Foreign Direct Investment, Regional Integration Agreements and Economic Growth

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for my dad

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ABSTRACT

The importance of studying economic growth cannot be overstated. Though it does not guarantee a better standard of living, economic growth offers unrivalled potential to reduce poverty in developing countries and improve the fortunes of those lucky enough to be born in the developed world. The aim of this thesis is to explore the relationship between three 'open-economy' factors that are believed to strongly influence economic growth: regional integration agreements (RIAs), foreign direct investment (FDI) and trade.

We employ the well-known gravity model as the empirical framework in which to analyse the interplay between these three factors. We also conduct a case study analysis of Mexico; this allows us to further explore some of our empirical findings in the context of a developing country that has been heavily influenced by trade, investment, and membership of a regional integration agreement.

In addition to evidence that integration agreements stimulate intra-regional investment and trade, our empirical analysis is clear that there are also significant and varied effects on non-member countries. Such effects should not be overlooked by policymakers when assessing the merits of a particular RIA.

We also report results which indicate that outward FDI and exports are complements, not substitutes. This suggests that fears that outward investment leads to a loss of employment at home are overblown. There is evidence, however, that the strength of the complementary relationship depends on the characteristics of the countries involved.

The case study ably demonstrates the significant influence that integration agreements can have on countries and economies. One of the key impacts of the North American Free Trade Agreement (NAFTA) was simply its ability to legitimise and deepen the liberalisation policies that Mexico had begun to implement some years before. It is also evident, however, that NAFTA has induced serious spatial effects on the Mexican economy. Such effects may have contributed to income inequality and again highlight that policymakers must be aware that integration agreements can have profound, unintended effects on both member and non-member countries.

1. INTRODUCTION

1.1 CONTEXT

This thesis explores the relationship between foreign direct investment (FDI), trade and regional integration agreements (RIAs) in the context of endogenous growth theory. FDI, trade and RIAs are all intimately linked with the process of globalisation - the increasing integration of the world's economies. Between 1970 and 2003, the global stock of FDI (as a percentage of world GDP) more than tripled from 1.2% to 4.9%; international trade, as a percentage of world GDP, has risen from 26.5% to 47.6%; and the number of RIAs has risen from 30 to over 200 (Crawford & Fiorentino, 2005). This expansion in international activities has undoubtedly had significant effects on economies across the globe, the potential effect on economic growth being of particular interest.

The importance of studying economic growth, trying to determine what drives it, seems obvious. Though economic growth does not guarantee a higher standard of living or increasing equality, it probably offers unrivalled potential to reduce poverty in developing nations and improve the general standard of living for those lucky enough to be born in the developed world. "It fires the imagination that policy might be able to influence economic growth..." (Quah, 1996: p.1353). Indeed, what a prize it would be if the result of research in this area came up with hard and fast rules that policymakers could implement to improve the growth of their economies and hopefully the welfare of their citizens.

Developing countries the world over, now as much as ever, need to harness the beneficial forces of growth. The recent UN Human Development Report 2003 makes sombre reading. More than 1.2 billion people survive on less than \$1 a day. During the 1990s the share of people suffering from extreme poverty fell from 30% to 23%. However, this progress was largely due to the huge leaps made by China and India and masks significant regional disparities. The number of people living on less than \$1 per day actually increased in Latin America and the Caribbean, the Arab States, Central and Eastern Europe, and Sub-Saharan Africa. During the 1990s, 54 developing and transition countries suffered falling average per capita incomes (Human Development Report, 2003).

Such reversals in progress were previously rare and are more difficult to tolerate today given the scale of global resources and the unprecedented wealth enjoyed by many in developed nations. If progress does not improve, of the eight Millennium Development Goals (MDG) only the targets of halving income poverty and halving the proportion of people without access to safe water will realistically be met by 2015; and this would be largely thanks to Chinese and Indian progress[1]. At the current pace of progress, Sub-Saharan Africa will not reach the Goals for poverty reduction until 2147, and for child mortality until 2165.

[1] The Millennium Development Goals were agreed at the UN-sponsored Millennium Summit in September 2000. The eight Goals are: eradicate extreme poverty and hunger; achieve universal primary education; promote gender equality and empower women; reduce child mortality; improve maternal health; combat HIV/AIDS, malaria and other diseases; ensure environmental sustainability; and develop a global partnership for development. The Goals fall due in 2015.

How is it that China and India have made such encouraging progress towards eradicating poverty while so many other developing and transition countries have actually gone backwards? The answer is simple and yet agonisingly difficult to achieve – rapid and sustained economic growth. Both China and India grew at rates of around 8% to 9% for most of the 1990s which, despite fears that rapid growth can be accompanied by increasing inequality, enabled them to pull vast numbers of their people out of poverty[2]. This is not to say that economic growth will automatically reduce poverty. Progress in China, for example, has been centred on the coastal regions with many inland pockets of entrenched poverty remaining. Some countries that have achieved sustainable economic growth have simultaneously suffered from increasing poverty. What is required in these circumstances is policies to strengthen the links between growth, development and poverty reduction, such as government investment in health and education.

Despite concerns that economic growth can be "ruthless", the Human Development Report 2003 states that "economic growth is important for achieving all the Millennium Development Goals". This is echoed by the Poverty Report from the World Bank (2002) which argues that "sustainable economic growth and appropriate social policies are keys to fighting poverty" (p.6). Economic growth is vital because it both directly increases the incomes of households and increases government revenues. As many investments in human development are provided by the state (e.g. health, education, sanitation, infrastructure, law and order) it is necessary that the public sector has sufficient resources for investment.

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[2] It is estimated that China lifted 150 million people out of poverty during the 1990s (Human Development Report, 2003).

There seems to be a general consensus that economic growth is a critical ingredient to aid development and tackle poverty. It is clear, however, that there are substantial challenges in trying to harness growth for development and ensure that the benefits are equitably dispersed. What insight does economic growth theory provide in this regard?

Modern growth theory can be broadly categorised into the following three groups: early post-Keynesian models that emphasised the role of savings and investment in fostering growth (e.g. the Harrod-Domar model); neoclassical models that cast exogenous technological progress as the catalyst of growth; and endogenous models (or *new growth theory*) that typically emphasise the role of R&D, human capital and externalities in endogenising the rate of economic growth.

The evolution of economic growth theory, from the Harrod-Domar model to new growth theory, is discussed in greater detail in section 1 of Chapter 2. The important point to note here is that early models of growth (as progressive and insightful as they were at the time) were somewhat lacking in terms of policy proposals[3]. Endogenous growth models, or *new growth theory*, were born as a direct result of this. These models seek to *endogenise* the rate of growth (i.e. identify and incorporate the key drivers) and so contribute to ongoing policy debates.

[3] Although the Harrod-Domar and neoclassical models both highlight the importance of savings in fostering economic growth, they offer little in the way of practical (or micro) policy advice. For instance, they say nothing about labour market regulations, tax concessions, immigration policies etc.

Early endogenous growth models (e.g. Romer, 1986, 1994; Lucas, 1988) emphasised the role of R&D and human capital accumulation in fostering economic growth (by permitting non-decreasing returns to investment). More recently, endogenous models have been developed which reintroduce convergence due to open-economy effects such as international trade and investment. The logic of these models is straightforward. In updating their technology, poor countries have the potential to make large productivity gains by employing the superior technology that is in use by rich countries (Abramovitz, 1986)[4]. Various models have been proposed that formalise the channels through which international technological diffusion is believed to operate. For example, Grossman and Helpman (1994) develop an endogenous model in which technology is embodied in capital goods. Countries therefore have an opportunity to enjoy technological progress simply by importing capital goods from technologically superior nations.

FDI is another channel that has received much attention in the literature. The opposition that existed to FDI in many LDCs in the 1950s and 1960s has long since been supplanted by governments that often actively compete to attract FDI. This competition has arisen from the belief that FDI is a "composite bundle of capital, know-how, and technology" (Balasubramanyam *et al.*, 2001: p.234) that can be exploited by the host nation to not only allow them to produce at a point nearer to their production possibility frontier (PPF), but to actually shift the PPF outwards. This seems very encouraging for developing nations. However, Abramovitz (1986) argues that a country's ability to exploit the potential gains from inward FDI is limited by its 'social capability' to assimilate foreign

[4] Therefore, whilst the neoclassical model predicts (conditional) convergence due to diminishing marginal returns to capital, open-economy endogenous growth models predict convergence due to gains from technological diffusion.

technology and knowledge. It is easy to imagine a whole host of factors that might affect a country's 'social capability', not least human capital[5].

1.2 OBJECTIVES

There are clearly a wide range of factors that can affect the rate of economic growth. As mentioned, we have chosen to concentrate on regional integration agreements, foreign direct investment and trade. These factors are of particular interest given the phenomenon known as *globalisation*.

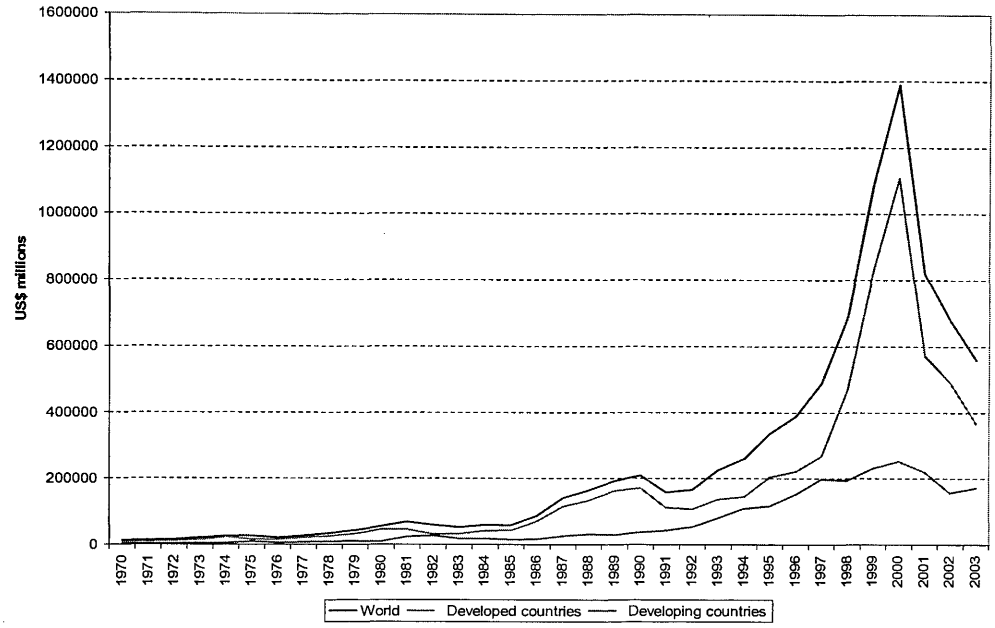
Despite lacking a precise definition, the term globalisation is typically used as a reference to the increasing integration of the world's economies, both driven and symbolised by rapid increases in international trade and FDI during the last three decades. Since 1970 the global stock of FDI (as a percentage of world GDP) has more than tripled, while international trade has nearly doubled. Globalisation is effectively making the world a smaller place, with distance becoming less of an obstacle to cross-border interaction.

However, the increases in FDI and trade have not been even across the board, with developed and developing countries undergoing markedly different experiences. Figure 1 shows global FDI inflows for the years 1970 to 2003. It is clear that there has been a significant change in trend during this time. In the first half of the period, 1970 to 1985,

[5] As it happens, think of a factor that might reasonably be expected to influence 'social capability' and you will almost undoubtedly find that there is already an empirical study of its effect on growth. For example, Hermes and Lensink (2000) find that "a more developed financial system positively contributes to the process of technological diffusion associated with FDI" (abstract). Balasubramanyam et al. (1996) report evidence that FDI is more beneficial in an exporting-promoting (EP) than an import-substituting (IS) regime. Huang and Xu (1999) investigate the importance of institutions and innovation for growth.

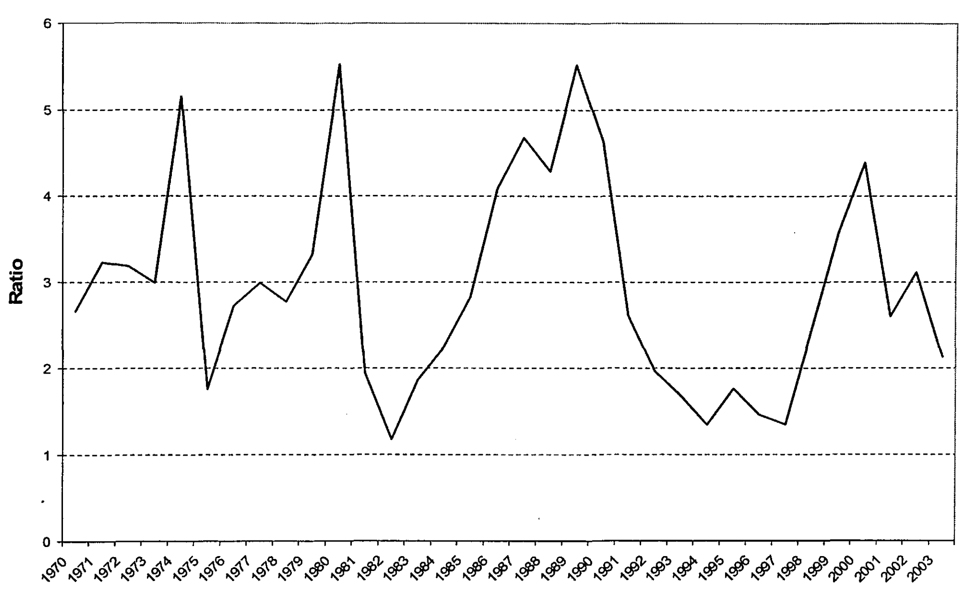
world FDI inflows grew from $13 billion to $58 billion, equivalent to an annual growth rate of 10.5%. By 2000 world inflows had risen to $1,388 billion, an implied annual growth rate since 1985 of 23.5%. Since the peak in 2000, world inflows have fallen dramatically (back to $560 billion in 2003). UNCTAD argues that this reversal in FDI is a temporary reaction to short-term economic weakness, particularly in the three major economies of the US, Europe and Japan (World Investment Report, 2002).

Figure 1.1 World FDI Inflows, 1970 to 2003



Source: UNCTAD online database

Figure 1.2 Ratio of Developed to Developing Country FDI Inflows, 1970 to 2003



Source: UNCTAD online database

Figure 1.1 also highlights the large inequality in FDI inflows between developed and developing countries. In 1970, inflows to developed countries totalled \$9.5 billion, roughly 2.7 times the \$3.5 billion received by developing countries. Figure 1.2 illustrates how this ratio has varied over the period under consideration. The ratio has fluctuated considerably (between values of 1.2 and 5.5) over time, seemingly in a fairly regular pattern. For instance, from a low of 1.2 in 1982, the ratio has increased (with the exception of a slight decrease between 1987 and 1988) to a peak of 5.5 in 1989; the ratio then fell steadily over the next five years to a value of 1.3 in 1994, before increasing rapidly again from 1997. As the world economy moved into recession (and the internet bubble burst) in the early years of the new century, developed countries bore the brunt of the downturn in FDI.

To a large extent, discrepancies between inflows to developed and developing countries can be attributed to merger and acquisition (M&A) activity. These transactions, which can account for a significant proportion of annual FDI flows, typically take place between firms located in developed countries. Their importance was well illustrated by the downturn in 2000 and 2001. M&A activity fell from around \$1,000 billion in 2000 to \$504 billion in 2001 with a consequent fall in FDI to developed countries of 59% compared with only a 14% reduction in FDI to developing countries. Conversely, in periods when the world economy is performing strongly and multinationals are enjoying rising profits, M&A activity is typically buoyant, and this manifests itself primarily as FDI flows between developed countries[6].

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[6] "John Dunning agreed that FDI flows during the early 1990s increased but this was mostly due to M&As between firms of developed countries, the developing countries did not experience all that much of an

Figure 1.3 combines the FDI ratio shown in Figure 1.2 with an overlay of periods of US recession[7]. A falling FDI ratio appears to be accompanied (or recently preceded) by a recessionary period (represented by the vertical bars). Expansionary phases of the business cycle (periods between the bars), however, seem to be associated with a rising FDI ratio. This suggests that during periods of strong world economic growth, FDI to developed countries tends to grow at a greater rate than that to developing countries. During periods of world recession however, FDI inflows to developing countries are less likely to fluctuate than those to developed countries because of a decline in merger and acquisition activity (which accounts for a much greater proportion of FDI to developed countries than to developing countries).

Let us now compare this with the pattern of international trade in recent times. Figure 1.4 shows international exports and imports for the years 1970 to 2004. It is clear that exports-from- and imports-to- developed countries far exceed those to-and-from-developing countries. Despite this, developing countries have enjoyed rapid growth in trade since 1970.

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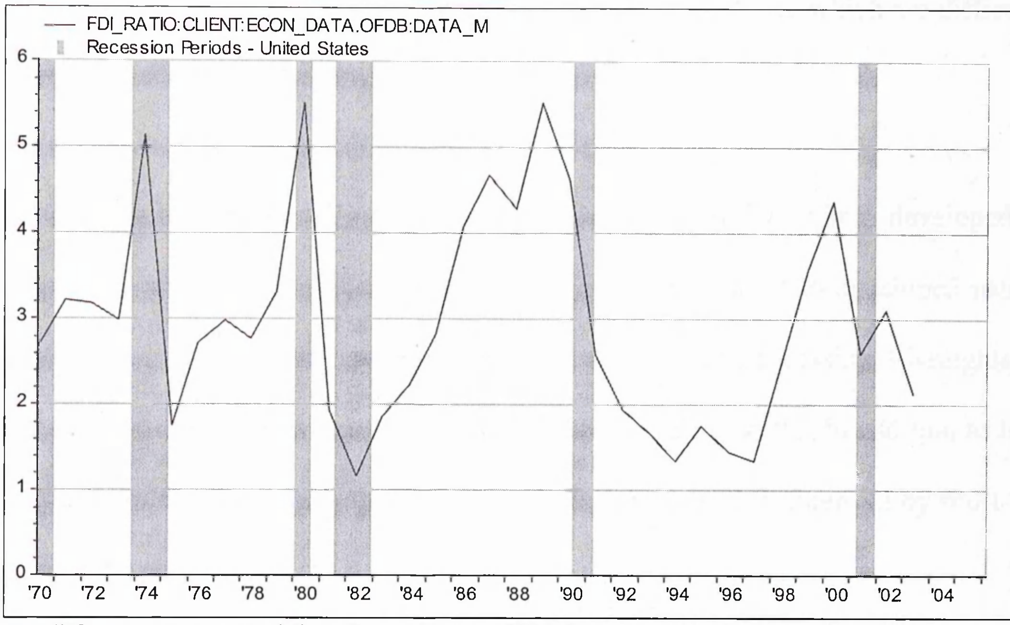
increase in FDI flows. It is interesting that in 2001 FDI fell dramatically because there was a dramatic fall in M&A activity. And the share of FDI going to developing countries increased, and some countries such as China have maintained this growth in inflows of FDI." (Balasubramanyam and Wei, 2004: p.131).

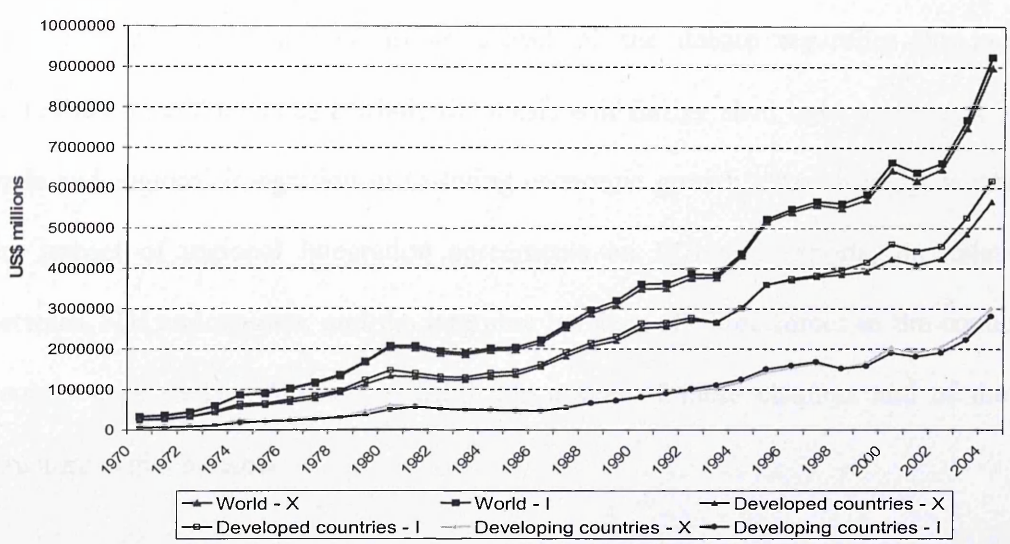
[7] Given the size of the US economy, periods of US recession are typically synonymous with global recessionary periods.

Figure 1.3 Ratio of Developed to Developing Country FDI Inflows and US Recessionary Periods, 1970 to 2003



Source: US recession period data from Factset; FDI data from UNCTAD online database.

Figure 1.4 World Trade Flows, 1970 to 2004



Notes: X represents exports and I represents imports.
Source: UNCTAD online database.

The similarity in magnitude of exports and imports within the developed-country and developing-country groups is striking – although perhaps unremarkable given that divergences between exports and imports result in trade imbalances which are difficult to sustain over the long term[8].

It is interesting to note the fall in trade between 2000 and 2001 (for both developed and developing countries). This effect was seen for FDI with respect to developed nations. The slowdown in FDI and trade during the recent global recession highlights the endogeneity that exists between these factors and economic growth. In addition to being determinants of economic growth, FDI and trade are themselves influenced by short-term changes in the pace of growth.

The aim of this thesis is to examine the interplay between international trade, FDI and regional integration in a number of discrete, but related, chapters. The intention is that each chapter will contribute to an aspect of the debate regarding the merits of globalisation, and taken as a whole the thesis will further shed light on the role of FDI, trade and regional integration in fostering economic growth. Accordingly, we examine the impact of regional integration agreements on FDI and exports, the relationship between FDI and exports, and the interplay between all three forces in the context of a country case study. A more in depth discussion of these chapters and of the thesis structure is given below.

[8] Obviously the US has proved an exception to this rule, using capital inflows to fund large, persistent current account deficits in recent years (with resulting pressure on the US exchange rate).

1.3 STRUCTURE

In Chapter 2 we address a number of issues that are pertinent to the empirical analyses of the later Chapters. We develop a simple endogenous growth model in section 2.1 to illustrate how FDI may contribute to economic growth. Although individual firms face constant returns to scale with respect to the reproducible factors of production, economy-wide accumulation of FDI offers the opportunity for increasing returns overall. Permitting FDI to have spillover effects is consistent with the view that FDI, in addition to being a provider of capital, embodies knowledge and technology.

The role of the multinational enterprise (MNE) in international trade and investment theory is reviewed in section 2.2 of Chapter 2. Early theories of international trade, such as comparative advantage and the Heckscher-Ohlin theory, made no allowance for the existence of MNEs. As the growing importance of FDI became increasingly evident during the 1960s, it became clear that the MNE warranted inclusion in international trade theory[9]. In an influential paper, Vernon (1966) sought to address this omission by "putting less emphasis upon comparative cost doctrine and more upon the timing of innovation, the effects of scale economies, and the role of ignorance and uncertainty in influencing trade patterns" (p.190).

Although largely qualitative, it is clear that ideas from Vernon's work have informed more recent, formal models of multinational activity. These include the *vertical*,

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[9] According to the US Tariff Commission (1973: p.322), in 1970 multinationals accounted for 62% of US exports and 34% of US imports.

horizontal and *knowledge-capital* models[10]. Vertical models attribute multinational activity to a desire by firms to locate production globally in the lowest cost location (e.g. resource and efficiency-seeking FDI). Horizontal models posit that FDI is the result of a proximity-concentration trade-off which involves firms weighing the cost of exporting against the cost of producing in the local market (e.g. market-seeking and tariff-jumping FDI). The knowledge-capital model is an attempt to combine elements from both vertical and horizontal models. In Chapter 2 we discuss these different rationales for FDI and explore their implications for international trade and investment activity.

Section 2.3 of Chapter 2 outlines the growing popularity of regional integration agreements in recent years. According to the World Trade Organisation (WTO), of the 194 agreements notified at the beginning of 1999, 87 have been notified since 1990. Most industrial and developing countries are now members of an RIA, and many belong to more than one (Crawford and Fiorentino, 2005).

The structure of RIAs has also evolved substantially in recent years. Early RIAs normally focussed on reducing barriers to trade between member countries. Acknowledging the perceived importance of FDI, RIAs formed today will often include explicit investment provisions aimed at reducing barriers to the flow of investment between members. It is likely, therefore, that RIAs will have a marked effect on FDI flows, both between member countries and between *insiders* and *outsiders*[11].

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[10] For an exposition of the *vertical*, *horizontal* and *knowledge-capital* models see Helpman (1984), Markusen (1984) and Markusen (1997) respectively.

[11] Even in the absence of such provisions, RIAs are expected to have a considerable impact on FDI flows because of the interplay between trade and investment.

Particular attention is paid to two of the world's most prominent integration agreements – the European Union and the North American Free Trade Agreement. The regionalism versus multilateralism debate is also discussed.

To complete Chapter 2 we introduce the *gravity model*, an empirical device that has proved popular in the analysis of trade and investment flows. We discuss the origins of the model and the potential empirical problems that arise when it is applied to FDI flows.

As FDI is thought to be beneficial in fostering economic growth, it is important that we understand the potential influence of RIAs. In Chapter 3 we conduct an empirical investigation into the effects of the European Union (EU) and the North American Free Trade Agreement (NAFTA) on FDI flows (both between members and between *insiders* and *outsiders*).

Despite a vast number of RIAs being in existence today, we choose to focus our investigation solely on the effects of the EU and NAFTA for a number of reasons. Firstly, RIAs vary considerably in scope and depth and it would be misleading to imply that all such agreements are homogenous. By explicitly examining the EU and NAFTA we are able to draw useful conclusions that apply to specific agreements. Furthermore, the members of NAFTA and the EU together accounted for 61% of world FDI inflows and 84% of world FDI outflows in 2003. Concentrating on these agreements therefore allows clarity in empirical implementation while encompassing the majority of global FDI activity. In addition, the EU and NAFTA are the most advanced RIAs in existence (in terms of breadth and depth of integration), and so it is reasonable to expect that they are the most likely to have a detectable impact on FDI flows.

In order to test whether the EU or NAFTA have an impact on *insider* or *outsider* FDI flows we apply the gravity model to a panel data set covering the period 1992 to 2003. The gravity model accounts for the main determinants of FDI flows, which allows an integration dummy variable to be introduced to capture any possible RIA-effect on FDI. A positive and statistically significant integration dummy provides evidence to support the hypothesis that RIAs encourage FDI flows. A range of dummy variables are used to test for the impact of the EU and NAFTA separately and to ensure that potential *insider* and *outsider* effects are properly analysed.

In Chapter 4 we apply the gravity model to international export flows, testing whether the existence of the EU and NAFTA does in fact result in an increase in trade flows between members. We also investigate possible trade-diversion effects by considering the impact of trade flows between *insiders* and *outsiders*.

This analysis is important because trade and investment are inextricably linked. Furthermore, it affords us a greater understanding of our application of the gravity model and permits comparison with a vast literature employing the gravity model to international trade flows. We compare the results from Chapters 3 and 4 to examine whether certain factors are more influential in determining investment flows than they are in determining trade flows.

As in Chapter 3, we include a range of integration dummy variables to allow the impact of the EU and NAFTA to be separately estimated and to explore possible trade creation and diversion effects.

In recent decades there has been a "new-found enthusiasm for FDI on the part of most developing countries" (Balasubramanyam, Salisu and Sapsford, 1996). This is encouraging given the belief that FDI is an important contributor to economic growth. It is therefore unfortunate that there remains considerable opposition across the world to globalisation (and the growth in integration, international trade and investment that accompanies it).

The formation of a new RIA will often be accompanied by considerable concern that it will lead to a loss of jobs (a fear not restricted to any single group). For example, plans to implement the European Single Market program gave rise to vehement protests from *outsiders* convinced that 'Fortress Europe' would drastically curtail their access to these markets; during NAFTA negotiations, US and Canadian special interest groups (i.e. *insiders*) voiced fears that domestic firms would relocate thousands of jobs to Mexico to take advantage of cheap and abundant labour.

Often, concern as to the perceived costs of globalisation will be voiced only by the minority, with the majority comfortable that the benefits will outweigh the costs. However, to the extent that the minority can exert significant political influence, they may be able to derail the progress of globalisation (e.g. by forcing new RIAs to be less *open* than they might otherwise have been). This is obviously of great concern if we believe that globalisation, through the mechanisms of international investment and international free trade, confers benefits across the globe.

In Chapter 5 we investigate the common concern that *outward* FDI can result in a loss of employment (and in extreme cases deindustrialisation) in the source economy due to the displacement of exports. This argument hinges on the relationship between FDI and exports. If they are *substitutes* then an increase in outward FDI will result in a fall in exports which may harm domestic employment. However, if they are *complements* outward FDI will be accompanied by an increase in exports.

As the relationship between FDI and exports is inconclusive from a theoretical standpoint, we are encouraged to try to resolve the issue by empirical analysis. Fortunately, the gravity model proves a convenient empirical tool for analysing the relationship. In addition to estimating the relationship in an aggregate sense, we explore whether the relationship varies depending on the types of country (e.g. developed or developing) involved.

In Chapter 6 we conduct a case study of FDI in Mexico. This allows us to explore some of the themes we have investigated throughout the thesis in the context of the experience of a developing country. Mexico provides an interesting case study of the effect of inward FDI because, like many developing countries, it has progressed from a highly protectionist regime focused on import-substituting industrialisation (ISI) to an open regime actively seeking to attract FDI. Furthermore, its proximity to the world's most 'powerful' nation is interesting and should make it easier to detect any beneficial (or negative) effects of FDI[12].

Examining the experience of Mexico also affords closer scrutiny of the influence of a regional integration agreement. Anecdotal evidence suggests that NAFTA has had a marked effect on the Mexican economy since its implementation in 1994, and it will be interesting to explore these potential effects in greater detail.

The availability of comprehensive data from the US Bureau of Economic Activity (covering US FDI into Mexico) also allows a time series analysis of the growth effects of FDI in Mexico to be undertaken.

Finally, Chapter 7 concludes, summarising the discussion and analyses of the previous chapters and drawing together the main conclusions regarding the interplay between regional integration, foreign direct investment and trade. Implications for policy, particularly with respect to developing countries, and possible directions for future research are discussed.

[12] Over the last two decades the US has consistently been the source of over half of Mexico's inward FDI. Given that US FDI, on average, is likely to embody a high degree of technology and know-how, Mexico should be in an excellent position to reap the benefits.

2. LITERATURE REVIEW AND METHODOLOGY

This chapter is designed to address a number of issues that are pertinent to the empirical analysis that we intend to undertake in subsequent chapters. It is divided into five sections. The first section discusses the mechanisms through which foreign direct investment may contribute to economic growth. Section two reviews the theory behind international trade and investment, with particular reference to attempts made to include the role of multinational enterprises. The third section discusses regionalism and FDI, including a brief history of the North American Free Trade Agreement and the European Union. Section four offers a critique of the *gravity model*, an empirical model commonly used to estimate trade and investment flows. Section five concludes.

2.1 GROWTH EFFECTS OF FOREIGN DIRECT INVESTMENT

Over the last half-century nations have become amazingly more receptive to foreign direct investment (FDI). Back in the 1960s and 1970s FDI was blamed for all manner of ills that beset countries, from local firm closures to national unrest. Nations looked to the example of Japan, whose refusal to permit FDI seemed to give rise to a remarkable success story. However, rapid growth in world trade, the liberalisation of many economies (e.g. China post-1991) and national industries (e.g. telecommunications), and Japan's 1990s decline foreshadowed a remarkable change in attitude towards FDI. Whilst multinational enterprises clamoured to invest to penetrate new markets and exploit previously inaccessible resources, nations began to appreciate the potential benefits of FDI and were soon fiercely competing to attract it.

FDI has become closely associated with the phenomenon known as 'globalisation'. For all the rhetoric, globalisation lacks an exact definition and means different things to different people. It is probably best used as a term to describe the increasing integration of national markets and the worldwide division of production (which has caused geographical separation of the value-added chain). The main drivers of globalisation are multinational enterprises (MNEs) that strive to access new markets and minimise production costs through international investments (i.e. FDI). Despite the now widely-held view that FDI is beneficial for the host economy, there are those who consider globalisation to be a capitalist tool designed to exploit developing countries. In one sense, the close link between FDI and globalisation has been beneficial, because the furore over globalisation has heaped enormous attention on FDI, both in academic journals and the popular press. However, it has also meant that they are frequently 'thrown in the same boat' and consequently many erroneous statements and claims as to the benefits or otherwise of FDI have been made. In order to ensure that the same mistake is not made here, we begin by grounding our analysis in economic theory.

The neoclassical growth model is typically expressed as a Cobb-Douglas production function with two inputs, capital (K) and labour (L):

$$Y = K^{\alpha}(AL)^{1-\alpha} \qquad [2.1]$$

'A' represents technological progress (which is assumed to grow at the constant, exogenous rate 'g') and 'AL' can be thought of as units of effective labour (which incorporates both the quantity and productivity of labour as governed by the level of available technology). We assume constant returns to scale (CRS), but diminishing returns to individual factors. Under this specification, FDI inflows are modelled simply as contributions to capital (K) and, therefore, there is no distinction between foreign and domestic investment. As the model assumes CRS with diminishing returns to capital accumulation, increases in national output will diminish as the stock of inward FDI (and domestic investment) accumulates, if not matched by proportionate increments of AL. In this manner, the neoclassical model predicts that economies will converge towards a steady-state equilibrium[1]. The level of the steady state is determined by the positive influences of FDI and the domestic saving rate and the negative effect of population growth. However, the growth rate of the economy at its steady state is governed purely by the exogenous rate of technological progress, 'g'. Therefore, the neoclassical model permits FDI only a short-run effect on growth (the length of which is determined by the economy's transitional dynamics to its steady state).

Obviously the neoclassical model is completely inadequate for analysing the potential growth effects of FDI. Its narrow specification constrains FDI to having the same characteristics as domestic investment. As Graham & Krugman (1991) observe, domestic firms will surely have superior knowledge and access to domestic markets. If a foreign firm is to enter these markets it must counter these advantages with some of its own. It is quite plausible that these advantages may be embodied (at least to some extent) in the

[1] Steady-state equilibrium is an equilibrium in which each variable is either constant or growing at a constant rate.

firm's FDI and may therefore spillover to the host nation. As such we require a growth model which will permit FDI to have differing characteristics and effects from domestic investment.

Fortunately, such a class of growth models was developed during the 1980s as a response to the inadequacies of the neoclassical growth model. Many questioned the power of the neoclassical model, which they saw as unable to explain the causes of long-run growth itself. What they sought was a model that could illuminate the causes and determinants of technological progress. As Romer (1994: pp.20/21) writes:

"if we make use of all of the available evidence, economists can move beyond these [neoclassical] models and begin once again to make progress toward a complete understanding of the determinants of long-run economic success. Ultimately, this will put us in a position to offer policy-makers something more insightful that the standard neoclassical prescription – more saving and more schooling. We will be able to rejoin the ongoing debates about tax subsidies for private research, antitrust exemptions for research joint ventures, the activities of multinational firms, the effects of government procurement, the feedback between trade policy and innovation…"

…and so the list goes on. These attempts to make use of all of the available evidence and ensure that relevant variables were determined *within* the model led to the creation of endogenous growth theory.

The origins of endogenous growth theory are usually cited as Romer's (1986) paper, "Increasing Returns and Long-Run Growth", published in the *Journal of Political Economy* and Lucas' (1988) paper, "On the Mechanics of Economic Development", in the *Journal of Monetary Economics*. Endogenous growth theory encompasses a number of different models whose common characteristic is that they endogenise one or more factors which neoclassical theory takes as exogenous. Significantly, they also allow non-diminishing returns to capital. This is normally due to externalities arising from industry-wide or economy-wide accumulation of human capital (Romer [1986], Lucas [1988]). However, we can develop a simple endogenous growth model that permits increasing returns to capital due to FDI inflows:

$$Y_j = K^{\alpha}{}_{dj} K^{\beta}{}_{fj} H^{\chi}{}_{j} (AL)_j^{\,1-\alpha-\beta-\chi} K_{fe}^{\ \varepsilon} \qquad [2.2]$$

where 'j' is a firm subscript and $K_{fe}^{\ \epsilon}$ is economy-wide accumulation of FDI (with the 'ϵ' term capturing the externality or spillover effect on the output of firm j). Each firm faces constant returns to scale in its reproducible factors (domestic capital, foreign capital, human capital, and effective labour) but due to positive externalities from $K_{fe}^{\ \epsilon}$ enjoys increasing returns overall. Therefore, whilst the simple neoclassical model regards FDI simply as a direct substitute for domestic investment, endogenous growth models (as illustrated above) acknowledge that FDI is crucially different from domestic investment and that it can benefit the host economy by means of transferring technological, managerial and organisational know-how.

Another interesting feature of endogenous growth models is that they typically do not predict convergence (in the per capita incomes of countries) because of their allowance for increasing returns[2]. In terms of the endogenous model we developed above, despite a single firm experiencing diminishing returns to domestic (K_{dj}) and foreign investment (K_{fj}), the economy-wide accumulation of FDI (K_{fe}) results in positive spillovers for the firm which permits it to enjoy increasing returns overall. If we assume that it is possible to aggregate this result across all firms in the economy, then that economy may be able to enjoy unbounded growth (subject to sufficient inflows of FDI).

Does our model therefore predict that the United States, which has consistently been the largest recipient of FDI in recent years (with the exception of 2004 - see Figure 1.1), will experience the fastest growth rate in the world (at least while it maintains its dominance in attracting FDI)? Not exactly, for we have neglected to discuss the importance of the externality capturing term (ϵ). Whilst economy-wide accumulation of FDI offers nations the potential to benefit from spillovers, their ability to exploit this potential is limited by their ability to absorb and utilise it[3]. Paying respect to the work of Moses Abramovitz (1986, 1995) we may call this ability a country's 'absorptive capacity'. Many factors are likely to influence a country's 'absorptive capacity', but the most important ones are likely to be the level of human capital, the state of technology and infrastructure, government policies, and the sophistication of financial institutions and markets. Therefore, a country that is lacking in these factors may have a low 'absorptive capacity'

[2] However, Paul Romer (1994) regrets the influence convergence has had on the development of endogenous growth theory: "This paper [1987 NBER Macroeconomics Annual] contributed to the convergence controversy and to an emphasis on the exponents on capital and labor in aggregate production. I am now critical of this work, and I accept part of the blame." (p.20).

[3] As Chamarbagwala (2000) states: "It appears that attributes such as skills and technical knowledge are abundant in Hong Kong, Singapore and South Korea. Consequently, these attributes allow the labour force in these countries to utililize technologically superior foreign machinery and equipment more efficiently and productively [than Malaysia, Indonesia, the Philippines, and India]" (p.396).

and may consequently prove largely ineffectual at exploiting the potential benefits from any inward FDI that it receives.

In the case of the US we would expect a high 'absorptive capacity' as it has a considerable stock of human capital, advanced technology and infrastructure, stable and transparent government policies, and well-developed financial institutions and markets. Our simple endogenous model would therefore seem to suggest that the US should have been enjoying the highest per-capita growth rates in the world until very recently.

Table 2.1 FDI Inflows by Host Region / Economy (US$m)

Host	1999	2000	2001	2002	2003
World	1,092,396	1,511,180	806,328	699,032	572,774
EMU*	336,370	631,803	290,363	350,870	280,824
US	289,443	321,274	167,020	72,410	39,889
UK	89,535	122,157	53,842	25,532	20,696
China	38,753	38,399	44,241	49,308	53,505
India	2,169	2,496	3,768	3,700	4,269

** EMU represents the twelve members of the single European currency.*
Source: World Investment Report 1999

How do we reconcile this prediction with the observation that the US does not in fact enjoy the highest growth rate? There are a number of factors that our simple model obviously does not capture. For instance, we have argued that one failing of the neoclassical model is that it cannot distinguish between domestic and foreign investment. We attempted to remedy this in [2.2] by allowing (economy-wide) accumulation of foreign capital to proffer positive spillover effects on individual firms. Whilst this may not be too unrealistic for a country like India, it is unlikely to be a fair representation for the US economy. This is because the US is at the technological-leading edge, and so its domestic investment may be imbued with many of the characteristics of FDI (such as high levels of technological and process know-how). Therefore, the US may be limited in the gains it can make from FDI, not because it has a poor 'absorptive capacity', but rather because it is too near the technological-leading edge to make significant advances in the short run.

The idea that potential growth may depend on how close a nation is to the technological frontier has frequently been employed to support the concept of convergence. As we discussed above, by permitting increasing returns to one of the factors of production (i.e. foreign capital in [2.2]) endogenous growth models generally conclude that convergence will not occur. However, Barro & Sala-i-Martin (1995) suggest that the zero convergence prediction of endogenous models "is a substantial failing...because conditional convergence appears to be an empirical regularity" (p.40). With this in mind the authors (1992, 1995) employ a typical endogenous growth model in which technology diffuses gradually from rich (high-technology) economies to poor (low-technology) economies. This diffusion results in the narrowing of the so-called 'technology gap' or 'ideas gap'. Therefore, when it comes to replenishing the stock of capital, a low-technology economy can make a much larger jump in the level of technology employed than can a high-technology economy. This is because the rich country will always face a substantial 'stock pile' of technological knowledge that it has yet to employ.

We are arguing that FDI is one such conduit for the worldwide dissemination of technological, managerial, and organisational know-how. Furthermore, a nation's ability to benefit from FDI is negatively correlated with how developed and technologically mature it is. Therefore, FDI may not only bring absolute benefits to the host economy, but may also be a force encouraging the worldwide convergence in per capita income levels.

2.2 INTERNATIONAL TRADE & INVESTMENT AND THE MULTINATIONAL ENTERPRISE

In this chapter we discuss the evolution of international trade theory in relation to attempts to incorporate the role of the multinational enterprise. We also review the empirical literature, focusing on studies that have sought to discriminate between alternative theories of the multinational enterprise.

2.2.1 Classical Trade Theory

Following the seminal work "A Treatise on Political Economy and Taxation" by David Ricardo in 1811, international trade theory was dominated by the theory of comparative advantage (or comparative cost). Ricardo demonstrated (using Portugal and England as examples) that even if one country has an absolute advantage in producing both goods, countries will still specialise and trade in that good in which they have a comparative advantage. Under Ricardian Theory, comparative advantage is determined by the shape of the production function and hence the factor-output ratio of each good.

The other major theory that has dominated the thinking on comparative advantage is the Heckscher-Ohlin (H-O) theory, developed by Heckscher (1919), Ohlin (1933), and Samuelson (1948)[4]. The H-O model is a significant departure from the analytical framework employed by Ricardo. Whereas Ricardian Theory assumes only one factor of production (and hence, in conjunction with the assumption of constant returns to scale, makes factor endowments irrelevant in determining the pattern of trade), the H-O theory assumes two factors and makes international differences in factor endowments the driver of comparative advantage and therefore the determinant of the pattern of trade. Stated formally, the H-O theorem posits that a country's exports use intensively the country's abundant factor.

2.2.2 The Leontief Paradox

It was not until the middle of the twentieth century that the economics profession began seriously to look beyond these models in explaining the pattern of international trade. Although this renewed 'search' was probably the culmination of a number of disparate factors, we discuss two which are of particular interest. One was the empirical work by Leontief (known famously as the 'Leontief paradox'), and the other was the growing realisation of the importance of foreign direct investment and the role of multinational enterprises.

[4] Writing in 1964, Bhagwati notes that the theory "owes much to the work of Samuelson...[and] in its current form it has discarded so many of the variables which Ohlin explicitly listed as significant that it is almost certainly liable to be rejected by Ohlin as an adequate version of his original analysis" (p.17). Indeed, today it is often referred to as the H-O-S model.

Leontief set out to empirically test the H-O theory by ascertaining the factor-intensities of the average exports and 'competitive imports' of the US. As we will recall, the H-O theory states that a country will export the good whose production is intensive in that country's abundant factor. As the US is capital intensive, H-O theory predicts US exports to be capital intensive and imports labour intensive. As is well known, Leontief actually found US exports to be labour intensive, and imports to be capital intensive. Despite objections to Leontief's empirical approach, subsequent studies were unable to refute the paradox.

2.2.3 The Product Life-Cycle Theory

Around the same time, the growing importance of FDI was becoming evident. According to the US Tariff Commission (1973: p.322), in 1970 multinationals accounted for 62% of US exports ($22 billion from a total of $35 billion) and 34% of imports ($10.5 billion from a total of $31 billion). A theory of international trade in which the multinational played no role therefore no longer squared well with reality. In an influential paper, Vernon (1966) sought to address this omission by putting "less emphasis upon comparative cost doctrine and more upon the timing of innovation, the effects of scale economies, and the role of ignorance and uncertainty in influencing trade patterns" (p.190).

Vernon began with the assumption that enterprises in any one of the advanced countries are not distinguishably different from those in any other advanced country, in terms of their ability to access and comprehend scientific knowledge. However, this does not necessarily imply that all enterprises have the same capacity to exploit scientific knowledge in the generation of new products. Vernon considered there to be a large gap between the knowledge of a scientific principle and the embodiment of that principle in a marketable product, and that entrepreneurs were required to shoulder the risks involved in testing whether the gap could be bridged. Furthermore, Vernon posited that "the entrepreneur's consciousness of and responsiveness to opportunity are a function of ease of communication; and further, that ease of communication is a function of geographical proximity" (p.192). Therefore, Vernon abandoned the simplifying assumption of knowledge as a universal free good and instead introduced it as a determinant in the decision to trade or to invest.

