather reticent. Fortunately, I believed in its potential¹⁷², and the method not only turned out to be perfectly suitable to my research aims, but also delivered beyond expectations. It allowed a progressive well-paced investigation of the debate from data collection to analysis of emerging insights. It informed about the most and less relevant data¹⁷³, preventing me from being hesitant or overwhelmed at any stage, and generated abundant possibilities for the analysis of the data. Actually, the CC lenses showed how ‘documents’ could equate ‘observation’.

The CC also allowed enhancing the ‘Second degree Objectivity’ discussed in chapter 3, through the multiplication of observational lenses and openness to multiple perspectives. Finally, it linked gradually and subtly *micro* competing statements to their *macro* projected states of the world, dismantling the connectedness between both realms and enhancing the comprehension of the studied controversy.

6.1.2.3 *Providing a thoroughly described example of its application*

The flexibility of the CC as an observational toolkit does not suggest a simplified task. In reality, the absence of methodological conventions, although it leaves room for the researcher to make choices and accepts mixing different methodological

¹⁷² Facilitated by my supervisor support.

¹⁷³ It is crucial to admit that all data that can be collected should not and will not be relevant for the case (Dumez, 2013).

perspectives/techniques, it necessitates a complex montage of these allowing a sound interpretation of the observed reality.

The CC is a seemingly simple tool that gains complexity while performed, meeting the complexity of the observed reality, dismantling it, and then re-organising it. It opens up to all possible ‘contaminations’, seeking meaningful intersections and divergences.

6.1.2.4 Re-examining seminal works

The *Market Studies* literature draws heavily on the ANT authors’ contributions, especially Michel Callon, Bruno Latour, and John Law. Their most impacting ones were commented and interpreted by an array of researchers interested in the study of markets. However, a fresh look at these original works revealed some deep insights that finally seemed shadowed by the flow of interpretations and integration of these works into various topics and research orientations, although valuable. It also re-confirmed the topicality of these works. This is the reason why there is profuse referencing to these works in this thesis. Callon’s seminal article on *Saint Brieuc Bay Scallops* (1986) is a priceless gift to the academic community.

6.1.3 Contribution for practice

The following ensue mainly from the CC analysis presented in chapter 4.

6.1.3.1 Dissolving pervasive concerns

The findings showed that some concerns have a better rallying and expanding potency providing grounds for other ramified matters, that I called ‘pervasive concerns’. It

seems logical then that, to understand and ultimately respond to a ‘*concerned-concerning*’ stance, it would be more efficient to identify ‘pervasive concerns’ first and try to tackle these, by eliminating, neutralising, or integrating them. ‘Pervasive concerns’ are like leaks, as long as they are ignored and not fixed, they would flow in the form of ramified matters and cause trouble to their competing/opposing version.

6.1.3.2 *Discursive, authoritative systems, and representation power*

The findings showed how discursive elements and strategies were essential to link the raised concerns to their articulated literatures and underpinning values. These are held through an intricate combination of discourse and authoritative representations, such as ideologies or power positions. Both go in pair, and more importantly, are evolving in a shared space, in permanent competition with opposing representations.

For both groups, it appears crucial to pay utmost attentiveness to the articulation of their own discourses in relation to authoritative systems of reference (recall those in line with their perspective, and avoid frontal clashes with non-compliant, yet powerful ones), while simultaneously dismantling nascent conflicting literatures and attacks on their references.

In the GM opponents’ case, communicating through ‘*wholesale identities*’ and ‘*shadow coalitions*’ significantly undermined their speaking potential and credibility. I think, it is a matter of emergency for them to restructure their organisation and communication strategies, building credibility, coherence, and effectiveness. It appears also crucial at this stage to get rid of the ‘activists’ label, and try to account more faithfully for the

diversity they represent in terms of interests, concerns, social and intellectual backgrounds, and various degrees of opposition.

6.1.3.3 Progressive integration into the institutional matrix

There was a clear difference between opposing groups regarding their integrative ability into the wider institutional environment. GM opponents need to consider institutions as strategic allies and not mainly as adversaries. Markets do not exist without institutions, which means, a market version would remain marginal until it finds its way into institutions to be legitimised and normalised. GM opponents clearly expressed predominantly a conflicting position with power, which condemned them to marginality, despite the diversity of their collectives.

As discussed in the findings, there are soft ways to trace routes to institutions, namely, by considering councils and partnerships with research centres and governmental bodies. GM opponents should give priority to such plans, which would also encourage them to work on securing more stable alliances and forms of funding.

6.1.3.4 Betting on 'sustainability' alone, will not definitely resolve the issue

The study showed clearly the pervasiveness of environmental concerns in contemporary markets. However, it also highlighted an equally important kind of concerns hampering the establishment of the GM crop market in Europe specifically and beyond, which are of a socio-economic and institutional nature. GM supporters focused on shaping their GM-wheat prospect as environmentally-friendly favouring future sustainable farming, which was a relatively successful strategic move, however this will clearly not be

sufficient to defend fully the GM cause in the public sphere in the long-term. The GM market version is still economically and socially incompatible with other existing versions, due to the unresolved risk of contamination, the scientifically proven irreversibility of the latter when it occurs, and the pending question about liability. Ignoring these core matters would complicate even more the GM trajectory, despite present institutional support. Institutions are not essentially *Necessarily-concerned* by the GM cause, and despite their apparent rigidity, they constitute eventually a variable block.

6.1.3.5 Fixing divergences in terms of temporality and authoritative evidence

Time wise, the scientists appeared like ‘detached’ from the past, with little reference to ‘*Past factual occurrences*’ except for the anti-GM activism threat that was perceived in England a decade ago. This confirms their willingness to separate their GM-wheat prospect from its predecessors. While opponents referred massively to past occurrences to support their claims, which also denotes a rebuttal of the idea of ‘2nd generation of GM’.

Another important point here is the level of divergence in the appraisal of supporting evidence. While opponents consider independent research and think globally, referring massively to studies conducted abroad and GM incidents around the globe, the scientists referred to local occurrences and segregated their research (and that of their supporters) from ‘other’ research sowing doubt about their perspective.

The distinction between risks based on *Objective probabilities* and those based on *Subjective probabilities* also highlighted ideological clashes between actors’

approaches and perspectives, where some accept only objective risks, while others demand subjective risks to be given the same consideration. The two main positions appear antagonistic in their approach to *Risk*.

Lens 4 and 5 also showed the role played by underpinning ideologies feeding contradictory projected states of the world, hardening the terms of the debate. This situation appears closer to a ‘*dialogue of the deaf*’ than a reasonable debate on a matter that matters.

To conclude, I personally think that *WE* need a less passionate and more constructive discussion of the co-existence of GM and other forms of farming. Constructive negotiation starts by attenuating these divergences, to allow a better appreciation of adversaries’ concerns and standpoints from both opposing sides. Dogmatic thinking, when projected on others who do not submit to it voluntarily, becomes a real barrier to any fruitful exchange. Co-existence supposes *sharing* not *imposing*, and the first thing that appears worth sharing in this debate is respect of other beliefs outside one’s dogma and *empathy*.

The advent of GM farming reached a point where it would be unrealistic to demand its disappearance from the farming landscape. Similarly, other forms of agriculture, such as organic farming, are solicited by so wide range of consumers worldwide that they cannot be ignored and abandoned to an existential fight against uncertain and irreversible contamination risks. It appears crucial today to join forces and think seriously about possible co-existence plans, which could be *Scientifically, Culturally* and *Economically* validated.

6.2 Limitations

6.2.1 Data

In any research, collected data cannot represent the studied subject fully. Collection choices are necessarily reductionist, to make a subject reasonably approachable. Accordingly, Dumez (2013) describes any data as being inherently deficient.

In this study, despite the relevance of media data to the posited questions in terms of representativeness and ability to capture ‘live’ interactions, establishing chronological sequences allowed highlighting ‘silent’ periods where data seemed lacking, confirming this view. Due to the advent of social media platforms and popularity of online ‘conversations’ over the last decade, these forms of digital interaction seem to be hosting a substantive part of exchanges. What was referred to by ‘silent’ periods in this study, could present an effervescent facet if we were to consider online interactions as well.