Given the assumption that domestic producers have greater knowledge about their home market (the opportunities it offers as well as the risks involved) than do foreign producers, Vernon considered US firms to hold a number of advantages over their foreign rivals. At the time of writing, the US enjoyed GDP per capita that was considerably higher than any of its rivals (twice as high as that of Western Europe), and was also characterised by high unit labour costs and relatively unrationed capital compared with other markets. Vernon therefore concluded that whenever there was a chance to develop a new product that was either responsive to wants at high levels of income, or addressed the need to conserve labour, this opportunity would first be apparent to US firms (as they were in the best position to observe the US market).

Having deduced that US entrepreneurs will be the first to become aware of opportunities for new products, Vernon further assumes that "the evidence of an unfilled need and the hope of some kind of monopoly windfall for the early starter both are sufficiently strong to justify the initial investment that is usually involved in converting an abstract idea into a marketable product" (p.193). We therefore arrive at the prediction that US firms will spend more on 'product development' than their foreign rivals[5].

However, Vernon's theory goes far beyond the prediction of higher product-development investment, to make inferences about the location of production during a product's life[6]. Vernon identified three distinct stages: new product; maturing product; and standardised product. During the new product stage, producers are concerned with the degree of freedom they have in modifying their factor inputs, and the need for swift and effective communication between producer, customer, and supplier (and even competitor). As the first-mover, a firm will enjoy some degree of monopoly power and therefore face a low price elasticity of demand. Taken together, these considerations should encourage the firm to opt for domestic production during the new product stage[7]. To the extent that there is overseas demand for the new product, the firm will supply via exports at this early stage.

As the product matures and demand grows (both at home and abroad), a certain degree of standardisation takes place. Vernon is at pains to point out that this does not mean that

[5] Vernon notes that this prediction is consistent with the "pioneer appearance" in the US of products such as the sewing machine, typewriter, and tractor etc.

[6] Hence the name given to his theory, the 'product life-cycle'.

[7] In other words: "the producer who sees a market for some new product in the United States may be led to select a United States location for production on the basis of national locational considerations which extend well beyond simple factor cost analysis plus transport considerations" (Vernon, 1966: p.196).

product differentiation ceases to occur (on the contrary, differentiation may intensify as rival firms attempt to gain some degree of market power), but rather that industry (and consumer) acceptance of certain general standards (and features) is likely. This has implications for the location of production, as producers become less concerned about input flexibility and market communication, and more concerned with production cost and market share. Vernon seems to envision an evolution in the mode of foreign market supply (overseas production replacing exports) during this stage, although he is less than clear about the timing, or specific determinants, of such a transition. He observes that "as long as the marginal production cost plus the transport cost of the goods exported from the United States is lower than the average cost of prospective production in the market of import, United States producers will presumably prefer to avoid an [overseas] investment" (p.197). However, he notes that this calculation will be subject to considerable uncertainty (particularly with respect to the prospective overseas-production cost), and that firms will often be motivated by other factors, such as the threat of new competition in the foreign market, the anticipation of future tariff levels, or the prevailing political situation. Furthermore, he argues that a threat is a stronger motivator than an opportunity, with firms often quick to react when they perceive that the status quo is under threat.

Finally, we enter the standardised product phase in which the specification of the product is well defined and demand has become more geographically dispersed (so that US domestic demand is not as important as it was in the earlier stages). It is interesting that a reading of the product life-cycle from a modern textbook will typically tell you that this is the stage at which production moves almost completely overseas and US demand is met by imports from overseas affiliates. However, Vernon actually centres discussion of this stage around the possibility of production moving to less-developed countries (LDCs). The main thrust of his argument is that if LDCs were to be involved in export-led production, standardised products would be the most suitable, given that they are well-defined, have a well-established market, and tend to sell on the basis of price[8]. While this argument may be logical, it fails to convince. As a product becomes highly standardised it seems likely that production and market access costs will become increasingly important, with other factors such as first-mover advantages and market power from product differentiation becoming less so. Firms are therefore looking for the least cost location overall, and while this may certainly be a less-developed country is some cases, more often than not it will be one of the industrialised nations.

We have discussed the work of Vernon in some detail because it heralded the introduction of the multinational enterprise in international trade theory and the beginning of a move away from classical comparative advantage trade theory. Perhaps because it was in some respects a 'ground-breaking' paper, and also being typical of the style of academic papers of that time, the paper lacks rigour and is perhaps overly descriptive. Also, as Vernon is quick to observe, the discussion relates only to innovation in certain kinds of products, and consequently the theory says nothing about industrial innovation in general. Regardless of this, the paper introduces a number of important new ideas, many of which have gone on to be applied more generally by other authors. Indeed, we go on to discuss more recent, formal models of international trade and the multinational enterprise, the

[8] Vernon also suggests that "industries which produce a standardized product are in the best position to avoid the problem [of significant local supply chain requirements], by producing on a vertically-integrated self-sustaining basis." Such industries should prove most suitable for less-developed countries.

seed of which can clearly be found in Vernon's work.

2.2.4 OLI Theory

Offering a more formalised theory of multinational activity, Dunning (1977) introduced the OLI theory (also known as the 'eclectic paradigm'). This posits that the three main elements in the production decision process for a multinational firm concern the possession of ownership advantages, the ability to internalise operations, and access to locational advantages overseas. Ownership advantages are the rent yielding assets a firm possesses – these may range from proprietary technology and intellectual property to brand names. A firm may exploit such assets in foreign markets through exports of the products that embody these advantages, licensing the technology to others in return for a fee, or franchising the rights to manufacture and sell the product. However, if markets are imperfect in the sense that information flows are incomplete, transaction costs are excessive, or there are risks of the ownership advantages accruing to other through imitation, then the firm may prefer to internalise operations. In other words, it undertakes FDI and retains complete control over operations.

Despite being a more rigorous model than that offered by Vernon, the eclectic paradigm is primarily focussed at the micro level, examining the potential behaviour of individual firms. In order to seek to understand FDI behaviour at a more macro level, we are forced to turn to alternative models.

2.2.5 The 'Vertical' Model

One such model was developed by Helpman (1984). Building on the standard model of international trade in differentiated products, he introduced a general purpose input (*H*) which could both be used to produce the homogenous product, and could be adapted at a cost to produce a given variety of differentiated product. Inputs that fit this description include management, distribution, and product-specific R&D (or 'product development' as Vernon would have it). Once adapted, input *H* becomes a firm-specific asset that is tied to the entrepreneurial unit but, crucially, can be used to serve multiple plants simultaneously and need not be present in a plant to serve its product line[9]. Firms look to maximise profits, and therefore choose cost-minimising production locations based on differing factor rewards. Relative factor rewards are based solely on differences in relative factor endowments across countries. In order to clarify the theory Helpman makes a number of simplifying assumptions. Transport costs and tariffs are assumed equal to zero, so production facilities are not established in order to reduce shipping or to produce behind tariff walls. Other possible reasons for multinationals, such as tax treatment, are also not considered.

Let us briefly describe Helpman's model. In a competitive equilibrium the price of the homogenous product (y), which is taken as the numeraire, equals unit costs:

$$1 = c_Y(w_L, w_H) \qquad [2.3]$$

[9] In particular, it can serve multiple plants located in different countries.

where C_y is the cost function for product '*y*', W_L is unit labour costs and W_H is the unit cost of the general purpose input.

The production of differentiated products is more complicated. Following the function $l(x, h_x)$, '*l*' units of labour are required to produce '*x*' units of a differentiated product in a single plant when h_x units of '*H*' have been adapted for use. Helpman suggests the following as a possible form for '*l*', where $f_p>0$ and $g_1(x,h_x)$ is positively linear homogenous:

$$l = f_p + g_1(x, h_x) \qquad [2.4]$$

Here f_p results in a plant-specific fixed cost and the variable component exhibits constant returns to scale. More generally, Helpman assumes that $l= f_p + g_1(x,h_x)$ is the inverse of an increasing-returns-to-scale production function in which h_x is essential for production. In addition to '*l*' units of labour, a differentiated product must also incur the cost of adapting *H*, given by $g(w_l,w_h,h_x)$, which is associated with a no decreasing-returns-to-scale production function. Combining these, the firm's single plant cost function for producing a variety of differentiated product becomes:

$$C_x(w_L, w_H, x) = \min_{h_x} [w_L l(x, h_x) + g(w_L, w_H, h_x) + w_H h_x] \qquad [2.5]$$

The function, [2.5], has the standard properties of cost functions associated with increasing-returns-to-scale production functions. What is important to note is that the firm has fixed costs that are corporation specific but not plant specific (i.e. the cost of adapting H), it has plant-specific fixed costs, and it has plant-specific variable costs. By assuming that $l = f_p + g_l(x, h_x)$ is the inverse of an increasing-returns-to-scale production function, in the absence of transportation costs or differences in product prices across locations, production will invariably be located in a single location.

It is assumed that there is Chamberlain-type monopolistic competition in the differentiated product sector. This implies that firms equate marginal revenue with marginal product and free entry competes away any abnormal profits. Combined with [2.5], these formal conditions are those applied to existing models of trade in differentiated products. The novelty in Helpman's exposition derives from factor H, with firm-specific asset h_x permitting production to take place in countries in which h_x is not physically present. Note that "the specificity of h_x implied that arm's-length trade in its services is an inferior organizational form to an integrated firm" (p.455). This is the feature that allows the emergence of multinational corporations.

Let us now consider the model's predictions regarding the pattern of trade. In the case of factor-price-equalisation across countries, the model predicts that the inter-sectoral pattern of trade will be the same as in the Heckscher-Ohlin model. However, in this model intra-industry trade in differentiated products also occurs. There is no multinational activity as the optimal location decision is to locate all production at home and export where necessary.

Now consider the case where factor prices are not equal across countries, with H being cheaper in *country A* and l being cheaper in *country B*. Firms will clearly have an incentive to locate their (h_x-producing) headquarters in *country A* and their (x-producing) plant in *country B*. This will increase demand for H in *country A* and reduce it in *country B*, and increase demand for l in *country B* and reduce it in *country A*. Equilibrium will be obtained either when factor prices are equalised, or when *country A* becomes the home for the headquarters of all corporations. This results in *country A* importing the homogenous (l-intensive) product, and intra-industry trade in differentiated products, with some of this trade being undertaken by multinationals[10]. The amount of trade that will be undertaken by multinationals (and the determinant of whether country A will be a net exporter, or net importer, of the differentiated product) is determined by the initial difference in factor prices and how quickly they become equalised. The model therefore demonstrates that factor endowment differences can result in the existence of multinational enterprises, and that this will have an impact on the pattern of international trade.

In his conclusion, Helpman notes that "despite the relative richness of the theory it needs further extensions and elaborations in order to deal with the wide range of problems that are at the head of international economics" (p.470). Indeed, Helpman (1985) and Helpman and Krugman (1985) elaborate and extend the theory. Helpman's model, and those that have since been developed in its likeness, are commonly known as 'vertical' models, because they describe multinational activity in terms of fragmentation of the production process between different geographical locations (i.e. headquarter activities

[10] Intra-firm trade will also exist as headquarters export intangible "*H*-services" to their overseas subsidiaries.

are based in the parent country, and production is based overseas). Alternatively, they are known as 'factor-proportions' models (following Brainard, 1993), because this is what generates multinational activity.

2.2.6 The 'Horizontal' model

As is often the case in economics, at the same time as one model is being proposed, an alternative approach is being independently developed. Markusen (1984) explains the existence of multinationals by assuming the existence of firm-level scale economies (i.e. two-plant firms have fixed costs that are less than double those of a single-plant firm). Multinationals are defined as firms that produce the same product in multiple plants, serving local markets by local production. This model, and others in the same vein, is therefore known as 'horizontal' models. Extensions of Markusen's early model can be found in Horstmann and Markusen (1987, 1992) and Brainard (1993). Markusen and Venables (1998, 2000) develop general-equilibrium extensions that permit more direct comparison to be made between the vertical and horizontal models.

Brainard (1993, 1997) uses the term 'proximity-concentration hypothesis' to describe horizontal models, emphasising that multinational production-location decisions can be explained by a trade-off between maximising proximity to customers and concentrating production to achieve scale economies. Whereas the early horizontal model of Markusen relies on firm-level economies of scale to generate multinational activity, Brainard's version introduces transport costs so that firms have an incentive to locate close to customers. This incentive is tempered by the extent of plant-level economies of scale relative to firm-level economies of scale.

If we briefly review a typical version of the horizontal model, we can see many similarities to the vertical model in terms of its construction and assumptions. Brainard (1997) describes a model with two factors, two countries, and two sectors. One sector produces a homogenous good using constant-returns-to scale technology, and the other sector produces differentiated goods using increasing-returns-to-scale technology. Simplifying assumptions are made, which include symmetry in factor endowments and consumer preferences, homothetic preferences across the two aggregate goods, and demand characterised by constant elasticity of substitution among different varieties of the differentiated product[11]. Technology in the differentiated sector is assumed to be "characterized by increasing returns at the firm level due to some corporate activity unique to the firm, such as R&D, which can be spread among any number of production facilities with undiminished value" (p.521). Furthermore, the invention of each variety of differentiated good will require a fixed cost, which is a function of the local wage. Technology so defined is akin to the firm-specific input produced by adapting factor H in Markusen's vertical model.

As in the model of Markusen, Brainard assumes Chamberlain monopolistic competition in the differentiated sector, with firms equating marginal revenue to marginal cost, and free entry ensuring no abnormal profits. Unlike Markusen, however, it is assumed that exporting incurs a transaction cost because of transport costs and trade barriers. These

[11] Note that the assumption of symmetry in factor endowments means that 'vertical' multinational activity will not take place.

costs are modelled according to an 'iceberg' methodology, so that the amount of product that survives shipment is decreasing in the distance between the two markets.

The model provides for three possible equilibria: one in which all firms operate as multinationals with plants at home and abroad; another in which all firms operate as national firms with headquarters and plant located in the same country and the foreign markets served purely by exports; and a mixed equilibrium in which some firms are multinationals and others are national firms. The pure multinational equilibrium is most likely to occur when the transaction costs involved in exporting are very high and the fixed costs of establishing a plant are low (or plant-level economies are low relative to firm-level economies). The pure trade equilibrium becomes more probable under opposite conditions.

Under a reasonable set of model parameters the mixed equilibrium is the most likely outcome (as we would expect from casual observation of the real world). In this situation there is both two-way multinational production, and two-way trade in final goods[12]. For a given 'world' output, the model predicts that multinational production will account for a growing share as transaction costs rise and plant-level economies of scale (relative to firm-level economies) fall.

Our review of the standard models of 'vertical' (or 'factor-proportions') and 'horizontal' (or 'proximity-concentration') multinational activity hopefully highlighted the

[12] As in the vertical model, there is also intra-firm trade in terms of multinationals supplying 'corporate services' to their overseas plants.

commonality in model construction. Although the models share a number of common assumptions, parting company in relation to just one or two of the assumptions has significant implications in terms of the predictions for the pattern of multinational activity and international trade. To summarise, the 'vertical model' attributes the existence of multinationals to differences in factor proportions, with differences in factor proportions and country size stimulating multinational activity. The 'horizontal model' predicts multinationals will exist when the benefits of proximity outweigh the benefits of concentration.

2.2.7 The 'Knowledge-Capital' Model

Not surprisingly (given their inherent similarities) attempts have been made to combine the models into a single theory (Markusen et. al. (1996), Markusen (1997)). This has become known as the 'knowledge-capital' model of the multinational enterprise. By incorporating *horizontal* and *vertical* motivations for FDI the model makes three key assumptions. Firstly, 'corporate services' (such as product development, process innovations etc) can be geographically separated from production and supplied at low cost. Secondly, these 'corporate services' are skilled-labour-intensive relative to production. Thirdly, 'corporate services' have some degree of joint-input characteristic, meaning they can be utilised simultaneously by multiple production facilities without degrading their productivity. These assumptions should be familiar from our preceding discussion of the antecedent models. The first two assumptions provide for *vertical* motivations for FDI, encouraging firms to locate headquarters (i.e. 'corporate services' production) in the skilled-labour-intensive country and production in the unskilled-labour-intensive country. The third assumption permits firm-level economies of scale and provides the *horizontal* motivation to locate production close to the target market.

More formally, the 'knowledge-capital' model can be described as follows. Assume two countries (a and b), two homogeneous goods (X and Y), and two homogeneous factors (skilled and unskilled labour) that are both internationally immobile. Good Y is unskilled-labour-intensive and produced under constant returns to scale in a competitive industry. Good X is skilled-labour-intensive, subject to increasing returns to scale in an industry under Cournot competition with free entry and exit. As mentioned, within a firm 'corporate services' can be geographically separated from production, and a firm may have plants in one or both countries.

This model results in six possible firm types: horizontal multinationals that locate headquarters in *country a* and have plants in both countries (*Ha*); horizontal multinational headquartered in *country b* with plants in both countries (*Hb*); national firms with headquarters and a single plant in *country a* (*Na*); national firms with headquarters and a single plant in *country b* (*Nb*); vertical multinationals with headquarters in *country a* and a single plant in *country b* (*Va*); vertical multinationals headquartered in *country b* with a single plant in *country a* (*Vb*). Types *Na*, *Nb*, *Va*, and *Vb* may or may not export to the other country.

The types and number of firms that will exist in equilibrium depends on country and industry characteristics. It is typical to use simulation analysis to generate possible outcome scenarios, but for our purposes a discussion of the relevant factors and their potential outcome will suffice. Type *Ha* firms are most likely to exist when both countries are large and have similar factor endowments (this is equally true of type *Hb* firms). If both countries are small however, national firms (type *Na* and *Nb*) may be more likely to emerge as aggregate trade costs will be lower (due to smaller foreign markets) and will therefore provide less incentive to establish overseas production facilities. The probability of vertical-type firms (*Va* and *Vb*) emerging is greatest when the countries are very different in relative factor endowments (with *Va* firms prevailing when *country a* is heavily endowed with skilled labour and *country b* with unskilled labour, and the inverse for *Vb* firms).

Here we conclude our review of the theory relating to multinational enterprises and international trade. We have seen how theory has moved away from the classical model based on comparative advantage to embrace the activities of multinational enterprises and their effect on the pattern of international trade. Modern theory also incorporates a range of other factors (which casual observation of the real world tells us are evidently important), such as imperfect competition, transport costs and trade barriers.

2.2.8 Empirical Literature Review of Studies Seeking to Discriminate Between Alternative Models of Multinational Activity

Given the range of extant models, attempting to discriminate between them empirically has become a popular research topic. In this section we will consider the results of a number of such studies.

Brainard (1997) provides an empirical assessment of the proximity-concentration trade-off between multinational sales and trade (also known as the 'horizontal model'). The first point to note is that the term itself used by Brainard to describe the model, i.e. proximity-concentration trade-off, implies that FDI and exports are substitutes (and, indeed, in the confines of this particular model they are just that). However, as we will discuss in detail later, while FDI and exports may well be substitutes with respect to transport costs and trade barriers, this does not preclude a complementary relationship from prevailing overall.

Brainard confines the analysis to bilateral US relationships in order to exploit the superior data collected by the US Bureau of Economic Analysis (BEA). The focus is on 1989 cross-section data disaggregated by industry and country[13]. In order to avoid simultaneity between trade flows and multinational sales, she used the share of total trade accounted for by exports as the dependent variable. Brainard also notes that hers is the first paper to employ a direct product- and country-specific measure of transport costs, as well as disaggregated data, and variables measuring concentration advantages[14].

The following regression equation estimated by Brainard is derived directly from the

[13] Countries were chosen to maximise diversity in geographical coverage, income, production structure, and data coverage. Twenty-seven countries were chosen in total (it is unclear why Brainard has not included all countries for which sufficient data exists). Data on bilateral imports and exports at the three-digit SIC level were obtained from the US Bureau of the Census. Data on affiliate sales were compiled at the lowest available level of aggregation (between the two- and three-digit SIC levels). Industries for which services account for over half of total revenues have been excluded (e.g. finance and utilities), leaving 63 manufacturing and primary industries.

[14] The measure of transport costs is derived from the data on freight and insurance charges reported by importers to the US Bureau of the Census. Measures for tariffs come from a 1988/89 GATT database and are a simple average of *ad valorem* tariff rates. Concentration advantages are measured in terms of plant-level scale economies and firm-level scale economies. Plant-level economies are proxied by the number of production employees in the median US plant ranked by value added. Firm-level economies are proxied by the number of non-production workers in the average US-based firm in each industry.

'proximity-concentration' hypothesis:

$$X_i^j = \alpha_0 + \alpha_1 FREIGHT_i^j + \alpha_2 TARIFF_i^j + \alpha_3 PWGDP_I + \alpha_4 TAX_i + \alpha_5 TRADE_i$$
$$+\alpha_6 FDI_i + \alpha_7 PSCALE^j + \alpha_8 CSCALE^j + \mu_i^j$$

The dependent variable, X_i^j, is the natural log of the export share of total US sales (exports plus affiliate sales) of *good j* in *country i*. *FREIGHT* is the log of the transport cost measure for *good j* transported between the US and *country i*. *TARIFF* is the log of the tariff measure of imports of *good j* in *country i*. *PWGDP* is the log of the absolute value of the differential in per-worker GDP between the US and *country i*. *TAX* is the log of the average effective corporate tax rate in *country i*. *TRADE* and *FDI* are the logs of survey-measures of a country's openness to trade and foreign direct investment respectively. *PSCALE* and *CSCALE* are the logs of plant scale economies and firm scale economies in *industry j*, respectively.

The proximity-concentration hypothesis implies negative coefficients on *FREIGHT*, *TARIFF*, *FDI* and *CSCALE*, and positive coefficients on *TAX*, *TRADE*, and *PSCALE*. The per-worker income differential has been included to control for factor-proportions differences. Brainard notes that it is not as straightforward to predict the expected sign on this coefficient as it is for the other independent variables, but does suggest that it may be positive if affiliate sales are relatively better explained by the Linder hypothesis than are exports[15].

[15] Linder (1961) proposed a possible solution to the Leontief Paradox by developing a demand-based theory of trade that was consistent with Leontief's empirical findings. Linder hypothesised that countries with

The estimated equation for Brainard's OLS regression is[16 17]:

$$X_i^j = -4.73 - 0.27 FREIGHT_i^j + -0.37 TARIFF_i^j + 0.30 PWGDP_I - 0.57 TAX_i$$
$$+1.66 TRADE_i - 0.83 FDI_i + 0.13 PSCALE^j - 0.27 CSCALE^j$$

The results lead Brainard to conclude that "the proximity-concentration hypothesis appears to be fairly robust in explaining the share of total sales accounted for by trade as opposed to affiliate sales" (p.539/540). The share of affiliate sales is increasing in tariff rates, freight costs, openness to FDI, and firm-level scale economies. The only result that does not accord with *a priori* expectations is the negative coefficient on the *TAX* variable. Brainard suggests that this may be because the *TAX* variable is correlated with other macroeconomic variables, such as public investment and income, that would be expected to encourage affiliate production.

In a short empirical paper, Ekholm (1998) sets out to challenge the standard measures of revealed factor abundance. Recall from our earlier discussion that the famous Leontief paradox refers to the finding that US exports are relatively labour intensive. This is at odds with classical trade theory (which predicts that US exports should be capital intensive) and, according to Ekholm, is one of the reasons for the widespread

similar demand preferences would develop similar industries; these countries would then trade with one another in similar, but differentiated, goods.

[16] Brainard includes some additional variables derived from managerial research that we do not report here. Neither do we report the results from the random-effects and fixed-effects models as they do not alter the findings.

[17] The t-ratios, in the order listed in the regression equation, are: (-2.04), (-4.58), (-7.45), (3.75), (-1.80), (6.31), (-1.81), (2.73), (-4.66).

discontentment with traditional trade theory as an explanation of the determinants of trade. Ekholm suggests that the poor empirical performance of the classical model may be due to a misspecification of the standard measures of revealed factor abundance, specifically that trade in intangible 'corporate' or 'headquarter services' is not being captured. In our theory review, we saw the key role that such services play in both *horizontal* and *vertical* models.

Ekholm estimates measures of revealed factor abundance (both standard measures and her modified measure which takes account of trade in 'headquarter services') based on factor requirements for the years 1967 and 1987. The standard measures reveal that the United States was most abundant in agricultural workers in both 1967 and 1987. This finding is consistent with other studies on factor content (e.g. Bowen et al., 1987). The standard measures also reveal aggregate labour to be more abundant than capital and hence the Leontief paradox prevails in this data.

The modified measures, which take 'headquarter services' into account, have limited effect on the results. Agricultural workers remain the most abundant factor, and the Leontief paradox continues to hold. In fact, the modified measures actually lead to a downward revision of the US's revealed abundance of physical capital. Ekholm concludes that "the recalculation of RFA here does not seem to be able to reverse, or even mitigate, the result that the United States appears to be relatively well endowed with labour, and relatively poorly endowed with physical capital" (p.552).

In a recent paper Carr, Markusen and Maskus (2001) turn their attention to an empirical estimation of the 'knowledge-capital model' of the multinational enterprise. As we discussed in the theory review above, this model combines elements from the *vertical* and *horizontal* models, allowing multinational activity to be motivated both by factor-proportions considerations and a proximity-concentration trade-off. The authors begin by running simulations to generate predictions on the relationship between affiliate sales and country characteristics. They are then able to use these predictions to condition their econometric specification as follows:

$$MOFAsales = \beta_0 + \beta_1 \sum_i^j GDP + \beta_2 (GDP_i - GDP_j)^2 + \beta_3 SkillDiff + \beta_4 [(GDP_i - GDP_j)^2 * (SkillDiff)]$$
$$+ \beta_5 FDICost_j + \beta_6 TradeCost_j + \beta_7 [TradeCost_j * SkillDiff^2] + \beta_8 TradeCost_i + \beta_9 Dist$$

The dependent variable, *MOFAsales*, is the real volume of sales by majority-owned manufacturing affiliates in each host country. The first independent variable is the sum of GDPs of the source (*i*) and host (*j*) countries. The expected sign on β_1 is positive (although a stricter hypothesis is that the elasticity of affiliate sales with respect to the sum of GDPs should be greater than one). The second independent variable is the GDP difference between source and host countries squared, which is expected to be negative. Third is the difference between countries in a measure of skilled labour abundance, expected to be positive. Fourth is the product of differences in economic size and skill endowments (the product of the second and third independent variables). The sign on this interaction term is predicted to be negative. The fifth variable is a measure of the cost of investing in the host country, obviously anticipated to have a negative coefficient. The sixth is a measure of the cost of exporting to the host country, predicted to be negative.

The seventh explanatory variable is the product of the trade cost measure and the difference in skilled labour endowments, included to try to capture the hypothesis that trade costs may encourage *horizontal*, but not *vertical*, investment and that horizontal FDI is most important when *source* and *host* have similar relative endowments. The coefficient is therefore expected to be negative. The penultimate variable is a measure of the cost of exporting to the source country, intended to capture disincentives to establishing foreign affiliates for the purpose of exporting back to the parent country (and therefore expected to be negative). The final variable is a simple measure of geographic distance between the source and host countries. It is unclear what the *a priori* expectation for this variable is as distance is a factor in the cost of both exporting and foreign investment (including monitoring of affiliates).

The authors estimate the regression equation detailed above using a panel of cross-country observations for the years 1986 to 1994[18]. Data on affiliate sales is from the US Department of Commerce, with the Unites States being either the *source* or *host* country in every bilateral observation. There are 36 countries in addition to the US (as there are not an equal number of observations for each the panel is unbalanced). The following shows the results for the regression equation estimated by OLS:

$$MOFAsales = 16,630 + 10.8\sum_{i}^{j} GDP - 0.0012(GDP_i - GDP_j)^2 + 33,743 SkillDiff - 6.34[(GDP_i - GDP_j)^2 * (SkillDiff)$$
$$-516.6 FDICost_j + 119.2 TradeCost_j + 605.2[TradeCost_j * SkillDiff^2] - 93.7 TradeCost_i - 1.82 Dist$$

[18] The authors emphasise that the theoretical results apply equally well to both time-series and cross-section processes: "theory should correctly characterize both the time-path of the interactions between two countries and the interactions among countries in a single year."

We can see that the signs are as predicted for all coefficients (except for $TradeCost_j$ * $SkillDiff^2$, which is not statistically significant)[19]. Furthermore, the majority of the coefficients are statistically significant at the 1% level, the exceptions being $TradeCost_j$ and $TradeCost_i$ (in addition to the interaction term mentioned previously)[20]. The lack of significance of the trade cost variables immediately suggests two possibilities: that the survey measures used by the authors to estimate trade costs are providing a poor proxy; that affiliate sales and trade are not as closely linked as is commonly thought[21].

The regression equation is also estimated with Weighted Least Squares (WLS) and Tobit procedures. The WLS results are very similar to those for OLS, with the exception that $TradeCost_j$ * $SkillDiff^2$ becomes 'correctly' signed (-569.9), although still lacks statistical significance. The Tobit specification has an interesting effect on the variables involving skill differences, magnifying their absolute value considerably relative to the OLS and WLS results. Given the additional observations that were included in the Tobit procedure (119 observations for poor, generally small, countries were included with the missing value for affiliate sales assumed equal to zero), the authors argue that this finding makes intuitive sense as excluding these observations from the OLS and WLS regressions is liable to have downward-biased the role of skilled labour.

Next the authors discuss the magnitude of the coefficients and four partial derivatives,

[19] The t-ratios, in the order listed in the regression equation, are: (1.08), (7.01), (-6.89), (3.77), (-2.62), (-3.79), (1.16), (0.36), (-0.99), (-7.75).
[20] *GDP Difference* * *Skill Difference* is statistically significant at the 10% level.
[21] This might be the case, for example, if a significant volume of foreign investment was driven by competitive rivalry between multinationals in an oligopolistic market.

and from this they derive their five 'results'[22]. Their first result is that an increase in trade costs of the host country will raise production by foreign affiliates. The authors do not attempt any calculation of the magnitude of this effect, but simply note the implication that inward trade costs induce a substitution of local production for exports.

Their second result states that a bilateral increase in parent and host-country trade costs decreases affiliate production, "so trade and investment are complements" (p.705). Furthermore, the increase in trade costs decreases affiliate production when the non-US country is a developing country ('complements') but increases affiliate production when the non-US country is another high-income country ('substitutes'). Note that this finding accords well with theory which says that investment between two high-income countries (i.e. small skill difference) will be predominately *horizontal* (and therefore trade costs will discourage exports but encourage investment), whereas investment between the US and a developing country (i.e. large skill difference) will be predominately *vertical* (which should discourage exports and investment). It is important to highlight that this method of categorising exports and investment as either *complements* or *substitutes* (i.e. if higher bilateral trade costs reduce (increase) affiliate production they are complements (substitutes)) is extremely tautological, and perhaps unfairly misleading. We will shortly come to discuss how exports and investment may be 'substitutes' with respect to trade costs and yet be 'overall' or 'natural' complements.

For their third result the authors state that "convergence in income (GDP) between the

[22] The four partial derivatives are calculated to give an idea of the potential impact on affiliate sales of host-country trade costs ($\theta Sales/ \theta TradeCost_j$), bilateral trade costs ($\theta Sales/ \theta TradeCost_{(i+j)}$), difference in GDP ($\theta Sales/ \theta GDP\ difference$), and difference in skill endowments ($\theta Sales/ \theta SkillDiff$).

United States and any host country (holding the sum of their incomes constant) increases affiliate sales in both directions" (p.705). Note that in the dataset used the US has the highest GDP of all countries in all time periods.

To arrive at their fourth finding, Carr et al. consider the effect of changes in the abundance of skilled labour. They find that an increase in host country skilled-labour abundance relative to the parent country (i.e. a reduction in the *SkillDiff* variable) may increase inward investment if the host is small relative to the parent. For example, in the case of the US an increase in *host*-country skilled-labour abundance increases US-affiliate production in the host country. When the US is the host, an increase in *parent*-country skilled-labour abundance is required to increase the parent-country's affiliate production in the US. This result seems to accord well with the *horizontal* motivation for FDI as both examples given above imply a convergence in relative factor endowments.

Finally, the effect of an increase in the sum of bilateral income is investigated. Recall from our discussion of the independent variables that a strict hypothesis for the sum of GDP variables predicts an elasticity greater than one. The authors calculate the implied elasticity of total affiliate sales with respect to bilateral GDP and find the elasticity to be 1.35 (for mean values of the $[GDP_i\text{-}GDP_j]^2$ and *SkillDiff* variables). Not only is this broadly consistent with the work of Eaton and Tamura (1994) who report the elasticity of US FDI with respect to host-country per capita income to be between 1.2 to 1.6, but it also accords well with the reality that for the last three decades global FDI growth has outpaced world GDP growth[23].

To summarise, the authors derive a testable empirical specification for affiliate sales from the 'knowledge-capital' model of the multinational enterprise. This model accommodates both *horizontal* and *vertical* motivations for FDI, and also endogenises trade flows. According to their findings, affiliate sales are increasing in the sum of bilateral GDPs, similarity in country size, skilled-labour abundance of the parent, and the interaction between size and relative endowment differences. It is notable that these findings are consistent with earlier studies, particularly the work of Brainard (1997) and Ekholm (1997). Of particular interest is the statement that "bilateral increases in trade costs produce results that suggest that trade and investment are 'complements' but may be 'substitutes' for similar countries" (p.707). In conclusion, the authors find strong empirical support for the knowledge capital model and are optimistic that it will prove useful for future policy analysis.

In a comment on the Carr et al. paper, Blonigen, Davies and Head (2002) argue that rather than offering direct support for the 'knowledge-capital' model, the dataset used by Carr et al. cannot reject the 'horizontal' model in favour of the 'knowledge-capital' model. Blonigen et al. note that the 'knowledge-capital' and 'horizontal' models are distinguished empirically by the estimate of the effect of skill differences on the level of affiliate activity. They argue that Carr et al. mis-specified the skill difference term in their empirical framework, and use a 'corrected' measure to show that the same dataset

[23] It does perhaps beg the question of what was happening to the world economy prior to the 1970s, during the period when FDI growth was not outstripping income growth – were the current models of the multinational enterprise and international trade not applicable then?

cannot reject the 'horizontal' model in favour of the 'knowledge-capital' model[24].

Although to my knowledge there has been no formal response by Carr et al. to the comment by Blonigen et al., two of the authors of the original paper have published further empirical work seeking to discriminate amongst the 'vertical', 'horizontal' and 'knowledge-capital' models (Markusen and Maskus, 2002). Although they use the same dataset as the two papers discussed previously, they employ a different estimating equation[25]. Their results support both the 'horizontal' and 'knowledge-capital' models, with it proving impossible to choose a preferred model. The 'vertical' model performs poorly, however, with the authors suggesting that it "is a poor characterization of the overall pattern of world FDI activity" (p.706).

2.2.9 Literature Review of Studies Investigating the Relationship Between Trade and Investment

As we have seen, many of the empirical studies discussed above make inferences (implicitly if not explicitly) regarding the nature of the relationship between trade and investment. There is also a rich literature that examines this relationship in its own right.

Some of the earliest empirical studies on this topic were a direct result of official concern in both the US and UK during the late 1960s as to the impact of outward FDI on the

[24] Using their 'corrected' measure of skill difference, Blonigen at al. find that absolute skill differences reduce affiliate sales in the host country. Carr et al. found that increases in the parent's relative skill endowment raise affiliate sales in the host so long as the parent is small (and this effect of skill differences is decreasing in the parent-host GDP difference).

[25] Markusen and Maskus (2002) nest a 'horizontal' and 'vertical' model within a hybrid (unrestricted) 'knowledge-capital' model.

balance of payments. Integral to this was the issue of whether foreign investment results in decreased exports. To address this concern, two studies were sanctioned: "Effects of UK Direct Investment Overseas" by Reddaway (1968); and "Overseas Manufacturing Investment and the Balance of Payments" by Hufbauer and Adler (1968).

Despite using different methodologies and data, both studies came to the similar conclusion that outward FDI contributes positively to the balance of payments in the long run. With specific regard to the relationship between FDI and exports, both studies concluded that "outward FDI tended to stimulate exports (mostly of capital and intermediate goods) without stimulating imports in equal magnitude" (Graham, 1995).

Gruber, Mehta, and Vernon (1967) followed Vernon's product life-cycle theory in their approach, viewing foreign investment and exports as separate stages in the dynamic process by which US firms expand abroad. The theory begins from "the observation that entrepreneurs in the United States are surrounded by a structure of domestic demand for producer and consumer goods that is in some respects a forerunner of what will later be found in other countries" (p.21). During the early stages of the product's life-cycle, when the majority of demand is domestically located, the US firm favours domestic production to ensure flexibility of inputs and ease of communication with the market. To the extent that there is foreign market demand at this stage it may be serviced by exports. However, as the product matures, cost considerations become more important and foreign firms become more able to replicate the product of the US firm. During this stage the US firm becomes more likely to undertake FDI, both to reduce the cost of servicing foreign markets, and to establish marketing, service and production facilities in foreign markets.

As the product becomes highly standardised, production in the US may actually cease with the US market being supplied by imports from the overseas subsidiaries of the US parent. The authors therefore view foreign investment as the successor to exporting in the life-cycle of a product.

The authors examine basic statistics on trade, investment, affiliate sales and R&D expenditures by the US for the years 1958 to 1962 to try and find evidence to support the product-life cycle theory. Remembering that their techniques are not very sophisticated (resulting from the combination of a relatively informal model and the sophistication of econometrics at that time), they show that the five US industries with the greatest "research effort" are also the five industries with the most favourable trade position. Also, they report that in the European area the sales of US subsidiaries are more important in relation to US exports than in non-European areas. They interpret these findings as consistent with the expectations of their theory

Horst (1972) elaborates on the work of Gruber et al, by considering how static effects (such as technological knowledge, tariff rates, market size, factor costs) might influence the dynamic investment process of firms. He assumes that US firms have a technological advantage that they are able to exploit either by exporting or making available to a Canadian subsidiary. It is interesting to note that there is no discussion in the paper as to the direction of the relationship between FDI and exports, rather it is taken for granted that exporting and investing abroad are substitutes owing to the equal applicability of technology in both markets and the ability to exploit it by either entry mode.

His empirical analysis focuses on the sales of US manufacturing firms to the Canadian market in 1963 for eighteen two-digit SIC manufacturing industries. Horst regresses the shares of US exports, subsidiary sales, and the sum of the two, in world exports to Canada plus total Canadian production, against parent firm R&D expenditures as a share of domestic sales[26]. For all three equations he finds a positive coefficient on R&D expenditure, with 5.47 for the exports equation, 14.65 for the affiliate production equation, and 20.69 for the combined share of exports and affiliate sales. Somewhat surprisingly, Horst suggests that these results provide "strong, if indirect, support for the hypothesis that exporting and foreign investing represent alternative methods by which US firms exploit the same technological advantages over their Canadian competitors" (p.40). This seems an overly bold assertion, and it may be safer to conclude that Horst's results are merely an indication that firms spending more on R&D are more inclined and better able to expand into Canada, regardless of the entry mode chosen.

In further regressions, Horst regresses the share of US exports in total sales (exports plus affiliate production) against measures of the nominal and effective rates of protection in Canadian industries. He finds that a higher rate of protection lowers the share of exports in total sales, all else equal[27]. He finds similar results for comparable regressions for US exports to the UK and (what was) the Common Market (albeit with data limited to seven industries).

[26] R&D expenditures are taken as a proxy for the technological advantage of US firms over their Canadian counterparts.

[27] As an interesting aside, Horst finds that the effective rate of protection performs no better than the nominal rate.

In an influential paper, Lipsey and Weiss (1981) examine exports to a cross-section of 44 foreign destinations, for the year 1970, from the US and a group of thirteen other major exporting nations. They relate exports to a measure of affiliate activity and to characteristics of the destination countries[28]. These characteristics include GDP, membership of the EEC, and distance from the US and from Germany. Essentially the authors have taken the elements of a crude trade model and added some measures of direct investment by the US and the group of thirteen major exporters. Whereas earlier studies compared foreign investment and exports across industries, Lipsey and Weiss use data within industries and are therefore able to avoid some of the bias that might result from the operation of industry comparative advantages that promote both FDI and exports.

The authors explicitly note one of the major potential pitfalls with empirical work on this topic, stating that there may be factors which simultaneously affect investment and trade and therefore give a spurious appearance of a relationship between them[29]. Earlier papers have perhaps been guilty of not paying this due regard. Lipsey and Weiss suspect the most important missing variable from their work to be host country trade policy (such as tariffs or exchange controls that discourage imports), so warn that their results may be biased towards indicating FDI and exports are substitutes. Their theoretical approach is quite different to that of Gruber, Mehta and Vernon (1967) and Horst (1972), who saw FDI and exports as alternative (if not competing) modes of foreign market penetration.

[28] The affiliate activity variables are measures of the output of US-owned manufacturing and non-manufacturing affiliates and of the number of foreign-owned manufacturing facilities in each country.
[29] They offer size of the destination country as an example of such a factor, noting that its omission from empirical work would give the impression of a complementary relationship between investment and trade.

Lipsey and Weiss assume that "goals other than the promotion of exports or replacement of exports are the main considerations in investment decisions" (p.489). While the earlier papers seemed to make an a priori assumption that exports and investment were substitutes, Lipsey and Weiss are open to the possibility that they may in fact be complements once other factors (such as trade policy) have been taken into account.

Lipsey and Weiss run their regressions for fourteen industries for exports to developed countries and eleven industries for less developed countries. For US exports to developed countries they find the coefficient on affiliate sales to be significant at the 5% level for ten industries, and for less developed countries they find significant coefficients for nine industries - all of these significant coefficients are positive[30]. The authors conclude that "if there is any tendency for overseas production to substitute for exports from the United States, it appears from these equations to be offset by influences that tend to increase US exports" (pp.489/490). Furthermore, the variation in size of the coefficients suggests that the role of FDI in promoting intra-firm trade in intermediate products may be important, and also that the complementary relationship between FDI and exports is stronger for trade with less developed countries than for trade with other developed nations.

The authors also run the same regressions with exports from a group of 13 developed countries as the dependent variable to determine the effect of US affiliate sales on the exports of foreign rivals. They expect to find that US affiliate production competes with exports from foreign countries, especially when the host nation is a less developed

[30] The significant coefficients are somewhat higher for the metals and machinery industries, and significantly higher for the equations for less developed countries.

country and hence competition from domestic firms is not so important.

The results for the less developed country regressions provide strong support for their theory, with negative coefficients on affiliate sales for all six industries that are significant at the 5% level. Furthermore, the coefficients are economically significant, implying that a dollar of net sales by a US-owned affiliate displaces foreign exports from the group of 13 countries by amounts ranging from 12 cents to $1.66. Given the size of the coefficients compared with those for US exports, the negative impact of US affiliate production on 13-country exports seems to be larger than the positive impact on US exports. The results for the developed country regressions are less conclusive, with only four industries returning significant coefficients, and one of these being positive[31].

In order to try to find further support for their results, the authors run similar regressions for foreign affiliates. Unfortunately, while they had data on sales of US affiliates, only data on the *number* of foreign affiliates is available. However, data for the US pharmaceutical industry (for which the authors have data on number, size, and activity for US affiliates) indicates that the two variables (sales and numbers) yield similar results. Although the results are not as convincing, they do suggest that foreign-owned affiliates are associated with increased foreign exports and reduced US exports to host countries.

Finally, the authors briefly discuss the results for the other explanatory variables (GDP,

[31] The positive coefficient is for the office machinery and computer industry. The authors suggest that the positive coefficient may be resulting from the fact that much of the production in this industry in the 13 developed countries is itself controlled by US parents, and "it would not be surprising to find that production in a country by US-owned affiliates increases exports by foreign countries in which the same US parents have other affiliates" (p.491).

distance, and EEC membership), concluding that they are broadly as expected and that this gives credibility to the results reported for affiliate activity. To reiterate, the key finding by Lipsey and Weiss (1981) is that they "find no evidence that on net balance a country's production in overseas markets substitutes for its own domestic production and employment" (p.494).

Having investigated the relationship between FDI and exports within industries, but across firms, in their 1981 paper, Lipsey and Weiss (1984) exploit individual firm data from a 1970 US Bureau of Economic Analysis survey in a subsequent paper. Once again, the authors run their regressions for 14 industries, relating US firm level exports to parent company size, host country GDP, and affiliate sales in five developed-country areas[32]. In concordance with the results from their previous study, they find that higher levels of affiliate output go along with higher exports by the parent company (six of the fourteen industries show statistically significant results, all have positive coefficients for the affiliate output variable).

The authors also run additional regressions with parent exports to their foreign affiliates (as opposed to total exports to the area) as the dependent variable (for final goods, intermediate goods, and both combined). They find that, in general, there is some effect of foreign production in raising parent exports of intermediate goods in most industries, whilst there was either no net effect, or a positive effect, for parent exports of final goods

[32] Surprisingly distance is not included as an explanatory variable, with the authors noting (by way of explanation) that three of the five destination areas for which they have data are at about the same distance from the US. The five destinations are Canada, UK, EEC (six), other Europe, and the group Japan, Australia, New Zealand and South Africa.

to their own affiliates.

Lipsey and Weiss also take advantage of more comprehensive data for the pharmaceutical industry to include two less developed areas in the destination list. Dividing their sample into the five developed areas, and the two less developed areas, they find coefficients for affiliate net sales of 0.06 and 0.21 respectively (the coefficient for all seven areas taken together is 0.27). Although the coefficient of 0.21 for the less developed areas is not statistically significant (those for the 'world' and five developed areas are significant at the 5% level), the authors interpret the relative sizes of the three coefficients has suggesting "that much of the relation [of FDI] to worldwide parent exports may involve exports to the less developed areas" (p.306).

Blomstrom, Lipsey and Kulchyck (1988) studied the offshore production of Swedish affiliates. They found that increases in offshore production were positively related to increases in exports for the seven industrial categories examined. They also found that there was no tendency for this relationship to change as offshore production expanded.

Pearce (1990) examines the foreign production and exports of 458 of the world's largest multinational corporations for the year 1982. He finds evidence that increases in foreign production are correlated with increases in exports, and highlights the importance intra-firm trade plays in this relationship.

In a wide-ranging paper Grubert and Mutti (1991) investigate the effects of taxes, tariffs and transfer pricing on multinational decision making. One of the questions they ask is "are US exports displaced or promoted by greater foreign direct investment?" (p.285) They argue that the "Horst-Lipsey-Weiss" approach has shortcomings and so depart from that methodology and instead use exogenous indicators of the relative attractiveness of operating abroad (e.g. the effect of host country tax treatment on investment)[33]. They employ data for a cross section of 33 countries, for the year 1982, covering US exports and imports, US affiliate sales abroad, and the sales of US-based foreign affiliates. They find that US multinationals allocate a disproportionate amount of foreign direct investment in manufacturing to low-tax countries. Furthermore, they find that US parents export more to their foreign affiliates in low-tax countries. From this they conclude that US exports are promoted by greater foreign direct investment.

As Graham (1995) notes, much of the empirical literature cited above can be criticised for failing to account of the possible effects of simultaneous determination of FDI and exports. If both FDI and exports are commonly correlated by one or more independent variables (e.g. both positively correlated with income per capita or both negatively correlated with political corruptness in the host economy), then simply demonstrating that greater exports are associated with markets that also receive greater FDI does not prove that FDI and exports are themselves correlated. Therefore, previous studies which neglect to control for such possible common causal factors may in fact be detecting a spurious correlation between FDI and exports as opposed to actual complementarity.

[33] These shortcomings relate to the possibility that "unobserved variations in tastes and technology, comparative advantage and government policy can create positive correlation between exports and foreign direct investment even though an increase in affiliate sales, due to lower costs of production abroad for instance, will not cause a complementary increase in exports" (p.291).

To avoid this pitfall, Graham (1995) examines the relationship between FDI and exports after removing those factors that might simultaneously determine exports and FDI. In order to do this he employs a two stage procedure. Step one involves using the gravity model to estimate separate regressions for FDI and exports. Host economy per capita income, host population, and distance are selected as the independent variables (these are deemed to be the factors most likely to determine both FDI and exports). Step two involves regressing the residuals from the two regressions performed in step one upon one another. By employing this methodology, Graham is making the presumption "that if gravity models have succeeded in removing simultaneity bias, then any correlation of the residuals would reflect some other causal relationship between FDI and exports – such as that due to sourcing substitution or complementarities in production or distribution and marketing" (p.10). A positive correlation coefficient in step two would suggest complementarity; a negative coefficient substitutability.

Graham applied this methodology to test the relationship between FDI and exports for two home countries, the US and Japan. For the US, the sample included 40 individual countries that were destinations for both US FDI and US exports; for Japan, the sample comprised 36 destination countries. In both cases the sample was also divided into three additional subsets: only those countries located in Europe; only those countries located in the western hemisphere; only those countries located in East Asia. The two-stage process was repeated for three separate years (1983, 1988 and 1991) with roughly consistent results (Graham therefore chooses only to report and discuss the results pertaining to the 1991 data).

Table 2.2 Graham's (1995) Second-stage Regression of Residuals on Residuals for the US

	Coefficient	*Standard Error*
World	0.486	0.207
Europe	0.479	0.126
Western Hemisphere	-0.866	0.253
East Asia	0.524	0.228

Notes: Regression of (stage one) gravity equation export residuals on gravity equation FDI residuals.
Source: Graham (1995)

Table 2.2 above recreates Graham's second-stage results for the US. The positive coefficient for the world sample implies that US outward FDI and US exports are global complements (the coefficient is statistically significant at the 5% level). A similar finding is reported for the Europe and East Asia subsamples. However, a statistically significant negative coefficient is reported for the Western Hemisphere subsample[34].

We will discuss Graham's findings and his further work on this topic in greater depth in chapter 5 when we conduct our own analysis on the relationship between FDI and exports.

2.3 REGIONAL INTEGRATION AGREEMENTS

The latter part of the twentieth century witnessed strong growth in the number and coverage of regional integration agreements (RIAs)[35]. According to a recent WTO paper (Crawford and Fiorentino, 2005), since its inception in 1948, the WTO (or its predecessor GATT) has been notified of 312 RIAs. Of these, 170 are still in force today. During the GATT years (1948 - 1995) 124 RIAs were notified, with 38 remaining in force today. Since January 1995, 196 new RIAs have been notified to the WTO, and 132 are currently in force. Despite part of the increase in notifications being due to increased WTO

[34] Graham suggests that the legacy of import-substituting industrialisation (ISI) policies adopted in many Latin American countries during the 1970s and 1980s may be responsible for the negative coefficient. Under these policies multinationals were induced to establish local production facilities which operated behind protectionist walls. Graham argues that this type of FDI is more likely to substitute for exports than the type of investment undertaken by US multinationals in countries located in Europe and East Asia.

[35] We use the term regional integration agreements (RIAs) to cover a variety of preferential trading arrangements, whether or not they are confined to a specific region. Such agreements include, free trade agreements, customs unions, common markets and economic unions.

membership and new notification procedures, there has undoubtedly been a proliferation of trade agreements in recent years. Furthermore, with 20 RIAs awaiting ratification and 70 under negotiation, it is clear that regionalism is set to continue. The expansion of the European Union (EU) in May 2004, to include an additional ten members, is the most high profile (if not the most recent) example of this growing popularity.

Although trade preferences constitute the basis for most RIAs, loosening of controls on factor flows between members and common rules and regulations governing economic activity are also features of many agreements, and are becoming more standard. There is a rich literature on the welfare implications of RIAs. Unfortunately, most of it considers the effects of RIAs on trade in isolation. Trade and FDI are undeniably linked, and to understand the true effects of RIAs, we need to consider the impact they have on both. In the remainder of this chapter we examine the effect of RIAs on FDI flows.

2.3.1 Regionalism versus Multilateralism

There has long been considerable debate regarding the merits of regionalism versus mutilateralism as mechanisms for increasing global free trade. Following the First World War, a wave of regionalism was largely blamed (particularly by the United States) for significantly reducing international trade and contributing to the Great Depression. The US, in particular, subsequently strove to promote mutilateralism in favour of regionalism.

Following the Second World War there was a strong desire amongst the international community to promote freer trade for all. In concert with the creation of the two Bretton

Woods institutions (the World Bank and the IMF), countries sought to establish an International Trade Organisation that would be the overseer of world trade and responsible for coordinating the mulitlateralist movement. Even as negotiations for the ITO Charter continued, 23 countries agreed to 45,000 tariff concessions affecting approximately $10 billion of trade (about a fifth of the world's total at that time). These countries became the founding members ("contracting partners") of the General Agreement on Tariffs and Trade in January 1948.

Although the formation of the ITO was eventually agreed at the UN Conference on Trade and Employment in Havana in March 1948, national ratification was to prove problematic. The most serious opposition came from the US Congress (which was ironic given the favourable stance of the US Executive). In 1950, the US Government was forced to announce that it would not seek national ratification of the Havana Charter and the ITO was effectively finished.

Though provisional, GATT remained the only multilateral instrument governing international trade from 1948 until the creation of the World Trade Organisation (WTO) in 1995. Early GATT rounds concentrated on further tariff reductions. The Kennedy Round in the mid-sixties then introduced sections on anti-dumping and development. The Tokyo Round during the seventies was the first major attempt to tackle non-tariff barriers. The eighth, the Uruguay Round from 1984 - 1986, was the last and most extensive, and led to the creation of the WTO and a new set of agreements.

It is commonly held that, despite prevailing international support for multilateralism, the desire to rebuild Europe following World War II, and to ensure that further such conflicts did not occur, led to the approval of Article XXIV of GATT which allows for the creation of preferential trade agreements.

This Article has been a source of heated debate since the treaty's inception in 1947. It exempts free trade areas and customs unions from the requirement to accord most-favoured nation (MFN) treatment in international trade. Bhagwati (1993) argues that Article XXIV is "full of holes" (p.44) and suggests that it needs to be redrafted so as to be much more robust on the requirements of regional trade agreements. One of the principal problems with the Article is the manner in which it has been implemented. Clause 7 requires that each free trade area or customs union notified to GATT "make available...such information regarding the proposed union or area as will enable them [the contracting parties] to make such reports and recommendations to contracting parties as they may deem appropriate." However, during GATT's existence (1948 – 1994) only one working party determined that a regional trading agreement had satisfied Article XXIV, and yet none were found to be incompatible with the Article (Chase, 2005: p.1). The Uruguay Round produced a ''Memorandum of Understanding on Article XXIV'' which established a Committee on Regional Trade Agreements to conduct reviews on behalf of the WTO[36]. Unfortunately, a lack of consensus within the working parties has meant that the WTO has so far failed to adopt a single report on Article XXIV compliance (Chase, 2005: p.2).

[36] See Clause 7 of the "Understanding on the Interpretation of Article XXIV of the General Agreement on Tariffs and Trade 1994".

In an illuminating paper, Chase (2005) questions the conventional wisdom regarding the origins of Article XXIV. Drawing on records from the US National Archives, he provides convincing support for the argument that the controversial provisions of Article XXIV were in fact prompted by the desire of US policymakers to accommodate a trade treaty they had secretly been negotiating with Canada[37]. Specifically, this desire led to free trade areas and interim agreements being included in the Article, whereas previous drafts made provision only for customs unions to be excluded from MFN obligations[38].

Analogous to Article XXIV, Article XI of the General Agreement on Trade in Services (GATS) provides for economic integration agreements in services. Regional agreements between developing countries are catered for under a different section of GATT, the 'Enabling Clause'.

Proponents of regionalism argue that they help foster global free trade by locking in unilateral liberalisation, creating larger groups that can negotiate more forcefully and efficiently, and encouraging export industries that contribute to domestic political momentum in favour of free trade. Opponents counter that RIAs are subject to manipulation by special interest groups, use scarce negotiating resources, and can lead to a political impasse. In a review of RIAs between 1970 and 1992, Frankel (1997) tentatively concludes that regionalism has been consistent with more general liberalisation. A report from the Council of Economic Advisors (1995) considers

[37] Ironically, the proposed trade agreement with Canada never materialised due to a change of heart on the part of the Canadian executive.
[38] US policymakers required free trade areas to be included in Article XXIV because the proposed integration agreement with Canada could not meet the requirements of a customs union due to Canada's commitments to the Commonwealth regarding external tariffs; the language pertaining to interim agreements was necessary to allow tariffs on US and Canadian trade to be reduced over a number of years.

arguments for-and-against- free-trade agreements as either "building blocks" or "stumbling blocks" towards multilateralisation, concluding that they will further multilateral liberalisation. However, Bhagwati (1992) argues that several of the arguments typically voiced in favour of preferential agreements are of dubious merit, and Levy (1997) "demonstrates that bilateral free-trade agreements can undermine political support for further multilateral trade liberalization" (*abstract*).

In discussing regionalism, it is imperative to note that the level of integration (both achieved and aimed for) varies considerably from one agreement to another. According to the WTO, 84% of RIAs in force today are free trade agreements (FTAs). FTAs mandate an equal reduction in trade barriers between members, but allow individual members to maintain their own trade barriers with non-members. However, there are a number of RIAs in force today that have resulted in a deeper level of integration amongst member states[39]. Chief amongst these are the EU and NAFTA. These two groups, in particular, have negotiated rules and commitments that go beyond what has been agreed multilaterally during Development Rounds.

2.3.2 The North American Free Trade Agreement

The seeds of the North American Free Trade Agreement (NAFTA) were sown over a decade before the actual agreement came into force on 1 January 1994. As mentioned previously, the US had historically been a proponent of multilateralism, accepting

[39] For instance, the "Singapore Issues" (relating to trade facilitation, investment government procurement, and competition) that were rejected at the WTO Ministerial Conference in Cancun in 2004 have been implemented in a number of RTAs.

European regionalism for the sake of global economic and political stability. In response to further European regionalism, the US had typically sought to initiate a new round of multilateral developments via the GATT. However, at a GATT ministerial conference in Geneva in 1992, US Trade Representative William Brock encountered European resistance to further multilateral liberalisation. From this point on, the US made it known that it would entertain approaches regarding potential RTAs. In 1990, Mexican President Carlos Salinas de Gortari sought to form a free trade area with the US (effectively ending Mexico's prolonged attempt at import-substituting industrialisation, which had been the prevailing policy since Cárdenas in the late 1940s).

Canada was initially reluctant to participate in the agreement, content that its interests were already well served by the Canada US Free Trade Agreement (CUSFTA) signed in 1988[40]. However, as it became evident in September 1990 that the US and Mexico intended to proceed with or without Canada, the Canadian government decided that it had more to gain from joining the talks than from abstaining[41]. The three member countries concluded negotiations in 1992, and ratified the treaty in 1993.

Ratification of the treaty in the US was not straightforward, facing opposition both from those who outright objected the notion of a free trade area, and from those who argued that the treaty did not go far enough in its proposed plans for integration. In the end, a number of side agreements were added to the treaty to ensure that it gained sufficient

[40] CUSFTA set out a schedule for the elimination of all tariffs on trade (goods and services) between Canada and the US by 1st January 1998. It also established the necessary institutional procedures required to ensure that trade disputes could be adequately managed.

[41] "Involvement allowed the government to minimize the risks to Canada of US-Mexico free trade and offered an opportunity to extract new commercial concessions from the United States." (Hufbauer and Schott, 2005: p. 4)

votes to be approved by both the US House and Senate[42]. The side agreements included the North American Agreement on Environmental Cooperation (NAAEC), the North American Agreement on Labor Cooperation (NAALC), a $90m transitional adjustment assistance program (NAFTA-TAA), and the creation of the North American Development Bank (NADBank) to finance infrastructure projects on both sides of the US-Mexico border.

NAFTA was the first North-South agreement of its kind in the Western hemisphere. In addition to significant trade liberalisation policies, the agreement mandated the creation of institutions to settle trade and investment disputes (both investor-state and state-state disputes)[43]. It also boasts one of the most comprehensive frameworks of investment provisions.

Most merchandise trade was liberated between 1994 and 1998, with intra-regional trade facing an average tariff of 0.2%. This compares very favourably with the average MFN tariff of each country - 16.5% for Mexico (2001), 7.7% for Canada (1998), and 5.5% for the US (2000).

Investment provisions, laid out in Chapter 11 of the Agreement, grant national treatment for the establishment, acquisition, expansion, management, conduct, operation and sale of investments. Furthermore, investors are guaranteed free transfer of funds across borders

[42] The House passed the treaty by 234 votes to 200 and the Senate passed it by 61 to 38.
[43] Although state-state dispute resolution mechanisms are fairly common, the investor-state mechanism was rather progressive. The first decade of NAFTA saw a number of investor-state cases - 10 against Mexico, 8 against Canada, and 9 against the US. Canada and Mexico both lost 2 of their cases (with Canada paying out CDN$27 million and Mexico paying US$18.2 million). The US lost none.

and protection from expropriation and nationalisation. Although in principle they apply to all sectors, in practice each partner excludes some sectors it deems to be of national importance. Mexico excludes the petroleum sector and all state-owned sectors. Canada excludes cultural industries, health and social services, and aboriginal affairs. The US also excludes health and social services, as well as maritime activities being highly restrictive.

2.3.3 The European Union

The European Union is undoubtedly the world's foremost example of successful regional integration. Numbering 27 member states today, it boats an aggregate population in excess of 450 million and produces around a quarter of the world's gross national product. Its wide-ranging policies and varied supranational institutions evidence the breadth and depth of integration it has achieved.

The impetus for the EU lay in the two world wars which devastated the continent in the first half of the twentieth century. By the late 1940s, leaders in Europe and the US believed that France and Germany must be united, both economically and politically, if future conflicts were to be avoided. The first step towards this goal was to integrate the coal and steel industries of Western Europe: the European Coal and Steel Community (ECSC) was formed in 1951 between France, West Germany, Belgium, Luxembourg, Italy and the Netherlands[45]. By linking the coal and steel industries of Europe,

[45] Under the ECSC, the power to take decisions regarding the coal and steel industries in these six countries was placed in the hands of an independent, supranational body (the "High Authority").

Germany's defence industry was effectively tied to that of its neighbours.

Encouraged by the success of the ECSC, the six members pursued further integration in both the political and military spheres. However, when these efforts failed, European leaders decided to focus on the economic front alone. At a meeting in Messina, Italy, in June 1955, negotiations began on two new treaties. The first sought to establish a European Economic Community (EEC) that would integrate the economies of the six member states and provide for the free movement of goods, services, people and capital (the "four freedoms"). The second aimed to further the use of nuclear energy for peaceful purposes through the formation of the European Atomic Energy Community (EURATOM). The treaties were signed in Rome on 25 March 1957 and came into force in January 1958[46]. In 1967 the institutions of the three Communities were merged, creating the European Parliament, Council of Ministers and European Commission.

In 1987 the Single European Act (SEA) came into force to facilitate the creation of a single internal market. The SEA also engendered institutional reform and expanded the powers of the European Community with respect to research and development, the environment, and common foreign policy.

The Treaty of European Union was signed in Maastricht and came into force in November 1993[47]. It constituted a major overhaul of the preceding treaties and provided the foundation for achieving Economic and Monetary Union (EMU). The treaty created

[46] They are commonly referred to as the "Treaties of Rome".
[47] The Treaty of European Union is commonly known as the "Maastricht Treaty".

the "three pillars" of the European Union that endure today. The first pillar incorporates the three founding treaties that were combined in 1967 into the "European Community" (the ECSC, EEC and EURATOM). The second pillar established the Common Foreign and Security Policy (CFSP) that allows the EU to take a coordinated approach with regard to foreign and security affairs. The third pillar contains the Justice and Home Affairs (JHA) policy which deals with asylum, immigration, judicial cooperation in criminal and civil matters, and customs and police cooperation to fight terrorism, drug trafficking, and fraud. The Maastricht Treaty also created European citizenship and strengthened the role of the European Parliament in certain legislative areas.

2.3.3.1 Governance and Institutions

The European Union is governed through a combination of supranational and intergovernmental organisation. Much of the supranational organisation takes effect under pillar one, with member states relinquishing aspects of their national sovereignty and allowing EU institutions to implement legislation and the rule of law. Pillars two and three are, to a greater extent, subject to intergovernmental organisation, with member states working in cooperation to determine a joint approach on foreign and security policy and criminal matters.

The principal institutions of the EU are the European Commission, Council of the European Union and the European Parliament. The European Commission essentiality operates as the executive branch of the EU, with responsibility for: proposing legislation to Parliament and the Council; managing and implementing EU policies and the budget;

enforcing European law (jointly with the European Court of Justice); and representing the EU in the international arena (e.g. negotiating agreements between the EU and third parties). The members of the Commission are appointed as opposed to being elected directly by the citizens of the EU. Every five years the member state governments agree on a new Commission President-designate, who in turn (in consultation with member state governments) chooses one Commissioner from each member state. The European Parliament interviews every Commissioner and then presents its opinion on the Commission as a whole. The Commission remains accountable to, and may be dismissed by, Parliament. Individual Commissioners must resign if asked to do so by the Commission President.

The Council of the European Union (often called the "Council of Ministers") is comprised of one minister from each of the EU members' national governments, with each minister having responsibility for a different policy area and having the power to speak for their whole government. The Council has the following key responsibilities: adopting European laws (jointly with the European Parliament in many instances); coordinating the broad economic policies of the member states; approving the budget of the EU (again, in conjunction with the European Parliament); developing the Common Foreign and Security Policy; coordinating action between national courts and police forces in respect of criminal matters; and concluding international agreements between the EU and third parties. On the majority of issues, the Council is empowered to make decisions based on qualified majority voting (QMV). This means that decisions made by the majority are imposed on countries even when they have voted in opposition. In some areas (such as the Common Foreign and Security Policy) unanimity is required, essentially giving each member the power of veto.

The European Parliament, based in Strasbourg, is responsible for passing European laws (jointly with the Council of the European Union), exercising democratic supervision over other EU institutions (particularly the European Commission), and approving or rejecting the EU budget. Since 1979, the members of Parliament have been elected directly by the citizens of the EU under a system of population-based proportional representation. The current Parliament was elected in June 2004 and has 732 members (the next election will be in 2009).

In addition to the Commission, Parliament and Council, a number of additional institutions are vital to the process of governing the EU. For instance, the European Court of Justice (ECJ) ensures that EU legislation is interpreted and applied uniformly across all member states[48]. It is empowered to settle legal disputes between member states, EU institutions, corporations and citizens. Its rulings are binding and cannot be overturned by the courts of individual member states. Other important institutions include the European Court of Auditors (responsible for monitoring EU funds), the European Central Bank, the European Economic and Social Committee (advisory body representing employers, trade unions, and consumers), and the Committee of the Regions (advisory body representing local authorities).

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[48] To assist the ECJ with its large workload, the Court of First Instance (CFI) was created in 1989. The CFI tends to hear cases relating to citizens and corporations (as well as cases pertaining to competition law).

2.3.3.2 The Single Market

The creation of an enlarged single market with over 450 million consumers is at the heart of the European Union. The Single European Act (SEA) was signed in 1987, but the work towards implementing the single market began in 1985 and lasted for some seven years. Although the central tenets of the single market are the free movement of people, capital goods and services, a raft of supporting policies were required to tackle the regulatory, legal, bureaucratic and cultural barriers present between members[49].

Although the single market was officially completed by the end of 1992, work continues today on furthering the process. In particular, the internal market for services requires further harmonisation (with the creation of a single market for financial services proving particularly problematic given the complexity and longevity of many of the services and the need to coordinate the policies of national regulators).

The European Commission estimates that the single market has created 2.5 million new jobs and generated in excess of €800 billion in additional wealth since 1993. It also offers consumers far greater choice and lower prices than they would otherwise face. Firms benefit from the enlarged market which translates into greater effective demand for their products. The single market also leads to greater economics of scale, permits more efficient resource allocation and forces firms to minimise x-inefficiencies in the face of greater competitive forces. All of these factors help EU firms to compete on the global stage.

[49] For example, the EU's antitrust policy prevents monopolies from dominating industries.

2.3.3.3 The Single Currency

As part of the move towards Economic and Monetary Union (EMU), the 1992 Treaty of the European Union ("Maastricht Treaty") mandated the creation of a single currency. Currently, 12 of the 25 EU members have adopted the single currency (the "Euro"), with the ten most recent EY members, as part of their accession agreement, having pledged to join the Eurozone at some point in the future[50]. Denmark, Sweden and the UK have all opted out of the single currency and currently have no definite plans to join.

The single currency was first introduced in non-physical form at midnight on 1st January 1999. From that point, the national currencies of the 12 'Eurozone' members were fixed against the Euro and one another. Physical Euro currency notes and coins were introduced on 1st January 2002 (with a phase-out period for national currencies of approximately two months).

The implications for adopting the single currency are significant, requiring members to surrender control over interest and exchange rates. For the Eurozone, interest rates are independently determined by the European Central Bank[51]. This means that the members of the Eurozone are unable to use monetary policy to influence the economic situation in their domestic economies, potentially limiting their ability to adequately respond to

[50] The Euro is also legal currency in the overseas territories of French Guiana and national regulators coordinate their policies at the EU level., Guadeloupe, Martinique, Mayotte, Reunion and Saint-Pierre et Miquelon. Furthermore, by virtue of a number of bilateral agreements, the European microstates Monaco, San Marino and Vatican City are able to mint their own Euro coins on behalf of the European Central Bank (ECB). Andorra, Montenegro and Kosovo have adopted the Euro has the legal currency for capital flows.
[51] The ECB controls the interest rate with the sole regard of maintaining a low and stable rate on inflation in the Eurozone area. Neither the national governments of member states, nor other EU institutions, have any control over the setting of the interest rate.

economic shocks.

The theory of optimal currency areas argues that four factors are important in alleviating the potential impact of asymmetric shocks in currency unions. These are labour and capital mobility, product diversification, openness and fiscal transfers. The EU scores quite highly on these criteria, although the movement of people within the EU and the use of fiscal transfers are limited (especially in comparison with the Unites States, which could be thought of as a currency union of the 50 States)[52].

Given the potential hazards of adopting the single currency, the Eurozone members obviously expect to reap a number of offsetting benefits. The most obvious benefit is the removal of transaction costs and exchange rate risks. Rose (2004) finds that the adoption of a single currency increases trade by 300%[53]. A single currency should also lead to greater price transparency (and hence price parity) between members.

Another key benefit of adopting the Euro was the anticipation that it would result in lower and more stable inflation in the member countries. The German Bundesbank has historically been very successful in controlling inflation, and it was thought that by modelling the European Central Bank on the Bundesbank it would *de facto* inherit its

[52] Although the EU mandates free labour mobility within the Union, in practice the movement of people is limited (due largely to cultural differences, such as language). Furthermore, labour mobility is generally lower amongst the less affluent, and these are the workers whose movement at the margin is perhaps most likely to combat the effects of an asymmetric shock.
[53] The adoption of a single currency is more effective in alleviating exchange rate risk that simply tying one currency to another because it gives firms and consumers more confidence that the exchange rate will remain fixed in the future.

reputation for being aggressive on inflation[54]. The independence of the ECB also creates confidence that monetary policy will not be influenced by political agenda.

2.3.3.4 Enlargement

In addition to broadening and deepening integration between members, the EU has also experienced a process of continued enlargement. Membership of the European Union is open to any European country that upholds "the principles of liberty, democracy, respect for human rights, and fundamental freedoms, and the rule of law" (Article 6 of the Treaty of European Union)[55]. In practice the accession process is complicated and may take a number of years[56]. Having applied for membership, countries typically become "candidate countries" before being granted full membership – this is especially true of the more recent members from central and eastern Europe that tend to be considerably less economically advanced than their western European colleagues[57].

The first enlargement of the EU (still, at that time, the "European Community") occurred in 1973 with the accession of Denmark, Ireland and the UK. Greece was the next country to join in 1981. To those ten members were added Spain and Portugal in 1986. Austria, Finland and Sweden became members in 1995. With all of the developed countries of

[54] Inflation expectations are key here – the expectation that inflation will be kept low and stable become somewhat self-fulfilling as workers see less need to demand wage increases and firms feel under less pressure to raise prices.

[55] The membership requirements are more formally defined by the "Copenhagen Criteria" as: democracy, the rule of law, respect for minorities; a functioning market economy and the capacity to cope with competitive pressures; the ability to apply the EU's rules and policies.

[56] For example, despite having applied for full membership of the EU in 1987, Turkey was only granted the right to begin accession negotiations in December 2004.

[57] As a "candidate country", a potential member will benefit from strategic advice and discussions with the EU aimed at fostering the appropriate economic and political environment to facilitate integration.

western Europe desired membership having joined, the EU remained a fifteen-member union for a number of years. The next enlargement occurred nine years later and was on a scale unprecedented. On 1 May 2004, Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, the Slovak Republic, and Slovenia became EU Member States. On purely logistical grounds, the 2004 enlargement is remarkable. It is considerably more impressive, however, given the economic and political disparities between the ten new CEEC members and the previous fifteen members. Necessary adjustments (both at the EU level and within individual countries) to accommodate this enlargement explains why the process of accession can become very protracted.

Even as the EU comes to terms with the prospect of managing an economic and political union spanning 25 partner countries, it continues to court new members. Bulgaria and Romania signed accession treaties in April 2005 with full membership expected in 2007, and Turkey has been in membership negotiation since October 2005.

2.3.3.5 The European Constitution

As the EU has become larger and increasingly more complex, attempts have been made to simplify the raft of treaties, institutions and governing processes. In October 2004, Heads of State and Foreign Ministers signed the Treaty establishing a Constitution for Europe. This new treaty aims to institute internal reforms to allow the enlarged EU to function more effectively and transparently, and with more direct involvement from European citizens. Some of the more significant changes proposed in the Treaty include strengthening the powers of the European Parliament, simplifying the EU voting procedures, abolishing the rotating European Council presidency (in favour of appointing a single individual for a five year term), and creating the post of Foreign Minister and a Foreign Service.

However, despite being signed in 2004, the Treaty requires ratification by all EU members before it can become operational. While it has been ratified by 12 Member States, it failed to be approved by Referenda in France and the Netherlands[58]. Following its rejection by these two members, the European Council called for a period of reflection and debate so as to adequately address the concerns raised. Although the Constitution remains in limbo, it has no effect on the current functioning of the European Union.

2.3.3.6 Contrasting the EU and NAFTA

It is clear from the foregoing discussions on the EU and NAFTA that there are both considerable similarities and differences between the two. Although the EU currently encompasses 25 members to NAFTA's three, they are of a similar size in terms of population and gross national production. Furthermore, both comprise industrial economies and less-developed countries (although this is only true of the EU since the latest enlargement to include the ten CEEC countries)[59]. Although the primary aim of both agreements is to create free trade between member countries, they also include provisions to facilitate foreign direct investment and other capital flows (e.g. portfolio

[58] As part of their accession treaties, the ten new EU members had to agree to the Treaty on the Constitution of Europe.

[59] Given the time period (1992 to 2003) of the data to be analysed in later chapters, we are only afforded the opportunity to analyse the EU during a period when its membership comprised solely industrial countries of western Europe.

investment). In addition, both have created institutions (or procedures) to address other areas of mutual interest to member states (e.g. labour markets and the environment).

In terms of depth of integration, however, the EU is undoubtedly far more advanced than NAFTA. Whereas NAFTA is a free trade area in which each member maintains its own external tariff structures, the EU is a customs union (and for some members a monetary union) with a common external tariff. The EU has also gone much further than NAFTA in terms of establishing supranational institutions which take precedent over national governments in many economic, political and legal areas.

The free movement of people mandated by the EU is also a significant departure from the approach taken by NAFTA. While people are generally allowed to travel between Canada and the US without the need for prior notification or approval, immigration from Mexico to the US is strictly controlled.

A further difference of note is the distribution of power within the two integration agreements. NAFTA is obviously strongly dominated by the US, which accounts for over half of the total population of the NAFTA members and produces over 80% of the total output. Conversely, the EU is not dominated by any one member, especially following the latest enlargement that has taken it to a total of 25 members[60].

[60] Given their status as original members (and due to their respective economic size), Germany and France have historically exercised significant influence over the EU.

2.3.4 The Trade and Investment Effects of RIAs

As we have discussed, regional trade agreements are typically analysed in terms of their impact on trade. Following Viner (1958), the standard measure for estimating the welfare implications of RTAs is whether they lead to net trade creation or net trade diversion. Trade creation is said to occur when the formation of a trade agreement creates trade that would not otherwise have existed[62]. Trade diversion occurs when an RIA results in the diversion of trade away from non-RIA countries to less efficient RIA partners. If it is estimated that a particular RIA leads to net trade creation then it is normally taken as evidence that it is on the whole welfare enhancing (with net diversion indicating the opposite). However, trade creation / diversion is only a static measure and ignores the dynamic effects or RIAs. Dynamic effects include domestic firms being subject to increased competitive pressure and discipline, and any global trade enhancing effects that the RIA may encourage.

It is becoming increasingly common for investment provisions to be included in agreements - an explicit acknowledgement both that RIAs can have a profound effect on investment flows, and that investment can have significant welfare implications[63]. We now turn to a consideration of the potential investment effects of regional trade agreements.

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[62] For example, due to the tariff reduction of an RTA, overall economic welfare will increase if one of the partner countries ceases producing a certain good and instead imports it from its RTA partner that is able to produce the good more cheaply.
[63] Investment provisions are clauses or rules that refer specifically to the treatment of foreign investment within the RIA.

Recall the discussion of Dunning's eclectic paradigm in section 2.2. From OLI theory it is possible to derive various motivations for firms to undertake overseas investment. For example, a firm possessing a computer hardware patent (Ownership advantage) may decide to establish its own manufacturing facility abroad to secure the cheapest production location (Location advantage) because it is unwilling to license the technology from fear of theft (Internalisation). Another firm may have established a valuable brand (Ownership) that it wishes to exploit in overseas markets (Location), favouring direct investment in foreign outlets as opposed to franchising or licensing (Internalisation).

Obviously, the formation of a RIA will have a direct impact on the 'Location' decision faced by multinationals. Besides affecting the size of the 'internal' market within the RIA, the agreement will influence member countries' attitudes and policies towards issues such as expropriation and nationalisation, corporate taxation, profit repatriation, and local content requirements, all of which will impact on the location decision. Therefore, to the extent that RIAs improve the investment conditions in members' countries (and this is increasingly becoming an explicit objective) we would expect them to stimulate FDI, both between member countries, and from external parties[64].

However, it is feasible that the creation of a RIA could result in multinationals that have investments in multiple member countries consolidating their investments in just one

[64] It is interesting to note that not all trade agreements have led to a liberalising of investment conditions between members. Willem te Velde & Fahnbulleh (2003) examine the investment related provisions in regional trade agreements and find that at its outset the Andean Community actually created a more restrictive environment in relation to investment than existed previously. Decision 24, passed in 1970, sought to create international legal obligations with respect to investment. In practice it created several new restrictions, including a disinvestment scheme for foreign investments to become semi-nationally-owned companies after a period of time, limitation on profit repatriation, exclusion of certain sectors from foreign investment, and an investment screening mechanism with exacting standards for foreign entry.

member state (that which offers the most favourable location). In this sense, it is possible that the RIA may lead to an overall reduction in the total volume of FDI in the region - although not necessarily its efficiency.

Important as the 'location effect' of the RIA may be, the greatest influence on FDI will almost certainly be due to the influence on the 'internalisation' decision that multinationals face. In the presence of market imperfections, such as incomplete information and transaction costs, firms may find it preferable to internalise operations by undertaking FDI in favour of other means of servicing foreign markets (such as exporting or licensing). To the extent that RIAs improve information flows and reduce transaction costs (i.e. tariff and non-tariff barriers) we would probably expect MNEs to have less reason to internalise, as the cost of exporting has fallen relative to direct investment. Of course, things are never so straightforward.

Firstly, in addition to a reduction in the costs associated with exporting, the costs of foreign investment are also likely to fall, due both to explicit investment provisions and indirect effects. It is the *relative* cost of exporting versus direct investment that is of importance in the internalisation decision, not the absolute cost. This will obviously vary across member states, industries, and individual firms. While we may be able to say that following a RIA the cost of exporting between members has fallen relative to the cost of FDI on average, it is highly unlikely that this will be true for all firms in all member states.

Secondly, the impact of any trade and investment provisions implemented by the RIA will depend on the pre-agreement environment. For instance, the complete abolition of tariffs will have a much greater impact in an RIA that had high pre-RIA tariffs compared with a RIA where the MFN tariff was already very low. So the *ex ante* situation is extremely important.

Finally, the specific operations that firms are involved in, and hence the *type* of investment they are looking to undertake, will have significant bearing. For example, a firm looking to sell a homogenous product across a range of national markets will be concerned with accessing these markets at the minimal cost possible (subject, of course, to other considerations such as ensuring control of proprietary technology etc). Prior to a RIA this firm may have been servicing it in various foreign markets from a subsidiary in each country (perhaps because trade barriers meant costs of exporting were high relative to costs of FDI). Following the RIA and a reduction in tariffs it may now become more cost effective to consolidate production in one country and export to all member markets. In this case the creation of the RIA will have resulted in disinvestment and an increase in trade.

Contrast this with the example of a firm that wishes only to supply to its home market. Prior to the RIA it is a purely national firm, with no overseas operations or exports. Following the RIA it realises that it is now more cost effective to locate part of the manufacturing process in a low-cost member state and export the intermediate product back to its home country for final assembly and distribution. In this case the creation of the RIA will have resulted in an increase in both FDI and trade.

These types of issues are captured by models of horizontal (or 'market-seeking') FDI and vertical (or 'resource / efficiency seeking') FDI that analyse the trade-off between transport costs, firm-level fixed costs, and plant-level fixed costs. However, as we discussed in section 2.2, to date it has not proven possible to favour one model above all others. In the following three chapters we will conduct an analysis of the impact of regional integration agreements on FDI and exports. This builds on the framework employed by Graham (1995) and will culminate in an examination of the relationship between FDI and exports.

2.4 THE GRAVITY MODEL

In the 17th century Isaac Newton revolutionised Physics by deriving his Law of Gravity. This Law states that the gravitational force of attraction between any two objects is the product of their masses and the inverse of the square of the distance between them (multiplied by a gravitational constant, 'G'):

$$F_g = G\frac{M_1 M_2}{d^2} \qquad [2.6]$$

Though by no means as revolutionary, the economics profession adopted its own gravity model in the second half of the Twentieth century. This model takes a similar form to Newton's, but has been applied to a wide variety of goods and factors flowing over regional and national boundaries. By far its most common and successful usage has been in modelling international trade flows, leading Anderson (1979) to comment that "probably the most successful trade device of the last twenty-five years is the gravity equation" (p.106). Ironically, until Anderson (1979) there had been no formal attempt to derive the gravity equation from theory. Rather, it was a purely empirical device that owed its origin as much to Newton as it did to hard economic theory.

Timbergen (1962) and Poyhonen (1963) were the first authors to apply the gravity model to international trade flows. Tinbergen's aim was to use the gravity model to determine the normal (or base-line) level of international trade that would prevail in the absence of discriminating trade impediments. If actual trade flows then differed from the expected flows (as calculated by the 'normal' model) it would suggest that additional impediments (actual < normal) or inducements (actual > normal) existed between that pair of countries. Tinbergen reasoned that the quantity of exports a country is able to supply depends on its economic size (i.e. GDP); that the quantity that can be sold to a particular economy depends on the size of that country's market (also GDP); and that the volume of trade will vary with transportation costs (proxied by the geographical distance between the two trading economies). This gave rise to the following basic trade flow equation:

$$X_{ij} = \alpha_0 Y_i^{\alpha_1} Y_j^{\alpha_2} D_{ij}^{\alpha_3} \qquad [2.7]$$

where X_{ij} is exports from *country i* to *country j*, Y_i and Y_j are the GDPs of *country i* and *country j* respectively, and D_{ij} is the distance between countries i and j.

Tinbergen estimated this equation (with 42 countries for 1959) by least squares regression in log-linear form to obtain estimates of the coefficients on the independent variables (i.e. the alphas):

$$\ln X_{ij} = \alpha_0 + \ln \alpha_1 Y_i + \ln \alpha_2 Y_j + \ln \alpha_3 D_{ij} \qquad [2.8]$$

The coefficients were all found to be statistically significant and of the expected sign. α_1 was estimated to be around 0.7, α_2 around 0.65, and α_3 around –0.6. Therefore, a 1% increase in source country income is expected to lead to a 0.7% increase in exports between economies *i* and *j*. A 1% increase in host country income should increase exports by 0.65%, and a 1% increase in distance is predicted to decrease exports by 0.6%.

Although Linemann extended Timbergen's work as part of his doctoral thesis (1966), the gravity model continued to lack a sound theoretical basis. Anderson (1979) made the first attempt to formally derive the gravity equation using the properties of expenditure systems. This was followed by Bergstrand (1985, 1989) who explored the derivation of the gravity model in terms of monopolistic competition models. More recently, Deardoff (1995) has shown that the gravity model is also consistent with the H-O model of trade and therefore warns that "because the gravity equation appears to characterize a large class of models, its use for empirical tests of any of them is suspect" (p.25/6).. However, more recently, Rose et al. (1998) argue that the different theories that give rise to the gravity model have different testable implications. They use a 'reciprocal dumping' model of trade in homogenous goods and find that domestic income export elasticities are substantially higher for differentiated goods than for homogenous goods. This implies that trade in differentiated goods arises due to increasing returns, whereas trade in homogenous goods still accords with the gravity equation.

Whilst the gravity model was acquiring a sounder theoretical footing, papers were appearing which questioned its proper econometric specification. Polak (1996) argued that the gravity model so far estimated produced a downward bias for far-away countries and an upward bias for close-in countries. It was this bias that had led other authors to argue that the Asia-Pacific Economic Cooperation (APEC) was a 'natural trading bloc' and that the EU was not[65]. Polak proposed two methods "to salvage the gravity model" (p.544), both of which essentially amounted to modifying the distance variable by dividing the simple geographical distance between trading partners by the weighted average of all of the host country's bilateral distances. This gives the following 'corrected' gravity model, which Polak employed to show that APEC in not in fact a 'natural trading bloc':

$$M_{ij} = GNP_i^{\alpha_1} GNP_j^{\alpha_2} POP_i^{\beta_1} POP_j^{\beta_2} d_{ij}^{\ \delta} D_i^{\varepsilon-\delta} \qquad [2.9]$$

where M_{ij} is the imports of *country i* from *country j*; GNP_i and GNP_j are the gross national products of *country i* and *country j* respectively; POP_i and POP_j are the populations of countries i and j; d_{ij} is the distance between countries i and j; and D_i is the average trade-weighted distance of *country i* from all of its trading partners.

[65] APEC is a forum for facilitating economic growth, cooperation, trade and investment in the Asia-Pacific region. APEC was established in 1989 and now represents 21 member states, who collectively account for approximately 40% of the world's population, 56% of global GDP, and 48% of world trade.

Matyas (1997, 1998) also demonstrated that the gravity model was misspecified, arguing that the correct solution required the inclusion of proper source (export) country, host (import) country, and time specific effects. In the first instance, Matyas (1997) assumed that these effects were observable from the data and so adopted a fixed effects model. However, he later (1998) noted that in some cases (such as when the number of countries in the data set is large) this is not a parsimonious approach and a random effects model may be superior.

The relative merits of a fixed effect model and a random effects model are discussed by Egger (2000). He notes that country effects are widely predetermined due to geographical, historical and political factors, and (based on the results of the Hausman χ^2 –test) argues that "the proper econometric specification of a gravity model in most applications would be one of fixed effects" (p.29). In addition, he comments that whilst the majority of empirical work using the gravity equation has been on cross-section data (e.g. Timbergen (1962), Linnemann (1966)), a panel framework is advantageous because it allows country-specific and time-specific effects to be disentangled.

Cheng and Wall (2001) were motivated by the need to allow for country-pair heterogeneity to also employ a fixed effects model with pooled time-series / cross-section data. They note that incorporating fixed effects captures those factors which are constant over the span of the data, but which are correlated with the volume of bilateral trade (such as a common border, common language, colonial ties etc.). This also dispenses with the question of how to measure distance (as its influence is incorporated into the fixed effects). Noting that "the gravity model has become the 'workhorse' of empirical work on the effects of integration" (p.23) the authors test their model in this application and find that it is important to accommodate heterogeneity.

In addition to estimating the effects of integration on international trade, the gravity model has recently been employed to try to estimate the effects on international trade of various other factors. The common approach of such studies is to augment the 'gravity variables' (incomes and distance) with variables or dummies of interest. For example, Rose (1999) includes a dummy variable for whether or not the trading countries share a common currency. Though he advises caution in the literal interpretation of his results, he finds that trade between a pair of countries will be over three times greater if they share a common currency than if they do not. This finding obviously has important implications for the EU and the adoption of the single currency and so it is unsurprising that it has been so hotly debated.

Portes and Rey (1999) utilise the model to estimate the determinants of cross-border equity flows (i.e. portfolio investment). In this instance, the dependent variable is no longer international trade, but rather equity flows. The authors find that an 'augmented' gravity model accounts for almost 70% of the variance in transaction flows, and suggest that inclusion of their information transmission variables (in addition to the inclusion of distance) would also substantially improve the explanatory power of the standard gravity equation for trade in goods[66].

[66] Information transmission variables are intended to capture some of the transaction costs involved in portfolio investment (e.g. telecommunications cost).

Brenton et al. (1999) use the gravity model to investigate the effects of regional economic integration on FDI flows. This application involves using FDI as the dependent variable and including various dummy variables to account for different regional integration agreements (RIAs). Brenton et al. use time series data to avoid some of the specification problems highlighted by Polak and Matyas. They find that the *stock* of FDI in the Central and Eastern European Countries diverges little from the 'normal pattern'. Interestingly, they also find evidence of a complementary relationship between FDI and trade.

Di Mauro (2000) also seeks to estimate the impact of integration on FDI, but instead of using dummy variables has taken exchange rate variability (ERV) to be a measure of the level of integration between two countries. She finds the ERV variable to have no significant influence on FDI flows, but a significant negative impact on exports.

Balasubramanyam et al. (2001) also investigate the impact of RIAs on FDI flows. The authors use cross-section data for 1995 consisting of 14 investor and 41 host countries. Integration is accounted for by use of a dummy variable and the 'gravity variables' are augmented to include the Economic Freedom Index (EFI)[67]. They find that "the presence of a RIA results in an autonomous increase in FDI flows between member countries, but that this is offset by an enhancement in the magnitude of the dampening effect of distance, such that the RIA results in a decrease in FDI flows between countries whose

[67] The EFI is an index of 'economic freedom' compiled by the Heritage Foundation / Wall Street Journal on an annual basis (available since 1995). Economic freedom is defined as the "absence of government coercion or constraint on the production, distribution, or consumption of goods and services beyond the extent necessary for citizens to protect and maintain liberty itself" (www.heritage.org).

capital cities are located more than 3,300 kilometres apart" (p.17).

The gravity model has proved a highly successful empirical tool for modelling international trade flows. More recent work appears to show that its application to investment flows is also extremely promising. In future studies it would be interesting to experiment with a number of modifications to the model and its application. For instance, the potential advantages of using panel data as opposed simply to time series or cross section data warrant further investigation.

Efforts should also be made to better proxy for the costs of exporting and undertaking foreign investment. Whilst distance is an extremely convenient measure, the iceberg assumption of trade costs is overly simplistic and completely fails to take into account transaction costs that are not associated with shipping (e.g. red-tape costs at borders, the costs of complying with safety regulations and local content requirements). Although trade-weighted distance measures may mitigate some of the problems, explicit measures of the different transaction costs associated with exporting to different countries would be preferable. Unfortuantely, the construction of such a measure is not just enormously time and resource consuming, but may introduce its own biases in terms of the quality and availability of data.

The applicability of distance as a measure of the costs of undertaking FDI in different locations is also obviously questionable. Of more relevance may be the existence of a common language, similarity in culture and institutions between investor and host, and the existence or not of other foreign investors from the same source country. Fortunately, communication and cultural similarities can be accounted for (at least to some extent) by including a common language dummy variable. To attempt to incorporate other factors of relevance it would be interesting to try to include some measure of communication costs[68]. Including the information transmission variables proposed by Portes and Rey (1999) and the public infrastructure variables used by Bougheas et al. (1999) may also prove informative.

Interestingly, given the crudity of the distance variable, the gravity model may be more suitable for considering global rather than regional issues. Greater variability of distance within a global dataset is likely to allow more efficient estimation of the distance coefficient than would be possible in a regional dataset.

[68] This would also acknowledge that a high proportion of the cost involved in undertaking FDI will arise from ongoing monitoring costs, as opposed to up front costs.