Also, the collected data was gathered exclusively in its textual form, as saved in the *Nexis* database. It is probable that some articles may have presented images in their original form, which in this case would be missed.

6.2.2 Time limitation

Applying the CC as stated above has been a challenging, but fruitful endeavour. Emerging topics and analytical possibilities were way beyond this project time frame. I had to choose which insights to favour for my discussion chapter, refining my research questions. There were some other relevant topics in relation to *Concerned-markets* that

emerged but could not be given enough attention, namely the impact of *Uncertainty* levels on the ‘concerned’ scope, the limits of expert knowledge and split of authoritative systems.

6.3 Reflective statement

This research project, despite not being my first, helped me acquire much more maturity as a researcher, due to the scale of the project and its duration. I have selected the following few points to share with future PhD candidates.

Confirming the context of the study first

Reaching the end of my first year, I had a quite clear idea about the literature and methodological approach I was interested in, but had not yet sorted completely the context matter, the latter appeared a bit too broad. I was from the beginning interested in GM foods, however selecting a ‘niche’ controversy that presents a ‘hot’ phase that would constitute an apt and reasonable choice for a doctoral research, was a bit challenging. It took literally nine months of ‘trials’. It was a quite stressful period of my PhD. For future research projects, I will certainly consider testing and confirming the context of the study as a first priority.

Considering proper writing at an early stage

Since the first course I attended in my PhD training, the most redundant statement must have been ‘*Start writing at an early stage*’. I did. But, not the intended way. I wrote extensive notes and memos, on almost all main topics I thought would need to be discussed at some point. I recorded my emerging ideas as well, and took reading notes.

Despite having organised all by topic, I found myself after 3 years overwhelmed by all this material, and it took me a tremendous time to convert most relevant captured insights into a clean flowing text. I think, this experience confirmed to me that ideas only get refined over *written* forms of text, and not really through isolated progressive thoughts/reflections. For my future research projects/articles, I am considering incremental writing, where new captured insights (related to the same project) would be systematically added in relation to and merged with what already exists.

Being confident enough to interact fully with ‘new’ methods

To apply the CC efficiently, I had to adjust it slightly to improve its coherence and performance within the studied context. Of course, this needed to be backed up by some strong-enough justifications, but as a researcher, I did not prevent myself from interacting fully with the tool and shaping it when it was necessary and reasonable to do so.

Also, to construct my validation framework, I did extensive research on the subject, but no author(s) had a proposal that seemed matching perfectly my research validation needs. I had to conceptualise my own framework, nevertheless based on insights found in the extensive literature on the question. I think, *junior* researchers as well, should feel confident enough to play with the literature they are exposed to. This is what stimulates creativity and enhances their research potential.

And finally,

Freeing one’s mind from naturalistic evaluations

As it can be noticed through many discussions presented in chapter 3, social researchers seem pushed into an ‘accusing’ box and somehow compelled to integrate defensive

statements and strategies into the body of their research design due to this systematic assessment of the validity and *scientificity* of their research outcomes by contrast to naturalistic approaches and standards. We, social researchers, have been for decades in this defensive loop. All is not bad about it. It helped us, as a community, to reflect more deeply on our methods and develop their efficiency, scope, and validation strategies. But today, I think we can move forward and detach our research approaches from this systematic comparison with naturalistic approaches, and one way to do so, is to dare and start talking about it differently (e.g. talking about ‘knowledge transferability’ rather than ‘knowledge generalizability’).

The journey mostly stops here for this PhD project, but I hope this will announce the start of something equally or even more exiting and interactive...

Lately, I admit, I have started to feel impatient to complete this thesis and to get a sort of relief... it has been a demanding enterprise.

It is not submitted yet, and I feel like I’ll be missing it... there have been so many nights, days, weeks and months where it was one of my top priorities.

Hope You have enjoyed reading through and engaging with its assorted and colourful landscape as I have enjoyed shaping and painting it.

7 References

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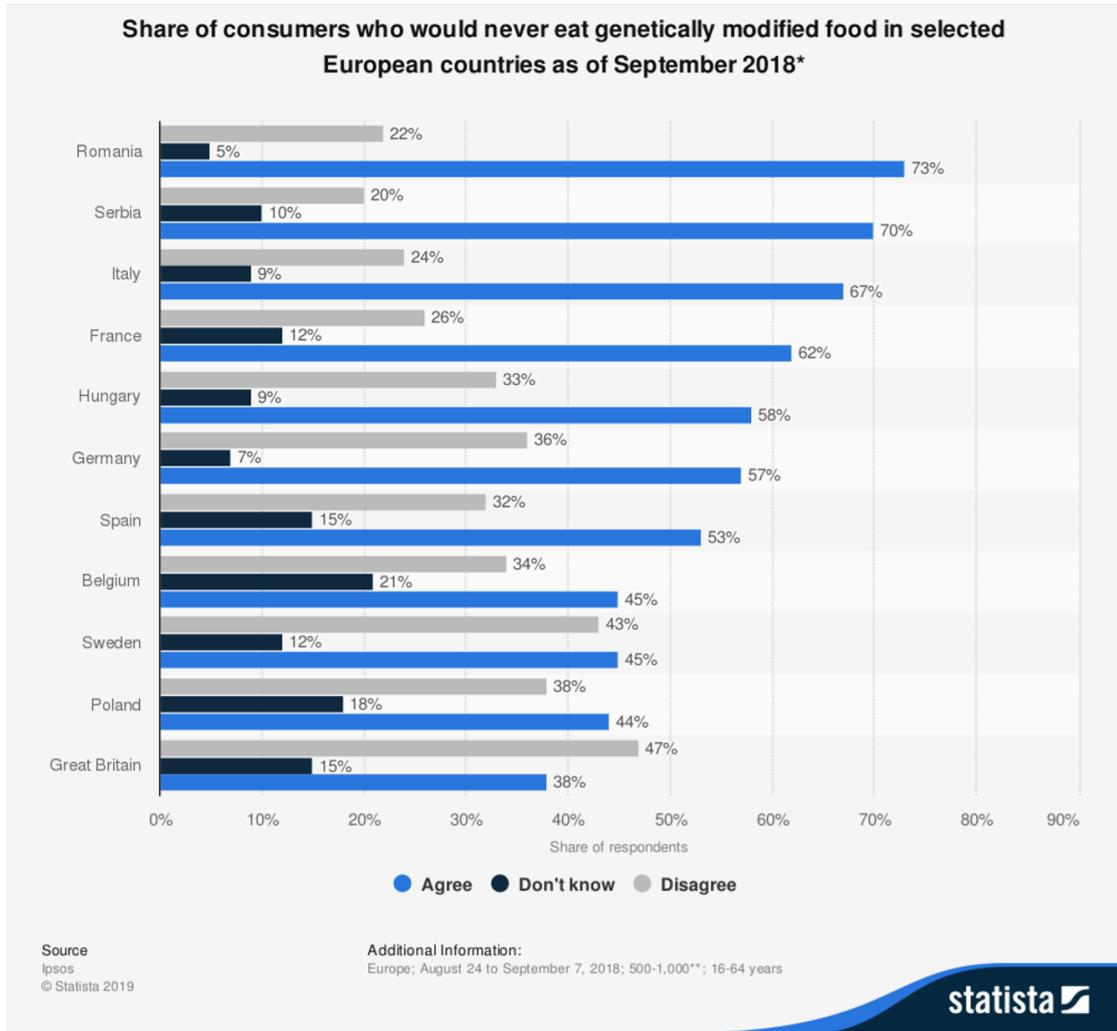
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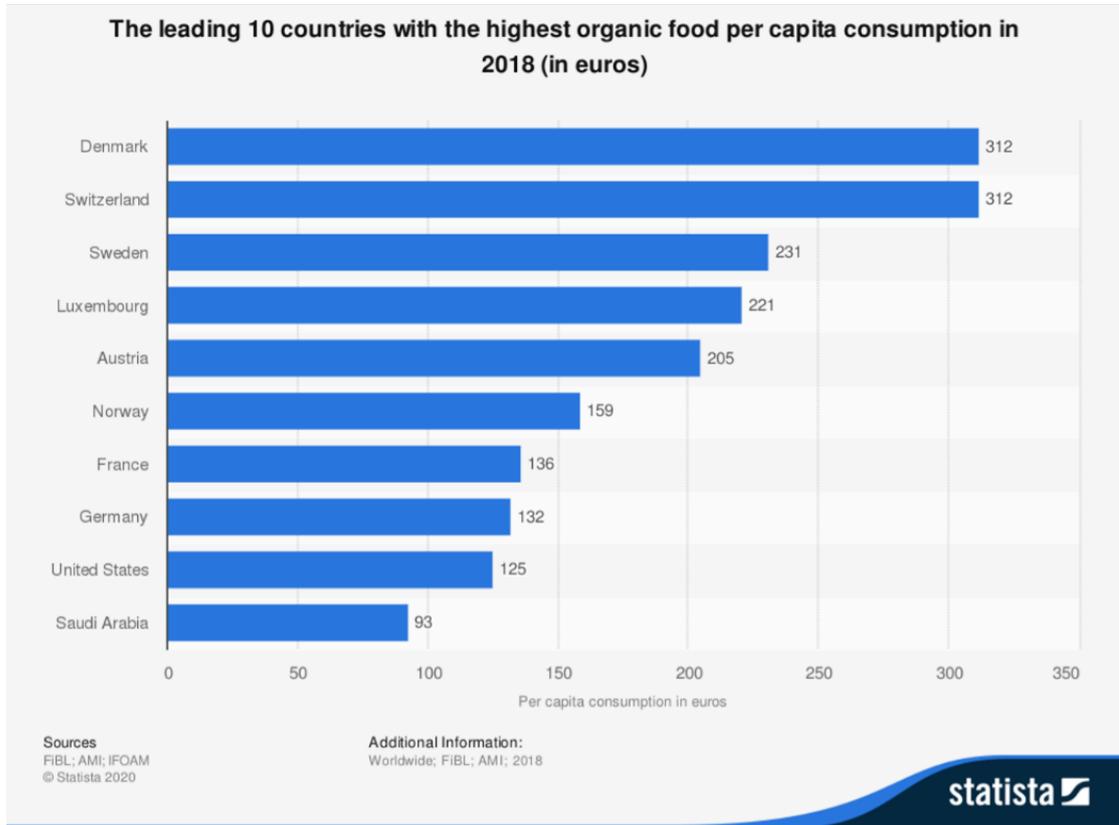
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8 Appendices