2.5 CONCLUSION

The purpose of this chapter was to discuss a number of issues that are relevant to the analysis to be undertaken in subsequent chapters. To begin, we explored potential mechanisms through which foreign direct investment might contribute to economic growth. Although early growth models (such as the Harrod-Domar and neoclassical models) did not make a distinction between foreign and domestic investment, endogenous growth models allow this inadequacy to be corrected. It therefore becomes possible to capture the characteristics of FDI that are thought to stimulate growth in excess of domestic investment (i.e. embedded managerial, technological and organisational knowledge) in a formal model of economic growth. Furthermore, we saw that FDI could be included in endogenous models in a range of formulations leading to different predictions. For example, the inclusion of FDI could be modelled in such a way that it allows countries to close the 'ideas' or 'technology gap' (implying *conditional convergence*, in the per capita incomes, of the world's economies), or it could be modelled to permit increasing returns to scale (potentially resulting in the absence of *conditional convergence*).

We also discussed the theory behind international trade and investment, with particular reference to the role of the multinational enterprise. Modern theory presents alternative models based on the differing motivations of national and multinational firms. The *vertical* model, building on the standard model of international trade in differentiated products, posits that multinational firms locate their headquarters in one country and their production facilities in one or more other countries. This is consonant with resource-seeking and efficiency-seeking motivations for foreign investment. The *horizontal* model, on the other hand, assumes that the decision to undertake FDI is the outcome of a 'proximity-concentration trade-off'; firms will undertake direct investment when the *proximity* advantages of local production outweigh the *concentration* advantages of exporting from a single domestic facility. This model resonates closely with market-seeking and tariff-jumping motivations for FDI. Empirical studies have found it difficult to discriminate between these alternative theories, although the majority of FDI today is of the *horizontal* variety, undertaken between developed countries.

We also discussed the relationship between FDI and exports. There are factors that suggest that the two should be substitutes, such as tariff-jumping FDI. However, there are also factors favouring complementarity (such as intra-firm trade). Unfortunately, theory offers no decisive direction as to the true relationship either way and we are left to turn to empirical methods to try to answer the question. As we have seen, the majority of the empirical literature finds in favour of complementarity. However, most of this literature can be criticised for failing to account for the possible spurious correlation between FDI and exports. Graham (1995) attempts to mitigate this problem by adopting a two-stage approach: the first stage involves using the gravity model to run separate regressions for FDI and exports; the second-stage regresses the residuals from the first-stage regression against one another. The intention is to try to remove all factors that might determine both FDI and exports in the first stage, so that any remaining correlation reported in the second stage will be unbiased evidence of either complementarity or substitutability.

The main body of this thesis (i.e. chapters 3, 4 and 5) is dedicated to conducting an empirical analysis building on Graham's approach. In chapter 3 we will run the first-stage regression for FDI flows, using a panel dataset we have constructed for the period 1992 to 2003. As well as simply obtaining the necessary residuals for the second-stage regression, we will explore the impact of regional integration agreements on FDI flows.

Regionalism has grown enormously in popularity in recent years, not just in terms of the number of agreements, but also in terms of the depth of integration. However, the merits of regionalism versus multilateralism are still the subject of debate. Our discussion of the possible trade and investment effects of RIAs emphasised how difficult it is to predict the impact of such agreements, with much depending on the conditions that are prevailing before the agreement comes into force. Despite this, the increasing adoption of investment provisions (in addition to trade provisions) in integration agreements is likely to stimulate intra-RIA investment. The analysis we conduct in chapter 3 will allow us to form an opinion as to whether integration agreements do, or do not, have a positive effect on FDI flows.

Our first-stage regression analysis for exports is conducted in chapter 4. We utilise the same panel dataset as we used for FDI flows and also employ the same gravity model approach. Once again, in addition to simply capturing the residuals for use in the second-stage analysis, we investigate the impact of regional integration agreements on exports. By also examining the impact of RIAs on exports to-and-from- 'outsiders', it is possible to from an idea of the trade creation or trade diversion effects of a RIA. A comparison of the integration effects on FDI and exports is also possible and informative.

The second-stage analysis of residuals on residuals is performed in chapter 5. As discussed, we follow the approach favoured by Graham (1995). However, whereas Graham used data relating to a single year, our panel dataset should afford more accurate and efficient estimation by allowing the temporal variability in exports and FDI to be taken into account (in addition to simply the cross-section variability). It will also permit the relationship between FDI and exports to be analysed over time to assess whether a trend exists. We also build on the work of Graham by disaggregating our dataset into separate subsamples in order to investigate whether the relationship between FDI and exports is dependent on the nature of the two countries involved (i.e. the investor and host countries).

In order to complement our empirical analysis and hopefully add texture to the results, chapter 6 is dedicated to a case study of FDI in Mexico. This provides an apt case study because Mexico is a member of NAFTA (one of the integration agreements we assess empirically in chapters 3 and 4) and also the recipient of large quantities of FDI from the US[69]. In addition to investigating the impact on inward FDI of its membership of NAFTA, we are able to investigate other determinants of FDI flows (i.e. unit labour costs) and also assess the potential benefit to economic growth of inward FDI.

[69] This has two principal benefits in terms of choosing Mexico for a case study assessment: the US collects unparalleled data on the activities of multinationals; given its technological sophistication, FDI from the US should be well-endowed with the 'additional benefits' (e.g. management know-how) thought to spill-over to the host economy.

6. FOREIGN DIRECT INVESTMENT IN MEXICO[1]

6.1 INTRODUCTION

Mexico provides an interesting case study of the effects of inward foreign direct investment (FDI) because, like many other developing countries, it has changed from being a highly protectionist regime focused on import-substituting industrialisation (ISI) to an open regime which actively attracts foreign investment[2]. Following the onset of industrialisation a decade earlier, Mexico officially endorsed ISI policies during the 1940s as the government raised import tariffs, introduced import licenses, and imposed export controls in an attempt to encourage its domestic industry. These policies proved successful in developing a manufacturing base centred on Mexico City[3].

Since the announcement of the North American Free Trade Agreement (NAFTA), which came into being in January 1994, considerable attention has been focussed on the effects that the dismantling of trade and investment barriers would have on the US and Mexican economies (and the Canadian economy to a lesser extent). However, this belies the fact that Mexico effectively made the transition from a closed economy to an open economy during the 1980s after it announced in 1985 that it intended to

[1] An earlier version of this chapter was published as a chapter in "Foreign Direct Investment: Six Country Case Studies" edited by V.N. Balasubramanyam and Yingqi Wei (2004), co-authored with my supervisor at that time, Professor David Sapsford. All of the empirical analysis has been updated in this version to include the latest available data, and the discussion has been redrafted to tie it together with the analysis conducted in the foregoing chapters.

[2] Mexico is a more suitable choice for our purposes than any of the central and eastern European states that have recently joined the EU because it has been a member of NAFTA for over 10 years now and this affords us considerable data with which to contrast the FDI and export performance of a pre-NAFTA Mexico.

[3] Between 1930 and 1970 the share of manufacturing in Mexican GDP grew from 12.9% to 23.3%, and Mexico City's share of manufacturing employment grew from 19.0% to 47.3% (Hanson, 1998).

join the General Agreement on Tariffs and Trade (GATT)[4]. Hanson (1998) even suggests that given the geographical proximity of Mexico and the US, trade liberalisation by Mexico in 1985 constituted the beginning of integration, with NAFTA merely finalising the process a decade later.

The proximity of the world's most powerful nation is another reason why the Mexican economy provides such an interesting case study. Over the last two decades the US has consistently been the source of over half of Mexico's inward FDI (see Table 6.1). The attraction of FDI is that it is supposedly "a composite bundle of capital, technology, and know-how" (Balasubramanyam et al., 1996, p.6) that can be harnessed by the host economy to help narrow the 'ideas gap' (Romer, 1993) and hence increase domestic productivity. The degree to which FDI embodies technology and know-how will evidently vary from one investment to another. Given that the technological sophistication of the source country is likely to be one important determinant, the fact that the majority of Mexico's FDI comes from the US suggests that Mexico may be in an excellent position to benefit from FDI (and is therefore an ideal candidate in which to test for possible FDI spillovers).

This Chapter is organised as follows. Section 6.2 looks at the volume and structure of Mexican inward FDI. The determinants of this FDI are discussed in section 6.3. Section 6.4 reviews the extant literature on FDI spillovers. The results of a simple

[4] In 1985 import licenses covered 92.2% of national production, the average tariff was 23.5%, and 85.0% of non-petroleum exports were covered by export controls. By 1987 export controls had been abolished, import licenses covered only 25.5% of national production, and the average tariff was down to 11.8% (Hanson, 1997).

time series analysis of the growth effects of FDI in Mexico are presented in section 6.5, and section 6.6 concludes and offers some policy proposals.

Table 6.1 FDI Participation in Mexico, 1976–1994 (%)

Period	US	Germany	Japan	UK	Switzerland	Spain	France
1976-94	62.3	7.3	7.3	3.9	5.1	2.8	3.1
1976-80	68.7	11.6	14.8	3.8	9.0	4.2	0.5
1981-85	63.0	8.7	6.3	3.3	4.1	3.4	3.6
1986-90	58.1	5.2	3.7	9.0	3.7	2.1	5.0
1991-94	58.6	2.9	3.7	7.9	3.4	1.4	4.6

Notes: Table shows the ownership percentage of the total stock of Mexican inward FDI.
Source: Love and Lage-Hidalgo (2000)

Table 6.2 FDI Flows to Mexico post-NAFTA by Country of Origin, 1994–2004 (%)

Year	*US*	*Germany*	*Japan*	*UK*	*Switzerland*	*Spain*	*France*	*Canada*
1994	46.7	2.9	5.9	5.6	0.5	1.4	0.8	6.9
1995	65.8	6.6	1.9	2.6	2.4	0.6	1.5	2.0
1996	67.3	2.6	1.8	1.0	1.1	0.9	1.6	6.9
1997	61.1	4.0	2.9	15.2	0.2	2.7	0.5	2.0
1998	65.3	1.6	1.2	2.1	0.6	4.1	1.5	2.6
1999	53.4	5.6	9.2	-1.4	0.9	7.8	1.3	4.6
2000	71.2	2.0	2.4	1.6	0.9	12.3	-14.6	3.9
2001	77.3	-0.5	2.7	0.3	0.5	2.5	1.4	3.6
2002	63.6	3.8	1.0	7.5	2.8	4.3	1.7	1.2
2003	55.0	3.6	1.0	8.3	2.5	13.9	3.5	1.8
2004	42.4	2.1	1.0	0.7	6.6	39.4	0.8	2.2

Notes: Table shows the ownership percentage of the total annual inflow of FDI to Mexico for the years 1994 to 2004.
Source: Secretaria de Economia (www.economia.gob.mx)

6.2 VOLUME AND STRUCTURE OF INWARD FDI

Mexico has long been a large recipient of FDI. During the 1980s it accounted for approximately 10 percent of all FDI flows to developing countries and roughly a quarter of all flows to Latin America (Love and Lage-Hidalgo, 2000). Though many Mexicans once lamented that they were "so far from heaven and so close to the United States" (Blomstrom and Kokko, 1997, p.21), Mexico's proximity to the world's largest economy is perhaps its greatest advantage. Table 6.1 illustrates the primacy of the US in Mexican inward FDI.

Despite a modest decline in FDI participation in Mexico by the US between 1976 and 1994, the US remains by far the largest single investor. One of the principal advantages of this for Mexico is that the US economy is at the technological frontier and it may be expected that US FDI may be managerially and technologically well-endowed. The principal advantage for researchers is that the US collects the most comprehensive data on the activities of its multinationals abroad, and hence provides detailed information pertaining to roughly 60 percent of all FDI inflows into Mexico. Few other countries, if any, offer this wealth of data.

Figure 6.1 shows the stock and flows of FDI from the US to Mexico for the years 1966 to 2000. As flows in any individual year are heavily influenced by individual undertakings, they show a marked volatility in comparison with the stock data. For this reason, it is preferable to analyse the FDI trend by consideration of the stock as opposed to the flow. Whilst the figure shows a gradual increase in FDI stock from the outset, there appears to be a dramatic increase in FDI during the nineties[5]. In fact, Graham and Wada (2000) report that there is a trend break in 1989.

It is interesting that the timing of this trend break precedes the implementation of NAFTA by some five years. During the negotiations of NAFTA there was considerable concern expressed in the US and Canada that the abundant supply of cheap labour in Mexico would lead to sizeable negative effects on domestic wages and employment[6]. What these concerns overlooked, however, was that trade and investment liberalisation in Mexico had begun in earnest ten years earlier; with corresponding adjustments in trade and investment volumes already having taken place[7]. Graham and Wada (2000) report that the earliest indications that NAFTA was in the 'pipeline' were from 'leaked' reports from the Mexican Government in the spring of 1990, and so "the trend break cannot be attributed to NAFTA nor even to expectations that it would occur" (p.781).

Recognising that FDI typically involves long lead times between the decision of firms to invest and the actual investment taking place, Graham and Wada (2000) further discount the re-election of the incumbent Institutional Revolutionary Party (PRI) in 1988 and significant liberalisation of the Law on Foreign Investment (LFI) in 1989 as explanations of the trend break.

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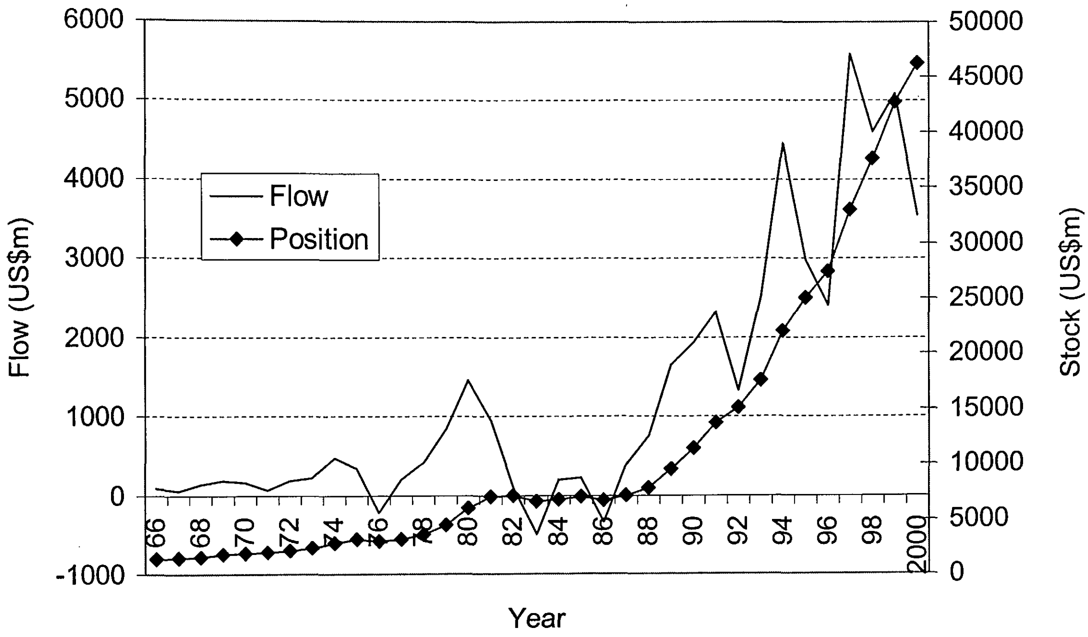
[5] Note that the apparent drop in stock in 1982 is due to a recalibration of the data by the US Department of Commerce and not an actual withdrawal of foreign investors (Graham & Wada, 2000).
[6] Ross Perot, a former US Presidential Candidate, argued that NAFTA would create a "giant sucking sound to the South."
[7] Furthermore, despite the primacy of US activity in the Mexican economy, the relative size of Mexico somewhat precludes dramatic effects on the US and Canada.

Figure 6.1 US FDI in Mexico, 1966-2000



Source: US Bureau of Economic Activity (BEA)

The true catalyst for the break in trend would seem to be the dramatic policy reorientation that Mexico was forced into in the aftermath of its sovereign debt crisis in 1982. In 1985 Mexico announced its intention to join the General Agreement on Tariffs and Trade (GATT), began a series of bilateral negotiations to liberalise trade and investment with the US, and instituted unilateral policy reform. It is these significant changes in Mexico's policy environment that seem to have generated a marked increase of FDI from the US. Despite fears pertaining to the consequences of NAFTA, the major structural changes to the Mexican economy and their associated effects on trade and investment occurred some years prior. The main impact of NAFTA may actually have been to 'lock in' Mexico's policy liberalisation and to validate it on the international stage. An increase in the proportion of FDI originating from 'outsiders' after 1994 would certainly seem to validate this conclusion.

Globerman and Schwindt (1996) provide a framework for determining the potential impact of economic integration. We recreate this framework here as Table 6.2. Integration agreements which fall into quadrant 1 (characterised by positive locational advantages and strong environmental change) are expected to have the greatest impact. Agreements categorised by quadrant 4 (those with negative locational advantages and weak environmental change) are predicted to have the least impact. Agreements categorised by quadrant 2 (negative locational advantages, strong environmental change) and quadrant 3 (positive locational advantages, weak environmental change) are predicted to have an impact somewhere between the two extremes. Environmental change can be defined as the degree of change in policies, practices and institutions brought about as a direct result of the integration agreement[8].

[8] For example, a customs union (CU) would be expected to result in a greater environmental change than a free trade area (FTA) because the CU requires member countries to adopt a common external

Figure 6.2 Factors Determining the Impact of Economic Integration

	Locational Advantages (positive to negative →)	
Environmental Change (strong to weak ↓)	1	2
	3	4

Source: Globerman and Schwindt (1996)

tariff whereas the FTA allows members to maintain their own individual external tariffs. Of course, the degree of environmental change wrought by any integration agreement will depend on the situation prevailing prior to the agreement coming into force.

In a study of the impact of regional integration on FDI, Blomstrom and Kokko (1997) suggest that the effect of NAFTA is likely to characterise Mexico as being in quadrant 1 of Figure 6.2. This region is reserved for those countries upon which the regional integration agreement (RIA) has a strong policy impact *and* which have positive locational advantages (such as low unit labour costs, sizeable domestic market etc.). It is expected that the potential for positive impacts from the formation of an RIA will be greatest for countries described by this combination of characteristics. Undoubtedly, low labour costs and proximity to the US market endow Mexico with strong locational advantages. However, our preceding discussion suggests that the environmental impact of NAFTA may not have been as strong as originally thought (or *feared*, in some cases), indicating that the impact of integration on Mexico may be more accurately categorised by quadrant 3[9]. In this region the impact of the RIA on inward FDI is still expected to be positive, but not as strong as it would be if the country was in quadrant 1.

Let us now turn towards the sectoral distribution of total world FDI in Mexico. Table 6.3 shows the breakdown for the last decade according to the Instituto Nacional de Estadistica. While the service sector received the majority of inward FDI in the early nineties, by the close of the century the industrial sector was by far the greatest recipient. The wholesale and retail trade sector has also enjoyed rapidly accelerating FDI during the decade, firmly establishing itself as the third most important sector. Extraction and agriculture receive comparatively little FDI.

[9] Figure 2 may more satisfactorily be depicted as a continuum in both environmental change and locational advantages, in which case we would argue that Mexico may be more properly located in the west of the diagram (as opposed to the north-west as suggested by Blomstrom & Kokko, 1997).

Table 6.3 Sectoral Composition of Mexican Inward FDI

US$ million, (%)

Year	Industrial	Services	Trade*	Extractive	Agriculture	Total
1990	1,193 (32)	2,203 (59)	171 (5)	94 (3)	61 (2)	3,722
1991	964 (27)	2,138 (60)	388 (11)	31 (1)	45 (1)	3,565
1992	1,101 (31)	1,700 (47)	751 (21)	9 (0)	39 (1)	3,600
1993	2,321 (47)	1,731 (35)	760 (16)	55 (1)	35 (1)	4,901
1994	6,115 (58)	3,093 (29)	1,251 (12)	95 (1)	11 (0)	10,564
1995	4,738 (58)	2,367 (29)	1,006 (12)	79 (1)	11 (0)	8,202
1996	4,682 (61)	2,145 (28)	720 (9)	84 (1)	32 (0)	7,662
1997	7,233 (61)	2,585 (22)	1,854 (16)	130 (1)	11 (0)	11,813
1998	4,900 (64)	1,774 (23)	867 (11)	42 (1)	29 (0)	7,612
1999	8,662 (72)	2,176 (18)	926 (8)	123 (1)	77 (1)	11,965
2000	7,633 (61)	2,886 (23)	1,689 (14)	162 (1)	82 (1)	12,452

Notes: Figures in parentheses are percentage shares. * *Wholesale & Retail Trade*
Source: Instituto Nacional de Estadistica

In order to gain a more detailed insight into the industrial location of Mexican FDI it is once again necessary to examine data maintained by the US Department of Commerce. As before, this has the disadvantage that it accounts only for US FDI, but the advantage that the data is considerably more comprehensive and accurate than that available elsewhere[10]. Table 6.4 shows a detailed decomposition of US FDI flows into 2-digit SIC Mexican manufacturing industries. It is evident that the three most important industries are transport equipment (SIC 37), food (SIC 20), and chemicals and allied products (SIC 28). Unfortunately, a number of the investment figures have been suppressed to ensure that it is not possible to identify the activities of any individual firm. However, by subtracting the available data from the total for all manufacturing industries we can be certain that none of the suppressed figures are masking significant FDI flows.

[10] Concerning accuracy,, it is interesting to note that the Instituto Nacional de Estadistica reports US inward FDI for 1999 as US$6635m, whereas the US Department of Commerce reports only US$5084m. This discrepancy is likely due to the fact that the Instituto records planned or announced FDI, but the Department of Commerce only records FDI that has actually taken place. This example serves to emphasise the importance of verifying investment data when and where possible, and offers an indication of the potential data problems that plague empirical studies.

Table 6.4. US FDI Flows in Mexican Manufacturing Industries, 1982-2000 (US$m)

Year	Food	Chemicals	Primary Metals	Industrial	Electronics	Transport	Other	Total
1982	18	93	37	-3	37	-74	96	203
1983	-58	-21	-42	-141	-56	-59	-51	-427
1984	122	131	32	-279	85	48	-10	129
1985	33	55	6	-52	-18	87	89	200
1986	-45	-52	-29	-111	-2	-83	-29	-351
1987	-91	120	26	-79	48	5	236	264
1988	69	190	32	21	27	163	168	670
1989	281	289	39	60	D	250	D	1,159
1990	393	173	49	53	D	257	D	1,323
1991	281	262	19	-9	-43	619	196	1,325
1992	28	152	D	D	-92	404	268	720
1993	952	410	D	D	-95	-628	304	1,023
1994	674	314	D	D	158	1,028	281	2,530
1995	360	289	D	D	-69	687	D	1,785
1996	692	599	52	D	7	-211	D	1,665
1997	1,007	577	D	D	-14	144	D	2,499
1998	713	107	D	D	D	1,300	495	2,472
1999	-23	729	80	D	D	774	656	2,468
2000	507	483	D	D	D	726	D	1,710

Notes: 'D' indicates suppressed data (to protect the identities of individual firms).
Source: US Department of Commerce

Finally, it is important to note that a significant proportion of FDI into Mexico has been in in-bond foreign assembly plants (maquiladoras) based overwhelmingly along the 3,326 km US-Mexico border[11]. Although the maquiladora program has proven popular with foreign investors since its introduction in the 1960s, relaxation of restrictions in the early 1980s saw maquiladora employment increase from 150,867 in 1983 to 460,293 in 1990 as the share of maquiladora workers in national manufacturing employment grew from 5 percent to 19 percent (Feenstra and Hanson, 1997). Today there are approximately one million workers in nearly four thousand maquiladoras.

Gerber (2001) reports that maquila investment has accounted, on average, for 27 percent of US FDI into Mexico over the period 1994 to 2000[12]. Furthermore, five cities located on the US-Mexico border share 50 percent of the firms and 51 percent of the workers in US-origin maquilas. Feenstra and Hanson (1997) find that in the regions where FDI was most concentrated, the growth in maquiladora investment can account for over half of the increase in the share of skilled labour in total wages that occurred during the late 1980s[13]. Given this, the authors claim that the "FDI boom...has resulted in a region-specific shock to labour demand" (p.374).

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[11] Maquiladoras are subject to tax only on the value added of their activities. They import most of their intermediate imports from abroad and export virtually all of their output (until 1988 they were required by law to export 100% of their output). The vast majority of maquiladoras produce electronic equipment, clothing, plastics, furniture, electrical appliances, or auto parts.

[12] In addition, US investment in maquiladoras was 87% of total world FDI in maquiladoras and around 80% of maquila output is shipped to the US.

[13] US investment in maquiladoras is aimed at outsourcing low-skilled production tasks in order to take advantage of lower unit labour costs in Mexico. However, these tasks which are viewed as low skilled to US firms are in fact relatively highly skilled in terms of the skills and training of the Mexican workforce. In this manner, US FDI in Mexico can cause an increase in the relative demand for (relatively) skilled labour in both countries simultaneously.

Hanson (1996, 1998) draws similar conclusions investigating the spatial impact of FDI and Mexican-US integration. He argues that the massive US inward FDI concentrated in maquiladoras near the Mexican-US border has essentially created vertical production networks spanning the border. This has contributed to a significant contraction in employment in the Mexico City manufacturing belt, a rapid expansion of manufacturing employment in Northern Mexico, and an increase in wage inequality.

Interestingly, these studies also suggest that the impact of NAFTA on the US has been understated. Hanson (1996) examines data for US-Mexico border-city pairs (e.g. San Diego – Tijuana), concluding that export manufacturing in maquiladoras encourages growth in employment in US border cities.

Early evidence therefore seems to indicate that despite the benefits inward FDI can foster in terms of capital and productivity spillovers, it may also lead to rising inequality and regional deindustrialisation. The potential costs of such effects are well known and it is obvious that the spatial aspects of FDI and integration warrant further investigation.

In this section we have argued that Mexico's sweeping liberalisation and policy reform in the mid-eighties was the catalyst to a dramatic acceleration in inward FDI, with the implementation of NAFTA nearly a decade later serving to consolidate and validate these reforms. Given this, we need to ask what factors explain the attraction of the Mexican economy to foreign investors, and what determines the industrial and geographical location of FDI in Mexico? These are the questions that we turn to next.

6.3 DETERMINANTS OF FDI IN MEXICO

The decision process prior to undertaking foreign investment will undoubtedly vary from one firm to another. However, there are many considerations (such as availability of factor inputs, domestic demand conditions, property rights protection etc.) that will be common to all firms. One theory that neatly encapsulates these diverse factors is the eclectic paradigm developed by Dunning (1988). This argues that FDI will be the appropriate mode of foreign market entry when multinationals find it most advantageous to exploit ownership and location advantages through internalisation rather than through exporting or licensing.

There are numerous recent empirical studies which seek to test the determinants of FDI[14]. Most of the issues under investigation can be categorised as location advantages, but there are also studies which seek to assess the impact of ownership advantages and strategic considerations on FDI. Despite the wealth of such studies, the number that specifically address Mexican FDI is unfortunately rather small. Two authors who seem intent on remedying this are Love and Lage-Hidalgo. In one paper (1999a) they test the ownership advantages of US multinational as determinants of FDI flows into Mexico, while in other papers (1999b, 2000) they consider a derivative of the model employed by Buckley and Casson (1991) which takes the principal determinants of FDI to be the scale of demand in the host economy and relative factor costs in the capital exporting and importing countries.

[14] For example, Lehmann (1999) investigates the role of country risk, Traxler and Woitech (2000) consider labour market regimes, Schoeman et al. (2000) analyse fiscal policy, List and Co (2000) study environmental policy, Sung and Lapan (2000) assess exchange rate volatility.

In order to investigate the significance of ownership advantages, Love and Lage-Hidalgo (1999b) develop a model which tests the hypothesis that sectoral FDI flows from the US to Mexico over a four-year period can be explained by the ownership advantages of US multinationals. The authors argue that the firms most likely to display the ownership advantages proposed in the literature are the Mexican affiliates of US multinationals. They therefore construct a database based on US majority owned non-bank foreign affiliates (MOFAs) based in Mexico for the years 1989 to 1992 inclusive[15]. The dependent variable is FDI flows (accounted for by MOFAs), whilst the independent variables are R&D expenditures, capital expenditures, net tangible assets, employee compensation, and total Mexican sales (taken as proxies for the ownership advantages of US multinationals). Their analysis reveals that all of the explanatory variables (with the exception of R&D expenditure) are positively related to FDI flows. They conclude that "direct investment into US MNEs' affiliates in Mexico is driven by benefits derived from embedded human knowledge and from technical knowledge embodied in plant and machinery" (p.77). That is, US multinationals are encouraged to undertake foreign investment partly because of the ownership advantages they possess. Although this goes some way to explaining why US multinationals may want to undertake FDI in the first place, it offers little explanation as to why Mexico itself is an attractive location for FDI.[16]

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[15] MOFAs are those subsidiaries in which the US parent has a stake of 50% or more. As data for these firms is considerably more comprehensive than that for all affiliates (and given that the US Department of Commerce benchmark studies indicate that MOFAs typically represent approximately two thirds of overall US investment in Mexico) the authors opted to focus on these affiliates only.

16 Beyond the implicit assumption that the ownership advantages possessed by US multinationals are not also possessed by domestic Mexican firms (and therefore US affiliates in Mexico can exploit such ownership advantages to gain a competitive advantage versus domestic rivals), ownership advantages tend to offer a "push" explanation for FDI. To incorporate "pull" factors into the discussion we must also examine locational advantages.

In an attempt to address such questions, the authors employ data on US FDI flows to Mexico for the period 1967 to 1994. In this instance the independent variables are Mexican income per capita (as a proxy for the scale of domestic demand), the difference between US and Mexican hourly real wages, and an estimate of the difference between the cost of capital between the US and Mexico[17]. The model was able to explain two-thirds of the variation in FDI flows and strongly supported the belief that real wage differentials were an important locational determinant. Cost of capital differentials, on the other hand, were found to have a weak positive effect on FDI. The authors' suggested explanation for the unexpected sign on capital cost is that when the cost of capital increases in the home nation it encourages MNEs to raise capital from the host country which ultimately leads to increases in FDI. Mexican income per capita was also found to have a strong positive influence on FDI, which is interpreted as indicating that the domestic Mexican market is attractive to FDI in its own right (and not simply because it offers a plentiful supply of 'cheap labour').

One notable shortcoming of these studies (which is readily acknowledged by the authors) is their use of wage differentials instead of the more appropriate unit labour costs (ULCs), which take into account labour productivity as well as labour compensation. Fortunately, the recent provision of ULC measures for Mexico by the Key Indicators of the Labour Market (KILM) database enables this to be remedied.

[17] The lagged stock of US FDI in Mexico is included as a fourth explanatory variable because "in any given period, actual and desired foreign capital stocks are unlikely to be equal as a result of adjustment costs and operating lags [so] flows of foreign direct investment will therefore be a lagged function of the difference between actual and desired capital stocks in previous periods." (p.209/10)

We employ a simple gravity model (familiar from previous chapters), augmented with the ratio of the unit labour costs in the host and home countries, in an attempt to model both 'push' and 'pull' effects on US FDI flows to Mexico and Canada[18]. The dependent variable is US FDI flows to Mexico or Canada in constant 2000 US$ (derived from OECD Direct Investment Statistics online database). The independent variables are home (i-subscript) and host (j-subscript) country GDPs and populations (from the World Bank World Development Indicators online database). The unit labour cost variable is derived from the KILM database which reports labour compensation per unit of output in constant 1990 US$ (from KILM)[19]. Employing a log-linear specification, we accordingly estimate the following regression model:

$$\ln FDI_{ijt} = \alpha + \beta_1 \ln GDP_{it} + \beta_2 \ln GDP_{jt} + \beta_3 \ln n_{it} + \beta_4 \ln n_{jt} + \beta_5 \ln(ULC_j / ULC_i)_t \quad [6.1]$$

Although GDP and population data is readily available, this is unfortunately not the case with FDI and unit labour cost data. Data is available on the dependent variable for the years 1982 to 2003, inclusive. We have observations for the ULC variable for the years 1980 to 2002, inclusive. Obviously we would rather have a more comprehensive dataset, but as with many fields in economics we are forced to work with the limited data available.

As we have seen in previous chapters, *a priori* we expect the sign on home and host country GDPs to be positive. Although theory is unclear as to the sign on the

[18] As the US shares a common border with both Mexico and Canada we exclude the distance variable that is typically included in gravity models when applied to a more geographically diverse dataset.
[19] The ULC variable is the ratio of host (i.e. Mexico or Canada) ULC against home (i.e. US) ULC in any given year.

population variables, our experience has been that these coefficients are typically negatively signed (so that for a given income, a higher population and hence lower per capita income both offsets the 'push' effect on FDI from the home country and the 'pull' effect from the host). The coefficient on the ULC variable is expected to be negative, reflecting that US FDI is attracted to Canada and Mexico to exploit lower unit labour costs than are available domestically.

Table 6.5 presents the results when the dataset is used to estimate the above model using pooled ordinary least squares (OLS). The first column of results reflects estimation of the model specified in [6.1] above. Although the F-statistic implies that the explanatory variables are jointly significant, only the coefficient on home GDP is statistically significant at the 10% level in its own right. The magnitude of *ln GDPi* is much greater than that typically found in gravity models applied to FDI flows - it is likely that this variable is picking up other factors that influence FDI flows from the US to Canada and Mexico (such as proximity, cultural ties and historical trading patterns etc).

The sign on the ULC variable is contrary to our *a priori* expectations. Were it statistically significant it would suggest that higher relative (to the US) unit labour costs in Mexico and Canada actually seem to attract FDI from US firms. However, as the coefficient is not statistically different from zero, we are forced to say that (based on the results of the initial regression) relative unit labour costs appear to exert no influence on US FDI to Mexico or Canada. This conclusion goes against our *a priori* expectations and is also at odds with previous work by Griffiths and Sapsford (2002) who found that unit labour costs in Mexico and Canada exerted a statistically significant (at the 6% level) negative effect on US FDI flows for the period 1980 to 1996.

Table 6.5 FDI Flows and Unit Labour Costs in Mexico and Canada

	6.1	*6.2*	*6.3*	*6.4*	*6.5*
Constant	-148.4 (128.8)	-145.8 (148.6)	-262.8 (155.2)	-108.2 (142.1)	-210.4 (146.8)
$\boldsymbol{lnGDP_{it}}$	10.31* (5.88)	6.82 (7.90)	0.86 (7.62)	2.73 (7.74)	-0.89 (7.16)
$\boldsymbol{lnGDP_{jt}}$	-4.68 (4.47)	-1.74 (4.67)	-1.42 (4.33)	-0.10 (4.50)	-1.51 (4.05)
$\boldsymbol{ln\ N_{it}}$	-0.40 (14.85)	0.74 (17.56)	16.29 (18.62)	-11.25 (17.60)	3.19 (18.24)
$\boldsymbol{ln\ N_{jt}}$	-0.84 (0.80)	-0.89 (1.00)	-1.85 (1.10)	14.92* (7.41)	13.04 (6.23)
$\boldsymbol{ln\ (ULC_j/ULC_i)_t}$	1.25 (0.95)				
$\boldsymbol{ln\ (ULC_j/ULC_i)_{t-1}}$		0.29 (0.88)		-0.79 (0.98)	
$\boldsymbol{ln\ (ULC_j/ULC_i)_{t-2}}$			-1.16 (0.88)		-1.74* (0.86)
$\boldsymbol{D_i}$				-18.19** (8.45)	-17.17** (7.09)
F-statistic	15.77 (5, 32)	12.46 (5,33)	13.54 (5, 34)	12.30 (6, 32)	13.87 (6,33)
$\boldsymbol{Adj\text{-}R^2}$ ***obs.***	0.67 38	0.60 39	0.62 40	0.64 39	0.66 40

Notes: Dependent variable is the natural logarithm of US FDI flows. Figures in parentheses are standard errors.

- *indicates significance at the 10% level, ** at 5%, and *** at 1%.*

As we have discussed previously, there is likely to be a considerable lag between the decision to invest and the actual realisation of that investment. Although any firm looking to invest overseas will give due regard to its expectations of changes in key economic variables going forward (e.g. market growth rates, exchange rates, labour costs etc), it will undoubtedly place significant store in the economic situation that prevails at the time the decision to invest is being made. As the ULC variable is a 'decision variable' faced by firms, it may be more appropriate to lag this variable (as this should more accurately capture the unit labour cost ratio upon which US firms were making their foreign investment decisions).

Equation 6.2 of Table 6.5 reports the results when we introduce the unit labour cost variable lagged one period. Although the coefficient on the lagged ULC variable is less positive (i.e. smaller magnitude) than the current ULC variable in equation 6.1, it remains statistically indistinguishable from zero. Furthermore, the coefficient of home GDP, which was significant at the 10% level in equation 6.1, is no longer statistically significant.

Equation 6.3 reports the results when the ULC variable is lagged two periods. Although the coefficient on $ln(ULC_j/ULC_i)_{t-2}$ is negative, it is not statistically significant despite a lower standard error than in equations 6.1 and 6.2[20].

[20] Note that introducing the ULC variable in lagged form increases the number of available observations (in comparison to when ULC is included without a lag) because the ULC data is available for 1980 to 2002 and the FDI data is available for 1982 to 2003. Therefore, when we include $ln(ULC_j/ULC_i)_t$ we have data for the years 1982 to 2002, but with $ln(ULC_j/ULC_i)_{t-1}$ we can include data for 1982 to 2003.

Thus far, we have implicitly imposed the restriction that the gravity and ULC variables have an identical impact on US FDI to Mexico as they do on US FDI to Canada. In order to relax this assumption we add intercept and slope dummy variables to our regression specification. Although the slope dummies proved to be statistically insignificant, the intercept dummy had a notable effect when introduced with the lagged ULC variables. Equation 6.4 of Table 6.5 reports the results when the intercept dummy is introduced together with the ULC variable lagged one period[21]. The intercept dummy is statistically significant at the 5% level, with the negative coefficient implying that US FDI flows to Mexico are lower than they are to Canada (after taking account of the gravity variables and lagged unit labour costs). Given the historically close ties between the US and Canada it is not surprising that Canada receives more US FDI than Mexico even after accounting for GDP, population and unit labour costs. Although the lagged ULC variable is now reporting a negative coefficient, we must note that it is still not statistically significant and we should not therefore place undue emphasis on this reversal in sign.

Equation 6.5 reports the results when the intercept dummy is included with the two-period lagged ULC variable. Once again, the intercept dummy is negative and statistically significant. On this occasion, the lagged ULC variable is also statistically significant at the 6% level, with the negative coefficient implying that an increase in unit labour costs in Mexico or Canada (relative to the US) will discourage FDI from US firms.

[21] The intercept dummy (*Di*) takes the value of unity for observations in which the host country is Mexico and the value zero when the host country is Canada.

In order to gain an insight into the possible length of the lag between the decision to undertake foreign investment and the actual realisation of that investment, we experimented by including different lags of the ULC variable. With a three-period lag the ULC variable was -1.30 with a standard error of 0.88; with a four-period lag the coefficient was -0.04 with a standard error of 1.09; and with a five-period lag the coefficient was 0.07 with a standard error of 0.93. It therefore appears that the investment decision may precede actual investment by two to three years.

Despite data limitations and the simplicity of the foregoing analysis, there is evidence that US firms take account of the prevailing unit labour costs in target countries when making their investment decisions – lower (relative) unit labour costs lead to greater FDI.

In order to attempt a more comprehensive analysis of the determinants of Mexican inward FDI we have constructed a data set of FDI flows disaggregated by two-digit SIC manufacturing industries. US flow data for the years 1987 to 2000 was taken from the Bureau of Economic Analysis (BEA) for the food, chemicals, primary metals, industrial machinery, electronics and transport industries. As disaggregated ULC data are not available for Mexico, we employ data on hourly compensation available from the US Bureau of Foreign Labour Statistics.

In addition to the compensation variable we included the GDP of the domestic US industry (IND_{it}), and the GDP growth rates of the US (Y_{it}) and Mexican (Y_{jt})

economies as explanatory variables[22]. This gives the following equation to be estimated:

$$\ln FDI_{ijt} = \alpha + \beta_1 \frac{COMP_{jt}}{COMP_{it}} + \beta_2 \ln IND_{it} + \beta_3 Y_{it} + \beta_4 Y_{jt} \qquad [6.6]$$

Unfortunately, due to data suppression by the BEA (to protect the identity of individual firms) and missing values for compensation in some years, our potential panel size of 68 observations is reduced to 31. Given this, it is not surprising that we failed to achieve conclusive results, whether using pooled OLS, a random effects model (REM) or a fixed effects model (FEM). The sole statistically significant coefficient was β_2, whose value ranged from 1.24 to 1.59 (significant at the 5 percent level) depending on the model specification and sample used[23]. This implies that, *ceteris paribis*, the size of a manufacturing industry in the US is associated with a higher level of FDI flows to Mexico[24]. Obviously though, the lack of data has prevented us from undertaking a more sophisticated and comprehensive study and this conclusion should be treated cautiously.

The empirical work we have so far undertaken on Mexican FDI seems to offer some evidence to support the intuition that unit labour costs (or, more correctly, two-period lagged relative ULC) and the size of US manufacturing industries have been factors

[22] IND_iY and Y_i are intended to capture the 'push' effects on FDI and Y_j the 'pull' effect. This is similar to the standard 'gravity model' which has proved very successful empirically at accounting for a whole range of factor flows.

[23] In order to increase the number of observations available we also experimented with the inclusion of data for US FDI into Canada. However, this failed to alter the results and β_2 remained the only significant coefficient.

[24] Note that our regression specification assumes that all FDI in a given Mexican industry comes from US firms in that same industry. However, this may not be too unrealistic at the two-digit level.

in stimulating inflows of FDI to Mexico. An analysis of the attraction of factors such as tax breaks, special economic zones and agglomeration economies would make a valuable contribution to the literature if a sufficiently comprehensive dataset could be assembled.

6.4 SPILLOVER CHANNELS

Perhaps the main reason that foreign direct attention receives so much attention, in policy debates, economic circles and the popular press, is the belief that it can contribute positively to economic growth (and hence welfare) in the recipient country, in excess of the contribution that can be made by domestic investment. Thus far we have had little opportunity to explore this idea. This case study of Mexico affords this opportunity by allowing us to explore the existence, or otherwise, of spillovers from Mexican inward FDI.

The literature identifies four main channels through which spillovers from FDI are thought to occur: imitation, competition effects, human capital acquisition, and export spillovers. We briefly consider each in turn.

6.4.1 Imitation

The most convincing explanations in the theoretical literature on why multinationals invest abroad as opposed to licensing or exporting tend to assume that the firm has some sort of ownership advantage (such as patented technology) that it must internalise through direct investment to overcome market imperfections (such as poor intellectual property rights in the host country). As Hymer (1960) observed, the multinational will surely be disadvantaged in terms of local knowledge and so must have some proprietary advantage to counteract this. Either by imitation or demonstration, dispersion of this proprietary knowledge (whether it be technology, a product or process innovation, or simply managerial or organisational expertise) is believed to be one of the primary channels through which domestic firms can improve their productivity.

Immediately, it is obvious that a number of factors will be crucial in determining how successful domestic firms will be in gaining from this type of spillover. For instance, the level of technology or knowledge embodied in FDI can be expected to vary with the type of investment (e.g. initial capital or reinvested earnings), industry of investment (e.g. electronics or agriculture), and source country (e.g. US or Brazil). Furthermore, the host nation's ability to benefit from any spillovers likely depends on its technological sophistication, levels of human capital, cultural and social capital, and financial institutions and markets (factors which Abramovitz (1986) might refer to as determining a country's 'absorptive capacity'). Indeed, there is quite a debate in the literature as to whether the size of the 'technology gap' (that is, the difference in technological sophistication between the source and host countries) exerts a positive or negative influence on spillovers[25]. The argument that it is positive rests on the belief that the more 'backward' the host nation the greater the scope for it to make gains on the leading countries and hence the faster domestic productivity growth will be. However, if the gap is large it may prove too great for domestic firms to 'jump'

[25] See Findlay (1978) and Wang and Blomstrom (1992).

and ultimately they may gain very little from FDI (and may actually be harmed by it if they are forced out of the market).

In a cross-section industry level study of Mexico for 1970, Kokko (1994) investigates the role of the 'technology gap'. He finds that "factors related to technology alone do not seem to inhibit spillovers, but that large productivity gaps and large foreign market shares together appear to make up significant obstacles" (p. 290). This finding may be of particular concern to Mexico because US investments in maquiladoras in Northern Mexico exhibit aspects of enclave behaviour.

6.4.2 Competition

A number of authors emphasise the role of competition effects in generating spillovers from FDI (Wang and Blomstrom, 1992; Glass and Saggi, 2001). Entry by a foreign firm will initially increase competition in the domestic industry which should force domestic firms to adopt new technologies or reduce X-inefficiency even if there are no gains in terms of imitation as discussed above[26]. This spillover mechanism is analogous to the standard gains associated with increased arms-length trade and is often cited as potentially one of the most important benefits from FDI[27]. Of course, if foreign entry forces out some domestic firms that are unable to compete and hence ultimately leads to an increase in concentration and imperfection in the market, competition effects from FDI may actually harm the host economy.

[26] Although entry by a similar-sized domestic firm would also increase competitive pressure, the fact that foreign affiliates are generally more efficient than domestic firms (Blomstrom and Wolff, 1994) leads us to expect that FDI will lead to greater and more beneficial competitive pressure than the equivalent domestic investment.

[27] For example, the Cecchini Report on the benefits of completing the European Single Market identified competition effects as the primary source of gain (Gorg and Greenaway, 2002).

6.4.3 Acquisition of Human Capital

Human capital has long been held to be a vital determinant of economic growth and has recently been incorporated into endogenous growth models to permit countries to enjoy increasing returns. Given this, the prospect that FDI is linked with training and on-the-job learning for domestic workers is particularly encouraging. Fosfuri, Motta, and Ronde (2000) note that "the fact that MNEs undertake substantial efforts in the education of local workers has been documented in many instances (e.g. ILO, 1981; Lindsey, 1986), and empirical research seems to indicate that MNEs offer more training to technical workers and managers than do local firms (Chen, 1983; Gerschenberg, 1987)" (p.206).

The possibility of spillovers is magnified when affiliate employees move to domestic firms or set up their own enterprises. Katz (1987) observes that managers of domestic firms in Latin America often started their careers and were trained in foreign affiliates. Aitken, Harrison, and Lipsey (1996) investigate the possibility of human capital spillovers in Mexico, Venezuela, and the US by estimating the effect of foreign ownership on wages. They find for all three countries that FDI is associated with higher wages, but in Mexico and Venezuela higher wages were only found for workers in foreign firms. This implies that FDI does improve the human capital of domestic workers employed by foreign affiliates, but there is no evidence of human capital spillovers to workers of domestic firms (or rather that there is no evidence that workers in domestic firms are compensated for potential human capital spillovers they may have received).

6.4.4 Export Spillovers

There is a rich history of research on the export-led growth hypothesis. More recently, a number of papers have considered the prospect that involvement in exporting increases a firm's productivity[28]. Given that exports also secure foreign currency for the exporting nation, the prospect that FDI may enhance the ability of domestic firms to export has received significant attention. Multinationals have an obvious advantage over domestic firms when it comes to knowledge and experience of exporting. It is not difficult to imagine that some of this expertise may spillover from foreign affiliates to domestic firms, especially if the affiliate is itself engaged in export activity. Furthermore, if the affiliate is producing for export then it may encourage the formation of export infrastructure (such as transport, warehousing etc) that can be utilised by domestic firms.

Aitken, Hanson, and Harrison (1997) employ cross-section firm level data for 1986 and 1989 to study the link between FDI and export spillovers in Mexico. They find that the probability that a domestic plant will export is positively correlated with proximity to multinational affiliates, but unrelated to general exporting activity. They conclude that "foreign-owned enterprises are a natural conduit for information about foreign markets and technology, and a natural channel through which domestic firms can distribute their goods. To the extent that foreign investors directly or indirectly provide information and distribution services, their activities enhance the export prospects of local firms" (p.25).

[28] See Bernard and Jensen (1999), Bernard and Wagner (1997), and Girma, Greenaway & Kneller (2002).

6.4.5 Empirical Studies on Productivity Spillovers

As previously mentioned, Mexico has proved a popular area of study, although the most recent empirical studies have focussed on other developing countries from Latin America and East Asia. Whilst overall evidence from empirical studies on FDI spillovers is mixed, there is a general consensus amongst the Mexican studies that FDI does lead to beneficial spillovers for domestic firms.

The earliest study of spillovers in Mexico was by Blomstrom and Persson (1983) who related the technical efficiency of Mexican manufacturing industries in 1970 to capital intensity, labour quality, degree of competition, and the presence of foreign affiliates. They found a positive relationship between technical efficiency and foreign presence, which they took as suggesting that 'spillover efficiency benefits' do occur from foreign plants to domestic plants. However, the study does not indicate through what channels these spillovers might take place.

Blomstrom (1986) attempts to remedy this failing by analysing the effects of FDI on the productive efficiency of the industrial structure in Mexico between 1970 and 1975. He does this by constructing an efficiency index, which is a measure of how far the average firm is from the industry frontier, and then running OLS regressions with a foreign share variable as one of the independent variables. In all of the regressions he finds a positive coefficient on the foreign share variable that he interprets as evidence that "MNCs have a positive independent influence on structure, so that industries dominated by foreign firms tend to be more efficient than others in the sense that the average firm is closer to the frontier" (p.105).

Then to investigate the possible channels through which the foreign firms may be contributing to structural efficiency, Blomstrom relates different aspects of structural change between 1970 and 1975 to changes in foreign presence during this same period. He finds that foreign entry is uncorrelated with both changes in the technological frontier and labour productivity in the least efficient plants, but that it is positively related to productivity changes in the industry average. This is interpreted as evidence that spillovers occur not through the transfer of technology but rather through competitive pressure. It may also indicate that FDI encourages the dualistic nature of developing country markets (i.e. foreign firms enter and improve the 'modern' sector of an industry, whilst the 'traditional' sector is unaffected and falls further behind).

Blomstrom and Wolff (1994) investigate the influence of multinationals on productivity convergence between Mexico and the US between 1970 and 1975. They report that "there is strong evidence that the presence of multinational firms acts as a catalyst to the productivity growth in Mexico and that foreign direct investment speeds up the convergence process between Mexico and the United States" (p. 275). Unfortunately, the study is unable to distinguish between the direct effect of FDI and possible indirect (spillover) effects and so it is possible that industry productivity in Mexico is improved simply by the entry of more productive MNE affiliates without any increase in domestic firm productivity.

It is important to note that all the spillover studies discussed above make use of cross-sectional industry-level data. Recently, Görg and Strobl (2001) have argued that use of cross section data may lead to biased results because of the problem of correctly identifying the causation between industry productivity and multinational affiliate entry. They recommend that panel data be used to circumvent this problem. Görg and Greenaway (2002) conduct an exhaustive survey of papers on productivity spillovers (covering a variety of developed, developing, and transition economies) and note that only "two studies using appropriate data and estimation techniques…report positive evidence for aggregate spillovers" (p. 7). The remaining sixteen find either negative or no statistically significant effects.

This would appear quite damning evidence against the positive spillovers found for Mexico. However, it must be realised that none of the studies which found negative or no effects were done for Mexico. As discussed previously, spillovers from FDI are likely to vary with the host economy under consideration. In fact, Kokko (1994) finds that "the technology imports of MNC affiliates seem to be larger in countries and industries where the educational level of the local labour force is higher, where local competition is tougher, and where the host country imposes fewer formal requirements on the affiliates' operations" (p.280). This combined with the fact that the majority of Mexico's FDI comes from the US may be the actual explanation for why positive spillovers have been consistently found for Mexico, but no statistically significant effects were found for Morocco (Haddad and Harrison, 1993) or Uruguay (Kokko et al., 1996).

Many developing countries, including Mexico, actively compete to attract FDI in the belief that it can contribute not just to the quantity of capital, but also the *quality*. In some instances governments are so eager to attract foreign firms that they will even subsidise the investment[29]. Given this, it is disappointing that there is no consensus in empirical research confirming the existence of beneficial FDI spillovers.

[29] For instance, Head (1998) claims that the state government of Alabama paid the equivalent of $150,000 per employee to entice Mercedes to locate its new plant in the state.

6.5 DOES FDI ENHANCE ECONOMIC GROWTH?

The majority of empirical studies investigating the host country effects of FDI focus on labour or output productivity in manufacturing as the dependent variable. We take a different approach here and follow Balasubramanyam et. al. (1996) and Carkovic and Levine (2002) in examining directly the growth rate of gross domestic product (GDP) in a model derived from a production function with FDI as an additional input alongside labour and physical capital. As discussed previously, foreign investment is attractive to host countries specifically because it is believed to embody greater technology and human capital than domestic investment. Given this, it is appropriate that the stock of foreign investment and domestic investment should enter separately in the production function.

In the usual manner we can represent the production function as:

$$Y = g(L, K, F, t) \qquad [6.7]$$

where Y is real GDP, L is labour, K is domestic capital stock, F is foreign capital stock, and t is a time trend capturing technical progress. Taking [6.7] to be a Cobb-Douglas production function with an exponential time trend, we obtain an expression for the growth of GDP after taking logs and differentiating:

$$y = \alpha + \beta_1 l + \beta_2 k + \beta_3 f + \beta_4 t \qquad [6.8]$$

where lower case letters denote growth rates and the beta coefficients therefore represent output elasticities for *L*, *K* and *F*, but not for the time trend (B_4 is the estimated rate of technical change).

With regard to measurement of the domestic and foreign capital stock we follow Balasubramanyam et al. (1996) and take the shares of domestic investment and foreign investment in GDP as adequate proxies for the growth rate of the domestic and foreign capital stocks respectively[30].

Having so far adhered closely to the model and procedure employed in Balasubramanyam et al. (1996), we now depart in terms of the data to be analysed. Whereas Balasubramanyam et al. (1996) employed cross-section data on 46 countries averaged over the period 1970 to 1985, we utilise time series data pertaining to growth and FDI in Mexico from 1970 to 2003[31]. In all instances the data are taken from the World Bank's World Development Indicators online database.

The results are reported in Table 6.6. Equation 6.9 is the regression estimated for the entire sample. Of the independent variables, only the coefficient on *I/Y* (the proxy for the growth rate of the domestic capital stock) is statistically significant, with an output elasticity of 1.05 (significantly different from zero at the 1 percent level)[32].

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[30] In doing this Balasubramanyam *et al.* (1996) were themselves following "the precedent set in numerous previous studies by approximating the rate of growth of the capital stock by the share of investment in GDP" (p. 98). See, for example, Mankiw, Romer, and Weil (1992).

[31] The World Development Indicators generally report data beginning from 1960. However, for FDI they begin reporting from 1970.

32 An alternative interpretation of the coefficient is that a one percent increase in the growth rate of the domestic capital stock will engender a 1.05% increase in output growth, *ceterus paribis*. This implies that economic growth is elastic with respect to domestic investment.

Table 6.6 Does FDI Enhance Economic Growth?

	6.9	6.10	6.11	6.12	6.13	6.14	6.15	6.16
α	-15.12 (0.75)	-7.88 (0.16)	2.93 (0.12)	-20.69 (19.80)	-14.23 (0.67)	-11.15 (0.51)	-82.81 (1.53)	-13.19 (0.59)
FDI/Y	-0.43 (0.49)	-4.64 (0.99)	-1.16 (1.09)	-5.21 (1.85)	-0.75 (0.72)			-0.41 (0.45)
I/Y	1.05 (3.91)	0.99 (3.14)	1.69 (3.06)	1.03 (3.96)	1.04 (3.77)	0.94 (3.20)	-0.27 (0.27)	1.06 (3.81)
$\Delta L/L$	0.19 (0.05)	0.26 (0.03)	-5.52 (1.06)	2.27 (0.56)	0.03 (0.01)	0.02 (0.00)	20.10 (1.40)	-0.22 (0.05)
FDI/Y x Openness				0.07 (1.78)				
FDI/Y_{t-1}					0.58 (0.55)	-0.23 (0.21)	0.71 (0.24)	
FDI/Y_{t-2}						1.23 (1.11)	4.89 (1.95)	
$\Delta X/X$								-0.02 (0.21)
t	-0.06 (0.24)	-0.20 (0.29)	-0.39 (1.49)	-0.002 (0.01)	-0.08 (0.34)	-0.18 (0.70)	0.68 (1.23)	-0.08 (0.30)
F-statistic	5.55 (4, 29)	3.84 (4, 11)	2.71 (4, 12)	5.41 (5, 28)	4.12 (5, 27)	4.22 (5, 26)	2.08 (5, 9)	4.31 (5, 28)
$\bar{R}^2$	0.36	0.43	0.30	0.40	0.33	0.34	0.28	0.33
sample period	1970-2003	1970-1985	1986-2003	1970-2003	1970-2003	1970-2003	1986-2000	1970-2003

Notes: Dependent variable is the growth rate of real GDP. Estimation is by ordinary least squares (OLS). Figures in parentheses are absolute t-ratios.

Although the coefficient on *FDI/Y* is negative (contrary to expectations) it is not statistically significant. This suggests that for Mexico, for the period 1970 to 2003, FDI has not played a role in economic growth (the statistically insignificant coefficient on labour force growth indicates that this has likewise been the case for labour).

This finding is at odds with previous studies on Mexico cited earlier and also with Balasubramanyam et. al. (1996) who report a statistically significant, positive effect of FDI on growth (albeit for a cross-section of 46 economies). Fortunately, the work of Balasubramanyam et. al. (1996) also hints at a convincing explanation for our finding. Bhagwati (1978) hypothesised that the volume and efficacy of inward FDI will be dependent on the trade regime pursued by the host nation. Further, he suggested that FDI would be far more beneficial under an export-promoting (EP) strategy than under a strategy of import substitution (IS)[34] [35]. By separating their sample into EP and IS countries, Balasubramanyam et al. (1996) find evidence to suggest that this is indeed the case. As Mexico has undergone a dramatic reorientation of its trade policy during our sample period, we are motivated to explore the possibility that this is masking a positive effect of FDI in our overall sample.

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[34] The reasoning for this being that an EP strategy offers a distortion-free environment, whereas an IS strategy offers artificial and transitory incentives. So FDI will locate in an EP environment based primarily on efficiency considerations, but tax and other such incentives in an IS environment may encourage FDI to locate in sub-optimal locations.

[35] Bhagwati (1978) also hypothesised that the volume of FDI would be greater under an EP regime. Balasubramanyam and Salisu (1991) offer evidence supporting this contention.

Our initial procedure for classifying our sample into an IS period and an EP period was to perform the CUSUM and CUSUMSQ tests of structural stability. However, even for a range of equation specifications, neither of these tests indicated a structural break. Given our failure to identify a natural break, we chose to divide the sample according to the date given by Sachs and Warner (1995) for the liberalisation of Mexico (i.e. 1986). Equation 6.10, for the years 1970 to 1985, represents Mexico under an IS regime; equation 6.11, for the years 1986 to 2003, represents Mexico under an EP regime.

The variable *FDI/Y* fails to attain statistical significance in either of the subsamples. We therefore find no evidence that FDI has contributed to economic growth in Mexico, whether during the years of import-substituting industrialisation or the export-promoting period. Domestic investment (*I/Y*) is the only explanatory variable that is significant in either 6.10 or 6.11. We may interpret the larger coefficient on *I/Y* in 6.11 as an indication that domestic investment provides a greater inducement to growth under an EP regime.

Another approach to investigating the possible impact of trade orientation was to include an interaction term between foreign investment and a measure of openness as an additional explanatory variable (the product of FDI/Y and 'openness')[36]. If a liberal regime does indeed improve the efficacy of FDI then we should find a positive coefficient on the interaction term. Although the interaction term is positive and statistically significant at the 10% level (as reported for equation 6.12 in Table 6.6), the coefficient on FDI/Y is negative and statistically significant at the 10% level. The

[36] The openness variable is defined as (imports + exports / GDP).

value of the coefficients imply that foreign investment will only make a positive contribution to economic growth when the share of trade in GDP is 79% or greater. Despite increasing rapidly from 20% in 1960, this measure of openness has not exceeded 79% for Meixco at any point for the period under consideration. According to the results of equation 6.12 therefore, FDI has only detracted from economic growth between 1970 and 2003.

Given that there is often a substantial delay between the moment of entry of FDI and the point at which the foreign operation is 'up-and-running', or at least operating at expected efficiency (especially for initial investments), it seems reasonable to expect that output growth may lag behind growth of the foreign capital stock[39]. We therefore experimented with varying lag lengths of the foreign direct investment variable[40]. A two-period lag came the closest to achieving statistical significance (a coefficient of 1.23 with a t-ratio of 1.11). The lags were also applied in the IP and EP subsamples but performed no more favourably than in the complete-period sample. However, when applied to the period 1986 to 2000, the two-period lagged foreign investment variable attained statistical significance at the 10% level with a coefficient of 4.88. Although this may provide some evidence that FDI has proven beneficial to Mexican economic growth during the EP regime (after discounting recent turbulent years), we must note that equation 6.15 only has nine degrees of freedom. Furthermore, 4.88 is

[39] Anecdotal evidence in Hanson (2001) of investments by General Motors and Ford in Brazil would seem to support this assumption.

[40] Note, we also experimented with the inclusion of year dummies for 1982, 1983, 1984, 1994, and 1995 (to try and account for periods of crisis in Mexico during our sample period). The inclusion of these did not change the results on our variables of interest (although the dummies 1982, 1983, and 1994 were negative and statistically significant).

an implausibly high coefficient, implying that a 1% increase in the growth of the foreign capital stock leads to a (lagged) increase in economic growth of nearly 5%.

In equation 6.16 we include a variable measuring the growth rate of Mexican exports ($\Delta X/X$) in acknowledgement of the vast literature on the export-led growth hypothesis. However, neither this variable (or lagged variations) proved to be statistically significant. We therefore find no evidence that Mexico has benefited from export-led economic growth.

Obviously the evidence supporting the beneficial growth effects of FDI in Mexico is much weaker than one might have expected. Without introducing lagged values of the variable, *FDI/Y* appears to exert no influence on growth. There is limited evidence that, in the presence of an appropriate host environment (e.g. the increasingly liberal regime found in Mexico post-1986), FDI may contribute to economic growth. If this is an accurate reflection of reality it is encouraging news for Mexico considering that it continues to attract increasing inflows of FDI and is consolidating its policies of liberalisation through the ongoing demands of NAFTA and negotiation of various bilateral treaties with countries such as the UK.

6.6 POLICY PROPOSALS

Many developing countries offer generous incentives to try to attract FDI in the belief that it offers an attractive social return. Given this, it is of great concern that the existence of positive spillovers, as supported by early cross-section studies, has been cast into doubt by recent empirical work. Many of these early studies focused on

Mexico and we must investigate the cause of these empirical discrepancies. Though there is a suggestion (Görg and Strobl, 2001; Görg and Greenaway, 2002) that cross-section approaches lead to biased results, there are currently no panel data studies for Mexico. Until this is the case it is difficult to take a firm position either way. What should help support the view that there are spillovers in the case of Mexico, however, is the fact that around 60 percent of Mexico's inward FDI comes from the world's most technologically advanced nation. Subject to some evidence that spillovers may be reduced if the technology gap is too large (Kokko, 1994, 1996), this suggests that the potential is there for Mexico to reap substantial benefits from FDI.

How can Mexico ensure that it maximises the potential spillovers from FDI? As Caves (1999) observes, no systematic theory has emerged in the development literature to address this issue. This is a major failing that deserves investigation. Lacking sound micro-management policies on how to maximise spillovers, we are left to recommend broader macro objectives based on improving a country's 'absorptive capacity'. These include investment in human capital, physical and financial infrastructure development, and openness.

The advantage of 'investing' in 'absorptive capacity' is that it also attracts FDI. Indeed, in an ideal world there would be no competition for FDI (in terms of tax concessions etc.), rather multinationals would be left to choose investment locations based purely on efficiency and competitive advantage considerations. This would ensure the maximum social return for investment in a global sense and would limit MNEs ability to privately capture the benefits of FDI. Despite this not being the case, and evidence that lower corporate tax rates do attract FDI (Hanson, 2001), we would recommend that Mexico discontinue any attempts to 'artificially' attract FDI and instead focus on offering a favourable economic environment (e.g. high growth, educated labour force, good infrastructure etc.). By providing a 'distortion-free' environment Mexico would enjoy the greatest opportunity to benefit from FDI spillovers[41].

Furthermore, given its geographical proximity to the US, Mexico need not fear loss of FDI flows. The formation of NAFTA has legitimised the liberalisation policies adopted by Mexico in the mid-eighties and appears to be attracting considerable non-member FDI intent on penetrating the US market. As the domestic Mexican market continues to grow and becomes more 'Americanised' it will attract more FDI in its own right[42]. Hopefully, this will allow it to move away from maquiladora-type operations to activities which add more value and provide greater opportunity for spillovers[43].

Ending on a note of caution, recent research suggests that FDI may result in undesirable spatial effects and inequality[44]. The costs of these are well documented and this issue deserves serious consideration. Although the Mexican government has

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[41] Furthermore, there is evidence (Love and Lage-Hidalgo, 1999a) that Mexico and Canada do not compete for US investment (i.e. increased US investment in Canada will not lead to decreased investment in Mexico).

[42] Using Hofstede's four dimensions of national culture (power distance, uncertainty avoidance, individuality, and masculinity) Kogut and Singh (1998) estimate the 'cultural distance' between the US and Mexico as 3.13 (compared with 0.08 for the UK, 0.11 for Canada, 1.63 for India, and 3.60 for China).

[43] Despite a pervasive view in the popular press that maquiladoras are little more than 'sweatshops' employing young female labour (Feenstra and Hanson, 1997), Silver (2002) reports that each maquiladora job indirectly supports 3.5 more jobs at suppliers, transport companies and other service providers.

[44] Given that the top 20% of earners account for 55% of the income in Mexico (CIA World Factbook, 2001), inequality is already a serious issue that needs no exacerbation.

implemented policies to try to attract FDI and maquiladora investment into the southern regions, economic factors (including transport costs and agglomeration economies) dictate that foreign investment will continue to be concentrated primarily along the US-Mexico border and near Mexico City. Future integration among the Southern Hemisphere economies may serve to revitalise the south of Mexico, but the effects of any such RIA are hard to predict with much certainty.

Foreign direct investment, particularly with reference to developing economies, is a subject that will continue to attract a great deal of attention, and rightly so. Issues concerning the scope of FDI to confer spillover benefits on the host nation and how these benefits can best be realised are still far from resolved. The potential spatial effects of FDI also warrant further investigation. Regrettably, as is so often the case in economics, we are at the mercy of the available data.

6.7 CONCLUSION

This case study has focussed on the nature of FDI inflows to Mexico and their economic impact. Mexico provides an interesting case study because it has undergone substantial economic liberalisation since pursuing import-substituting industrialisation policies during the 1970s and early-1980s. It is also an ideal candidate because it allows us to investigate whether membership of NAFTA has influenced flows of FDI to Mexico. We are therefore able to explore further some of the issues discussed in earlier chapters.

The US has historically been the principal foreign investor in Mexico, accounting for around two-thirds of Mexico's FDI stock for the period 1976 to 1985 (Love and Lage-Hidalgo, 2000). However, FDI from other countries became increasingly important after 1985 and the US share of FDI to Mexico fell[45]. The formation of NAFTA seemed to reverse this trend for some years, although US FDI has again been falling (as a proportion of total Mexican FDI) in recent years. In 2004 the US accounted for 42% of total FDI flows to Mexico.

Although the figures show that there has been a gradual increase in FDI to Mexico for over four decades, there was a dramatic increase in the 1990s. In fact, Graham and Wada (2002) report the existence of a trend break in 1989. This preceded the implementation of NAFTA by some five years. Neither can it be attributed to expectations that NAFTA would come into existence as the earliest indications of this were from leaked press reports in 2000 (Graham and Wada, 2000). The true catalyst for the marked increases in inward FDI would seem to be the dramatic policy reorientation forced upon Mexico in 1985 due to its sovereign debt crisis. This crisis forced Mexico to stop pursuing import-substitution industrialisation and instead liberalise trade and investment. The apparent success of this in attracting FDI emphasises how important a conducive environment is to attracting investors. It also offers a possible explanation for our inability to detect a positive NAFTA ('insider') effect on FDI in the empirical work of Chapter 3: it is not NAFTA that has led to increased FDI, but rather the economic liberalisation undertaken by Mexico nearly a decade earlier.

[45] Sachs and Warner (1995) give 1986 as the date of economic liberalisation in Mexico. Liberalisation seems to have had a marked effect both in increasing the volume of inward FDI and in diversifying its sources.

This is not to say that the formation of NAFTA has not had an impact on FDI. The gateway to the US that Mexico has provided because of the provisions of NAFTA has undoubtedly attracted European and Japanese investors. This is supported by the finding in Chapter 3 that NAFTA has resulted in greater FDI inflows from 'outsiders' to 'insiders'.

An analysis of the determinants of US FDI to Mexico indicated that the ownership advantages of US multinationals (e.g. superior technology, advanced management practices etc) together with Mexican location advantages seem to explain the majority of FDI. Some limited evidence is reported suggesting that low Mexican unit labour costs have proved attractive.

Given the benefits that inward FDI is believed to confer to the host country (be it through spillovers, increased tax revenues, employment or exports), it is surprising that little, if any, evidence is found to support this in our empirical work of section 6.5. One possible explanation for this lack of evidence is that the issue has been tackled at too broad a level. Inward FDI has had a substantial spatial effect on the Mexican economy, resulting in agglomeration economies centred around Mexico city and along the US-Mexican border. What we may be detecting is the lack of geographical spillovers within Mexico from regions where FDI is located to the rest of the country. If the data enabled us to look at regional growth in specific areas then we may possibly detect a substantial positive effect of FDI on economic growth.

It is important to be aware of the potential spatial discrepancies in the effects of FDI. While FDI may bring benefits for the host economy, it is quite possible that these benefits may only accrue to certain groups or regions. Policymakers must be careful to ensure that the benefits are spread as widely as possible. Only then will the full potential of free trade and investment be realised and a true supporting consensus be found.

3. THE IMPACT OF REGIONAL INTEGRATION AGREEMENTS ON FOREIGN DIRECT INVESTMENT

3.1 INTRODUCTION

In this section we report results from our empirical investigation into the effects of regional integration agreements on foreign direct investment. The analysis here builds on work by Balasubramanyam, Sapsford and Griffiths (2002), which analysed the effect of NAFTA and the EU on FDI using cross-section of data for 1995. Their initial findings suggested that the presence of a regional integration agreement (RIA) results in an autonomous increase in FDI flows between member countries (albeit offset by an enhancement in the negative effect of distance). Further empirical results, however, led them to conclude: "these apparent RIA effects evaporate, implying that it is economic characteristics of host and investing country…that accounts for the observed pattern of FDI flows" (p.480).

Despite a huge number of RIAs being in existence today, we choose to focus our investigation on the effects of the European Union (EU) and the North American Free Trade Agreement (NAFTA). There are several reasons for this. Firstly, RIAs vary considerably in the depth of integration and cooperation they foster between members, and it would be misleading to assume that all such agreements are homogenous. By explicitly examining the EU and NAFTA we are able to draw meaningful conclusions that apply to specific agreements. Secondly, the EU and NAFTA are the most advanced RIAs in existence, incorporating both trade and investment measures (in addition to many other common policies - see earlier discussion of the EU and NAFTA in Chapter 2).

Given this, if RIAs do have an effect on FDI it would be reasonable to expect them to be most readily detected in the EU and NAFTA. Thirdly, between them, the members of the EU and NAFTA accounted for 61% of world FDI inflows and 84% of world FDI outflows in 2003 (WTO, World Development Indicators, *online database*). Concentrating on the effects of the EU and NAFTA therefore retains an element of clarity in the empirical analysis, while ensuring that the vast majority of FDI activity is accounted for.

The remainder of this chapter is organised as follows: in section 2 we introduce our empirical model; section 3 discusses the data and summary statistics; we report our benchmark OLS estimates in section 4; in section 5 we extend the model and conduct a sensitivity analysis; alternative regression techniques are explored in section 6; we conclude in section 7.

3.2 EMPIRICAL MODEL

Our favoured empirical framework is the gravity model. We have discussed this model in depth in the preceding chapter, so we will merely reiterate the key points. The gravity model has been applied to many different areas of economics, but its most popular application is overwhelmingly in relation to international trade[1]. In more recent years, the similarities between trade and FDI (e.g. they are both influenced by distance, market size,

[1] Anderson (1979) comments that the gravity model is "probably the most successful trade device of the last twenty-five years" (p.106). Anderson was also the first to offer a theoretical justification for application of the model in relation to trade flows. Until then, the model had been a purely empirical device. Following Anderson several alternative theoretical justifications were offered, and the model (in respect of trade flows at least) now "rests on a sound theoretical footing".

income etc) have led a number of authors to successfully apply the gravity model to investment flows[2].

The basic gravity model is defined as follows:

$$\ln FDI_{ijt} = \alpha_0 + \beta_1 \ln Y_{it} + \beta_2 \ln Y_{jt} + \beta_3 \ln N_{it} + \beta_4 \ln N_{jt} + \beta_5 \ln d_{ij} + \mu_{ijt}$$

where FDI from country i to country j is a function of the incomes (Y) and populations (N) of both countries and the geographical distance (d) between them. In the usual way, the error term μ_{ijt} is assumed to be normally distributed with zero mean. It is not unusual to further augment the basic model with additional explanatory variables that are thought to influence the location of FDI. For example, dummy variables will often be included to account for a common language or common border effect. Such effects may go some way to explaining the "home-bias puzzle", which was first stated by McCallum (1995) who found (using Canadian data) that the measured effect of national borders was too large to be accounted for solely by border-related trade barriers.

Obviously, our model will also include variables to allow us to estimate the effect of integration agreements on FDI. This is achieved initially with a series of simple dummy variables. The first one, RIA_{ijt}, takes the value of 1 if both the source and host country are in the same RIA (i.e. either both in NAFTA or both in the EU), and 0 otherwise. This dummy variable therefore makes the implicit assumption that the EU and NAFTA have

[2] In addition to direct investment flows, the gravity model has also been applied to portfolio flows (see for example Portes and Rey (2002).

exactly the same impact on FDI flows. A second dummy variable, EU_{ijt}, has the value of unity when both countries are members of the EU, and zero otherwise. A similar variable, $NAFTA_{ijt}$, is constructed for NAFTA.

Later in the chapter we will construct further dummy variables to examine the potential effects of integration on FDI flows from 'insiders' to 'outsiders' and vice-versa. This should help us shed some light on the issue of FDI creation and diversion. We will also introduce a number of additional explanatory variables as part of our sensitivity analysis (e.g. internet usage and urbanisation in the home and host countries) to test whether our results are reliant on model specification.

3.2.1 Data and Summary Statistics

We have constructed a data set with 13 home (i) countries and 48 host (j) countries for the period 1992 to 2003. With a complete dataset this would allow for a total of 8,112 observations (i x j x t = 13 x 48 x 13). However, as with all studies on this topic, the size (longitudinal and latitudinal) of the data set has been restricted due to data availability for the dependent variable (data for the majority of the explanatory variables is readily available for longer time periods and for a greater cross-section of countries). Table 3.1 reports some summary statistics for the dependent variable and the explanatory variables that form the basic gravity model. Table 3.2 reports the mean values of the variables for each year.

Table 3.1 Summary Statistics for the Entire Data Set

Variable	*Units*	*Observations*	*Mean*	*Standard Deviation*	*Minimum Value*	*Maximum Value*
FDI_{ijt}	US$ billion	4414	0.88	4.1	-27.4	150
Y_{it}	US$ billion	5,048	1,700	2,590	89	10,300
Y_{jt}	US$ billion	5,033	633	1,480	6.3	10,300
N_{it}	Million	5,048	62	77	4.3	291
N_{jt}	Million	5,013	97	239	0.26	1,290
d_{ij}	km	4,990	5,841	4,631	173	19,400

Sources: FDI data is taken from the Eurostat New Cronos database and the OECD; GDP and population data is from the World Development Indicators online database; distance is the great circle distance between capital cities (taken from www.wcrl.ars.usda.gov).

Table 3.2 Mean Variable Values for each Year

Year	FDI_{ijt} *Obs.*	FDI_{ijt} *US$ billion*	Y_{it} *US$ billion*	Y_{jt} *US$ billion*	N_{it} *million*	N_{jt} *million*	d_{ij} *Km*
1992	295	0.37	1,400	650	61	90	5,479
1993	325	0.46	1,500	552	64	99	5,442
1994	352	0.49	1,440	634	60	102	5,382
1995	339	0.64	1,460	660	60	108	5,514
1996	395	0.64	1,660	611	64	106	5,770
1997	378	0.79	1,670	717	63	106	5,699
1998	369	1.29	1,750	731	65	106	5,617
1999	292	2.19	1,900	797	70	98	5,448
2000	395	1.68	1,790	621	60	90	5,983
2001	407	0.90	1,800	629	60	91	6,133
2002	435	0.61	1,820	454	60	88	6,161
2003	432	0.63	1,860	657	61	93	5,923

Sources: FDI data is taken from the Eurostat New Cronos database and the OECD; GDP and population data is from the World Development Indicators online database; distance is the great circle distance between capital cities (taken from www.wcrl.ars.usda.gov).

Data on FDI flows has been primarily sourced from the Eurostat *New Cronos* database. Data from the OECD has been used to cross-check the Eurostat data for consistency. FDI data from Eurostat and the OECD is in nominal terms, so it has been deflated by each country's GDP deflator to arrive at FDI in constant 2000 US dollars. The GDP deflator series were taken from the Worldbank's World Development Indicators (WDI) online database[3]. The source countries have been chosen according to data availability and quality, and for these reasons are restricted solely to developed countries. The 48 host countries include both developed and developing countries (see Table 3.3 for a complete list of countries represented in the data).

The mean FDI flow for the entire data set is US$0.88 billion. The standard deviation is quite large at $4.1 billion, indicating that there is significant variability between countries (and through time) in the size of FDI flows. The minimum FDI value is -$27.4 billion and the maximum is $150 billion[4].

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[3] OECD data is also reported in domestic currency, so data from this source was converted into US dollars at mid-year exchange rates. The choice of mid-year exchange rates as opposed to end-year or some other point is somewhat arbitrary. A further and potentially more problematic issue with exchange rates is that they do not take into account differences in prices levels between countries. Therefore, because of the significant appreciation of the US$ during the 1990s, converted FDI data from the OECD may underestimate the real value of FDI outflows from non-US countries. Fortunately, the Eurostat data has been converted at purchasing power parity (PPP) exchange rates. This method should take into account variations in the price level across countries when converting values into US$. For further information on the calculation and use of PPP exchange rates see "Eurostat – OECD Methodological Manual on Purchasing Power Parities", 2005. Given that we used the OECD data to cross-check the Eurostat data, where there is a discrepancy in values that appears to have arisen due to the difference in exchange rate methodology, we have chosen to retain the Eurostat data.

[4] A negative value indicates disinvestment. This does not mean that outflows have exceeded inflows, rather that inflows, *in themselves*, have been negative (either due to the dissolution of previous investments, or significant repatriation of profits etc).

Table 3.3 Countries Represented in the Dataset

Country	*Home*	*Host*	*Country*	*Home*	*Host*
Argentina		√	Japan		√
Australia		√	Korea		√
Austria	√	√	Malaysia		√
Belgium / Luxembourg	√	√	Mexico		√
Brazil		√	Morocco		√
Bulgaria		√	Netherlands	√	√
Canada		√	New Zealand		√
Chile		√	Norway	√	√
China		√	Philippines		√
Colombia		√	Poland		√
Denmark	√	√	Portugal		√
Egypt		√	Romania		√
Finland	√	√	Singapore		√
France	√	√	South Africa		√
Germany	√	√	Spain	√	√
Greece		√	Sweden	√	√
Hong Kong		√	Switzerland		√
Hungary		√	Thailand		√
Iceland		√	Turkey		√
India		√	United Kingdom	√	√
Indonesia		√	United States	√	√
Ireland		√	Uruguay		√
Israel		√	Venezuela		√
Italy	√	√			

Table 3.2 reports mean values for the dependent and independent variables for individual years. As the dataset is unbalanced we must be careful in comparing the values across time. For example, the mean FDI flow apparently jumps significantly between 1998 and 1999. While this may be a true reflection of the trend, it is important to note that the number of observations is substantially lower for 1999 than for other years, and this may be the cause of the inflated figure. As we would expect from our discussion of world FDI trends in Chapter 2, the *mean* FDI flow increases from 1992 to 1999, and then begins to fall back thereafter.

Figure 3.1 plots *total* FDI outflows (1992 to 2003) for our sample dataset, developed countries, and the world[6]. It is evident that our sample is representative of the trend in both world and developed-country outflows. Furthermore, our dataset accounts for a significant percentage of total world flows (the average percentage coverage across years is 59% of total world outflows and 67% of total developed country outflows).

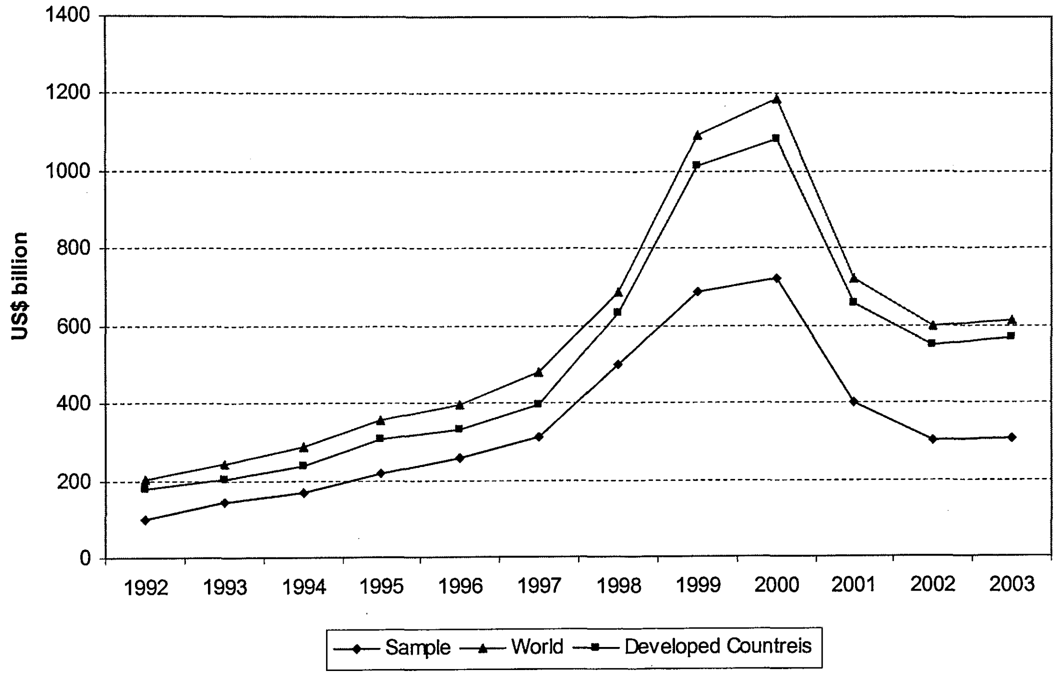
Gross Domestic Product (GDP) in constant 2000 US dollars is used for the income variables. Data is taken from the WDI online database. Table 3.1 reports that the mean value for Y_{it} across the entire data set is \$1.7 trillion. This is significantly higher than that for Y_{jt}, which has a mean value of \$0.63 trillion. This is to be expected given that the source countries include only developed countries, whereas the host countries include both developed and developing nations. This is also reflected in the standard deviations,

[6] FDI outflows for developed countries and the 'world' were taken from the *World Development Indicators* online database.

with that for Y_{jt} being relatively greater than that for Y_{it}. The minimum value for Y_{it} is \$89 billion (for Belgium-Luxembourg) and the maximum is \$10.3 trillion (the US). The minimum value for Y_{jt} is just \$6.3 billion (for Iceland), with the US again occupying the maximum value of \$10.3 trillion. Table 3.2 shows that Y_{it} has generally increased steadily over the sample period (remember, however, that the panel is unbalanced and the source countries have not remained constant throughout). The pattern for Y_{jt} through time has been less clear. There is a significant fall in the mean value of Y_{jt} between 1999 and 2000 (from \$797 to \$621 billion), which is most probably a reflection of a greater number of host countries being included in the sample post-2000 (due to improvements in data availability). Notice also that this has resulted in an increase in the number of observations for the years 2000 onwards.

Population data was also taken from the WDI online database. The sample mean for source-country population is 62 million with a standard deviation of 77 million. The host country mean is 97 million with a standard deviation of 239 million. The higher mean value of N_{jt} also reflects the high populations of a number of developing countries (e.g. China, India, Indonesia, Brazil etc). The minimum and maximum values for N_{it} are 4.3 million (Norway) and 291 million (US). The minimum and maximum for N_{jt} are 260,000 (Iceland) and 1.3 billion (China). As we would expect for population variables over a relatively short sample period, there is little fluctuation in the mean values of N_{it} and N_{jt} across years. The decrease in the later years for the mean of N_{jt} is again a reflection of changes in the sample of host countries from 2000 onwards.

Figure 3.1 Total FDI Outflows for the Sample, Developed Countries and the World



Source: UNCTAD online database

Distance is measured as the great circle distance, in kilometres, between the capital cities of the source and host countries[7]. For any given pair of countries (source-host, ij) the distance variable will obviously remain constant throughout time. Changes in the mean distance in Table 3.2 therefore reflect differences in the country-pairs across years. The average distance between investor and host for the whole data set is 5,841km. The standard deviation is relatively large at 4,631km reflecting that whilst many pairs are geographically proximate, others are separated by significant distance. This is reflected in the minimum and maximum values of 173km and 19,400km.

Table 3.4 gives a breakdown of the regional integration agreement dummy variables. For the sample as a whole, a quarter of the observations are for country-pairs in a mutual RIA. The EU overwhelmingly accounts for the majority of these observations, as the $NAFTA_{ijt}$ dummy variable only takes the value of one when the source country is the US and the host is either Canada or Mexico[8]. The US is the only member of NAFTA included in the sample of investor (i) countries due to data availability and reliability. Notice that the number of RIA observations (i.e. where $RIA_{ijt} = 1$) jumps considerably between 1994 and 1995. This is due to the entry of Sweden, Austria and Finland into the EU at the beginning of 1995. There is a general decline in the number of RIA (and EU) observations from 1999 onwards due to missing data for some of the European Union countries.

[7] Great circle distance is the shortest distance between any two points measured along a path on the surface of the Earth. Data taken from www.wcrl.ars.usda.gov.
[8] The $NAFTA_{ijt}$ also only takes the value of one for years 1994 onwards as NAFTA came into effect on 1 January 1994.

Table 3.4 Regional Integration Agreement Dummy Variables

Year	RIA_{ijt}		EU_{ijt}		$NAFTA_{ijt}$	
	ones	**zeros**	**ones**	**zeros**	**ones**	**zeros**
whole sample	978	2,906	958	2,926	20	3,864
1992	44	251	44	251	0	295
1993	54	271	54	271	0	325
1994	59	293	57	295	2	350
1995	99	240	97	242	2	337
1996	105	288	103	290	2	391
1997	105	271	103	273	2	374
1998	102	260	100	262	2	360
1999	94	185	92	187	2	277
2000	82	230	80	232	2	310
2001	85	222	83	224	2	305
2002	79	200	77	202	2	277
2003	70	195	68	197	2	263

3.2.2 Benchmark OLS Estimates

We begin by estimating the basic gravity model with ordinary least squares (OLS) to ascertain whether our data set performs as expected and so that we have benchmark estimates to compare against later results from more sophisticated empirical techniques.

The coefficients on the income variables are both expected to be positive. This is the 'gravity effect' on inter-country interactions. The population coefficients are both expected to be negative because for a given level of income, a larger population results in lower per capita income. Lower per capita income in the investor country is likely to imply less FDI to invest to begin with, and lower per capita income in the host suggests a less affluent country and so the "market seeking" motive for FDI is less intense[9]. Note that many studies introduce per capita GDP as a single gravity variable (instead of GDP and population separately). The methods are equivalent and equally valid. Geographical distance can be expected to increase the cost of FDI (both of the initial investment and ongoing monitoring costs), so we expect a negative coefficient on the distance variable[10]. As time progresses and the costs of international communications and travel fall, we would expect the absolute value of the distance coefficient to decrease – it will be interesting to observe whether this effect occurs in our data set. As the model is being estimated in log-linear form, the slope coefficients are to be interpreted as elasticities (or semi-elasticities for the dummy variables).

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[9] Hamilton and Winters (1992) suggest that population is a proxy for the physical size of a country and that larger source countries have less need to export and larger host countries are more self sufficient and thus have less need to import. An analogous argument is applicable to foreign investment.
[10] A strict 'Newtonian' interpretation would imply a coefficient on the distance variable of -2.

Equation 3.1 (see Table 3.5) shows that the basic gravity model performs well with our dataset, with nearly half of the variability in the dependent variable explained by variability in incomes, populations and distance. The signs on all of the explanatory variables are as expected. The negative coefficients on the population variables suggest that for a given level of income a higher population translates into lower per capita income which lessens the 'supply' of FDI from the home country perspective and reduces FDI 'demand' from the host country perspective. All of the coefficients are statistically significant at the 1% level. Though we hesitate to interpret the magnitude of the coefficients literally, the coefficient on Y_{it} implies that a one percent increase in the GDP of the investor country leads to a 2.24% increase in FDI outflows from that country (FDI is therefore income elastic with respect to the home country). Likewise, the coefficient on Y_{jt} implies that a one percent increase in the GDP of the host country leads to a 0.86% increase in inflows of FDI to that country (so FDI is income elastic with respect to the source country, but income inelastic with respect to the host country). The coefficient on N_{it} implies that a one percent increase in the population of the investing country results in a 1.43% decrease in FDI outflows, all else being equal. The N_{jt} coefficient suggests that a one percent increase in host country population would lead to a reduction in FDI inflows of 0.25%. Finally, the distance coefficient implies that a one percent increase in distance between investor and host reduces FDI by 0.64%.

Table 3.5 Benchmark OLS Estimates

Explanatory Variables	*3.1*	*3.2*	*3.3*	*3.4*
α	-30.96 (26.2)	-31.76 (26.8)	-30.63 (26.5)	-30.93 (26.4)
$\ln Y_i$	2.24 (20.9)	2.32 (21.5)	2.29 (21.8)	2.31 (21.9)
$\ln Y_j$	0.86 (32.2)	0.81 (29.3)	0.78 (28.9)	0.78 (28.8)
$\ln N_i$	-1.43 (12.7)	-1.52 (13.4)	-1.56 (14.1)	-1.57 (14.2)
$\ln N_j$	-0.25 (10.3)	-0.22 (9.1)	-0.19 (7.8)	-0.18 (7.7)
$\ln d_{ij}$	-0.64 (24.4)	-0.54 (17.0)	-0.50 (15.0)	-0.50 (14.8)
RIA_{ij}		0.46 (5.7)	0.53 (6.6)	
EU_{ij}				0.54 (6.8)
$NAFTA_{ij}$				-0.11 (0.28)
$Lang_{ij}$			1.29 (13.0)	1.30 (13.0)
$Border_{ij}$			0.31 (2.89)	0.35 (3.18)
F - statistic	702 (5,3878)	596 (6,3877)	496 (8,3875)	442 (9,3874)
$\overline{R}^2$	0.47	0.48	0.51	0.51
Obs.	3,884	3,884	3,884	3,884

Notes: Dependent variable is the natural log of FDI flows between countries i and j. Figures in parenthesis beneath the estimated coefficients are absolute t-ratios.

In equation 3.2 we include the RIA_{ij} variable as an intercept dummy. As discussed above, this variable is defined to take the value of unity when the investor and host countries are both members of a common RIA (either the EU or NAFTA). The inclusion of the integration intercept dummy has little effect on the standard gravity variables – they all remain statistically significant at the 1% level and are similar in magnitude to equation 3.1. The coefficient on RIA_{ij} is statistically significant at the 1% level. The positive coefficient suggests that FDI flows between members of an RIA are higher, all else being equal, than flows between two countries that are not members of a common integration agreement. Specifically, the value of the coefficient implies that FDI flows between 'insiders' are 60% greater than flows between 'outsiders' (since $e^{0.46} = 1.60$).