Apx.1-1: European consumers rejecting GM food in 2018



Apx.1-2: European consumption of organic food in 2018



Apx.3-1: Main database: List of press articles

Main database: List of Press Articles

	Pre-narratives
	Rothamsted GM-wheat debate
	Rothamsted GM-wheat related discussions

Article Nb.	Month	Year	Headline	Author	Source
1	Jan.	2001	Monsanto to launch the first GM loaf	Steve Connor /Science Editor	The Independent
2	Jan.	2001	Biotechnology: Why Monsanto thinks GM Wheat is the next best thing: As GM bread heads for American shelves, trade negotiators in Europe prepare for a battle over labelling	Steve Connor /Science Editor	The Independent
3	Jan.	2001	Wheat trial is condemned as threat to safety...	Shamim Chowdhury	The Express
4	Nov.	2003	Cabinet papers warn Canada off GM crops: Farmers fear long-term threat to food exports	Paul Brown	The Guardian
5	May	2004	Monsanto abandons its plans to sell GM wheat	Steve Connor /Science Editor	The Independent
6	Dec.	2009	Time is now ripe for GM wheat to make a comeback	Henry Miller	The Guardian
7	June	2011	GM wheat crop trial awaits government green light	Hal Hodson	The Guardian
8	Sept.	2011	Green light for GM wheat trial to tackle aphids	Hannah Devlin	The Times (London)
9	March	2012	A new kind of wheat, designed to reduce the use of pesticides	Steve Connor /Science Editor	The Independent
10	March	2012	Fears over GM Wheat that fends off greenfly	Tamara Cohen Science Reporter	Daily mail
11	May	2012	GM wheat scientists plead with protesters not to destroy 'years of work'	James Titcomb	Mail Online
12	May	2012	Scientists send video plea to anti-GM crop campaigners	Ian Sample Science correspondent	The Guardian
13	May	2012	Protesters threaten to destroy GM wheat crops		Daily mail
14	May	2012	A chance to move the GM debate on	Ian Sample Science correspondent	The Guardian
15	May	2012	The tendrils of GM inch in by the back door	Charles Clover	The Sunday Times
16	May	2012	A research station in the prosperous town of Harpenden in Hertfordshire faces being overrun by anti-GM activists on 27 May	Robin McKie Science Editor	The Observer
17	May	2012	Man arrested after break-in at GM wheat trial site; An open-air trial of a genetically modified strain of wheat has been vandalized...	Nick Collins	The Telegraph
18	May	2012	GM Vandals are shutting down scientific debate		
19	May	2012	Intruder fails to disrupt GM trial	Nick Collins	The Telegraph
20	May	2012	GM wheat 'damage attempt' condemned	Emily Beament	The Independent
21	May	2012	GM wheat vandalised a week before protesters threatened to uproot crop	Nick Collins	The Daily Telegraph
22	May	2012	Fair crop, guy; accused due in court over attack on GM wheat trial	Tom Parry	The Daily Mirror
23	May	2012	Aristocrat old Etonian eco-warrior 'vandalises' contro-versial GM wheat field trial	Daily Mail Reporter	Mail Online
24	May	2012	Police: Farmer charged over damage to GM wheat trial	Ian Sample Science Correspondant	The Guardian
25	May	2012	Many plants have been genetically modified to satisfy consumer demands		The Telegraph
26	May	2012	Back to the battlefields: But have the arguments changed?	Leo Hickman	The Guardian
27	May	2012	GM crop trials are needless and reckless: Farm protests	Joanna Blythman, the author of 'What to Eat: Food that's good for'	The Independent
28	May	2012	Don't vote Green until they drop the anti-science zealotry	Tom Chivers	The Telegraph
29	May	2012	Feeding a hungry world - or meddling with laws of nature?	Michael McCarthy	The Independent
30	May	2012	Though Greens sometimes get their science wrong, they're better than most	Sunny Hundal	The Guardian
31	May	2012	Lottery funding for anti-GM activists	Patrick Sawyer	The Telegraph
32	May	2012	This experiment in food technology has to continue	Editorial	The Observer
33	May	2012	Hundreds of protesters stage demo at site growing experimental GM wheat crop	James Titcomb	Mail Online
34	May	2012	Opponents of this crop trial are blind to the food crisis	Steve Connor	The Independent
35	May	2012	Police keep activists from tearing up GM crops	Shiv Malik	The Guardian
36	May	2012	The 'Frankenfood' experiments	Ian Sample, science editor	The Guardian
37	May	2012	Threats to destroy GM crops amount to vandalism in the service of superstition	Editorial	The Times
38	May	2012	Hundreds of activists are prevented from destroying controversial test crop of wheat	Steve Connor	The Independent
39	May	2012	GM crop-trial website taken down by cyber-attack	Adam Vaughan	The Guardian
40	May	2012	Police block GM wheat crop protest	Luke Salkeld	Daily Mail
41	May	2012	The GM lobby still trying to force increasingly discredited Frankenstein food down our throats	Joanna Blythman	The Daily Mail
42	June	2012	GM foods: Science and society	Guardian leader pages	The Guardian
43	June	2012	True greens know GM is the answer	Mark Lynas (a former crop vandal who is supporting GM technology)	The Sunday Times
44	June	2012	GM crops good for environment, study finds Bt Cotton	Damian Carrington	The Guardian
45	Dec.	2012	GM trials to go ahead next year	Louise Gray Environment Corresp	The Telegraph
46	June	2013	US Department of Agriculture probes Oregon Monsanto GM wheat mystery	Suzanne Goldenberg	The Guardian
47	July	2013	The great GM food hysteria: Do you believe eating genetically modified crops is like dining with the devil?	DAVID ROSE	Mail Online
48	June	2015	Taxpayer-funded trial of GM wheat designed to beat bugs and cut need for insecticides ends in a £3million failure	SEAN POULTER	Mail Online
49	June	2015	Search for Aphid-resistant crop is £3m flop	Not specified	The Daily Telegraph
50	June	2015	Field trial of genetically-modified wheat failed to show it can repel aphid pests, scientists say	Steve Connor	The Independent
51	June	2015	GM wheat no more pest-resistant than ordinary crops, trial shows	Ian Sample	The Guardian
52	June	2015	GM wheat trial to beat bugs ends as a £3M failure	Sean Poulter	The Daily Mail
53	June	2015	Anti-GM protesters don't understand how science works	Michael Hanlon	The Telegraph
54	Nov.	2016	GM wheat sprinkled with GOLD DUST could be grown in the UK in a world first - but is it safe?	Shivali Best	Mail Online
55	Nov.	2016	Two thirds of public would back growing GM crops, study claims	Oliver Moody	The Times
56	Nov.	2016	Scientists seek permission for world-leading trial to show grain yields can be boosted by 40 per cent	Sarah Knapton	The Daily Telegraph
57	Nov.	2016	The GM Wheat dusted with Gold	Sean Poulter	The Daily Mail
58	Dec.	2016	Monster-wheat grown by Oxford could revolutionise farming	Sarah Knapton	The Telegraph
59	Dec.	2016	Crop spray makes wheat 20% larger, and it's GM free!	Victoria Allen	The Daily Mail
60	Jan.	2017	Fertile ground in Britain for next gen of GM crops...	Tom Bawden	The Independent
61	Feb.	2017	Genetically modified 'super-wheat' will be grown in the UK after trial is given the go-ahead despite fears of contamination	Sean Poulter	Mail Online
62	Feb.	2017	Superwheat trial will start in the spring	Ben Webster	The Times
63	Feb.	2017	How the mutant strain escaped across the US	Tom Leonard	The Daily Mail
64	Feb.	2017	Safety fears after new fields of GM super wheat get go-ahead	Sean Poulter	The Daily Mail
65	Feb.	2017	Brussels 'will block' GM food from Britain	Ben Webster	The Times

Apx.3-2: Codes listing

C1: Triggering events	Nb. Of Articles
(Pre-Narratives) The 1st American GM Wheat trial	5
(Pre-Narratives) The Canadian cabinet paper on GM crops	1
(Event 1) The GM-Whiffy-wheat trial announcement	4
(Event 2) The GM-Whiffy-wheat break-in & mass protest	36
(Event 3) The GM-Whiffy-wheat trial results	6
The American GM-wheat escape	2
The Oxford non-GM wheat spray alternative	2
(Event 4) The GM-Super-wheat trial announcement	9

C 2: Competing statements
Opposing
Supporting
Informative

C4: Generic concerns
Continuation of the trials/Scientific progress
Environment
Healthier/More nutritious food
Food Security/Production
Food Safety/Quality/Authenticity
Irreversibility of effects
Market (Economic/Commercial)
Market (Institutional/Ethical)
Unknown effects
Unnaturalness/ Weirdness

C5: 'Concerned-concerning' stage
Sowing seeds of concern
Selling matters of concern
Responding to concerns (R1)
Response/rebuttal-Level 1 (R-L1)
Response/rebuttal-Level 2 (R-L2)
Translating concerns
Integrating concerns

C 3: Mobilising concerns
Anti-GM activism
Anti-Science spirit/Ignorance of science
(Anti-GM) Vandalism/Trials' interruption
Aphids' attacks on Wheat
Biodiversity/Ecosystems
Consumer rights & choice
Contamination-Conventional crops
Contamination-Outcrossing with the wild
Corporate hegemony & excessive profit making
Cow's gene
Damage of other research plots
Defying Nature/unnatural
Denying non-sc/compliant forms of Knge
Enhance farmland productivity
Excessive use of pesticides
Food authenticity/Consuming frankenstein foods
Food democracy
Formation of pesticide immune species
Generally harmful
GM lobbying/Unclear political agenda
Growing population/Imminent food shortages
Institutional blockage
Institutional credibility/Bias
Irresponsible research/Waste of public money
Lack of control
Liability
Loss of export markets
Loss of scientific opportunity/Knowledge
Not profitable/useless
Organic food lobbying
Producing more nutritious food
Public/Consumer rejection of GM
Regulation/Labelling
Sustainable future food production
The 3rd World famine
Triggering uncontrollable possible effects
Unhealthy/unsafe
Unpredictable outcomes
Unsustainable agriculture
Vandalism (Public order)

C 6: Articulated literatures
2nd Generation of GM
Corporate hegemony
State's sovereignty
Industry only thinks profit
Democracy
Consumer rights
Right to campaign
Right to conduct research without threat
Politics are industry compliant
Frankenstein foods
GM is an unreliable technology
Organic farming is the sustainable option
Sustainable alternatives
Precautionary principle
EU legendary opposition to GM
EU/US cleavage
Publically funded research
Scientific Consensus
Scientific/Tech innovation basis for progress
3rd agricultural revolution
2nd agricultural revolution
Transcendence of scientific knowledge
Special status of staple foods
Sustainability
Biodiversity
Gene pollution
Unnaturalness
Gene manipulation is against nature
Gene manipulation is dangerous

C10: Actors contribution to action
Definitely supporting GM-wheat/plans
Definitely opposing GM-wheat/plans
Favouring the pro-GM perspective
Favouring the anti-GM perspective
Indeterminate actors (pending/inconclusive action)

C7: Uncertainty classification
Certainty
Risk
Uncertainty

C 8: Uncertainty typology
Actual occurrence/Loss
Actual occurrence/Benefit
Actual State
Risk_Obj-prob_Undesired Effects
Risk_Obj-prob_positive speculation
Risk_Obj-prob_Loss Opportunity
Risk_Subj-prob_Undesired Effects
Risk_Subj- prob_Loss Opportunity
Uncertainty_Unkown Adverse Effects
Uncertainty_Hope
Uncertainty_Loss of opportunity
Uncertainty_Unpredictable outcomes/events
Uncertainty_Lack of info
Radical Uncertainty

C 9: Uncertainty basis
Absence Past experience
Absence of warranty
Absence of Leadership
Contractual stipulations
Controversial /Multiple Truth paths
Current legislation/Market rules
Future forecasts
General opinion
(Governmental or not) safety tests
Hype phase (New tech)
Independent research
Lack of information/premature process
Lack of info/Fallacy
No clear basis/Unknown
On-going research
Others past factual experience
Official bodies proclamation
Past-Factual experience/statistics
Present facts/circumstances
Past-Perceived experience
Perceptions-Societal
Personal-Groupe opinion/declaration
Scientific research
Surveys/polls/studies
Social conventions
Unknown/unpredictable Future