As the EU and NAFTA are both *regional* integration agreements (i.e. agreements between geographically proximate countries) it is possible that the RIA dummy is picking up border effects in addition to integration effects[11]. If this is the case, the coefficient on the RIA dummy in equation 3.2 may be misleadingly large. To try to account for this possibility we include a common border dummy in equation 3.3. If the border dummy is significant it should pick up any proximity effects that are present, leaving the RIA dummy to more accurately estimate the pure integration effect. The common border dummy, $border_{ij}$, is defined to equal unity when the investor and host countries share a common border[12].

[11] Many of the EU members share a common border and the US shares a common border with both of the other NAFTA members (Canada and Mexico).

[12] Across the entire data set, the common border dummy takes the value of unity for 335 country-pair observations (and has a zero value 3,549 times).

Equation 3.3 also incorporates a common language intercept dummy which is defined as unity when the investor and host share a common language and zero otherwise[13]. The benefits to the investor of a common language are likely to be significant given that the entity established through a direct investment will undoubtedly require some form of ongoing monitoring from the parent company throughout the lifetime of the investment. A common language is therefore likely to significantly reduce FDI-related costs.

The results in Table 3.5 reveal that the coefficient on the border dummy is statistically significant at the 1% level. Its estimated coefficient of 0.31 implies that contiguous countries invest more in each other than countries that do not share a common border. The common language dummy is also statistically significant at the 1% level. The estimated coefficient of 1.29 implies that FDI flows between countries that share a common language are 372% the magnitude of flows between countries that have different languages. This seems implausibly high, even when we take into account that the common language dummy is probably also accounting to some extent for other effects, such as similarity in institutions and legal framework, colonial ties etc. It would be interesting to compare the size of this coefficient with that for a common language dummy in a gravity model of exports. This is something we will do in the following chapter.

Contrary to our suspicion that the RIA_{ijt} dummy in equation 1.2 might be artificially high due to the inclusion of a spurious border effect, following the inclusion of the additional

[13] The common language dummy ($lang_{ij}$) has the value of unity (zero) for 318 (3,566) observations. Given that the principal language of many developing countries is a product of their colonial roots, the common language dummy may, to some extent, be picking up the effect of colonial ties.

dummy variables in equation 3.3, the coefficient on RIA_{ijt} has actually increased in value and become more statistically significant. The estimated effect is now 70% compared with 60% previously.

Thus far we have imposed the restriction that the EU and NAFTA have an identical integration effect. In equation 3.4 we introduce separate integration variables for the EU and NAFTA, therefore permitting them to have differing effects on the dependent variable. The EU_{ijt} variable is statistically significant at the 1% level and has a value of 0.54, which is very similar to the coefficient for the combined integration dummy in equation 3.3. Perhaps this is not surprising given that the EU accounts for the vast majority of the observations between 'insiders'. The coefficient on the NAFTA dummy is not statistically significant. Judging solely from the results reported in Table 3.5, we would conclude that the EU stimulates FDI between members but NAFTA does not. However, given that there are only 20 NAFTA 'insider' flows across the entire dataset, we must be careful of concluding that NAFTA does not have an influence on FDI.

Having presented our initial benchmark OLS results we now proceed by conducting a sensitivity analysis to ascertain whether our findings are dependent on the inclusion or exclusion of additional variables, the sample being used, or the regression techniques employed.

3.2.3 Sensitivity Analysis

The results reported in Table 3.5 show that the basic gravity model, when applied to our dataset, explains 46% of the variability in the dependent variable. When integration and common language dummies are also included this rises to 50%. This still leaves 50% of the variability in the dependent variable unexplained by our model. It is possible that this unexplained element could be biasing the coefficients on the gravity and/or the dummy variables due to the absence of other determinants from the model. In this section we discuss the regression results from various specifications of the gravity model that have been augmented to include a range of additional explanatory variables that might have an impact on FDI flows.

Table 3.6 tabulates the summary statistics for the additional explanatory variables that we introduce into a number of 'augmented' gravity equations. With the exception of the Corruptions Perception Index (*CPI*) and Unit Labour Cost (*ULC*), the data for all of the variables was derived from the WDI online database. Some of the variables suffer from a reduced number of observations (i.e. CPI_j, ULC_j, EE_j, $Internet_j$). As the 'missing observations' will typically be for the 'low-income' countries, inclusion of these variables in a regression will result in the inclusion of fewer developing countries compared with the equations reported in Table 3.4.

Table 3.6 Summary Statistics for Additional Explanatory Variables (1992 – 2003)

Explanatory Variables	*Units*	*Observations*	*Mean*	*Standard Deviation*	*Minimum*	*Maximum*
Income Growth$_j$	%	3884	2.42	3.27	-14.3	12.8
$\dot{P}_{j,t-1}$	%	3877	20.9	143.8	-3.96	2075.9
CPI$_j$	Score 1 - 10	2850	6.18	2.43	1.7	10
ULC$_j$	US$	2418	0.65	0.27	0.09	1.5
EE$_j$	%	3340	90.4	4.99	72.9	97.7
Urban$_j$	%	3884	69.6	18.2	26.0	100
Internet$_j$	Number of users	3547	96.2	136.5	0.001	647.9

Notes: ***Income Growth***$_j$ *is the annual percentage growth rate of GDP;* $\dot{P}_{j,t-1}$ *is the lagged (one period) inflation rate;* ***CPI***$_j$ *is the Corruptions Perceptions Index score;* ***ULC***$_j$ *is the unit labour cost;* ***EE***$_j$ *is the electricity transmission efficiency;* ***Urban***$_j$ *is the percentage of the population living in urban areas; and* ***Internet***$_j$ *is the number of internet users per thousand population. All variables refer to the host country.*

Sources: All data is from the World Development Indicators online database, with the exception of CPI$_j$ *(taken from Transparency International) and ULC*$_j$ *(taken from the International Labour Organisation's KILM database).*

The first variable in the table, *Income Growth$_j$*, is the annual per capita GDP growth of the host country. The mean value across all host countries and across all years is 2.42% with a standard deviation of 3.27%. There is a substantial gap between the minimum (-14.3%) and maximum (12.8%) values. A high rate of income growth in the host country should prove attractive to multinationals looking to exploit fast-growing markets, so we expect the coefficient on the income growth variable to be positive.

$\dot{P}_{j,t-1}$ is the lagged (one year) inflation rate in the host country. The mean value is very high (certainly compared to what we would consider normal in developed/industrialised countries), largely due to some very high observations for a handful of countries (the maximum value is 2076%, for Brazil, 1995)[14]. Although changes in the inflation rate foster uncertainty, and rapidly rising inflation in a host country is likely to discourage investment, steady inflation is not likely to discourage FDI. Furthermore, disinflation is likely to act as a deterrent to investment as it means prices will be falling. It is therefore difficult *a priori* to predict the sign on this variable[15].

The Corruptions Perceptions Index (*CPI*), compiled by Transparency International, scores countries according to the degree to which corruption is perceived to exist among public officials and politicians. It is a composite index based on a number of surveys that reflect the views of business people and analysts from around the world, including experts who are resident in the country of interest. Countries are scored from 1 to 10 with a higher number indicating less corruption. The index was initiated in 1995, so we are missing

[14] In 1990 the inflation rate in Brazil was a record 2,938% (www.nationsencyclopedia.com).
[15] It also suggests that inflation should perhaps be included in the model in a polynomial form (although when this was performed, the polynomial inflation coefficient was not statistically significant).

observations for all countries in years 1992, 1993 and 1994. Neither does the index offer complete coverage of our sample of host countries (although its coverage improves with each year).

In its inaugural year, the CPI scored 41 countries based on seven surveys. In 2003, scores were reported for 133 countries based on seventeen surveys[16]. Scores are therefore susceptible over time to changes in the data and methodology used to compile the index and this should be remembered when interpreting the coefficient on this variable. Corruption in the host country is obviously a deterrent to foreign investors and so we expect the coefficient to be positive (because a higher score indicates a less corrupt economy).

Unit Labour Cost (ULC) data it taken from the ILO's KILM database, and is the labour compensation per unit of output in 1990 US dollars. The mean value across all host countries and across all years in our dataset is \$0.65 with a standard deviation of \$0.27. The minimum and maximum values are \$0.09 and \$1.5. Low unit labour costs in the host country should attract "resource-seeking" FDI from multinationals looking to locate production stages in their lowest cost location. We therefore expect the coefficient on ULC_j to be negative.

[16] Survey sources for the 2003 index include: the Global Competitiveness Report of the World Economic Forum; the World Competitiveness Yearbook from the Institute for Management Development in Switzerland; the Survey of Middle Easter Businesspeople from Information International; the World Business Environment Survey from the World Bank; Country Risk Service and Country Intelligence reports from the Economist Intelligence Unit; the Nations in Transit survey from Freedom House; Risk Ratings by the World Markets Research Centre; the State Capacity Survey from Columbia University; the Asian Intelligence Issue from the Political & Economic Risk Consultancy; the Opacity Index from PricewaterhouseCoopers; a corruption survey by Gallup International on behalf of Transparency International; and Business Environment and Enterprise Performance Survey by the World Bank and EBRD.

EE_j captures the electricity transmission efficiency of the host country. It is derived from WDI data on electric power transmission and distribution losses as a percentage of electricity output[17]. The mean value is 90.4% with a standard deviation of 5%. Minimum and maximum values are 72.9% and 97.7%. This variable is intended to act as a proxy for infrastructure sophistication in the host country (i.e. quality of infrastructure as opposed to quantity), something potential investors should have regard to. We therefore expect the coefficient on EE_j to be positive.

$Urban_j$ is a host-country measure of the percentage of the total population in urbanised areas. It is derived from the WDI measure of the percentage of the total population in rural areas ($Urban_j = 100 - Rural_j$). The mean value for the variable in our dataset is 69.6% with a standard deviation of 18.2%. The minimum value is 26% while the maximum is 100% (reflecting the presence in the list of host countries of the city-states Singapore and Hong Kong). A high level of urbanisation in the host country should reduce market access costs and distribution costs for firms and is therefore likely to prove attractive to foreign investors (at least for those undertaking "market-seeking FDI"). However, a number of countries that are commonly believed to attract FDI due to low labour costs (or, more correctly, low *unit* labour costs) also have large rural populations (e.g. India, China etc), and this may have a negative influence on the coefficient of $Urban_j$. The variable may also act as a more general measure of the economic development of the host (because countries become more urbanised as they become more

[17] $EE_j = 100$ – Electricity Transmission and Distribution Loss, so a higher value indicates higher electricity transmission efficiency.

developed).

Internet$_j$ is taken from the WDI and is the number of internet connections per thousand population in the host country. The mean value is 96.2 and the standard deviation is 136.5. There is a significant discrepancy between the minimum and maximum values of 0.001 and 647.9. This variable is intended to capture the general level of technological sophistication of the host economy and its citizens, and as such we would expect the coefficient to be positive[18].

The additional explanatory variables we have discussed above could be added in many different combinations to allow us to estimate literally hundreds of different regression equations. To keep the analysis manageable, and to avoid overly complicating the discussion, we introduce each additional explanatory variable in isolation from the other additional explanatory variables. Table 3.7 reports the results for these regressions. In each instance we are adding an additional explanatory variable to our favoured specification from Table 3.5 - equation 3.4 (the basic gravity model with the EU, NAFTA, common language and border dummy variables).

In equation 3.5 we include the income growth of the host country variable. This has little impact on either the magnitude or the statistical significance of the other variables. Income growth is statistically significant, however, and the positive coefficient suggests that an increase in the rate of per capita income growth in the host country encourages

[18] An alternative proxy variable would be the number of internet service providers (ISPs) per thousand population.

greater inflows of FDI than would otherwise be the case, all else being equal.

The lagged inflation rate in the host country is included in equation 3.6. Again it has very little impact on the other variables, with all coefficients retaining their statistical significance and approximate magnitude. Although the coefficient is positive, it is not significantly different from zero at the 5% level. Furthermore, its inclusion does not improve the explanatory power of the regression. In alternative specifications (not reported here for brevity) we included the current inflation rate and the inflation rate lagged two periods. The results were similar to those reported in equation 3.6, with neither specification impacting the other variables or proving statistically significant.

The inclusion of the CPI variable has a more noticeable impact on the other variables. The absolute magnitude of all of the gravity variables (except distance) falls slightly. In each case the t-ratio also falls, although all gravity variables remain statistically significant at the 1% level. This suggests that the CPI variable contains some information that was originally being picked up by the gravity variables. CPI_j is positive, as predicted, but is not statistically significant.

Our real interest, of course, is in the effect on the integration dummies. The inclusion of CPI_j results in a significant reduction in the magnitude of the EU dummy parameter estimate and a decrease in its statistical significance to the 2% level. The NAFTA dummy remains statistically insignificant. *Prima facie* this would seem to suggest that the EU does not provide as great a stimulus to internal FDI as was suggested by the results of equation 3.4. However, notice that the number of observations used in the estimation of equation 3.7 is significantly lower than the number used in equation 3.4. CPI data is missing for all observations for the years 1992, 1993 and 1994, and for many of the observations in the remaining years[19]. We need to investigate whether it is this reduction in observations, rather than the inclusion of the CPI variable *per se*, that is resulting in the loss of significance of the EU dummy. In order to do this we re-estimate equation 3.4 restricting the observations to those for which CPI data exists. The results are reported as 3.13 in Table 3.7.

The results of equation 3.13 are very similar to those of equation 3.7, particularly the effect on the EU dummy. This indicates that the drop in magnitude and significance of the EU dummy is not due to the inclusion of the CPI variable itself, but rather the resultant loss of observations. Furthermore, this implies that the strong integration effect found for the EU in the entire dataset (equation 3.4) is weakened when certain observations are removed. Note however, that the gravity variables are all highly statistically (and economically) significant in equation 3.13. This begs the question whether it is the loss of the observations from years 1992, 1993 and 1994, or the biasing of the sample towards the more developed countries (i.e. those for which CPI data exists) that is causing this effect. We will explore this issue in greater depth in a subsequent section when we come to disaggregate the dataset by years.

[19] CPI data is missing for some countries between the years 1995 to 2003 because of the coverage of the constituent surveys on which the CPI is based. Missing values will typically be for the smaller, less developed countries. Inclusion of CPI will therefore bias the sample towards observations in which the host country has a higher GDP per capita.

Table 3.7 Regression Results for Sensitivity Analysis with Additional Explanatory Variables

	3.4	*3.5*	*3.6*	*3.7*	*3.8*	*3.9*	*3.10*	*3.11*	*3.12*	*3.13.*
α	-30.93	-31.15	-31.02	-28.69	-35.03	-29.16	-31.25	-30.39	-27.89	-28.99
	(26.4)	(26.6)	(26.5)	(20.1)	(21.2)	(21.9)	(26.9)	(23.5)	(10.2)	(19.2)
$\ln Y_i$	2.31	2.31	2.32	2.16	2.33	2.35	2.36	2.29	2.03	2.17
	(21.9)	(21.9)	(21.9)	(16.9)	(17.5)	(21.0)	(22.4)	(20.2)	(12.1)	(17.0)
$\ln Y_j$	0.78	0.79	0.78	0.75	1.07	0.88	0.64	0.73	0.56	0.80
	(28.8)	(29.0)	(28.9)	(15.8)	(12.5)	(26.6)	(18.9)	(23.5)	(2.30)	(24.3)
$\ln n_i$	-1.57	-1.57	-1.58	-1.44	-1.54	-1.58	-1.62	-1.55	-1.23	-1.45
	(14.2)	(14.2)	(14.2)	(10.6)	(11.2)	(13.6)	(14.6)	(13.1)	(7.1)	(10.7)
$\ln n_j$	-0.18	-0.20	-0.19	-0.13	-0.38	-0.26	-0.01	-0.13	0.34	-0.19
	(7.7)	(8.1)	(7.8)	(2.61)	(4.4)	(9.0)	(0.30)	(4.9)	(1.39)	(6.5)
$\ln d_{ij}$	-0.50	-0.50	-0.50	-0.59	-0.70	-0.50	-0.55	-0.50	-0.79	-0.59
	(14.8)	(14.8)	(14.9)	(14.3)	(15.3)	(13.7)	(16.0)	(14.1)	(13.6)	(14.2)
EU_{ij}	**0.54**	**0.53**	**0.55**	**0.24**	**0.53**	**0.59**	**0.57**	**0.55**	**0.23**	**0.25**
	(6.8)	**(6.6)**	**(6.8)**	**(2.47)**	**(6.0)**	**(6.9)**	**(7.2)**	**(6.6)**	**(1.80)**	**(2.57)**
$NAFTA_{ij}$	**-0.11**	**-0.11**	**-0.12**	**-0.23**	**-0.51**	**-0.24**	**-0.21**	**-0.15**	**-0.72**	**-0.23**
	(0.28)	**(0.30)**	**(0.32)**	**(0.57)**	**(1.21)**	**(0.58)**	**(0.56)**	**(0.38)**	**(1.55)**	**(0.57)**
$Lang_{ij}$	1.30	1.30	1.30	1.28	1.27	1.28	1.32	1.31	1.27	1.31
	(13.0)	(13.0)	(13.1)	(10.8)	(9.5)	(11.8)	(13.3)	(12.4)	(7.7)	(11.1)
Border	0.35	0.36	0.36	0.30	0.24	0.39	0.31	0.38	0.25	0.29
	(3.18)	(3.28)	(3.26)	(2.29)	(1.97)	(3.25)	(2.83)	(3.30)	(1.63)	(2.24)
Income Growth$_j$		0.02							0.08	
		(2.93)							(4.9)	
$\dot{P}_{j,t-1}$			0.0003						-.0002	
			(1.40)						(0.69)	
CPI_j				0.03					0.22	
				(1.27)					(5.49)	
ULC_j					-0.82				-0.37	
					(6.2)				(1.76)	
EE_j						-0.04			-0.08	
						(6.4)			(5.2)	
$Urban_j$							0.01		0.007	
							(6.9)		(1.48)	
Inter-net$_j$								0.0007	0.0007	
								(2.85)	(1.87)	
F-statistic	442	399	397	270	226	352	407	359	96	299
	(9,3874)	(10,3874)	(10,3866)	(10,2839)	(10,2407)	(10,3329)	(10,3873)	(10,3536)	(16,1610)	(9,2840)
$\bar{R}^2$	0.51	0.51	0.51	0.49	0.48	0.51	0.51	0.50	0.48	0.49
Obs.	3,884	3,884	3,877	2,850	2,418	3,340	3,884	3,547	1,627	2,850

Notes: Dependent variable is the natural log of FDI flows between countries i and j. Figures in parenthesis beneath the estimated coefficients are absolute t- ratios.

Before moving on, we should note one interesting difference between equation 3.13 and 3.7. The coefficient on host population, N_j, in equation 3.13 has approximately the same value and statistical significance as in equation 3.4 (which is the same estimating equation, but includes all available observations), but the same coefficient in equation 3.7 has dropped in value and statistical significance. This indicates that the CPI variable is incorporating some information that was previously captured by the host population variable. Furthermore, it suggests that countries with a high population are more corrupt (the correlation between host population and the CPI variable is -0.36)[21].

Equation 3.8 incorporates the unit labour cost (ULC) in the host country as an additional explanatory variable. As this data was not available for the entire dataset, the regression is limited to 2,418 observations. The inclusion of ULC_j has little effect on either of the integration dummies (EU_{ijt} remains statistically significant and $NAFTA_{ijt}$ remains insignificant). There is also limited effect on the other explanatory variables, although the coefficient on distance rises to 0.70 and the coefficient on host population rises in absolute magnitude. The ULC coefficient itself has the expected sign (-0.82, significant at the 1% level), implying that a 1% increase in the average ULC of the host country results in a 0.82% decrease in FDI flows. This finding provides support for the

[21] Recall that a lower CPI value indicates a more corrupt country, so the negative correlation does confirm that countries that have a larger population tend to be more corrupt. We are unable, however, to make any statement regarding causality. While a larger population may provide a more accommodating environment for corruption, it is perhaps more likely that the correlation is spurious and there is no causality between population and corruption (with both variables independently correlated to a third variable, such as income per capita).

efficiency-seeking motivation for FDI.

Equation 3.9 includes a measure of electricity efficiency in the host country. Curiously the coefficient on the EE_j variable is negative (and statistically significant at the 1% level), which was not the expected sign. This implies that higher electricity efficiency in the host country results in a decrease in FDI inflows. We introduced EE_j as a potential proxy for the sophistication of infrastructure in the host country, but perhaps this result indicates that this is not the case[22]. A low value for EE_j may indicate that there are attractive investment opportunities within the infrastructure sector of the host country. Given that such investments can be sizeable, the negative correlation may be a reflection that FDI is attracted to countries where there is greater potential to upgrade the existing stock of infrastructure. In any case, the inclusion of the EE_j variable has little effect on the other explanatory variables.

The percentage of the total population in the host country living in urban areas is included in equation 3.10. This coefficient has the expected positive sign and is significant at the 1% level. Its inclusion has little effect on the EU_{ijt} dummy and the $NAFTA_{ijt}$ coefficient continues to be statistically insignificant. There is little effect on the other explanatory variables, except for host income and population. The population variable in particular is significantly affected by the inclusion of the urbanisation variable (it increases from a value of -0.18 and high statistical significance in equation 3.4 to a value of -0.01 and not statistically significant in equation 3.10). However, the explanation for this is clear when

[22] In a search for alternative infrastructure measures, we also ran regressions with the number of fixed and mobile telephone lines per thousand population and the number of personal computers per thousand population (in place of EE_j).

we observe that the correlation coefficient between urbanisation and population is -0.51.

Equation 3.11 in Table 3.7 presents the results for the inclusion of the *internet*$_j$ variable. This variable has the expected sign and is statistically significant at the 1% level. It also has little effect on the other explanatory variables.

Figure 3.2 plots the coefficients of the two integration dummies according to their estimated coefficients for the different model specifications reported in Table 3.7 (for equations 3.5 to 3.12). The figure highlights the fact that, with the exception of equation 3.7, the coefficient on the EU dummy is not very sensitive to the inclusion of a range of explanatory variables. Although the NAFTA dummy does not fluctuate significantly (except for its value in equation 3.8), it did not achieve statistical significance in any of the regression specifications reported in Table 3.7.

Figure 3.3 is similar to Figure 3.2, this time showing the sensitivity of the gravity variables to the inclusion of the range of additional explanatory variables. The chart illustrates that the majority of the coefficients have proved to be extremely stable across equations, varying within a small band throughout. The variables describing the host country (i.e. host income and population) have varied to a greater extent (particularly for equation 3.8), but this is not surprising given that a number of the additional explanatory variables are correlated with them to some extent.

Both the common language and common border dummies proved to be remarkably stable throughout the additional specifications.

The additional explanatory variables have themselves proved to be statistically significant (with the exception of lagged inflation) and of the predicted sign (with the exception of EE_j). To summarise, they imply that FDI inflows are greater when the host country has higher per capita income growth; lower unit labour costs; and more internet connections per person. Although the level of perceived corruption and the extent of urbanisation appeared to be significant when included in the regression specification individually, they lost statistical significance when all variables were included together (equation 3.12)[23].

[23] Note, due to missing observations for a number of the additional explanatory variables, including all of the additional variables in a single regressions limits the number of usable observations to 1,627.

Figure 3.2 Sensitivity of Integration Dummies to Additional Explanatory Variables

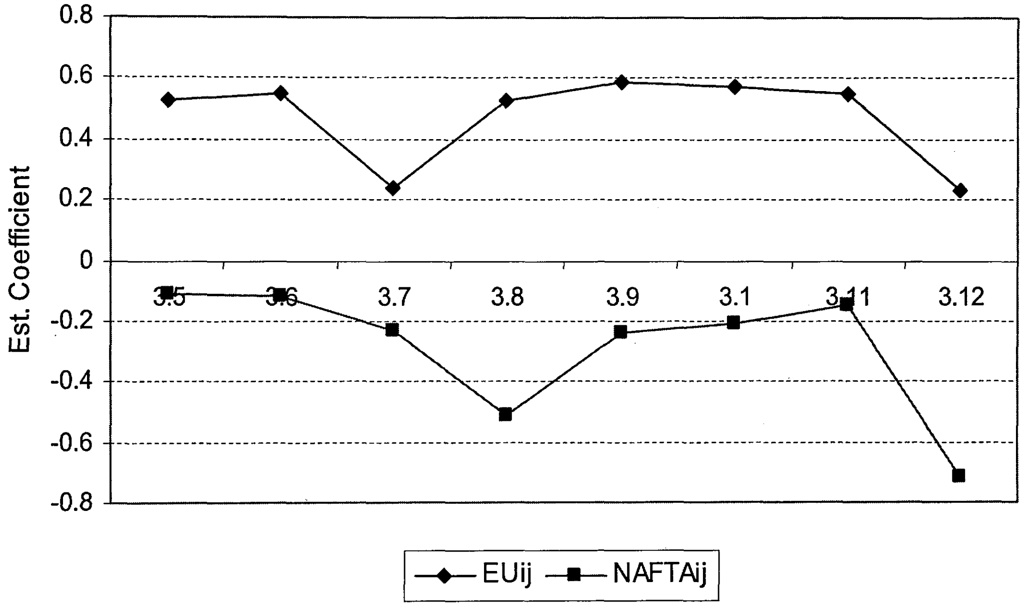
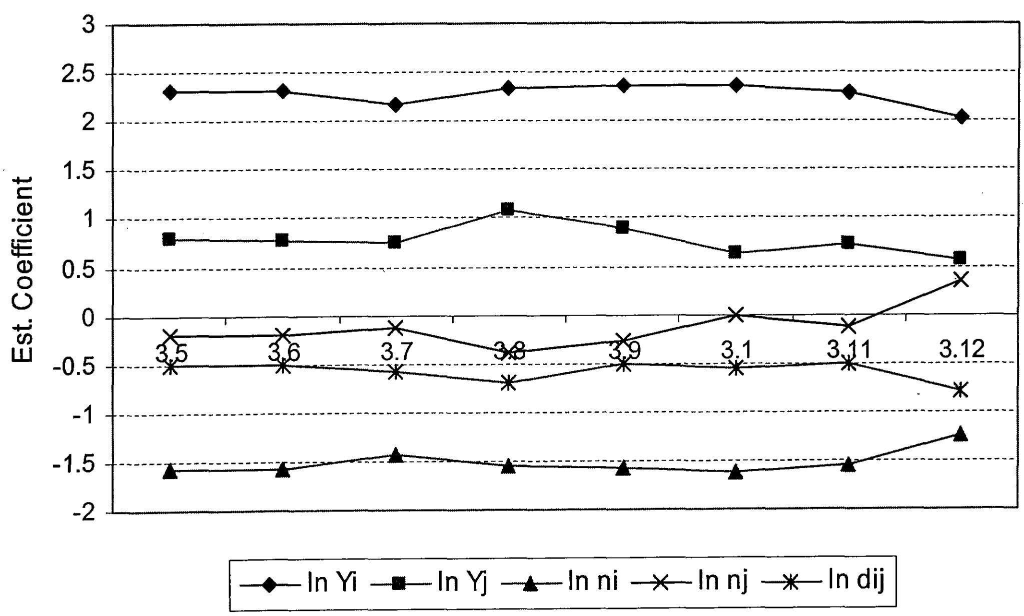


Figure 3.3 Sensitivity of Gravity Variables to Additional Explanatory Variables



3.2.4 Sensitivity Analysis – Specific Years

Due to restrictions in the number of observations available for the CPI variable, we were motivated to estimate a parsimonious model on a reduced dataset (equation 3.13). The results of this indicated that the positive integration effect of the EU reported for regressions on the entire data set may be significantly weakened when certain observations are excluded due to missing values for CPI. In particular, lack of data for 1992, 1993 and 1994 for the CPI variable indicated that the integration effects may break down when data is not included for the earlier years of the sample. Accordingly, we now conduct a sensitivity analysis on the dataset when it is disaggregated through time.

Table 3.8 reports the results when equation 3.4 is applied to the dataset for each year. The explanatory power of the model remains roughly constant throughout, with the adjusted-R^2 varying between 0.44 and 0.56. The gravity variables (and the common language variable) remain statistically significant throughout, though the estimated coefficients vary from year to year. Figure 3.4 illustrates the change in the estimated parameters of the gravity variables. The coefficients on lnY_j and lnN_j remain relatively stable, lnY_j varying between 0.69 and 1.00 and lnN_j varying between –0.05 and -0.34. The variation in the coefficients on the other gravity variables, however, is somewhat more pronounced.

It is striking that the coefficients on investor GDP and population are virtually mirror images of one another (see Figure 3.4). There is a similar pattern for host GDP and population. This suggests that it may be more appropriate to use the log of GDP per capita ($ln\ Y_i/N_i$) rather than lnY_i and lnN_i separately. We have decided to continue with the conventional gravity model formulation here.

The apparent absence of a trend in the gravity variables suggests that there is no need to include time dummies in our regressions for the entire dataset (i.e. any increase in global FDI flows through time seems to be accounted for by the gravity variables). In order to be certain of this however, in Table 3.9 we report the results for equation 1.4 estimated with the inclusion of time dummies for the years 1993 to 2003 (a year dummy is not included for 1992 so this becomes the 'base case' against which we interpret the coefficient of the other year dummies).

Contrary to expectations, the majority of the year dummies are in fact statistically significant (see Table 3.10 below), although the inclusion of the year dummies has little effect on the gravity variables or the common language and border dummies. However, the magnitude of the EU dummy is slightly reduced (from 0.54 to 0.47).

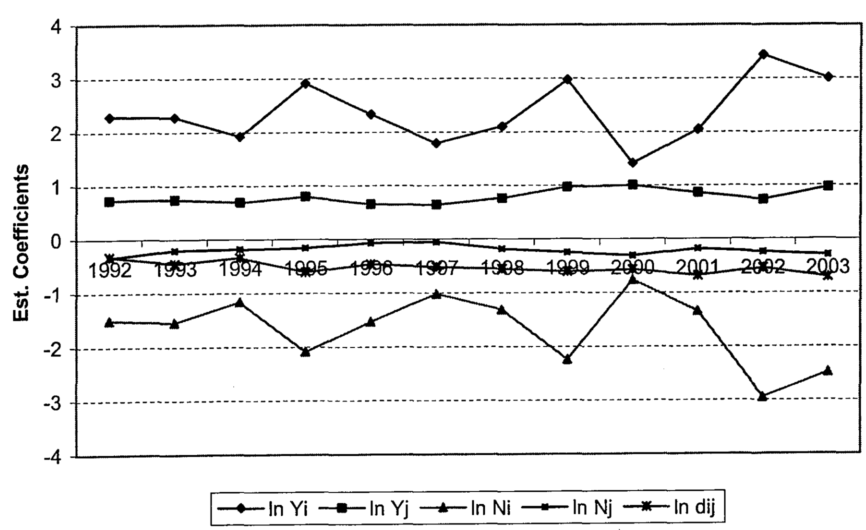
Table 3.10 reports the coefficients of the year dummies included in equation 3.4b. All are statistically significant at the 5% level with the exception of 1993 and 2003 (which are not statistically significant). As we might expect from the discussion (in a previous chapter) of the trend in global FDI flows, the coefficient values tend to increase in value up to 1999 and then begin to decrease.

Table 3.8 Regression Results for Individual Years

	3.14	*3.15*	*3.16*	*3.17*	*3.18*	*3.19*	*3.20*	*3.21*	*3.22*	*3.23*	*3.24*	*3.25*
	1992	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*
$\ln Y_i$	2.29	2.28	1.92	2.91	2.33	1.79	2.10	2.97	1.41	2.04	3.43	3.00
	(6.1)	(5.9)	(5.4)	(8.6)	(7.5)	(5.6)	(5.9)	(7.4)	(0.52)	(3.98)	(6.5)	(5.4)
$\ln Y_j$	0.73	0.74	0.69	0.80	0.65	0.64	0.76	0.97	1.00	0.86	0.73	0.96
	(8.6)	(8.5)	(8.2)	(9.3)	(7.5)	(7.1)	(8.2)	(9.1)	(9.7)	(8.1)	(6.8)	(9.4)
$\ln N_i$	-1.50	-1.54	-1.16	-2.09	-1.53	-1.02	-1.31	-2.24	-0.76	-1.34	-2.95	-2.48
	(3.9)	(3.79)	(3.21)	(6.0)	(4.8)	(3.09)	(3.56)	(5.3)	(1.38)	(2.47)	(5.2)	(4.1)
$\ln N_j$	-0.34	-0.20	-0.18	-0.16	-0.07	-0.05	-0.18	-0.25	-0.31	-0.18	-0.24	-0.30
	(4.3)	(2.71)	(2.44)	(2.10)	(0.97)	(0.64)	(2.22)	(2.62)	(3.27)	(1.99)	(2.83)	(3.25)
$\ln d_{ij}$	-0.32	-0.45	-0.34	-0.61	-0.46	-0.52	-0.55	-0.61	-0.57	-0.68	-0.54	-0.71
	(3.1)	(4.2)	(3.30)	(5.6)	(4.3)	(4.6)	(4.5)	(4.4)	(4.3)	(5.3)	(4.4)	(5.5)
EU_{ij}	1.09	0.90	1.04	0.26	0.58	0.21	0.20	0.19	0.17	0.33	0.41	0.007
	(3.84)	(3.25)	(3.81)	(1.05)	(2.30)	(0.81)	(0.73)	(0.62)	(0.52)	(1.04)	(1.33)	(0.02)
$NAFTA_{ij}$			0.45	-0.53	-0.80	-0.40	-0.98	-0.43	-0.04	0.64	0.01	0.05
			(0.39)	(0.47)	(0.69)	(0.33)	(0.80)	(0.35)	(0.03)	(0.50)	(0.01)	(0.04)
$Lang_{ij}$	1.23	1.22	1.25	1.15	1.46	1.57	1.38	1.25	1.39	1.11	1.26	1.07
	(3.83)	(3.96)	(3.87)	(3.75)	(4.58)	(4.8)	(3.81)	(3.48)	(3.20)	(2.83)	(3.51)	(3.03)
$Border_{ij}$	0.48	0.61	0.29	0.29	0.67	0.56	0.65	0.09	0.13	0.06	0.20	0.05
	(1.35)	(1.76)	(0.82)	(0.85)	(1.89)	(1.52)	(1.73)	(0.21)	(0.29)	(0.15)	(0.51)	(0.11)
F-statistic	46.3	46.6	36.8	48.8	43.5	33.5	36.9	35.2	28.7	28.6	28.9	32.8
	(8,286)	(8,316)	(9,342)	(9,329)	(9,383)	(9,366)	(9,352)	(9,269)	(9,302)	(9.297)	(9,269)	(9,255)
$\bar{R}^2$	0.55	0.53	0.48	0.56	0.49	0.44	0.47	0.53	0.45	0.45	0.47	0.52
Obs.	295	325	352	339	393	376	362	279	312	307	279	265

Notes: Dependent variable is the natural log of FDI flows between countries i and j. Figures in parenthesis beneath the estimated coefficients are absolute t- ratios. Figures for the constant term are not reported.

Figure 3.4 Sensitivity of Gravity Variables to Longitudinal Disaggregation



Having found year dummies to be statistically significant, they will be included (where relevant) in all future regressions.

Figure 3.5 illustrates the sensitivity of the integration dummies to longitudinal disaggregation of the dataset. Note that there are no values for the $NAFTA_{ijt}$ dummy in 1992 and 1993 as NAFTA had not yet been implemented. In the early years, the EU_{ijt} dummy is statistically significant and has a relatively high value (compared with its value in equation 1.4 for the entire dataset). However, from 1995 onwards the dummy tends to fall in magnitude and is in any case not statistically different from zero (with the exception of 1996 when it is significant at the 5% level). The $NAFTA_{ijt}$ dummy does not reach statistical significance for any year.

These results imply that the finding of positive integration effects across the entire dataset (equation 3.4) is driven purely by the EU effect in 1992, 1993, 1994 and 1996. This may be a fair or misleading representation of reality. If it is indeed a fair reflection then we need to consider why there is a positive effect on 'insider' FDI flows of the EU in the early years of our sample, but no effect in later years. Furthermore, why do we not find a corresponding positive effect due to the creation of NAFTA? If it is a misleading finding, then we need to investigate what may have caused it.

Table 3.9 Equation 1.4 Re-estimated with the Inclusion of Year Dummies

	3.4b	*3.4*
α	-30.35 (24.7)	-30.93 (26.4)
ln Y_i	2.25 (20.1)	2.31 (21.9)
ln Y_j	0.78 (28.8)	0.78 (28.8)
ln N_i	-1.51 (12.9)	-1.57 (14.2)
ln N_j	-0.19 (7.9)	-0.18 (7.7)
ln d_{ij}	-0.51 (15.3)	-0.50 (14.8)
EU_{ij}	0.47 (5.9)	0.54 (6.8)
$NAFTA_{ij}$	-0.17 (0.45)	-0.11 (0.28)
$Lang_{ij}$	1.31 (13.2)	1.30 (13.0)
$Border_{ij}$	0.36 (3.28)	0.35 (3.18)
$\overline{R}^2$	0.51	0.51
Obs.	3,884	3,884

Notes: Dependent variable is the natural log of FDI flows between countries i and j. Figures in parenthesis beneath the estimated coefficients are absolute t-ratios. Results for the year dummies included in equation 1.4b are reported separately below (see Table 10). The results for equation 1.4 (without year dummies) are included for comparison.

Table 3.10 Coefficient on the Year Dummies for Equation 3.4b

1993	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*
0.15	0.32	0.31	0.36	0.43	0.61	0.92	0.54	0.34	0.30	0.13
(1.15)	(2.58)	(2.45)	(2.88)	(3.44)	(4.82)	(6.88)	(4.11)	(2.57)	(2.18)	(0.95)

Notes: Figures are the estimated coefficients for the year dummies from equation 1.4. Figures in parentheses are absolute t-ratios.

Let us first assume that the finding is not an accurate representation of reality. It is possible that the regressions for individual years do not provide sufficient observations to allow the integration dummies to be properly estimated. If this were the case, however, we would perhaps not expect the EU_{ijt} dummy to be significant for any individual years (or at least for the pattern of significance to be more random). Alternatively, the method of estimation may be flawed, and we will investigate this in a later section by considering random and fixed-effects models. It is also possible that the integration dummies should be properly introduced as slope effects, and we will also investigate this in a later section.

If the finding is in fact accurate, two likely explanations suggest themselves. Firstly, regional integration agreements will surely have an effect on other economic variables. For instance, the EU has gone far beyond simple trade measures (such as tariff reductions) by introducing common European institutions and laws – factors that are likely to impact variables such as the CPI. To the extent that integration agreements influence FDI indirectly though their impact on other economic factors, we would not necessarily expect to pick up an integration effect by the inclusion of dummy variables in a regression equation[24]. Of course, if this were in fact the case, it is unlikely the integration dummies would have been significant in any of the regressions we have estimated. Furthermore, equations 3.14 to 3.25 do not include any of these 'other economic factors', and so even if integration effects were purely indirect it is likely the dummy variables would have picked up this effect in their absence.

[24] For instance, by encouraging trade and migration between members, it is likely that the formation of the EU has contributed to rising income levels in its member states. As we have seen, higher GDP (of both source and host countries) results in greater FDI flows. Therefore, notwithstanding any direct effects that the EU may have had on foreign investment flows, it is probable that it has encouraged FDI indirectly. Such indirect effects will not be captured by the integration dummy while GDP is also present as an explanatory variable.

Secondly, it is possible that integration agreements do influence flows of FDI, but that the impact is not consistent over time. Rather, the effect may manifest itself primarily in the early years of the integration agreement and then dissipate through time. This may be particularly true if RIAs have a significant signalling effect (i.e. they indicate to foreign firms that the host country is serious with regard to lowering trade and investment barriers). The implementation of an RIA will therefore be accompanied by increased FDI flows (compared with the quantity predicted by the standard gravity variables) in the early years, but perhaps as the RIA becomes more mature its effects become fully accounted for by the gravity variables and other macroeconomic factors. Evidence that NAFTA resulted in increased FDI flows to Mexico in years prior to its implementation (when it became known that discussions were taking place between the three prospective members) in 1994 offer some support for this theory (Griffiths and Sapsford, 2004). If this explanation holds any truth, we might expect to initially find an EU effect which decreased in magnitude over time. It does not explain, of course, why we have found no evidence of a NAFTA effect as our dataset includes observations before and during NAFTA's existence[25].

The completion of the Single European Market (SEM) in 1992 perhaps lends some support to the argument outlined above. Although efforts to reduce impediments to

[25] It is possible that the formation of NAFTA resulted in pre-implementation effects on FDI flows that dissipated very rapidly resulting in no detectable effect on the NAFTA dummy post-implementation. To test for this possibility we created a pre-NAFTA dummy defined to take the value unity in 1992 and 1993 for flows between NAFTA members (and zero otherwise). However, this dummy variable was not significantly different from zero at the 5% level when added to equation 3.4, implying that NAFTA did not result in an increase in FDI flows between 'insiders' prior to its implementation. This may seem contrary to the evidence reported from Griffiths & Sapsford (2004), but this study did not discount the possibility that the increased inflows to Mexico were from 'ousiders' (looking to exploit advantageous access to the US, and possibly Canadian, markets).

internal European Union trade and investment still continue today, the major strides in this regard where made between 1985 and 1992. It is not unreasonable to therefore expect the greatest impact on FDI to have occurred during these years and for a limited number of years thereafter. As we move away from 1992, it may be that the positive effect of the EU on FDI becomes primarily captured within the standard gravity variables. Unfortunately, due to lack of availability of disaggregated FDI data prior to 1992, we are unable to investigate this possibility further by empirical means.

Before moving on to test the model using alternative regression techniques, it is interesting to briefly discuss the effect of distance, common language and common border variables on FDI flows. The coefficient on the common language dummy remained remarkably stable (and statistically significant) through time, varying in value between 1.07 and 1.57. Furthermore, there appears to be no discernible pattern in the change in value over the years (i.e. we cannot say that a common language is becoming either more or less important in influencing FDI).

Figure 3.5 Sensitivity of Integration Dummies to Different Time Periods

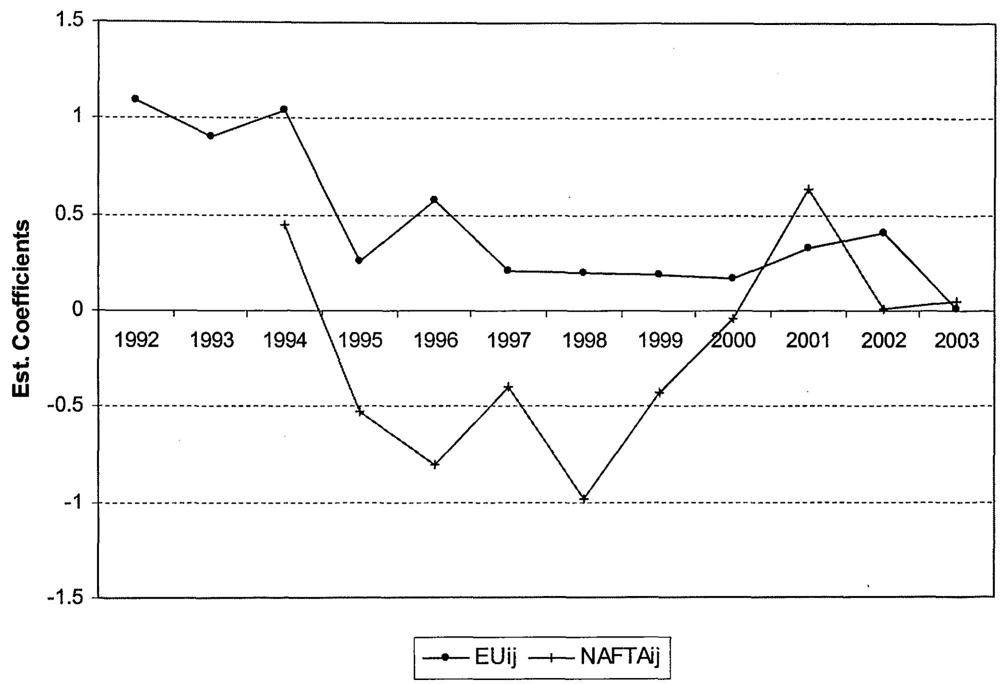
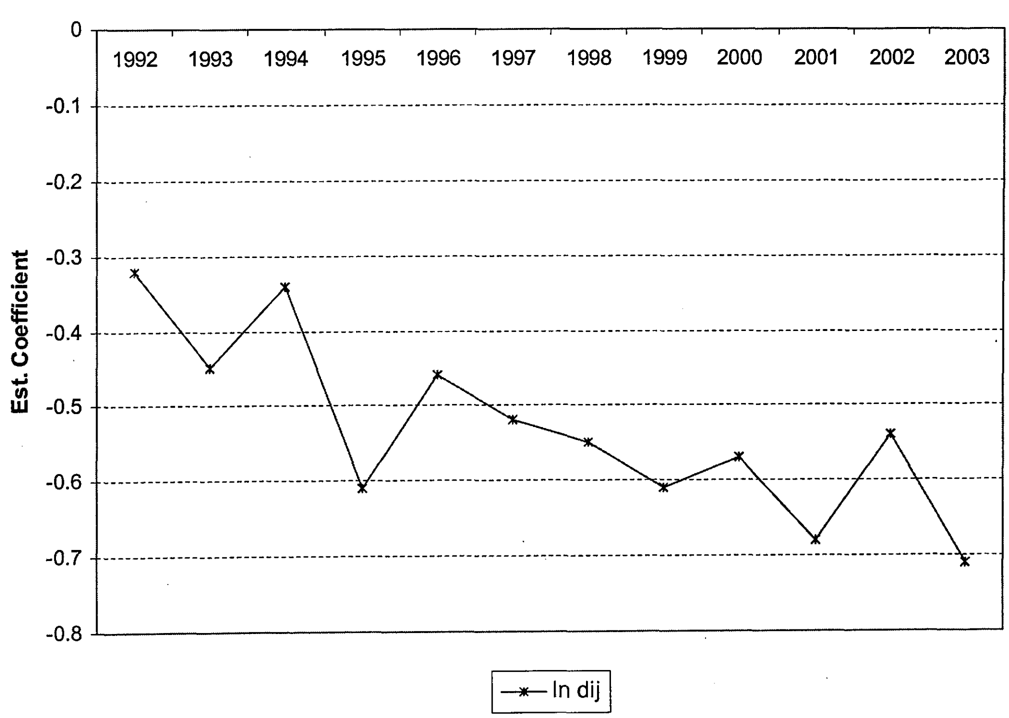


Figure 3.6 Estimated Coefficient on Distance over Time, 1992 – 2003



The common border dummy variable did not demonstrate comparable consistency. The estimated coefficient fluctuates between 0.05 and 0.67 and is only statistically significant (at the 10% level) for years 1993, 1996 and 1998.