Ap3-3: Extract from *Competing Statements* codification lines

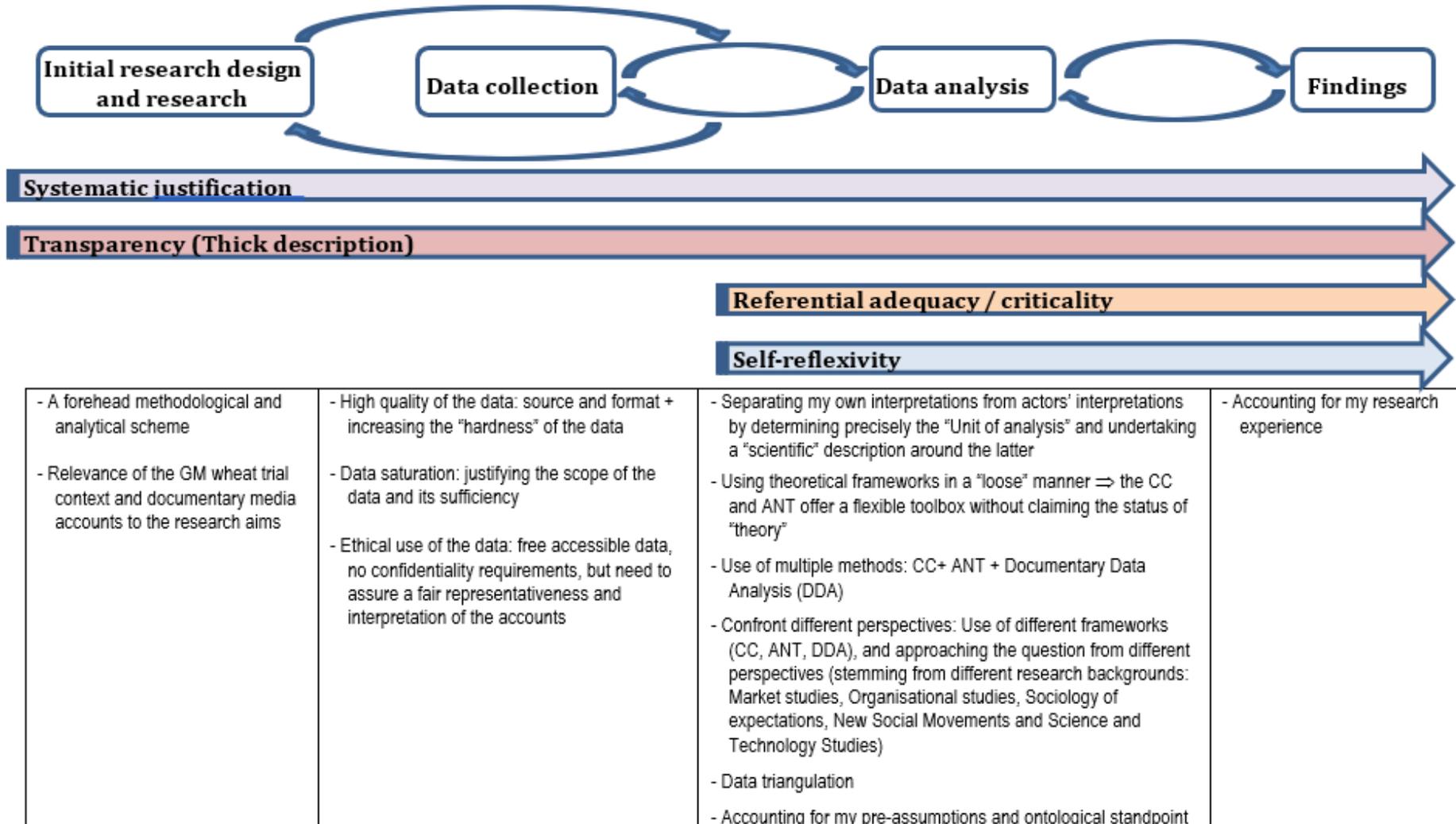
St. Nb.	Article Nb.	Month	Year	Headline	Cited Author	Author	Source	Statements	Purpose	Triggering Event	Raised concern	Generic concern	Concerns' Stage	Articulated Literature	Degree of uncertainty	Nature of Uncertainty	Uncertainty basis
123	9	March	2012	A new kind of wheat, designed to reduce the use of pesticides	The scientist in charge of the experiment (Professor John Pickett)	Steve Connor	The Independent	We've done a lot of work in the lab and it works really well. It repels the aphids and attracts in the parasitic wasps brilliantly - better than our wildest dreams	Supporting	GM-Whiffy-wheat trial announcement	Loss of scientific opportunity/Knowledge	Science (trials success) and progress	Selling concerns	Science-basis for progress	Risk	Risk_Obj-prob_positive speculation	On-going research
132	10	March	2012	Fears over GM-wheat that fend off greenfly	Peter Riley, of GM Freeze	Tamara Cohen Science Reporter	Daily mail	They have done this in a laboratory, he said. In the field it is different. The history of GM crops demonstrates that contamination can occur. It can interfere with the ecosystem and send aphids onto other plants.	Opposing	GM-Whiffy-wheat trial announcement	Contamination-Outcrossing with the wild	Environment	Selling concerns	GM tech unreliable and risky	Risk	Risk_Obj-prob_Undesired Effects	Others past factual experience
681	49	June	2015	Search for Aphid-resistant crop is £3m flop	Lead researcher Prof John Pickett	Not specified	The Daily Telegraph	Scientists believe the insects may have learnt to ignore the scent, "We may need to alter the timing of release of the alarm signal from the plant."	Supporting	GM-Whiffy-wheat trial results	Irresponsible research/Waste of public money	Market (Insti/Ethical)	Responding to concerns	Science-experimental	Risk	Risk_Obj-prob_positive speculation	Scientific research
173	13	May	2012	Protesters threaten to destroy GM wheat crops	Protesters		Daily mail	Opponents point to North American evidence showing GM crop cultivation has sometimes led to higher pesticide use and the arrival of superweeds and insects immune to certain pesticides.	Opposing	GM-Whiffy-wheat trial break-in & Protest	Excessive use of pesticides	Environment	Responding to concerns	GM tech unreliable and risky	Uncertainty	Uncertainty_Unpredictable outcomes/events	Others past factual experience
847	61	Feb.	2017	Genetically modified 'super-wheat' will be grown in the UK after trial is given the go-ahead despite fears of contamination	N/A	Sean Poulter	Mail Online	In 2013, academics reported that pigs fed a GM diet suffered inflamed stomachs and heavier uteruses, which could be a sign of disease.	Opposing	GM-Super wheat trial	Food Safety/Quality/Authenticity	Unhealthy/unsafe	Response rebuttals-Level 1	Risk/Novel tech	Risk	Risk_Obj-prob_Undesired Effects	Surveys/polls/studies
643	47	July	2013	The great GM food hysteria: Do you believe eating genetically modified crops is like dining with the devil?	N/A	David Rose	Mail Online	The author behind the 'bogus' research (GM feed may cause cancer or stomach problems in animals) fuelling this claim, Prof Gilles-Eric Seralini, is closely linked to and funded by leading members of a homeopathy group which believes bone cancer can be cured with water and minute quantities of magnesium. The research has been attacked by every major scientific institution in the field, including the European Food Standards Agency.	Supporting	GM-Whiffy-wheat trial break-in & Protest	Unhealthy/unsafe	Food Safety/Quality/Authenticity	Response rebuttals-Level 2	Sound versus fake science	Uncertainty	Uncertainty-Lack of info	Lack of info/Fallacy
293	22	May	2012	Fair crop, guy; accused due in court over attack on GM wheat trial	Director Prof Maurice Moloney	Tom Parry	The Daily Mirror	called the vandalism an attempt to "deny us all the opportunity to gather knowledge and evidence" on a possible new approach for reducing the use of pesticides.	Supporting	GM-Whiffy-wheat trial break-in & Protest	Scientific progress/Trials' success	Loss of scientific opportunity/Knowledge	Translating concerns	Science-basis for progress	Uncertainty	Risk_Subj-prob_Loss Opportunity	Personal-Gp opinion/declaration
426	31	May	2012	Lottery funding for anti-GM activists	N/A	Patrick Sawyer	The Telegraph	Theresa May, the Home Secretary, has ordered an exclusion zone around the centre near Harpenden, and police have warned that any-one who enters will face arrest.	Supporting	GM-Whiffy-wheat trial break-in & Protest	Public order/Vandalism	Market (Insti/Ethical)	Integrating concerns	Government role/Public order	Risk	Risk_Obj-prob_Undesired Effects	Past-Factual experience/statistics

Apx.3-4: Extract from *Actors* codification lines

Actor	Article	Event	Month	Year	Actors definitely supporting GM-wheat/plans	Actors favouring the pro-GM perspective (with the named action)	Indeterminate actors (pending/inconclusive action)	Actors favouring the anti-GM perspective (with the named action)	Actors definitely opposing GM-wheat/plans
179	7	GM-Whiffy-wheat trial announcement	June	2011	One of Britain's leading plant research centres (has applied for permission from the government to begin the trial of the GM crop)				
180	7	GM-Whiffy-wheat trial announcement	June	2011		Aphids (attacking wheat crops)			
185	7	GM-Whiffy-wheat trial announcement	June	2011			An objection to the trials proposal (if submitted before the 19 August 2011).		
187	7	GM-Whiffy-wheat trial announcement	June	2011		(E)-beta-farnesene (EBF) (a chemical that is also found in beer because it occurs naturally in hops)			
188	7	GM-Whiffy-wheat trial announcement	June	2011		The advisory body for the secretary of state for environment, food and rural affairs (lists more than 300 varieties of plants in which EBF is known to occur naturally)			
189	7	GM-Whiffy-wheat trial announcement	June	2011			The advisory body for the secretary of state for environment, food and rural affairs (depends on whether it approves the trial or not)		
192	7	GM-Whiffy-wheat trial announcement	June	2011		Wheat a Self-pollinating variety (a quality that wheat holds making the cross-pollination risk weaker)			
195	7	GM-Whiffy-wheat trial announcement	June	2011		The pheromone (by only affecting aphids, the risks are very different from those represented by more british GM crops)			
197	7	GM-Whiffy-wheat trial announcement	June	2011				Wheat being a staple crop (development of GM varieties is particularly controversial)	
199	7	GM-Whiffy-wheat trial announcement	June	2011				Absent No market	
200	7	GM-Whiffy-wheat trial announcement	June	2011				Absent No public acceptance	
201	7	GM-Whiffy-wheat trial announcement	June	2011					Claire Oxborrow, a foods campaigner at Friends of the Earth (This project is a waste of public money, as there is no public acceptance nor a market)
205	8	GM-Whiffy-wheat trial announcement	Sept.	2011		A chainlink fence 2.4 metres high (to protect the trials site as previous trials have been attacked by anti-GM campaigners)			
206	8	GM-Whiffy-wheat trial announcement	Sept.	2011		The Department for Environment, Food and Rural Affairs- Defra (approving the trials)			
207	8	GM-Whiffy-wheat trial announcement	Sept.	2011		An independent group (evaluating the situation in favour of the trials, saying no adverse effects expected on human health or the environment)			
208	8	GM-Whiffy-wheat trial announcement	Sept.	2011	Tina Barsby from the National Institute of Agricultural Botany (supporting the benefits of the trial from an experimental point of view)				
210	8	GM-Whiffy wheat trial announcement	Sept.	2011					Pete Riley from GM Freeze (The decision to approve an open-air trial of GM wheat is a big mistake and premature given the serious lack of information in the application)

Apx.3-5: Building my ‘Rigor framework’

GOALS		MAIN RISKS / CONCERNS
<p><u>I. Defend the reliability of my research outcomes</u></p> <p>① Accuracy of the findings</p> <p>② Credibility of the findings</p> <p>③ Utilisability of the findings</p>		<ul style="list-style-type: none"> • Low quality of the collected data • Deficient application of the selected methods • Lack of referential adequacy or criticality (Eisner, 1991; Whittemore, Chase and Maudle, 2001) • Lack of transparency (poor description of the ontological assumptions, the research process, and methodological decisions and implementations). (Danzin and Lincoln, 2018; Cresswell, 2012)
<p><u>II. Defend the validity of my research outcomes</u></p> <p>① Relevance of the data set</p> <p>② Appropriateness of the chosen method</p> <p>③ Soundness of the suggested interpretations</p>		<p><u>Lack of methodological rigor</u></p> <ul style="list-style-type: none"> • Low relevance of the type of data to the nature of the inquiry • Lack of data saturation (insufficient data) • Incompatibility of the chosen methods with the data set and/or the nature of the inquiry (Silverman, 2014) • Flat interpretation (failing to analyze the data) • Seeing in the data only what confirms theory and pre-assumptions (Dumez, 2013; Cresswell, 2012) • Overlooking other possible interpretations (Dumez, 2013) or failing to account for multiple realities (Cresswell, 2012) • Lack of a well-articulated analytical scheme (Silverman, 2014; Charmaz, 2006) <p><u>Lack of self-reflexivity</u></p> <ul style="list-style-type: none"> • Failing to account for actors <ul style="list-style-type: none"> ⇒ Failing to separate facts from interpretations ⇒ Failing to separate one’s interpretation from actors’ interpretations (Dumez, 2013) • Overlooking one’s background and pre-assumptions on the interpretation process (Angen, 2000; Cresswell, 2012; Whittemore, Chase and Maudle, 2001) • Overlooking research ethics (equitable representation of diverse voices). (Angen, 2000; Lincoln and al., 2011)



Apx.3-6: Ethics approval

8/2/2020 Email - Mejri, Olfa (Student) - Outlook

Reply all Delete Junk Block

Ethics approval (REC reference number FL16217 -please quote this in all correspondence about this project)

FASS and LUMS Research Ethics Like Reply Reply All Forward ...
Tue 30/05/2017 17:20
To: Bardet, Olfa
Cc: Hopkinson, Gillian; Cronin, James

Dear Olfa

Thank you for submitting your ethics application and additional information for *Genetically modified foods: concerns, expectations and myths*. The information you provided has been reviewed by member(s) of the Faculty of Arts and Social Sciences and Lancaster Management School Research Ethics Committee and I can confirm that approval has been granted for this project.

As principal investigator your responsibilities include:

- ensuring that (where applicable) all the necessary legal and regulatory requirements in order to conduct the research are met, and the necessary licenses and approvals have been obtained;
- reporting any ethics-related issues that occur during the course of the research or arising from the research (e.g. unforeseen ethical issues, complaints about the conduct of the research, adverse reactions such as extreme distress) to the Research Ethics Officer;
- submitting details of proposed substantive amendments to the protocol to the Research Ethics Officer for approval.

Please do not hesitate to contact me if you require further information about this.

Kind regards

Debbie

Debbie Knight
Secretary, FASS-LUMS Research Ethics Committee fass_lumsethics@lancaster.ac.uk
Phone (01524) 592605| D22 FASS Building, Lancaster University LA1 4YT | Web <http://www.lancaster.ac.uk/arts-and-social-sciences/research/ethics-guidance-and-ethics-review-process/> & <http://www.lancaster.ac.uk/lums/research/ethics/>

Lancaster University 
www.lancaster.ac.uk/50

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Apx.3-7: Thesis over-length approval