In earlier discussion, we suggested that the coefficient on the distance variable might be expected to decline through time as communication and other distance-related costs fell and hence became a less important determinant of FDI flows. However, Figure 3.6, which plots the estimated coefficient on the distance variable for equations 3.14 to 3.25, shows that the absolute value appears in fact to be increasing over time. This suggests that the distance-related costs of foreign investment (e.g. monitoring costs) are becoming an increasing deterrent to firms when deciding to undertake FDI. Rather surprisingly, geography appears to be becoming increasingly important despite the improvement in communications and the trend towards greater globalisation.

3.2.5 Different Estimating Techniques: Fixed and Random Effects Models

Thus far, we have employed the ordinary least squares (OLS) regression technique to derive benchmark estimates for an augmented gravity model. Although this has produced statistically significant parameter estimates in many of the regressions reported, we cannot be certain that OLS provides optimal results. In particular, coefficient estimates derived using OLS may be subject to omitted variable bias[26]. Furthermore, Cheng and Wall (2002) demonstrate that OLS estimation of the gravity model may be susceptible to heterogeneity bias[27].

The dataset we have constructed is derived from cross-section (country-pair) observations through time, which is known as a panel dataset (or cross-sectional time-series dataset). In fitting OLS regressions we are essentially pooling all of the observations and imposing the restrictions that there are no significant cross-section or temporal effects. By employing the panel structure (and allowing for the possibility of cross-section or temporal effects) it is sometimes possible to control for omitted variables (even if these variables cannot themselves be observed) by modelling changes in the dependent variable (Wooldridge, 2002).

There are several types of panel data regression techniques, the most popular being fixed effects (FE) and random effects (RE) models. The FE model allows for country-pair

[26] Omitted variable bias may arise when there are one or more variables that have been omitted (either unintentionally or because they cannot be adequately measured or proxied) which have an effect on the dependent variable.
[27] If observations on country-pairs are subject to effects not fully captured by the existing explanatory variables, and these effects are related to the existing variables, then OLS estimators will be biased.

individual effects by estimating a separate intercept for each country-pair. As it requires the inclusion of a dummy variable for all (but one) of the country-pairs in the dataset this technique is demanding in terms of degrees of freedom[28]. The major limitation to this approach is that it is unable to provide an estimate of time invariant explanatory variables, as these variables are dropped following the required data transformation. The FE technique applied to the gravity model is therefore unable to provide an estimate of the effect of distance on FDI flows. Of more concern, given that our integration variables are largely time invariant the FE approach is likely to provide inefficient estimates.

The RE model does allow for estimation of time invariant explanatory variables. This model assumes that country-pair individual effects are random and can be incorporated into the error term. Although it typically provides more efficient estimates than the FE model (because it does not require the presence of dummy variables and so has more degrees of freedom available for estimation), it requires the assumption that the country-pair effects are uncorrelated with the explanatory variables, which is often not empirically the case (McPherson and Trumball, 2003).

3.2.5.1 Stata Estimation

Before proceeding to employ these different estimation techniques, let us first discuss the estimation approach employed. Thus far, using OLS to estimate our pooled dataset, we have assumed the following regression specification:

[28] The use of dummy variables explains why the FE model is also known as the least squares dummy variable (LSDV) approach.

$$y_{ijt} = \alpha + \beta' x_{ijt} + \varepsilon_{ijt} \qquad [3.1]$$

In [3.1] ϵ_{ijt} is a "well-behaved" error term with the usual properties (zero mean, uncorrelated with itself and x, and homoscedastic). However, it is possible that significant cross-section effects exist, implying that the regression equation should be correctly specified as:

$$y_{ijt} = \alpha + x_{ijt}\beta + v_{ijt} + \varepsilon_{ijt} \qquad [3.2]$$

In [3.2] v_{ijt} is a country-pair-specific residual which may vary both between country-pairs and within country-pairs (i.e. through time). Such country-pair effects may result from the omission of explanatory variables, such as cultural or colonial ties[29]. If [3.2] is indeed the correct specification, then OLS estimation of [3.1] will result in biased estimators (if v_{ijt} is correlated with x_{ijt}).

Whatever the properties of v_{ijt}, we may take the temporal means to derive a third equation:

$$\bar{y}_{ij} = \alpha + \beta' \bar{x}_{ij} + v_{ij} + \bar{\varepsilon}_{ij} \qquad [3.3]$$

[29] To the extent that such ties encourage increased (or decreased) bilateral investment between certain countries (and assuming such an effect is not fully captured by the common language dummy), their omission could be a potential source for such an effect. Although it is likely that the impact of such ties will wane over time, it is not unreasonable to assume that their effect would be constant over the relatively short time horizon of our dataset.

where $\bar{y}_{ij} = \sum_t y_{ijt} / T_{ij}$, $\bar{x}_{ij} = \sum_t x_{ijt} / T_{ij}$, and $\bar{\varepsilon}_{ij} = \sum_t \varepsilon_{ijt} / T_{ij}$.

Subtracting [3.3] from [3.2] removes the time invariant factors, leaving:

$$(y_{ijt} - \bar{y}_{ij}) = (x_{ijt} - \bar{x}_{ij})\beta' + (\varepsilon_{ijt} - \bar{\varepsilon}_{ij}) \qquad [3.4]$$

Equations [3.2], [3.3] and [3.4] provide the basis for estimating β using the fixed and random effects panel techniques. Specifically, the FE model is equivalent to using OLS to estimate [3.4], and the RE model is equivalent to performing OLS on:

$$(y_{ijt} - \theta\bar{y}_{ij}) = (1-\theta)\alpha + (x_{ijt} - \theta\bar{x}_{ij})\beta' + \{(1-\theta)v_{ijt} + (\varepsilon_{ijt} - \theta\bar{\varepsilon}_{ij})\} \qquad [3.5]$$

The Between Effects (BE) model is equivalent to using OLS to estimate equation [3.3]. As this model simply regresses the means of the explanatory variables against the mean values of the dependent variable, it discards all temporal information and is therefore rarely used in empirical studies. The BE model is required, however, to provide the estimated variance of v_{ijt} ($\hat{\sigma}_u^2$) and ϵ_{ijt} ($\hat{\sigma}_\varepsilon^2$) which are required by Stata to derive the RE model estimators.

3.2.5.2 Fixed Effects Model

The fixed effects model is equivalent to using OLS to estimate equation [3.4]. As it is based only on deviations from group (country-pair) means, fixed effects estimators are also known as within estimators. It is this property that allows the fixed effects model to return unbiased estimators even in the presence of significant cross-section effects (as time invariant factors are dropped from the model). The fixed effects model is popular because it does not require the same zero correlation assumption as the RE (and BE) model.

Applied to the basic gravity model, employing the fixed effects model is equivalent to estimating the following equation using OLS:

$$(\ln FDI_{ijt} - \overline{\ln FDI_{ij}}) = (\ln y_{it} - \overline{\ln y_i})\beta_1 + (\ln y_{jt} - \overline{\ln y_j})\beta_2 + (\ln n_{it} - \overline{\ln n_i})\beta_3 + (\ln n_{jt} - \overline{\ln n_j})\beta_4$$

As discussed above, the distance variable is excluded because it does not vary across time (i.e. geographical distance is constant between each country-pair)[30]. The FE model is also likely to provide inefficient estimates of the integration effects because our integration dummy has limited temporal variance – we must be conscious of this point when we come to interpret the FE results for the integration dummies.

[30] An alternative distance measure, such as the average freight cost between countries, would be included in the fixed effects model as this measure would exhibit both cross-section and temporal variation.

3.2.5.3 Between Effects Model

The between effects model is equivalent to using OLS to estimate equation [3.3]. As it is based solely on group means, this model excludes all temporal information and is therefore typically less efficient than the fixed effects or random effects models. The model also requires the same restrictive assumption as the RE model; that v_{ijt} is uncorrelated with all explanatory variables.

Applied to the basic gravity model, utilising the between effects model is equivalent to estimating the following equation using OLS:

$$\overline{\ln FDI_{ij}} = \alpha + \beta_1 \overline{\ln y_i} + \beta_2 \overline{\ln y_j} + \beta_3 \overline{\ln n_i} + \beta_4 \overline{\ln n_j} + \beta_5 \overline{\ln d_{ij}} + \overline{v}_{ij} + \overline{\varepsilon}_{ij}$$

3.2.5.4 Random Effects Model

The random effects model is a weighted average of the estimates produced by the fixed effects and between effects model, with θ determining the relative weighting applied:

$$\hat{\theta} = 1 - \sqrt{\frac{\hat{\sigma}_e^2}{T\hat{\sigma}_u^2 + \hat{\sigma}_e^2}}$$

Therefore, if the estimated variance of v_{ijt} ($\hat{\sigma}_u^2$) is zero then $\hat{\theta}$ will equal zero and equation [3.2] may be estimated directly by OLS. If the estimated variance of ϵ_{ijt} ($\hat{\sigma}_\varepsilon^2$) is zero then $\hat{\theta}$ will equal one and the fixed effects model will return all of the available information.

Applied to the basic gravity model, utilising the RE model is analogous to estimating the following equation by OLS:

$$(\ln FDI_{ijt} - \theta\overline{\ln FDI_{ij}}) = (1-\theta)\alpha + (\ln y_{it} - \theta\overline{\ln y_i})\beta_1 + (\ln y_{jt} - \theta\overline{\ln y_j})\beta_2 + (\ln n_{it} - \theta\overline{\ln n_i})\beta_3$$
$$+(\ln n_{jt} - \theta\overline{\ln n_j})\beta_4 + (\ln d_{ijt} - \theta\overline{\ln d_{ij}})\beta_5 + \left\{(1-\theta)v_{ijt} + (\varepsilon_{ijt} - \theta\overline{\varepsilon_{ij}})\right\}$$

3.2.5.5 Empirical Results

Table 3.11 reports the results for estimation of our dataset using the BE, FE and RE models (OLS results are also presented for comparison).

The BE model is estimated on country-pair group averages, which is reflected in the number of observations (groups) of only 517 (the average group size is 7.5). The relevant R^2 is 0.64 which is somewhat higher than the R^2 of 0.51 reported for the OLS regression. The *F statistic* tests the null hypothesis that the coefficients of the explanatory variables are all jointly insignificant – its value of F(8,508) = 122.19 leads us to reject the null hypothesis in favour of the alternative hypothesis that our model is significant.

The reported coefficients for the BE model are very similar to those for the OLS regression, although they have higher standard errors. As with the pooled OLS model, the EU is found to have a positive effect on FDI flows between insiders, but the NAFTA dummy coefficient is not statistically different from zero. The standard gravity variables and common language dummy have the same sign (and similar magnitude) in the BE model as they do for the OLS results.

The results for the FE model are markedly different from the BE and pooled OLS model. Firstly, the relevant R^2 is significantly lower at 0.14 which suggests that the FE model is inadequate for identifying the determinants of FDI flows between countries. The estimated coefficients are also substantially different. Neither the EU nor NAFTA integration dummies are statistically significant, but as discussed this is to be expected given that there is little temporal variation in either dummy variable. The distance and common language variables have been dropped by Stata because they exhibit no temporal variation and cannot therefore be estimated within the FE model. The *F statistic*, $F(6,3361) = 89.23$, indicates that the explanatory variables present in the FE specification are jointly significant.

The results for the RE model are similar to those for the BE and pooled OLS models. Their similarity to the BE model instead of the FE model would seem to suggest that most of the relevant information is contained between country-pairs and not within, and hence a low value for θ. However, the median value for θ was in fact 0.70 (θ is not constant because the panel is unbalanced).

Table 3.11 Panel Data Regression Results

Explanatory Variables	BE	FE	RE	OLS
α	-28.99 (11.4)	66.89 (2.47)	-38.03 (19.3)	-30.93 (26.4)
$ln\ Y_i$	2.01 (9.1)	5.19 (9.3)	2.82 (16.5)	2.31 (21.9)
$ln\ Y_j$	0.79 (13.5)	1.74 (6.2)	0.89 (16.1)	0.78 (28.8)
$ln\ N_i$	-1.24 (5.4)	-11.25 (5.5)	-2.06 (11.4)	-1.57 (14.2)
$ln\ N_j$	-0.13 (2.49)	-2.36 (3.20)	-0.20 (3.94)	-0.18 (7.7)
$ln\ d_{ij}$	-0.60 (8.7)		-0.60 (10.2)	-0.50 (14.8)
EU_{ij}	0.59 (2.94)	-0.06 (0.53)	0.36 (3.57)	0.54 (6.8)
$NAFTA_{ij}$	0.02 (0.02)	0.71 (1.21)	0.33 (0.63)	-0.11 (0.28)
$Lang_{ij}$	1.61 (6.8)		1.53 (6.6)	1.30 (13.0)
*F-statistic**	112.2 (8,508)	76.5 (7,3360)	1293.4 (8)	494.4 (8,3875)
$\overline{R}^2$	0.64	0.14	0.50	0.51
Obs.	517	3,884	3,884	3,884

*Notes: Dependent variable is the natural log of FDI flows between countries i and j. Figures in parenthesis under the estimated coefficients are absolute t ratios (z statistics in the case of the RE results). *The figure reported for the RE model is the Wald test statistic, which is compared against the χ^2 distribution.*

The relevant R^2 of 0.50 in the RE model is comparable to that for the pooled OLS model and substantially higher than that for the FE model. All coefficients have the same sign, and are of a similar magnitude as in the pooled OLS model. The only exception is the NAFTA dummy which, despite a reversal in sign, remains statistically insignificant. The absolute magnitudes of all of the gravity variables (and common language dummy) are slightly higher in the RE model than in the pooled OLS results. The EU integration dummy, however, has fallen substantially in magnitude (0.36 in the RE model compared with 0.54 for the pooled OLS model and 0.59 for the BE model). Taking a literal interpretation of the coefficient implies that, according to the RE model results, FDI flows between EU members are 143% of the magnitude they would be if the countries were not both members of the EU. This is significantly lower than the 172% and 180% implied by the pooled OLS and BE models respectively.

Rather than reporting an *F statistic* for overall significance, Stata reports the Wald test statistic (which is appropriately compared against the χ^2 distribution). This takes the value of 1293.4 for the reported regression which allows us to reject the null hypothesis that the explanatory variables are not jointly significant.

3.2.5.6 Hausman Specification Test

Although the choice between the FE and RE models is typically a subjective one, the Hausman specification test provides a simple statistical test which is commonly used to aid such decisions. Although the FE model always returns consistent results with panel data, it may not be the most efficient model. Whilst the RE model may give more reliable estimates, we cannot be certain that they are unbiased. The Hausman specification test compares the estimates of a consistent model (i.e. FE) with the estimates of an efficient model (i.e. RE) to make sure that the more efficient model also gives consistent results (the null hypothesis). Being unable to reject the null hypothesis therefore provides support for the RE model.

The Hausman statistic is 89.2 which leads us to reject the null hypothesis in favour of the alternative hypothesis, and hence suggests that the RE estimates are not consistent. Before discarding the RE model however, we should note that the Hausman test may be unreliable in small samples. Furthermore, the FE model not only explicitly precludes the estimation of time invariant variables (i.e. distance and common language), but it also renders effectively meaningless the estimates of the integration dummy variables due to their lack of temporal variation. As these are the key variables of interest, the FE technique proves a rather limited model.

Given this (and despite the results of the Hausman specification test) we therefore favour the RE model for estimating the dataset in panel format. Not only does it offer a significantly better goodness of fit than the FE model, it also reports parameter estimates that are comparable to the pooled OLS results and are economically more realistic.

3.2.6 Insider and Outsider Effects

One way in which the empirical analysis may be developed further is by extending it to test for possible FDI effects on 'outsiders'. The formation of an RIA involves a reduction in trade (and often investment) barriers between members, and this may encourage firms from non-member countries to invest in a member country to establish a production facility from which the entire RIA-market can be served by exports. There is a wealth of anecdotal evidence of such an effect occurring within both the EU and NAFTA[31].

In order to test for this possibility, we construct two additional dummy variables, nEU_iEU_j and nNA_iNA_j. The former takes the value unity when the investor is a non-member country and the host is an EU member, and zero otherwise. The latter does the same for NAFTA. Table 3.12 reports the regressions results with the inclusion of these dummy variables.

The results for equation 3.26 show that the 'outsider' dummy for the EU (nEU_iEU_j) is not statistically significant, but the 'outsider' dummy for NAFTA is significant at the 1% level. This implies that the existence of NAFTA creates an attraction for FDI from non-members that would otherwise not exist. Although we should be cautious about making a literal interpretation, the coefficient on nNA_iNA_j indicates that FDI flows from non-members to members of NAFTA are 57% greater than flows between two 'outsiders'. This effect is almost as large as the effect on 'insider' flows generated by the EU (as

[31] For example, Ireland has benefited significantly from FDI from 'outsiders' since its membership of NAFTA in 1973 (although policies designed specifically to attract MNEs have also helped).

measured by the EU_{ijt} dummy).

In addition to encouraging inward investment from 'outsiders', it is possible that an RIA will have an effect on flows from member countries to non-members. It is difficult to predict the *a priori* effect, as it will likely depend on the dynamic adjustment process in the investor country following the formation of the RIA. To the extent that the RIA reduces investment barriers between members, however, we would anticipate an FDI diversion effect as members relocate investments from non-members to members. If a reduction in trade barriers post-RIA encourages internal FDI to be replaced by exports, however, FDI from members to 'outsiders' may increase. Equation 3.27 in Table 3.12 presents the results when two dummy variables are included to test for this 'insider-outsider' effect. EU_inEU_j is a dummy variable that takes the value unity when the investor country is a member of the EU and the host country is not a member of the EU (and zero otherwise). NA_inNA_j is constructed in a similar manner with NAFTA as the RIA of interest. The coefficient on the former dummy is positive and statistically significant at the 1% level. The estimated coefficient of 0.58 implies that investment from EU members to 'outsiders' is 81% greater than 'outsider-outsider' investment. The coefficient on the NA_inNA_j dummy is not statistically significant. Note also that the inclusion of the 'insider-outsider' effects in equation 7.2 has resulted in a substantial rise in the estimated coefficient of the EU_{ijt} dummy.

Table 3.12 Effect of Additional Integration Dummy Variables

Explanatory Variables	*3.26*	*3.27*	*3.28*
$ln\ Y_i$	2.28 (19.2)	2.82 (19.1)	2.82 (19.1)
$ln\ Y_j$	0.74 (24.1)	0.80 (29.5)	0.74 (24.3)
$ln\ N_i$	-1.53 (12.5)	-2.05 (14.0)	-2.04 (14.0)
$ln\ N_j$	-0.17 (7.1)	-0.20 (8.5)	-0.17 (7.2)
$ln\ d_{ij}$	-0.52 (15.3)	-0.52 (15.4)	-0.51 (15.0)
EU_{ij}	0.53 (6.2)	0.95 (8.2)	1.13 (8.84)
$NAFTA_{ij}$	-0.13 (0.34)	-0.01 (0.03)	0.15 (0.40)
$Lang_{ij}$	1.30 (13.1)	1.32 (13.3)	1.32 (13.3)
$Border_{ij}$	0.37 (3.41)	0.35 (3.22)	0.38 (3.51)
nEU_iEU_j	0.02 (0.14)		0.33 (2.70)
nNA_iNA_j	0.44 (3.56)		0.43 (3.47)
$EU_i\ nEU_j$		0.58 (5.8)	0.67 (6.3)
$NA_i\ nNA_j$		0.04 (0.30)	0.07 (0.53)
F-statistic	188.1 (22,3861)	190.5 (22,3861)	176.0 (24,3859)
$\overline{R}^2$	0.51	0.52	0.52
Obs.	3,884	3,884	3,884

Notes: Dependent variable is the natural log of FDI flows between countries i and j. Figures in parenthesis beneath the estimated coefficients are absolute t-ratios. Year dummies (for years 1993 to 2003) are included, but not reported. Constant term is not reported.

Equation 3.28 reports the results when we include the four additional integration dummies in a single equation. Again, there is a marked increase in the coefficient values of the EU_{itj} dummy. Its value of 1.13 implies that the FDI between EU members is 316% of the magnitude of FDI between countries that are not in a common integration agreement.

Encouragingly, the nEU_iEU_j dummy variable also obtains statistical significance in equation 3.28. This suggests that, as with NAFTA, the EU has also attracted 'super-normal' FDI from 'outsiders'[32].

The inclusion of the additional integration dummy variables has enhanced the estimation of the 'insider' (i.e. EU_{ijt} and $NAFTA_{ijt}$) effects. The simple explanation for this is that the model is more correctly specified when the additional integration dummies are also included. When EU_{ijt} and $NAFTA_{ijt}$ are included in a regression specification on their own, the 'base case' (against which we interpret them) includes 'insider-outsider' and 'outsider-insider' observations in addition to 'outsider-outsider' observations. Equations 3.26 and 3.27 have demonstrated that 'insider-outsider' and 'outsider-insider' flows are greater (all else being equal) than 'outsider-outsider' flows. The positive effect of the RIA on 'insider-insider' flows was therefore being dampened when EU_{ijt} and $NAFTA_{ijt}$ were included in isolation. When all six of the integration dummies are included in a single regression (equation 3.28), the 'base case' against which we interpret all of the dummy variables is solely 'outsider-outsider' observations. This allows the 'true' effect

[32] This suggests there is empirical evidence to support the anecdotal evidence cited earlier regarding Ireland's ability to attract FDI from 'outsiders' following its membership of the EU.

of the integration agreements to be estimated.

In light of the improved performance of the original integration dummies, we now re-estimate the individual year regressions with the addition of the 'outsider-insider' and 'insider-outsider' dummies to investigate whether the lack of any integration effect post-1995 is overturned. Table 3.13 reports the results.

As with the total sample, the inclusion of the additional integration dummies has a substantial affect on the EU_{ijt} dummy (there is less effect on $NAFTA_{ijt}$). Although the EU_{ijt} dummy falls in magnitude and statistical significance for the years 1997, 1998 and 1999, it returns with a vengeance in 2000. In fact, the coefficient value of 4.60 (statistically significant at the 1% level), for the year 2000, would imply that flows between 'insiders' are around ten times the volume of flows between 'outsiders', all else equal. Following 2000 the EU_{ijt} dummy falls in magnitude each year, although even in 2003 it is still substantially greater than the value in the early years of the sample. The pattern of coefficient values on EU_{ijt} over the years perhaps suggests that the positive effects (of the integration agreement) on FDI flows had begun to ebb away when suddenly there was a renewed stimulus around the year 2000.

Including the additional integration dummies has a much less marked effect on the behaviour of the $NAFTA_{ijt}$ dummy. It remains statistically insignificant throughout.

Table 3.13 Insider and Outsider Effects for Individual Years

Explanatory Variables	*3.29 1992*	*3.30 1993*	*3.31 1994*	*3.32 1995*	*3.33 1996*	*3.34 1997*	*3.35 1998*	*3.36 1999*	*3.37 2000*	*3.38 2001*	*3.39 2002*	*3.40 2003*
$ln\ Y_i$	2.47	2.31	1.53	3.39	3.10	2.72	2.58	3.48	8.27	7.05	6.76	7.12
	(5.88)	(5.54)	(3.38)	(7.21)	(6.52)	(5.39)	(4.72)	(6.23)	(6.39)	(5.95)	(5.78)	(5.66)
$ln\ Y_j$	0.69	0.68	0.52	0.72	0.68	0.59	0.69	0.93	1.01	0.89	0.72	1.01
	(7.99)	(7.64)	(5.46)	(7.16)	(6.81)	(5.60)	(6.43)	(7.43)	(8.83)	(7.25)	(6.35)	(8.69)
$ln\ N_i$	-1.70	-1.57	-1.00	-2.51	-2.21	-1.83	-1.71	-2.65	-7.32	-6.06	-6.02	-6.35
	(3.92)	(3.56)	(2.36)	(5.63)	(0.46)	(3.82)	(3.32)	(5.02)	(5.88)	(5.32)	(5.41)	(5.20)
$ln\ N_j$	-0.33	-1.72	-0.12	-0.13	-0.09	-0.06	-0.15	-0.26	-0.34	-0.22	-0.24	-0.31
	(4.24)	(2.32)	(1.67)	(1.65)	(1.23)	(0.72)	(1.76)	(2.53)	(3.47)	(2.25)	(2.71)	(3.24)
$ln\ d_{ij}$	-0.25	-0.39	-0.29	-0.61	-0.48	-0.53	-0.54	-0.59	-0.63	-0.67	0.49	-0.64
	(2.36)	(3.66)	(2.69)	(5.35)	(4.42)	(4.60)	(4.32)	(4.18)	(4.88)	(5.27)	(4.02)	(5.04)
$Lang_{ij}$	1.22	1.21	1.19	1.19	1.54	1.59	1.41	1.25	0.91	0.84	1.06	0.84
	(3.82)	(3.95)	(3.75)	(3.84)	(4.73)	(4.87)	(3.83)	(3.45)	(2.15)	(2.14)	(2.89)	(2.31)
$Border_{ij}$	0.59	0.73	0.62	0.29	0.63	0.54	0.66	0.10	0.32	0.13	0.25	0.14
	(1.67)	(2.10)	(1.78)	(0.86)	(1.78)	(1.48)	(1.75)	(0.24)	(0.75)	(0.33)	(0.62)	(0.34)
EU_{ij}	1.56	1.24	2.09	1.29	1.09	0.98	0.95	0.19	4.60	3.58	2.95	2.87
	(4.63)	(3.69)	(5.57)	(1.98)	(2.12)	(1.82)	(1.60)	(0.62)	(5.27)	(4.48)	(3.54)	(3.25)
$NAFTA_{ij}$	drop	drop	1.93	0.15	-0.86	-0.29	-0.66	-1.13	0.95	1.32	0.61	0.51
			(1.59)	(0.12)	(0.71)	(0.23)	(0.51)	(0.87)	(0.71)	(1.03)	(0.50)	(0.42)
nEU_iEU_j	0.88	0.90	1.17	0.69	-0.22	-0.04	0.64	-0.13	-0.08	1.35	0.44	0.30
	(2.50)	(2.58)	(3.57)	(1.38)	(0.54)	(0.10)	(1.23)	(0.21)	(0.17)	(0.29)	(0.97)	(0.67)
nNA_iNA_j	drop	drop	0.96	0.64	0.05	0.62	0.44	0.36	0.63	0.02	-0.11	-0.39
			(2.55)	(1.80)	(0.15)	(1.67)	(1.22)	(0.79)	(1.39)	(0.04)	(0.21)	(0.92)
$EU_i\ nEU_j$	0.43	0.23	0.86	0.93	0.62	0.78	0.64	-0.25	4.72	3.44	2.55	2.95
	(1.90)	(1.04)	(2.90)	(1.48)	(1.31)	(1.58)	(1.19)	(0.76)	(5.60)	(4.54)	(3.27)	(3.54)
$NA_i\ nNA_j$	drop	drop	1.50	0.26	-0.21	-0.25	-0.07	-0.91	1.24	0.50	0.25	0.12
			(2.52)	(0.38)	(0.49)	(0.55)	(0.15)	(1.33)	(2.58)	(1.11)	(0.58)	(0.27)
F-statistic	38.5	38.5	28.5	34.6	30.7	24.3	25.8	26.6	25.3	22.7	21.4	24.8
	(10,284)	(10,314)	(13,338)	(13,325)	(13,379)	(13,362)	(13,348)	(13,266)	(13,298)	(13,293)	(13,265)	(13,251)
$\bar{R}^2$	0.56	0.54	0.50	0.56	0.50	0.45	0.47	0.53	0.50	0.48	0.49	0.54
Obs.	295	325	352	339	393	376	362	279	312	307	279	265

Notes: Dependent variable is the natural log of FDI flows between countries i and j. Figures in parenthesis beneath the estimated coefficients are absolute t-ratios. The constant term is not reported.

There are limited instances of the 'outsider' dummy variables attaining statistical significance. In each of these instances, the coefficient on the dummy variable is positive. The dummy variable nEU_iEU_j is significant in 1992, 1993 and 1994, suggesting that in these years the EU encouraged increased inward FDI from 'outsider' countries to members of the EU. Similarly, nNA_iNA_j is significant in 1994, 1995, 1997 and 2000, indicating that 'outsider' flows to NAFTA members were inflated in these years. The EU_inEU_j dummy exhibits similar behaviour to the EU_{ijt} dummy (i.e. it is substantially positive and statistically significant for the years 2000 to 2004). This suggests that EU members, in the new millennium, are more active investors than countries that are not members of the EU. Finally, the NA_inNA_j variable is significant in 1994 and 2000, suggesting increased flows from NAFTA members to non-members for these two years.

3.3 CONCLUSION

There has been a proliferation of regional integration agreements over the last few decades. Accompanying this, there has been a long-standing debate as to the benefits of regionalism versus multilateralism. Although multilateralism may be the ideal scenario, in its absence regionalism probably provides the second-best solution to furthering integration between the world's economies. Further integration should prove universally beneficial as countries can increasingly engage in trade and firms can allocate capital to the location where it can achieve the greatest return.

As we discussed in the introductory chapter, foreign direct investment is considered to be one of the primary channels through which the benefits of globalisation materialise. As regional integration agreements are thought to stimulate FDI flows between countries, this would imply that such agreements result in economic benefits for member countries[33]. This chapter has been concerned with empirically testing the effect that RIAs exert on FDI flows (not only between member countries, but also on 'outsiders'). Specifically, we have focussed on the experiences of the European Union and the North American Free Trade Agreement.

Our initial OLS benchmark results indicated that RIAs do exert a positive influence on FDI flows between member countries. However, after disaggregating the RIA dummy variable into separate EU and NAFTA dummies, it transpired that the entire integration effect was being generated solely by a positive EU effect (the NAFTA dummy was not statistically significant). A literal interpretation of the coefficient on the EU dummy implies that FDI between EU members is 72% greater than FDI between non-members.

In order to investigate whether the EU result was dependent on the specification of the model, we conducted a sensitivity analysis to test whether the EU dummy coefficient was susceptible to the inclusion of various additional explanatory variables[34]. We found the EU dummy coefficient to be highly consistent, therefore providing support that it reflects a genuine effect in the data and is not merely due to model mis-specification.

We also investigated how the integration effect varies through time by estimating each

[33] Recent RIAs are increasingly including investment (in addition to trade) provisions in their articles of association. We would expect this to act as a further stimulant to intra-RIA investment.

[34] The additional variables were for the host country: per capita income growth, lagged inflation rate; corruptions perception index score; unit labour cost; electricity transmission efficiency; urbanisation; and percentage of internet users.

regression for individual years (1992 to 2003). We found the EU dummy to be most significant and of the highest magnitude in the early years of the dataset (i.e. 1992 to 1994). From 1997 onwards the coefficient was not statistically significant[35]. A possible explanation for this is that the EU's positive influence on FDI has gradually decreased over time; in the early years of the agreement it may have acted as a substantial stimulant to intra-RIA FDI, but over the last decade it seems to have had minimal effect. The completion of the Single Market in 1992 may have acted as a stimulus to FDI (in addition to trade) for a number of years afterwards, but perhaps this effect has diminished over time.

Alternative regression techniques (namely fixed-, random- and between-effects models) were introduced to examine whether this had any impact on the results. The random-effects model proved to be the most favourable technique, but did not alter the conclusions from the OLS benchmark results.

In order to investigate the possible effect of the EU and NAFTA on non-members we introduced four additional integration dummy variables. The results indicated that both integration agreements have attracted foreign investment from outsiders looking to exploit the enlarged internal market. This provides support for the wealth of anecdotal evidence that describes the experiences of countries such as Ireland and Mexico that have benefited from considerable amounts of FDI from non-member countries seeking to either avoid tariff and non-tariff barriers, exploit favourable investment provisions, and/or gain direct access to a greatly expanded market place.

[35] The NAFTA dummy failed to achieve statistical significance for any individual year.

EU members also appear to have invested more in non-member countries than they would have otherwise. This effect may result from efficiency savings from internal trade and investment (due to lower internal barriers) permitting more resources to be available for external investment. The results for NAFTA on this score, however, were not statistically significant.

Our analysis has therefore provided results which indicate that the EU has acted as a stimulant to FDI between member countries, but that NAFTA has not. There is evidence, however, that both RIAs have allowed member countries to attract greater than normal investment from non-member countries. For many countries, particularly the smaller and/or more peripheral members, this will have been one of the principal benefits of membership. For instance, there is a considerable body of work on the gains that Ireland has made from external FDI following its membership of the EU in 1973. Undoubtedly, much of Ireland's success is due to forward-looking domestic policies which have created an attractive environment for foreign companies, but we should not underestimate the pull of the Single Market (boasting over 350 million consumers) to which Ireland provides access.

The experience of Ireland, and the seeming ability for membership to attract investment from non-members, raises the question of whether members should compete with one another to attract FDI. Presumably, to a large extent, investors from non-member countries are ambivalent to the exact location of their investment within the RIA (at least to the extent that their investment is motivated with the goal of exploiting the enlarged market). If one member country offers investment incentives (e.g. tax breaks) that are more favourable than those available in the other member countries, it becomes probable that the investor will choose to invest there. In this manner, the majority of FDI from 'outsiders' may become located within a small number of member countries. The problem in this scenario is when a number of member countries compete to attract FDI by offering ever greater incentives to foreign investors. These incentives allow the investor to capture more of the benefits of the investment at the expense of the host nation. In extreme circumstances, members may become so desperate to attract FDI that they actually offer more in incentives than they have the opportunity to gain from the investment[36].

A further concern with employing incentives to attract FDI is whether this type of investment is more transitory than FDI that has occurred independent of incentives. In the event of a global or regional recession, or perhaps even a localised crisis, investors may be quick to withdraw transitory FDI, causing problems for the host nation (i.e. pressure on the balance of payments and employment). The persistency, or otherwise, of FDI was a popular topic in the aftermath of the Asia financial crisis. Most studies concluded that investors were slow to withdraw existing investments due to sunk costs, the fear of losing a foothold in strategic markets etc. Direct investment certainly proved to be more persistent than portfolio investment during the crisis.

The recent enlargement of the European Union, to include the ten countries from central and eastern Europe, surely provides an ideal opportunity to study these issues going

[36] Given the obvious problems in accurately measuring the varied benefits believed to derive from FDI, it is normally difficult for policymakers to determine an appropriate level for investment incentives.

forward. Undoubtedly, one of the principal attractions of membership for these countries is the opportunity it provides for them to attract FDI, both from fellow members and non-members. Once data becomes available it would be interesting to explore how their membership has affected both internal and external investment flows. As with the completion of the Single Market, it seems likely that the enlargement may act to stimulate FDI flows (both within the enlarged EU and from non-members). Over time it will also be possible to address issues regarding the persistency of FDI and the benefits and costs of offering investment incentives.

Although our analysis suggested that the EU has acted as a positive stimulant to intra-regional investment, we found no evidence that NAFTA has had a similar effect[37]. Unfortunately, it is difficult to say with certainty whether the NAFTA result is an accurate reflection of reality, or whether our analysis has simply failed to detect a statistically significant effect. The limited number of observations between NAFTA members will certainly have hindered the analysis. In Chapter 6 we undertake a case study of Mexico which will allow this matter to be investigated in further depth. Future work should also focus on increasing the number of observations for the NAFTA countries by collecting accurate and disaggregated investment data from Canada and Mexico[38].

[37] Although we did find evidence to suggest that NAFTA has had an effect on FDI from non-member countries.

[38] As Canada and Mexico only existed in our dataset as host countries, NAFTA observations were limited to the cases where the US was the source country.

4. THE IMPACT OF REGIONAL INTEGRATION AGREEMENTS ON EXPORTS

4.1 INTRODUCTION

In the previous chapter we investigated the impact of regional integration agreements (specifically the European Union and the North American Free Trade Agreement) on flows of foreign direct investment. In this chapter we perform a similar analysis for exports. This not only allows us to estimate the effect of the EU and NAFTA on trade, but also affords greater understanding and comparability of the augmented gravity model specification we have chosen to utilise for our empirical analysis. It is also a prerequisite for the empirical work we will undertake in Chapter 5 on the relationship between exports and FDI.

Given that integration agreements result in a reduction in tariff and non-tariff barriers, we expect to find that both the EU and NAFTA have stimulated intra-regional trade. Furthermore, it is reasonable to expect that the coefficients on the EU_{ijt} and $NAFTA_{ijt}$ dummies will be greater in magnitude than they were in the previous chapters as these agreements include more trade-related than investment-related provisions[1].

[1] In both the EU and NAFTA, the removal of impediments to trade is more advanced than the removal of restrictions on foreign investment. For example, under NAFTA there remain a number of industries in which direct foreign investment is prohibited (e.g. the Mexican oil industry, Canadian natural resources, the US Defence sector).

4.2 DATA AND SUMMARY STATISTICS

The dataset used in the previous chapter to investigate the effects of regional integration agreements on flows of foreign direct investment again forms the basis for the analysis in this chapter. The only difference is that exports from the source country (*i*) to the host country (*j*) are taken as the dependent variable (as opposed to bilateral FDI flows). This data is taken from the OECD's International Trade Statistics and deflated by the GDP deflator for each country taken from the WDI online database (therefore giving exports in constant 2000 US dollars).

The first row of Table 4.1 summarises the exports variable for the entire dataset. The mean value is US$4.95 billion with a standard deviation of US$11.8 billion. The minimum value is zero, indicating observations where there have been no exports from *country i* to *country j* for a particular year[2]. The maximum value is US$162 billion (exports from the US to Canada in 2000).

As in the previous chapter, an augmented gravity model is our favoured regression specification for estimating the determinants of the dependent variable:

$$\ln X_{ijt} = \alpha_0 + \beta_1 \ln Y_{it} + \beta_2 \ln Y_{jt} + \beta_3 \ln n_{it} + \beta_4 \ln n_{jt} + \beta_5 \ln d_{ij} + \beta_6 EU_{ijt} + \beta_7 NAFTA_{ijt} + \mu_{ijt}$$

[2] Due to the log-linear specification of the regression equation, we are forced to omit observations for which the there have been no exports from *country i* to *country j* for any given year. This results in a loss of 92 observations (or approximately 2% of the total observations). Although this is not a substantial number, we should be aware that it may bias the sample slightly towards more developed host countries.

where exports from *country i* to *country j* in *year t* (X_{ijt}) are a function of the incomes and populations of both countries, and the geographical distance separating them. EU_{ijt} and $NAFTA_{ijt}$ represent integration dummy variables, included to capture the effects of these integration agreements on exports. In the usual way, the error term, μ_{ijt}, is assumed to be statistically well-behaved.

Summary statistics for all of the independent variables are given in the previous chapter (see Table 3.1 in Chapter 3).

4.3 BENCHMARK OLS ESTIMATES

We start by estimating the basic gravity model with ordinary least squares (OLS) to ascertain whether our dataset performs as expected, and so that we have benchmark estimates to compare against later results from more sophisticated empirical specifications.

Our *a priori* expectations are that the coefficients on both income variables will be positive. Higher host country (*j*) income increases the demand for imports and higher source country income (*i*) increases the maximum potential supply of exports. Both population coefficients are expected to be negative. Hamilton and Winters (1992) suggest that population is a proxy for the physical size of a country and that larger source countries have less need to export and larger host countries are more self sufficient and thus have less need to import. As distance is a proxy for transport costs it is expected to have a negative effect on exports.

Table 4.1 Summary Statistics for the Dependent Variable (Exports)

Year	*Observations*	*Mean*	*Standard Deviation*	*Minimum Value*	*Maximum Value*
1992 – 2003	4990	4.95	11.8	0	162.0
1992	295	4.74	10.1	0.03	96.3
1993	325	4.36	9.5	0.04	104
1994	352	4.72	10.2	0.04	117
1995	339	5.51	11.5	0.02	126
1996	395	5.62	12.1	0.02	130
1997	378	5.91	12.8	0.04	144
1998	369	6.22	13.6	0.03	146
1999	292	6.49	13.8	0.03	153
2000	564	4.53	12.8	0	162
2001	564	4.23	11.6	0	147
2002	553	3.79	10.0	0	142
2003	564	4.78	12.5	0	147

Regional integration agreements reduce tariffs and non-tariff barriers (NTBs) between member countries. As this reduces the cost of trade we expect exports from one RIA member to another to be greater than trade between two countries who are not both members of a common RIA. The coefficient on the EU_{ijt} and $NAFTA_{ijt}$ dummies are therefore expected to be positive.

Table 4.2 reports the results for the benchmark OLS estimates. As we would expect, equation 4.1 shows that the basic gravity model performs well in explaining the variability of exports in our dataset. The *adjusted-R^2* of 0.81 indicates that 81% of the variability in exports is explained by variability in the gravity variables – this is considerably higher than the *adjusted-R^2* for the comparable FDI regression (see the results for equation 3.1. of the previous chapter). There is therefore less unexplained variability in the dependent variable (after the inclusion of the standard gravity variables) in the case of exports than FDI[3].

All of the gravity variables are statistically significant at the 1% level. In addition, they all have the expected sign, with the exception of the source country population (N_i) which is positive. We interpret the coefficient of Y_i of 0.52 as implying that a 1% increase in the income of the source country leads to an increase in exports from the source country of 0.52%, holding all else constant. This means that exports are (home country) income inelastic, whereas FDI was income elastic (coefficient of 2.24). This suggests that as a country becomes richer, outward FDI will increase relative to exports.

[3] There are a greater number of observations in the exports regression (4,898) than the FDI regression (3,884) due to better coverage and reporting of trade data than investment data (particularly for developing countries). Also, countries typically have more export destinations than they do investment destinations.

Table 4.2 Benchmark OLS Estimates

	4.1	*4.2*	*4.3*	*4.4*
α	-12.19 (23.2)	-12.74 (24.1)	-12.28 (24.1)	-12.25 (23.8)
ln Y_i	0.52 (11.1)	0.57 (12.1)	0.55 (12.1)	0.55 (12.0)
ln Y_j	0.83 (75.7)	0.81 (71.0)	0.79 (71.6)	0.79 (71.6)
ln N_i	0.34 (7.1)	0.28 (5.9)	0.27 (5.9)	0.27 (5.9)
ln N_j	-0.13 (13.2)	-0.12 (11.7)	-0.10 (10.8)	-0.10 (10.8)
ln d_{ij}	-0.76 (69.1)	-0.71 (53.9)	-0.64 (46.9)	-0.64 (46.8)
$Lang_{ij}$			0.50 (11.3)	0.50 (11.3)
$Border_{ij}$			0.65 (13.6)	0.65 (13.2)
EU_{ij}				0.26 (7.8)
$NAFTA_{ij}$				0.32 (1.84)
RIA_{ij}		0.24 (6.9)	0.26 (7.9)	
F-statistic	1337 (16,4881)	1273 (17,4880)	1256 (19,4878)	1193 (20,4877)
$\overline{R}^2$	0.81	0.82	0.83	0.83
Obs.	4,898	4,898	4,898	4,898

Notes: Dependent variable is the natural log of exports from country i to j. Figures in parenthesis beneath the estimated coefficients are absolute t ratios. Year dummies are included in all regressions, but are not reported.

The coefficient on Y_j is of a similar magnitude (0.83) and implies that a 1% increase in the GDP of the host country increases exports from the source country by 0.83%[4]. Once again, this implies that exports are inelastic with respect to host country income (this is also the case for FDI – coefficient of 0.86)[5].

As we have mentioned, the coefficient on home country population is positive which is contrary to expectations. Following the argument of Hamilton and Winters (1992), countries with a larger population should have less need to export (due to greater domestic demand). The positive coefficient, however, indicates that a higher population is associated with greater exports, holding all else constant.

As expected, the coefficient on host population (N_j) is negative, suggesting that for a given level of income a higher population implies lower per capita GDP and hence less domestic demand (for both domestic goods and imports).

The distance coefficient takes the expected negative sign with the value of 0.76 implying that a 1% increase in the geographical distance between the source and host countries results in a reduction in exports of 0.76%.

The standard gravity model is augmented to include our basic integration dummy variable (RIA_{ijt}) in equation 4.2. The coefficient is positive and statistically significant at the 1%

[4] Note that the coefficient on Y_j also implies that a 1% increase in the GDP of the host country will lead to an increase of 0.83% in total imports.
[5] Note, however, that exports are elastic with respect to aggregate GDP, so it does follow that trade has grown faster than world GDP.

level. As we have said before we must be careful in making literal interpretations of the coefficients, however, the value of 0.24 implies that exports between 'insiders' will be 128% the magnitude of exports between 'outsiders', all else being equal. This coefficient is lower in magnitude than it was for FDI, indicating that the positive impact of integration agreements is greater for FDI than it is for exports. The inclusion of the integration dummy in equation 4.2 has little effect on the other explanatory variables in the regression.

In equation 4.3 we introduce additional dummy variables to account for the possible effects of a common border and common language between the source and host countries. Both variables are significant at the 1% level. The coefficient of the common language dummy ($Lang_{ij}$) has a value of 0.50, which implies that exports between two countries that share the same language are 166% ($e^{0.50}$) the magnitude of exports between two countries that have different native languages (holding all else constant).

We would expect geographical distance to have a greater impact on trade costs than on investment costs. This is confirmed by the absolute magnitude of the coefficient on the distance variable being greater for the export regressions than it was for the FDI regressions[6]. The common border dummy is statistically significant at the 1% level and the coefficient of 0.65 implies that exports between contiguous countries are 194% the magnitude of exports between countries that do not share a common border. The magnitude of the common border coefficient is roughly twice the magnitude in the

[6] Whereas it is reasonable to assume that transport costs increase proportionally with distance, investment-related costs (e.g. communication costs) do not double when the distance between countries doubles.

exports regressions as it is the FDI regressions – providing further support for the theory that distance is a more important determinant of the volume of exports than it is of FDI.