Approval for submission of an over-length thesis		Lancaster University 
<p>The Postgraduate Research Regulations permit a candidate, with the support of his or her supervisor, to apply for exceptional permission to exceed the word limit for the thesis. Candidates should complete this form and obtain the signatures of their supervisor(s) before submitting it to the Student Registry.</p>		
Student's name	Olfa Mejri	Student ID number 31650989
Department	Marketing	Degree PhD Marketing Full Time
Name of supervisor(s) Dr Gillian Hopkinson		
<p>I believe that the length of thesis is appropriate at 100,000 because of the nature of the analysis as outlined below. It resembles more a thesis from linguistics in its methodological approach</p> <p><i>Gillian Hopkinson</i></p>		
Published thesis word limit for the degree scheme:	80,000	
Word length of final draft of thesis:	100,000	
<p>To support your application, please provide an explanation as to why this thesis exceeds the maximum permitted word limit (for example, has the scope or nature of the research generated an exceptional volume of material).</p> <p>The need for excess in terms of word count is mainly generated by my methodological choice. The latter matches perfectly the thesis research aims and context, for this reason it was given precedence over an eventual excess of the maximum permitted word limit.</p> <ol style="list-style-type: none"> <p>1. A particularly demanding method</p> <p>The Cartography of Controversies (CC) presents a toolbox extending over 5 <u>independent</u> lenses (angles of analysis), all <u>equally significant</u> in terms of contribution to the thesis findings and discussions. The 5 lenses allowed a thorough exploration of the studied controversy, through a gradual progression from micro to macro settings.</p> <p>2. A 'loose' analytical framework</p> <p>The CC does not provide clear guidance on how it should be used; it only sets the observation angles the researcher should focus on throughout a broad progressive grid. Therefore, I had to provide more detailed accounts on how I have codified the data and utilised the framework, especially that it has not been used before in the marketing or management field.</p> <p>3. A method that was not used before in Marketing/Management</p> <p>As far as I know, the CC has not been previously used in my research field, and thus, I presume it to be largely unknown by colleagues (including potential examiners), although its roots (the Actor-Network Theory) would be more familiar. This joins the point above regarding the need for more detailed accounts on how the method has been utilised and why. I also had to add into consideration providing examples all over the codification section to allow appreciating with no ambiguity my analytical codes, which cannot be deduced from a broad description of the CC as a method.</p> <p>And finally,</p> <ol style="list-style-type: none"> <p>4. A predominately explorative and descriptive method</p> <p>On top of adopting a qualitative methodology, which already supposes profuse descriptions, my approach, being explorative and descriptive at the first place, required thick descriptions of what actors actually did and said, which besides increased the need for quotation. My approach required exposing fully actors' voices, before interpreting. One of the things that demarcated both steps is the increased need for quotes illustrating actors' actual expression during the descriptive first and main step.</p> <p>Kind regards, Olfa Mejri</p>		

From: Heard, James <j.heard@lancaster.ac.uk>
Sent: 17 August 2020 14:37
To: Hopkinson, Gillian <g.hopkinson@lancaster.ac.uk>
Cc: Mejri, Olfa (Student) <o.bardet@lancaster.ac.uk>; Quirk, Jane <j.quirk@lancaster.ac.uk>
Subject: RE: Over length thesis request-Olfa Mejri (Marketing).docx

Hi Gillian,

Maria Piacentini has approved the request for the thesis length to be 100,000 words.

Best regards,

James



Over length thesis request-Olfa Mejri (Marketing) Approval.docx
61.6kB

Apx.4-1: Pre-narratives: concerns hierarchy

	Concerns' Hierarchy	Nb. Of Statements	Expressed by
1	Loss of export markets	8	GM Opponents
2	Public/Consumer rejection	7	Both
3	No Market	6	Both
4	Consumer rights	6	GM Opponents
5	Regulation/Labelling	6	Both
6	Global trade competitiveness	5	GM Supporters
7	Increasing yields	5	GM Supporters
8	Contamination-Conv. crops	6	Both
9	Corporate hegemony/Excessive profit	4	GM Opponents
10	EU Institutional blockage	3	GM Supporters
11	Contamination-Outcrossing	3	GM Opponents
12	Unhealthy	3	GM Opponents
13	Not profitable	2	Both
14	Transatlantic trade relations	2	GM Opponents
15	Pesticide immune spices	2	GM Opponents
16	Unpredictable outcomes	2	GM Opponents
17	Triggering uncontrollable effects	2	GM Opponents
18	Anti-GM activism	2	GM Supporters
19	Loss of scientific opportunity	2	GM Supporters
20	Developing new scientific approaches	1	GM Supporters
21	Food democracy	1	Both
22	Producers' choice	1	GM Supporters
23	Unwarranted interference in food Supply Chain	1	GM Opponents
24	More nutritious food	1	GM Supporters
25	Enhance farmland productivity	1	GM Supporters
26	Frankenstein foods	1	GM Opponents
27	Institutional credibility	1	GM Opponents
28	Acting against Nature	1	GM Opponents
		85	

ApX.4-2: Pre-narratives: Responses to GM opponents' concerns

Claims responded to	Responses	Spokesperson
Contamination-Conventional crops	<ul style="list-style-type: none"> - GM Wheat to be launched initially with a controlled marketing programme, with some form of traceability in place. (2001) - There has not been any contamination. All the tests that have been carried out using GM maize and soya show that this hasn't happened. (2001) - Genes do not pass through to other crops. (2001) 	Monsanto
Risk of outcrossing	<ul style="list-style-type: none"> - Wheat is pretty much self-fertilised but on the rare occasions when it does outcross, it will not transfer the trait. (2001) 	Mark Buckingham, spokesman for Monsanto
Unexpected environmental effects	<ul style="list-style-type: none"> - The company is looking at potential environmental impacts of the new strain of wheat. (2001) - Wheat is a genetically complex plant that is the result of cross-breeding experiments by Neolithic farmers many thousands of years ago. (2001) 	Mark Buckingham, spokesman for Monsanto
Risk of outcrossing	<ul style="list-style-type: none"> - Wheat is pretty much self-fertilised but on the rare occasions when it does outcross, it will not transfer the trait. (2001) 	Mark Buckingham, spokesman for Monsanto
Unsafe	<ul style="list-style-type: none"> - The US Food and Drug Administration (FDA) has already conducted extensive assessments on food-safety tests performed on other herbicide-resistant crops and have so far given them a clean bill of health. (2001) 	FDA (USA)
GM will be soon on European shelves	<ul style="list-style-type: none"> - GM wheat is still in the testing phase and has not yet completed all regulatory process. (2001) 	Monsanto
There is "No market"	<ul style="list-style-type: none"> - Time is now ripe for GM wheat. (2009) - A survey released in February 2009 says ¾ of farmers want access to GM enhanced wheat varieties. (2009) - Various relevant factors - technology, business, public policy and customer acceptance - had now become favourable. (2009) - The world food crisis tripling of the price of wheat and certain other food crops during 2008. (2009) 	Monsanto
Risky novel technology	<ul style="list-style-type: none"> - Monsanto, the world's leader in the production of seeds for GM crops, had made substantial progress in the development of GM wheat varieties. (2009) 	Monsanto
EU Precautionary attitude	<ul style="list-style-type: none"> - EU does not have the veto on what technology Americans can develop or crops they can produce. - We (Monsanto) will not stop the GM project because of EU pressure. (2001) - American producers should have the choice on what they produce. (2003) - The argument of "substantial equivalence" (on which the FDA's view is that labelling is only necessary if a product is materially different from a non-GM equivalent) (2001) 	Monsanto + FDA

Apx.4-3: Strong categories *Main Actors* and Spokespersons

Event 1		Event 2		Event 3		Event 4	
Supporting	Opposing	Supporting	Opposing	Supporting	Opposing	Supporting	Opposing
Rothamsted Research Centre	GM Freeze	Rothamsted Research Centre	The protest group Take The Flour Back (TTFB), a broad coalition of bakers, farmers, school workers	Rothamsted Research Centre	The protest group Take The Flour Back, a broad coalition of bakers, farmers, school workers	Rothamsted Research Centre	GM Freeze
Prof Maurice Moloney, Director of the centre	Pete Riley (From Friends of the Earth)	The seven scientists (who signed the letter sent to protesters)	A spokesperson, called Helen	The research team, working on the research	GM Freeze	The scientists, working on the GM Super-wheat	Liz O'Neill, Director of GM Freeze
The scientists in charge of the experiment	Anti-GM trials protesters/Campaigners	Professor John Pickett, the trial's leader & head of chemical ecology	Lucy Harrap, a campaigner who helped to organise the event	Dr Toby Bruce, first name on the paper	Liz O'Neill, Director of GM Freeze	Dr Malcolm Hawkesford, head of plant biology and crop science	Anti-GM protesters/Campaigners
Professor John Napier, Genetics team leader of the experiment		Gia Aradottir, a biologist specialising in insects	A campaigner (Unspecified)	Professor John Pickett, Lead researcher	GeneWatch UK	Essex University	Opponents of GM technology/Anti-biotech activists
Professor John Pickett, the trial's leader		Prof Maurice Moloney, Director of the centre	We (Protesters)-Used by a campaigner (Unspecified)	Professor Huw Jones, a senior molecular biologist at Rothamsted	Helen Wallace, director	Professor Christine Raines, head of the school of biological sciences at the University of Essex & professor of plant molecular physiology	
		Professor John Napier, Genetics team leader of the experiment	Nicola Gomez, a member	The Government (funded the project of GM wheat)	Anti-GM groups	Lancaster University	
		Dr Toby Bruce (a researcher at Rothamsted)	Eleanor Baylis, a member	The BBSRC	Critics of GM	Researchers from Lancaster University involved in the Super-wheat trials	
		The 3 Lead scientists on the research	Jyoti Fernandes, a spokesperson (lives a smallholding in Dorset and helped organise an organic food week in the county)	The GM technology		The British government (said it was considering a dramatic liberalisation of GM food laws after Brexit)	
		A spokesman for the laboratory	Kate Bell, a spokesperson			Brexit	
		Rothamsted staff	Liz Walker, a veteran of the 1990s anti-GM protests, now active member of TTFB			The Biotechnology and Biological Sciences Research Council	
		We (used 3 times by Prof John Pickett)	A rallying call (launched by Take the Flour Back on their website)			The American government (jointly funded the trials with the British government)	
		The video (in which scientists pleaded with protesters to reconsider their actions)	Ad-hoc mass protest campaigners (Ordinary farmers and concerned citizens)			Marjorie Chordinis, the vice-president for European affairs at the US chamber of commerce	
		Open letter (to protesters)	Anti-biotech activists/Opponents of GM technology/				
		Open letter (to the scientific community and politicians)	Theo Simon, a veteran anti-GM campaigner (we are here to defend the British society rejecting GM), participating actively in the protest				
		The BBSRC (The Biotechnology and Biological Sciences Research Council- the trial funding body)	Citizens concerned about GM				
		Professor Douglas Kell (chief executive of the BBSRC which is funding the trial)	Lawrence Woodward, a citizen concerned about GM, Hungerford, Berkshire				
		We (used by Prof Douglas Kell- will support the police and Rothamsted)	A representative from Citizens Concerned Against GM				
		The Government	Anti-open-air trials activists				
		Downing Street (working with the European Commission to change rules on GM, so that countries could licence GM cultivation without the need for EU approval)	GM Freeze				
		The Prime minister's official spokesman (said the UK are working with the European Commission to relax regulation on GM).	Hector Christie , A lone activist who broke into one of the GM experimental fields at Rothamsted Research labs				
		Sir John Beddington, the government's chief scientist (food security)					
		Owen Paterson, the Environment, Food and Rural Affairs secretary (GM crops should be developed to feed the world)					
		The GM technology (capable of boosting yields+has moved on a lot in the past 2 decades)					
		Pro-GM lobby (in the UK)					

Apx.4-4: Strong categories SSN and Spokespersons

Event 1		Event 2		Event 3		Event 4	
Supporting	Opposing	Supporting	Opposing	Supporting	Opposing	Supporting	Opposing
The John Innes Centre in Norfolk	Friends of the Earth	Michael H Gillins (from Brecon- As the co-author of A World Survey of Wheat Genetic Resources (1981) (defending GM crops)	Environmentalists/Ecologists	GM Scientists	The Soil Association (Organic Certification Body)	None	The Soil Association (Organic Certification Body)
Tina Barsby from the National Institute of Agricultural Botany. (relevance of the trial)	Claire Osbornow, a foods campaigner at Friends of the Earth	Many scientists (involved in talks with presentation to the public)	The Green Activists	Sense About Science, a British charitable organization that promotes the public understanding of science	Peter Melchett, the association's policy director		Peter Melchett, the association's policy director
Dr Shawn McGuire, a food security scientist at University of East Anglia (wheat bio-pollination risk)	Environmentalists/Ecologists	Norman Borlaug, the late Nobel peace prize laureate who saved the world from famine in the 1970s and 1980s with his Green Revolution (spend his final years warning that anti-biotech activists would bring starvation back into the world if they succeeded in stopping GM.)	Community Food Growers Network	The former Environment Secretary Owen Paterson			
The scientists (supporting GM in general)	The Green Activists	The US company Monsanto	The Climate Camp, a nationwide, non-hierarchical collective of environmentalists				
Leeds University (testing other GM crops)	Anti-capitalists	The John Innes Centre in Norwich (cultivating a Bt-resistant GM potato)	An organic farmer from Devon				
		Mark Lynas (now admits to a Damascene conversion to the merits of the technology)	Friends of the Earth				
		The British Crop Production Council	Pete Riley, A devoted Green and sustainable food campaigner From Friends of the Earth				
		Colin Ruscoe, chairman of the British Crop Production Council (a charity, supported by the biotech industry)	Claire Osbornow, a foods campaigner at Friends of the Earth				
		(unspecified actors) Some (have threatened to quit the Green party for its stance on GM food)	Organicia, which promotes organic food production in east London)				
		Green supporter Tom Chivers (at the Telegraph vowed to stop voting Green).	The Real Bread Campaign (RBC)				
		(unspecified actors) Several people (who resigned from the Green party)	Anonymous hacker behind a pair of Twitter accounts, who brought down Rothamsted's web servers for 12 hours on Sunday				
		(unspecified actors) causing a misnomer of criticism on Twitter (followed Jenny Jones when she announced attending the protest)	Independent scientists (who produced research that demonstrates the dangers of this inherently risky technology)				
		The Association of Medical Research Charities	The Soil Association (Organic Certification Body)				
		Lord Willis, the chairman of the Association of Medical Research Charities	Peter Melchett, the association's policy director				
		(unspecified actors) Signatories of the petition, more than 5,000 signatures.	Prof Gilles-Eric Serralini (author of the research showing that GM feed may cause cancer or stomach problems in animals)				
		A petition (opposing the decontamination has attracted more than 5,000 signatures).	Greenpeace (thwarted every attempt to get the Golden rice introduced)				
		Syngenta (multinational agrochemical company)	Anti-GM food protester and organic farmer Gerald Miles, concerned about other wheat crops being contaminated by this alien variety				
		Sites like Rothamsted doing that research (protected by the State)	Aggressive campaigns by Western anti-groups (using aggressive campaigns in EUR and the 3rd world causing institutional blockage for GM species approvals)				
		Mark Henderson (author of the book 'The Geek manifesto', claiming scientific consensus on GM)	Those opposed to 'Frankenstein Food'				
		Professor Kongming Wu (at the Chinese Academy of Agricultural Sciences in Beijing)	The Green Party's Jenny Jones				
		Professor Guy Poppy (an ecologist at the University of Southampton-GM whiffy wheat is a new generation of GM)	The Scottish National party (opposing GM planting in Scotland)				
		Plant scientists	French group The Volunteer Reapers (Les Faucheurs Volontaires d'OGM)				
		Bayer Crop Science	GM-Free Tag				
		The industry body, the Agricultural Biotechnology Council	British scientists (who produced research showing GM potatoes were poisonous to rats)				
		Julian Little, communications director for Bayer Crop Science and chairman of the industry body, the Agricultural Biotechnology Council					
		Other parts of the world (growing and selling GM crops)					
		North America and Asia (has pushed ahead with growing GM crops commercially)					
		Asia (has pushed ahead with growing GM crops commercially)					
		Brazil (has pushed ahead with growing GM crops commercially)					
		The Golden Rice Humanitarian Board					
		Adrian Dubock, chief executive					
		National Farmers' Union					
		Peter Kendall -National Farmers' Union president (Condemning the incident at Rothamsted)					

Colours key
Science
The Biotech Industry
Political/Institutional
NGO (Non-gov-org.)-Social
NGO-Environmentalists
General-public/interest groups
Food Authenticity/Quality
Commercial/Economical