The final column in Table 4.2 reports the results when the integration dummy is divided into two dummies, each separately reflecting the existence of the EU and NAFTA. The EU dummy is statistically significant at the 1% level, and the NAFTA dummy is significant at the 10% level. The coefficient of 0.26 on the EU dummy is identical to that for the combined integration dummy (RIA_{ijt}) in equation 4.3. The NAFTA coefficient is slightly larger at 0.32, and implies that exports between two members of NAFTA are 138% of the value we expect between two countries that are not both members of NAFTA[7]. The value for the EU dummy is approximately half the value it was for FDI, while the NAFTA dummy was not statistically significant in the FDI model. This suggests that the EU provides a slightly greater stimulant to FDI than it does to exports, but NAFTA provides a greater boost to exports than it does to investment[8].

[7] Or to put it another way, the coefficients imply that exports between two countries will increase by 29% (38%) when they both become members of the EU (NAFTA).

[8] Although both the EU and NAFTA have introduced many investment-related provisions (such as equal treatment for foreign companies, dispute mechanisms etc), the EU is undoubtedly more deeply integrated than NAFTA. Furthermore, the NAFTA countries may be more natural trading partners than the EU members (perhaps due to their distance from many of the other developed countries of the world). These factors, amongst others, may explain why NAFTA seems to act as a greater stimulant to intra-regional trade than the EU, and also why the EU has a greater effect on FDI than it does on exports.

4.4 EXTENDING THE MODEL

4.4.1 Additional Explanatory Variables

As in the previous chapter, we now investigate the effect of adding additional explanatory variables to the model and of disaggregating the dataset by year.

Table 4.3 reports the results when we introduce various additional explanatory variables into the model. To permit comparison with the analysis of FDI, we utilise the same seven variables as used in the previous chapter, namely: annual per capita income growth; lagged inflation rate; the Corruptions Perceptions Index (CPI); unit labour costs (ULC); a measure of electrical efficiency; the level of urbanisation; and the number of internet connections per thousand population. All variables refer to the host country (*j*) and are as described in the previous chapter (see Table 3.5 of Chapter 3 for summary statistics).

Equation 4.5 includes per capita income growth of the host economy as an additional explanatory variable. The coefficient is positive and statistically significant at the 1% level. As we would expect, the result suggests that higher income growth in the host economy results in an increase in imports (i.e. exports from other countries). The inclusion of the additional explanatory variable has very little effect on the other independent variables (they all remain statistically significant at the 5% level and of approximately the same magnitude)[9].

[9] The only exception is $NAFTA_{ijt}$ which is significant at the 10% level.

The lagged inflation rate is included in equation 4.6. Again, it has very little impact on the other explanatory variables, with all coefficients retaining their statistical significance and approximate magnitude. The inflation rate coefficient is statistically significant at the 1% level and its negative value indicates that a higher rate of inflation in the host country discourages exports from other countries. In alternative specifications (not reported here for brevity) we include the current inflation rate and the inflation rate lagged two periods. The results are very similar to those reported for equation 4.6, with both alternative inflation variables statistically significant at the 1% level and of negative sign.

The inclusion of the host country's Corruption Perceptions Index (CPI) value has more of an effect on the other explanatory variables. The coefficients on both income variables fall in magnitude while the coefficients on the population variables increase (the host population coefficient actually becomes positively signed). The EU dummy falls in magnitude from 0.26 (in equation 4.4) to 0.18. There is virtually no change in the NAFTA dummy. The coefficient on the CPI_j variable is itself positive and significant at the 1% level. Its value of 0.09 implies that a less corrupt environment (or at least the perception of less corruption) is more conducive to attracting exports.

As in the previous chapter, we run an auxiliary regression to ascertain whether the effect on the explanatory variables of introducing the CPI_j variable is directly due to the variable itself, or rather because its introduction results in quite a severe loss in the number of available observations (recall that the CPI index is not available prior to 1994). Equation 4.13 (see Table 4.4) reports the results for equation 4.4 restricted to those observations for which there is a CPI_j observation. It is evident that the majority of the impact on the existing explanatory variables stems from the reduction in the number of observations and not because of the introduction of the CPI_j variable itself. However, the impact on the host country population variable would seem to derive purely from the inclusion of the CPI_j variable and not from the reduction in observations[10].

In equation 4.8 we include the unit labour cost (ULC) of the host country. It would appear that this results in an increase in the coefficients on the two integration dummies but, as with the CPI variable, we cannot be sure whether this is due to the inclusion of the variable itself or because of the reduction in observations (to 2,746) that it entails. Equation 4.14 in Table 4.4 reports the results of re-estimating equation 4.4 restricted to observations for which there is an observation for ULC_j. It appears that the increase in the magnitude of the integration dummies is due to the reduction in observations, and not because of the inclusion of ULC_j *per se*. The effect on the host population variable appears to be primarily due to the inclusion of ULC_j however[11]. Note also that the adjusted-R^2 is the same in both equations, so it is not the inclusion of ULC_j itself that has resulted in the increase in the amount of explained variability.

[10] This is probably due to the high negative correlation between the CPI and host population variables (-0.36).
[11] Correlation between the ULC and host population variables in -0.09.

Table 4.3 Results for Additional Explanatory Variables

Explanatory Variables	***4.4***	***4.5***	***4.6***	***4.7***	***4.8***	***4.9***	***4.10***	***4.11***	***4.12***
$\ln Y_i$	0.55	0.54	0.55	0.46	0.89	0.71	0.56	0.64	0.84
	(12.0)	(11.9)	(12.0)	(8.9)	(18.3)	(14.9)	(12.2)	(13.5)	(14.8)
$\ln Y_j$	0.79	0.80	0.79	0.68	0.71	0.68	0.77	0.73	0.44
	(71.6)	(73.2)	(71.4)	(36.4)	(22.8)	(51.0)	(56.4)	(51.7)	(9.6)
$\ln N_i$	0.27	0.28	0.28	0.37	-0.12	0.09	0.27	0.17	-0.05
	(5.9)	(6.2)	(5.9)	(7.1)	(2.44)	(1.88)	(5.7)	(3.56)	(0.88)
$\ln N_j$	-0.10	-0.12	-0.10	0.05	0.02	-0.04	-0.08	-0.06	0.33
	(10.8)	(12.7)	(10.5)	(2.31)	(0.64)	(3.66)	(5.6)	(4.7)	(6.8)
$\ln d_{ij}$	-0.64	-0.64	-0.64	-0.68	-0.72	-0.59	-0.65	-0.62	-0.75
	(46.8)	(46.7)	(46.7)	(42.2)	(46.5)	(40.0)	(46.1)	(42.9)	(39.6)
EU_{ij}	0.26	0.25	0.26	0.18	0.33	0.30	0.27	0.30	0.30
	(7.8)	(7.3)	(7.7)	(4.61)	(10.5)	(8.5)	(7.9)	(8.6)	(7.6)
$NAFTA_{ij}$	0.32	0.32	0.32	0.32	0.36	0.34	0.30	0.31	0.38
	(1.84)	(1.87)	(1.83)	(1.75)	(2.39)	(1.89)	(1.73)	(1.77)	(2.29)
$Lang_{ij}$	0.50	0.49	0.49	0.42	0.44	0.48	0.50	0.47	0.37
	(11.3)	(11.2)	(11.2)	(8.1)	(9.4)	(10.4)	(11.3)	(10.4)	(6.4)
$Border_{ij}$	0.65	0.67	0.65	0.62	0.63	0.71	0.64	0.69	0.61
	(13.2)	(13.9)	(13.3)	(10.9)	(14.6)	(14.1)	(13.1)	(13.9)	(11.7)
$Income\ Growth_j$		0.03							0.03
		(10.6)							(5.3)
$\dot{P}_{j,t-1}$			-0.0003						-0.0001
			(3.56)						(0.53)
CPI_j				0.09					0.04
				(9.4)					(3.48)
ULC_j					0.08				0.28
					(1.63)				(4.3)
EE_j						0.03			0.001
						(10.3)			(0.27)
$Urban_j$							0.002		0.01
							(2.56)		(8.02)
$Internet_j$								0.0007	0.0003
								(5.6)	(1.59)
F-statistic	1193	1168	1134	1073	963	1019	1138	1047	666
	(20,4877)	(21,4876)	(21,4869)	(18,3831)	(20,2725)	(19,3807)	(21,4876)	(20,4256)	(21,1862)
$\bar{R}^2$	0.83	0.83	0.83	0.83	0.88	0.83	0.83	0.83	0.88
Obs.	4,898	4,898	4,891	3,850	2,746	3,827	4,898	4,277	1,884

Notes: Dependent variable is the natural log of exports from country i to j. Figures in parenthesis beneath the estimated coefficients are absolute t ratios. Year dummies are included in all regressions, but are not reported. Constant term is not reported.

Table 4.4 Restricted Number of Observations

Explanatory Variables	*4.13*	*4.14*
α	-11.97 (20.0)	-14.83 (26.9)
$ln\ Y_i$	0.48 (9.1)	0.89 (18.5)
$ln\ Y_j$	0.81 (62.8)	0.76 (49.4)
$ln\ N_i$	0.36 (6.7)	-0.13 (2.55)
$ln\ N_j$	-0.11 (9.8)	-0.02 (1.49)
$ln\ d_{ij}$	-0.68 (41.8)	-0.73 (49.3)
EU_{ij}	0.20 (5.1)	0.33 (10.5)
$NAFTA_{ij}$	0.31 (1.66)	0.34 (2.25)
$Lang_{ij}$	0.48 (9.3)	0.44 (9.3)
$Border_{ij}$	0.61 (10.6)	0.63 (14.6)
F-statistic	1106 (17,3832)	1013 (19,2726)
$\bar{R}^2$	0.83	0.88
Obs.	3,850	2,746

Notes: Dependent variable is the natural log of exports from country i to j. Figures in parenthesis beneath the estimated coefficients are absolute t ratios. Time dummies are included in all regressions, but are not reported.

Our measure of electrical efficiency (a proxy for infrastructure sophistication of the host country) is included in equation 4.9. EE_j is statistically significant at the 1% level and the positive coefficient implies that a host country with more developed infrastructure attracts greater exports[12]. Its inclusion in the regression specification has a limited effect on the other explanatory variables (although the coefficients on the population variables fall in significance, this is again due to a reduction in available observations as opposed to the specific inclusion of the EE_j variable).

Equation 4.10 incorporates the level of urbanisation in the host country as an additional explanatory variable[13]. This variable is statistically significant at the 1% level and the positive coefficient indicates that the more urbanised the host country is the more exports it is likely to attract. The inclusion of the measure of urbanisation has little effect on the other explanatory variables.

In equation 4.11, we include the number of internet connections per thousand population of the host country. We can think of this variable as a proxy for both the sophistication of the technology and communication infrastructure in the host country and for the technical sophistication of the population in general. This variable is statistically significant at the 1% level and the positive coefficient implies that a greater number of internet connections (for a given population) is associated with a greater value of imports. The inclusion of this variable has little effect on the other explanatory variables.

[12] Electrical efficiency may proxy infrastructure sophistication, which in turn may be correlated with distribution costs in the host country – lowering final market prices for exports.
[13] By 'urbanisation' we mean the percentage of the total population living in urban areas.

Finally, in equation 4.12, all of the additional explanatory variables are introduced together. Under this specification, the lagged inflation rate, electrical efficiency and internet variables are statistically insignificant. The unit labour costs, urbanisation, income growth and corruption variables are all statistically significant at the 5% level[14]. The EU and NAFTA dummies retain their approximate magnitude and remain statistically significant at the 5% level. There is an interesting effect on the income and population variables of the host (j) country; the coefficient on Y_j drops in magnitude and the coefficient on N_j becomes positive (both are statistically significant at the 1% level). This suggests that in the 'basic' gravity model, the income and population variables are capturing some effects that may be more directly attributable to a range of other factors[15].

The inclusion of additional explanatory variables has had limited impact on the dummy variables and (albeit to a lesser extent) the gravity variables[16]. For clarity, Figure 4.1 plots the estimated coefficients of the two integration dummies according to the different model specifications reported in Table 4.3.

Figure 4.1 illustrates that the EU dummy was more sensitive to the inclusion of additional explanatory variables than the NAFTA dummy. Indeed, the estimated coefficient of the NAFTA remained perfectly stable across equations 4.5 – 4.7. The minimum (0.18 in

[14] ULC_j and $Urban_j$ have actually risen in statistical significance, but we should note that this may have been influenced by the reduction in the number of available observations as opposed to the change in regression specification.

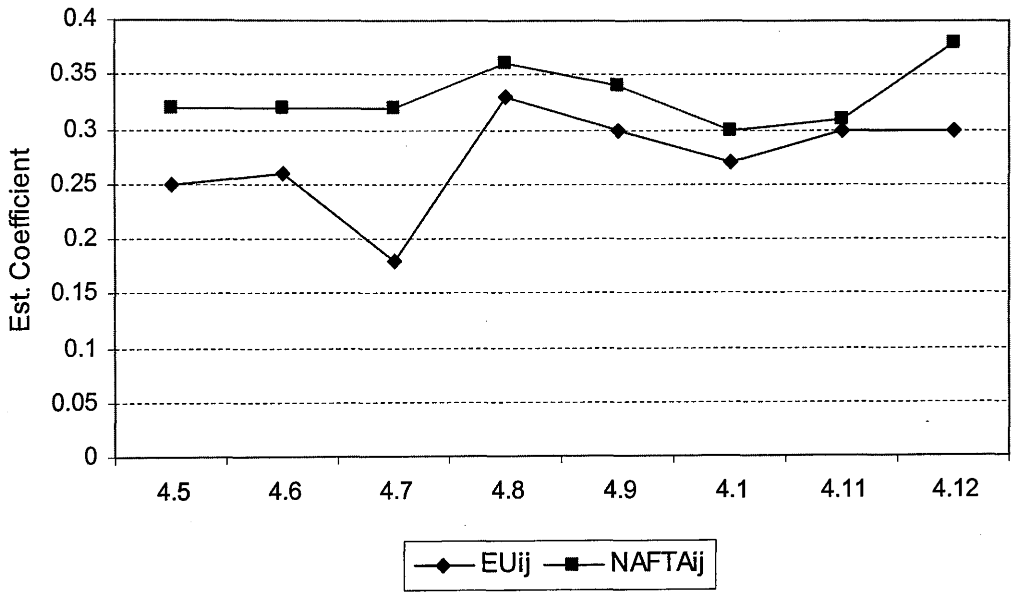
[15] In order to ensure that the change in the host income and population variables was not due solely to the reduction in the number of available observations in equation 4.12, we estimated the 'basic' gravity model (i.e. gravity variables plus integration, common language and border dummies) restricted to the 1,884 observations available in equation 4.12. The coefficient values (and t-ratios) for Y_j and N_j were 0.76 (40.5) and -0.02 (0.88) respectively.

[16] We have demonstrated that where there has been a marked impact, this is typically ascribable to a loss in the number of observations available.

equation 4.7) and maximum (0.33 in equation 4.8) values for the EU dummy both resulted from a reduction in the number of available observations and not because of the introduction of the additional explanatory variable itself. Discounting these equations, the EU dummy coefficient was far less subject to fluctuation. The maximum coefficient value (0.36 in equation 4.8) for the NAFTA dummy was also the product of a limited number of observations. We can therefore conclude that the integration dummies were very stable to the inclusion of a range of additional explanatory variables. Furthermore, it is encouraging to see the EU and NAFTA dummies fluctuating in a similar manner for equations 4.8 – 4.12, because it suggests that the inclusion of the additional explanatory variables is accounting for information previously captured by the dummy variables.

We also see from Table 4.3 that the coefficient on the distance variable varies little, between a minimum of -0.75 and a maximum of -0.59. The income and population variables for the source country vary to a greater extent, although again the largest variation is due to a loss in observations and not the inclusion of a specific variable *per se*. The host income and population variables also fluctuate, although this is less pronounced than for the source country variables. Note that for both the source and host variables, income and population are virtually the mirror image of one another.

Figure 4.1 Sensitivity of Integration Dummies to Additional Explanatory Variables



It is clear from Table 4.3 that the coefficients on both the common language and common border dummies are extremely stable, with both estimated coefficients varying by less than 0.1 throughout.

The results reported in Table 4.3 afford us some confidence that our model specification of equation 4.4 is fairly stable and insensitive to the inclusion of additional explanatory variables. In particular, the coefficients on the integration dummies remain within a relatively narrow range and always retain their statistical significance (even when the number of available observations is severely reduced). Although each of the additional explanatory variables was itself statistically significant, none of them had a marked effect on the explanatory power of the regression, suggesting that they are not major determinants of the level of exports between trade partners.

Furthermore, we cannot be sure of the direction of causality between the dependent and independent variables. It may be the dependent variable that is influencing the explanatory variables (and not vice versa). For example, as a country imports more, exporters may demand improved infrastructure. To the extent that the sophistication of infrastructure is correlated with electricity efficiency, this would result in higher exports (i.e. higher imports to the host country) driving improved electrical efficiency.

4.4.2 Annual Analyses

The aim of this section is to investigate changes in the estimated coefficients (especially EU_{ijt} and $NAFTA_{ijt}$) over time. The inclusion of additional explanatory variables in the previous section indicated that the gravity variables and integration dummies may be sensitive to restrictions in the number of observations used to estimate the regressions. In this section we divide the dataset into 13 individual year cross-sections. Given the improvement in data availability in recent years, the later cross-sections have considerably more observations than the earlier ones and we should bear this in mind when comparing the results from different years.

Table 4.5 reports the results when the model is run for each year separately. It is evident that the coefficients on Y_i and N_i are extremely sensitive to the year of estimation. The coefficients on Y_j and N_j remain relatively stable through time. Once again, notice the symmetry of the income and population variables for both the source and host countries. These results indicate that the model is very unstable when run separately for each year. Perhaps this is not surprising given that exports can vary substantially in the short run. This instability in the estimated coefficients suggests that it is more appropriate to estimate the impact of the explanatory variables over a longer time period than a single year.

The variation in the distance variable across time is interesting because there is a clear increase in the estimated effect of distance (with the coefficient falling from -0.52 to -0.79 between 1992 and 2003). This is surprising given that shipping and haulage costs continue to fall over time. However, even if these costs are falling in absolute terms, they may be increasing as a percentage of total production costs. This could explain the trend we have observed in the estimated parameter of the distance variable over time.

Table 4.5 Regression Results for Individual Years

Explanatory Variables	*4.15 1992*	*4.16 1993*	*4.17 1994*	*4.18 1995*	*4.19 1996*	*4.20 1997*	*4.21 1998*	*4.22 1999*	*4.23 2000*	*4.24 2001*	*4.25 2002*	*4.26 2003*
α	-15.80	-12.46	-10.77	-15.26	-14.13	-14.34	-14.82	-16.30	-8.45	-7.35	-7.13	-6.87
	(8.5)	(6.9)	(6.2)	(8.0)	(8.8)	(9.4)	(9.6)	(9.6)	(4.8)	(4.2)	(3.82)	(3.83)
$\ln Y_i$	1.11	0.81	0.73	1.05	0.98	1.07	1.05	1.35	0.32	0.17	0.41	0.53
	(6.7)	(4.9)	(4.9)	(6.5)	(7.1)	(8.4)	(8.0)	(8.7)	(1.87)	(1.00)	(2.33)	(3.07)
$\ln Y_j$	0.73	0.67	0.68	0.70	0.67	0.64	0.72	0.74	0.88	0.89	0.85	0.86
	(19.5)	(18.0)	(19.3)	(17.0)	(17.4)	(17.6)	(21.1)	(19.3)	(26.6)	(27.3)	(22.3)	(24.7)
$\ln N_i$	-0.32	-0.05	-0.01	-0.28	-0.20	-0.29	-0.20	-0.50	0.54	0.68	0.40	0.28
	(1.89)	(0.30)	(0.04)	(1.73)	(1.38)	(2.19)	(1.57)	(3.29)	(3.18)	(4.0)	(2.27)	(1.67)
$\ln N_j$	-0.16	-0.08	-0.10	-0.09	-0.08	-0.06	-0.10	-0.09	-0.13	-0.11	-0.07	-0.08
	(4.6)	(2.42)	(3.14)	(2.58)	(2.45)	(1.91)	(3.46)	(2.72)	(4.4)	(3.97)	(2.42)	(2.62)
$\ln d_{ij}$	-0.52	-0.51	-0.52	-0.50	-0.53	-0.54	-0.66	-0.68	-0.73	-0.74	-0.78	-0.79
	(11.5)	(11.2)	(11.8)	(9.5)	(11.0)	(11.8)	(14.7)	(13.5)	(16.8)	(17.6)	(17.1)	(17.5)
$Lang_{ij}$	0.41	0.53	0.52	0.33	0.32	0.33	0.47	0.55	0.62	0.63	0.71	0.65
	(2.87)	(4.0)	(3.85)	(2.24)	(2.23)	(2.50)	(3.58)	(4.2)	(3.92)	(4.0)	(4.5)	(4.3)
$Border_{ij}$	0.83	0.85	0.75	0.94	0.86	0.74	0.48	0.49	0.35	0.35	0.33	0.36
	(5.3)	(5.7)	(5.1)	(5.9)	(5.4)	(5.1)	(3.45)	(3.15)	(1.96)	(2.04)	(1.81)	(1.99)
EU_{ij}	0.46	0.49	0.45	0.40	0.38	0.32	0.09	0.14	-0.01	-0.05	0.004	-0.004
	(3.66)	(4.12)	(3.96)	(3.39)	(3.41)	(2.98)	(0.89)	(1.22)	(0.13)	(0.44)	(0.03)	(0.04)
$NAFTA_{ij}$			0.39	0.01	0.10	0.28	0.66	0.72	0.92	0.84	0.88	0.71
			(1.79)	(0.02)	(0.20)	(0.58)	(1.45)	(1.59)	(1.61)	(1.51)	(1.59)	(1.30)
F-statistic	210 (8,286)	205 (8,316)	180 (9,342)	159 (9.329)	176 (9,385)	178 (9,368)	228 (9,359)	173 (9,282)	321 (9,519)	343 (9,519)	282 (9,464)	303 (9,474)
$\bar{R}^2$	0.85	0.83	0.82	0.81	0.80	0.81	0.85	0.85	0.85	0.85	0.84	0.85
Obs.	295	325	352	339	395	378	369	292	529	529	474	484

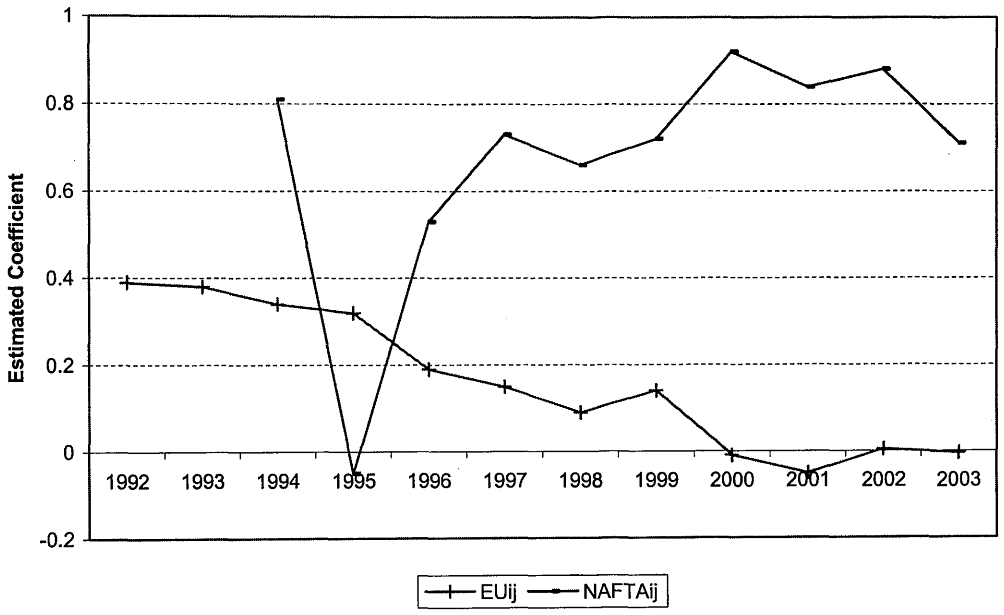
Notes: Dependent variable is the natural log of exports from country i to country j. Figures in parentheses are the absolute t-ratios.

Figure 4.2 shows the change in the two integration dummy variables for each year regression. There is a clear downward trend in the magnitude of the EU coefficient, suggesting that the positive effect on trade between any pair of EU 'insiders' has been decreasing during the nineties. In fact, the coefficient is not statistically different from zero (at the 10% level) from 1997 onwards. We found a similar effect for FDI flows in the previous chapter and hypothesised that this effect may be due to the completion of the Single European Market in 1992 (i.e. the implementation and completion of the SEA had a strong positive effect on trade which has petered out over time).

By comparison, the estimated parameter for the NAFTA dummy reveals no apparent trend and only attains statistical significance once (at the 10% level), for the year 1994. This should not cause undue concern however, as it may simply be the case that the individual year regressions do not afford sufficient observations to allow the NAFTA dummy to be adequately estimated. When the years are pooled together (i.e. in equation 4.4 in Table 4.2), the estimate on the NAFTA dummy is statistically significant at the 1% level.

The common language and common border dummies remain statistically significant throughout. Strangely, the two dummies appear to exhibit a striking level of symmetry, whereby an increase in the coefficient of one dummy is accompanied by a fall in the coefficient of the other. After 1995, the common language coefficient exhibits an upward trend and the common border coefficient a downward trend. This suggests that in recent years a common language is becoming ever more important in facilitating international trade, whereas a common border is becoming less so.

Figure 4.2 The Estimated Values of the Integration Dummies, 1992 – 2003



4.4.3 Insider and Outsider Effects

As in the previous chapter, we now extend the empirical analysis to investigate whether RIAs have an impact on trade between an 'outsider' and an 'insider'. To this end, we employ the additional integration dummies introduced in the previous chapter – nEU_iEU_j, nNA_iNA_j, EU_inEU_j, and NA_inNA_j. nEU_iEU_j takes the value unity when the investor in not an EU member but the host country is. Likewise, nNA_iNA_j, has unit value when the investor is not a NAFTA member but the host is. EU_inEU_j takes the value unity when the investor country is a member of the EU but the host country is not. NA_inNA_j takes the value unity when the investor is a NAFTA member but the host is not.

Table 4.6 reports the results when we introduce the additional integration dummies into the model. In the previous chapter, the inclusion of the additional integration dummies resulted in a sizeable increase in the magnitude of the estimated coefficients on the integration dummies (EU_{ijt} and $NAFTA_{ijt}$). A similar effect occurs here for the EU_{ijt} dummy (coefficient is 0.46 in equation 4.27 compared with 0.26 in equation 4.4), but the $NAFTA_{ijt}$ dummy falls slightly in magnitude (and is still not statistically significant). There is also limited effect on the other explanatory variables, although source-country population is no longer statistically significantly.

The estimated coefficient for nEU_iEU_j is not statistically significant. This means that we have been unable to detect an impact on flows on FDI from 'outsiders' due to the formation of the EU. The coefficient on nNA_iNA_j is statistically significant at the 1% level. It has a negative coefficient, which indicates that NAFTA has resulted in a reduction in exports from non-members to members. This accords well with theory, which argues that the formation of a RIA will encourage 'outsiders' to replace exports with 'tariff-jumping' FDI in order to gain access to the enlarged market. We have already discussed anecdotal evidence pertaining to Mexico that would seem to fit with this empirical finding. Following its membership of NAFTA, Mexico was fortunate to receive considerable inflows of FDI from non-member countries keen to exploit the enlarged RIA-market and to avoid tariffs and quotas on their imports into the region. To the extent that these investments have been responsible for generating output which has displaced exports from the non-member countries, we would expect to find a negative coefficient on the nNA_iNA_j dummy variable.

A similar story can be told of Ireland (and likely holds true for other EU members), so in this regard it is somewhat surprising that we have not found a statistically significant negative coefficient for the nEU_iEU_j. Indeed, there is evidence in the literature that the EU has discouraged exports from non-member countries. For example, Sapir (1997), reports that increased integration within the EU has negatively impacted exports from non-members into EU countries. He argues that this effect has encouraged European countries that are not members of the EU to apply for membership.

The EU_inEU_j coefficient is statistically significant at the 1% level. Its positive value suggests that the EU has resulted in higher exports from members to non-members than would otherwise have been the case. The estimated coefficient of 0.29 indicates that exports from an EU member to a non-member are 34% greater than exports between two 'outsiders'.

Conversely, the estimated coefficient on NA_inNA_j is negative, suggesting that NAFTA has resulted in fewer exports from 'insiders' to 'outsiders' than would otherwise have been the case. The estimated coefficient of 0.20 suggests that exports from a NAFTA member to a non-member are 22% less than exports between two outsiders. Unfortunately, the reason for the different effect for the EU and NAFTA is not obvious. The negative coefficient for NA_inNA_j may simply be a reflection of the geographical remoteness of the US from most of its major trading partners (if this is not being adequately captured by the distance variable).

Table 4.6 Insider and Outsider Effects

Explanatory Variables	*4.27*
***ln* Y_i**	0.94 (14.6)
***ln* Y_j**	0.82 (66.7)
***ln* N_i**	-0.08 (1.29)
***ln* N_j**	-0.12 (12.0)
***ln* d_{ij}**	-0.64 (12.9)
$Lang_{ij}$	0.53 (12.0)
$Border_{ij}$	0.62 (12.9)
EU_{ij}	0.46 (8.8)
$NAFTA_{ij}$	0.27 (1.53)
nEU_iEU_j	0.01 (0.30)
nNA_iNA_j	-0.32 (6.4)
EU_inEU_j	0.29 (6.7)
$NA_i\, nNA_j$	-0.20 (3.6)
F-statistic	1,022 (24,4873)
$\bar{R}^2$	0.84
Obs.	4,898

Notes: dependent variable is the natural log of exports from country i to j. Figures in parentheses underneath the estimated coefficients are absolute t-ratios. Year dummies are included in all regressions, but are not reported.

4.5 CONCLUSION

As expected, the results reported in this chapter suggest that the EU and NAFTA have stimulated intra-regional trade. Benchmark OLS results imply that an EU member will, on average, export 29% more to a fellow EU member than a non-member (all else being equal). Furthermore, the impact of NAFTA on exports is found to be even greater at 38%.

These 'integration effects' are robust to the inclusion of a range of additional explanatory variables. Indeed, when all seven additional variables were included in the regression specification simultaneously, the estimated magnitude of the integration effects increased (to 35% for the EU and 46% for NAFTA).

These results accord well with preceding empirical studies, the majority of which tend to find in favour of the hypothesis that regional integration agreements lead to increases in intra-regional trade. For example, Aitken (1973), using cross-section data from 1951 to 1967, finds that the European Economic Community (EEC) experienced cumulative growth in internal gross trade creation during the years 1958 to 1967[17]. Frankel and Rose (2001) report statistically significant results that indicate that two members of a common

[17] Aitken also finds that the European Free Trade Agreement (EFTA) resulted in positive internal trade effects between 1961 and 1967. He argues that his finding that the EEC was more trade stimulating than EFTA provides support for the notion that deeper integration results in greater trade creation.

RIA will trade more with each other than two countries that are not in a common RIA, all else being equal[18].

However, not all studies have found in favour of increased intra-regional trade. Soloaga and Winters (1999) employ the gravity model approach to investigate nine major regional blocs between 1980 and 1996[19]. They report a statistically significant negative effect for European Union intra-regional trade[20]. Unfortunately, the authors offer little explanation as to why membership of the EU might discourage intra-regional trade.

A comparison of the results of this chapter with those reported in Chapter 3 for FDI flows is instructive. The coefficient value for the EU dummy in this chapter is approximately half the magnitude it was in the previous chapter. However, the NAFTA dummy is positive and statistically significant in this chapter, whereas it was statistically insignificant in the previous chapter. This suggests that the EU provides a slightly greater stimulant to FDI than it does to exports, but NAFTA provides a greater boost to exports than it does to investment[21]. Such a finding is probably due to a number of connected factors. For instance, the trade and investment provisions enshrined within the respective integration agreements will undoubtedly play a considerable role. Following on from our

[18] This is actually a secondary finding of the Frankel and Rose (2001) paper. Their main focus is the impact of a common currency, which they find leads to a substantial increase in trade.

[19] The nine pacts investigated by Soloaga and Winters (1999) are: the ANDEAN Community, the Central American Common Market (CACM), the Latin American Integration Association (LAIA), MERCOSUR, NAFTA, the Association of South East Asian Nations (ASEAN), the Gulf Cooperation Council, the European Free Trade Agreement (EFTA), and the European Economic Community (EEC).

[20] They do, however, find a positive effect on intra-regional trade in relation to CACM, LAIA, ANDEAN and MERCOSUR. They also find that NAFTA has a positive effect on intra-regional trade, but this result is not statistically significant.

[21] As expected, geographical distance is a greater deterrent to exports than it is to foreign investment. A common border, however, proves more attractive to exporters than to investors.

earlier discussion of Chapter 2, the EU is generally considered to me more deeply integrated than NAFTA[22]. This would perhaps support the idea that the EU stimulates FDI to a greater extent than NAFTA[23]. However, the investment-related provisions in NAFTA (enshrined in Chapter XI) are extremely comprehensive. They go beyond the requirements of the World Trade Organisation TRIMs Agreement, are reinforced with a most favoured nation clause, and include a comprehensive dispute settlement mechanism (Fahnbulleh and te Velde, 2005). Perhaps, therefore, it is not the extent of the provisions that is of paramount importance, but rather the degree of change that is introduced by these provisions[24]. To further complicate matters, the trade and investment effects of integration agreements will also be heavily influenced by a range of dynamic and interrelated factors, such as changes in relative prices, the size of effective demand, resource endowments within the region, and agglomeration and competition effects. Future work on this topic may look to address these issues more thoroughly in the context of a general equilibrium framework.

We also investigated changes in the estimated coefficients of the integration dummies over time. The EU dummy exhibited a clear downward trend in magnitude over the period, suggesting that the positive effect of the EU on trade has been decreasing as the

[22] Not only has the EU been much longer in the making, it also a range of supranational institutions and policies that are not matched by NAFTA.
[23] Given that FDI typically involves considerable sunk costs, it does not seem unreasonable to suggest that firms would view deeper integration as a significant benefit in relation to FDI (as deeper integration implies less chance of a reversal in investment-friendly policies). Although there are also considerable costs associated with exporting, to the extent that these are not up-front sunk costs, firms may place less store in deeper integration when it comes to exporting within the region.
[24] In other words, even if extensive investment-related provisions are incorporated into an integration agreement, these provisions may have little impact on FDI flows if the member countries were already extremely open to foreign investment prior to the agreement. Conversely, even limited investment provisions may have a substantial effect on FDI if the member countries severely restricted foreign investment prior to the agreement.

integration agreement matures[25]. It is possible that this effect owes much to the implementation of the Single European Market (SEM) Program between 1985 and 1992. The goal of the SEM was to eliminate the remaining restrictions on the exchange of goods and services within the EU, and involved the adoption of nearly 300 measures to eliminate internal non-tariff barriers (OECD, 2005)[26]. These measures will have undoubtedly made it easier and less costly to trade within the EU, leading to an increase in intra-regional trade. To the extent that this stimulus will have been at its most powerful during the years of implementation and perhaps shortly after completion of the SEM in 1992, we might expect to find that the coefficient on the EU dummy falls in magnitude as time progresses. This would be an interesting avenue to pursue in future work using data prior to 1992.

To explore the possibility of trade creation and trade diversion, we introduced additional integration dummy variables. Although the EU appears to have little or no effect on exports from non-member countries, NAFTA seems to have discouraged non-members from exporting to member states. It is not immediately obvious from our analysis whether this effect is due to trade diversion (i.e. more expensive imports from member countries replacing cheaper imports from non-members due to lower trade barriers) or rather a natural result of external firms replacing their exports to the region with "tariff-jumping FDI" (or, of course, a combination of both factors). Although examining a different period, Bayoumi and Eichengreen (1997) report evidence of trade diversion

[25] A similar effect was found in the previous chapter in relation to FDI flows.
[26] These measures fell into five main categories: simplification of border controls; mutual recognition of product standards; deregulation of transportation; equality in public procurement; and deregulation of service sector activities.

during the formation of the EEC. Soloaga and Winters (1999) also "find convincing evidence of trade diversion" for the EU (p.13). However, both of these papers use a relatively simplistic metric to evidence trade diversion, and could therefore be accused of overlooking the possibility that reduced exports from non-members are due to increased tariff-jumping FDI as opposed solely to trade diversion[27].

In the previous chapter we reported results which indicated that both the EU and NAFTA have encouraged increased inward FDI from third countries. When we combine this with the finding from this chapter that EU members seem to export more to non-members than they would otherwise have done, it is more difficult to conclude that the EU has led to trade diversion[28]. NAFTA members, however, appear to export less to 'outsiders' than would otherwise be the case, suggesting it may be more culpable of fostering trade diversion.

Although the focus of this chapter has been the effect of the integration dummies on the dependent variable, the results for the 'standard gravity variables' (i.e. incomes, populations, and distance variables) affords a level of comfort in the suitability of the 'gravity model' as the favoured empirical tool. The coefficients on these variables are within expectations and largely accord with the extant empirical literature.

[27] A reduction in non-members imports, accompanied by an increase in intra-regional trade, is taken as evidence of trade diversion by both Bayou & Eichengreen (1997) and Soloaga and Winters (1999). We would argue that these are necessary, but not sufficient, conditions to evidence trade diversion.
[28] An increase in EU exports to 'outsiders' suggests that trade linkages have strengthened as a result of the EU.

5. THE RELATIONSHIP BETWEEN FOREIGN DIRECT INVESTMENT AND EXPORTS

5.1 INTRODUCTION

A significant subset of the work on international trade and the multinational enterprise has addressed the nature of the relationship between FDI and trade. Stretching back to the 1960s, there has been considerable concern, particularly amongst policymakers and special interest groups, that outward FDI will lead to a loss of employment in the source economy as foreign production displaces domestically produced exports. In severe cases, it is feared that this could even lead to deindustrialisation.

During this time there has been a very favourable change in the general attitude towards globalisation and multinational corporations. Whilst multinational corporations were blamed for all manner of ills that beset countries back in the 1960s, today most governments actively seek to attract them. Though perhaps still lacking conclusive empirical support, it has become a widely held belief that FDI contributes positively to the growth and development of the recipient country. While *intranational* trade is still freer than *international* trade, the Ricardian notion that free trade is welfare enhancing for all participants has been largely embraced.

Despite this, there remains considerable opposition across the world to globalisation, as unfailingly witnessed at World Trade Organisation (WTO) summits. The formation of a new regional integration agreement (RIA) is typically accompanied by considerable concern that it will lead to a loss of jobs. Furthermore, this fear is not the preserve of any one group. For example, plans to implement the Single European Market (SEM) program gave rise to vehement protests from 'outsiders' convinced that "Fortress Europe" would drastically curtail their access to these markets; during NAFTA negotiations US and Canadian special interest groups (i.e. 'insiders') voiced fears that domestic firms would relocate thousands of jobs to Mexico to take advantage of cheap and abundant labour[1].

Often, concern over the perceived costs of globalisation will be voiced only by the minority, with the majority comfortable that the benefits will outweigh the costs[2]. However, to the extent that the minority can exert significant political influence (e.g. trade unions, specialist interest groups etc), they have a real opportunity to derail the progress of globalisation[3]. This is obviously of great concern if we believe that globalisation, through the mechanisms of international investment and free trade, confers considerable benefits across the globe.

Regardless of the explosion in international investment that has been undertaken in recent decades, concern regarding its effect on home exports (and hence domestic employment and the balance of payments) will have undoubtedly resulted in less FDI taking place than

[1] Ross Perot, a former US Presidential Candidate, thought NAFTA would manifest as a "giant sucking sound to the South".

[2] Note that it is not only important for the benefits to outweigh the costs, but also that those costs should not be borne by a minority that are not entitled to compensation. Unless the 'losers' from a RIA are fully compensated out of the gains received by the beneficiaries, a Pareto optimal solution will not have been attained.

[3] An example of this would be the emergency protections implemented by President George W. Bush to protect the US steel industry from overseas imports. Despite the extensive costs inflicted on other US industries (those which make extensive use of steel during manufacturing) and the threat of a trade war with the EU, the political power of the 'Rust Belt' States (Pennsylvania, Ohio, and West Virginia) meant that it was politically expedient to introduce the measures.

would otherwise have been the case. This is unfortunate given the belief that FDI can be growth-enhancing for both home and host nations.

In this chapter we investigate whether outward FDI is in fact accompanied by a reduction in exports. The next section discusses the theoretical arguments regarding the relationship between FDI and exports. As we discussed in chapter 2, our empirical analysis builds on the approach favoured by Graham (1995) – his work is reviewed in section 3. The results of our analysis are discussed in section four. Section five concludes.

5.2 THEORY

Vernon's product-life-cycle theory implicitly assumes that FDI and exports are substitutes (at the individual firm level) as firms opt to invest in production facilities abroad rather than export directly as products mature. While this may have some relevance to the activities of a single firm (although it is clearly overly simplistic), it offers little insight into the relationship between FDI and exports at an aggregate country level. Unfortunately, more recent theoretical models are of little more help.

The horizontal model (also known as the proximity-concentration hypothesis) considers the investment decision to be a trade-off between minimising transport costs and exploiting plant-level economies of scale (Markusen, 1984; Brainard, 1997). If transaction costs are high relative to economies of scale firms will be more inclined to undertake FDI to establish foreign subsidiaries in their target market. If transaction costs are low relative to economies of scale, firms will have an incentive to concentrate production in their home market and export to their target market abroad. Investment induced because of this motivation is often known as "market-seeking" FDI, and is commonly believed to be a substitute for exports (in this scenario FDI and exports are two rival modes of foreign market penetration). "Tariff-jumping" FDI may be thought of as a special case of market-seeking FDI, as tariffs are just one element of aggregate transaction costs (along with transport costs, non-tariff barriers, exchange rate uncertainty etc).

The vertical model (also known as the factor-proportions hypothesis) posits that firms undertake FDI to exploit factor price differentials across countries (Helpman, 1984; Helpman & Krugman, 1985). The motivation for multinationals in this scenario is locating production in its lowest cost geographical location (and hence this type of FDI is commonly known as "efficiency-seeking"). It is difficult to predict the relationship between FDI and exports in this situation as it will surely depend on the activities of the firm prior to it undertaking foreign investment.

Let us consider a number of alternate scenarios. Firstly, imagine a national firm that serves only its domestic market (i.e. no exports). This firm decides to relocate production overseas to take advantage of lower labour costs, importing the product back into its home market[4]. In this case, FDI cannot have lowered existing exports because there were none to begin with, but it is clear that FDI has resulted in a loss of jobs as domestic

[4] The firm has obviously calculated that the labour cost savings outweigh the costs of importing the product back into the home market. A typical example of this would be a small US manufacturer that decided to locate production in Mexico following the implementation of the North American Free Trade Agreement.

production has been replaced by foreign production. However, to the extent that the firm must now export intermediate goods (including "corporate services" or "headquarter services") to its foreign subsidiary, FDI may have led to the creation of exports where there were none before, therefore partially offsetting the loss of domestic production jobs. Note, however, that even if new exports are generated where there were none before, this does not necessarily mean that employment in the source country will increase, as it is likely that these intermediate goods were already being produced (they are now being exported instead of consumed domestically)[5]. Of course, we have assumed that the firm has undertaken FDI because it can make efficiency gains by locating production in the foreign country. This implies that it will be able to lower price and increase quantity sold. All else being equal this should result in greater production which will require more intermediate goods and therefore lead to an increase in employment at home.

Secondly, consider the situation where the firm is initially a national firm that supplies to the domestic market and exports to a single foreign market. The firm determines that it is cheaper to relocate production abroad and export from there both back to its home market and to the foreign market it initially served by exports from home. It is clear in this case that FDI will have acted as a substitute for exports from the home country (though not 'world' exports in aggregate). However, to the extent that FDI leads to the creation of trade in intermediate goods to the foreign subsidiary, the loss in exports from the source country may be partially offset.

[5] However, it may also be reasonable to assume that the overseas subsidiary requires a greater input of intermediate goods per unit of output than the domestic plant did. If this is the case, relocating production abroad will lead to greater employment at home (assuming that the cost of producing the intermediate goods remains constant).

Thirdly, consider the case where the firm is already a multinational, having undertaken horizontal FDI to establish a second plant (in addition to the domestic one) in its target foreign market. It now determines that it would be cheaper to relocate its foreign plant to a third country and export back to the target foreign market[6]. On the surface it would appear that the firm is undertaking FDI with no effect on exports from the home country. However, the effect is more complicated than this, as there may be disinvestment from closing down the original subsidiary (i.e. selling the factory, inventory etc), there will be the creation of exports from the new foreign host to the old, and there may be new intermediate good exports from the host country to the new foreign subsidiary. What we can conclude is that relocation of the foreign subsidiary (i.e. the new FDI) should not lead to a loss of employment in the home economy.

We can introduce a variation on the third scenario to complicate matters further. Assume now that the new foreign subsidiary offers cheap enough production so that it becomes favourable to export not only to the foreign target market, but also back to the home economy. In this case (as in the first scenario we considered) FDI, while not leading to a reduction in home-country exports, may result in a loss of jobs in the home economy as domestic production is replaced by imports from the foreign subsidiary.

We could continue to envisage further plausible scenarios, but our discussion has sufficiently illustrated the point that it is not possible to make an *a priori* prediction for

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[6] Horizontal FDI is essentially being replaced by a combination of vertical FDI and exports.

[8] Even under the vertical scenario in which FDI results in a complete replacement of home-country exports, exports of intermediate goods to the foreign affiliate should offset to some extent the negative relationship between FDI and exports. While this may also be true of horizontal FDI, the offset is likely to be to a lesser extent.

the relationship between FDI and exports in the case of vertical FDI; in some instances they may be complements, in others substitutes. What we can conclude is that the relationship between FDI and exports should be *more positive* (or *less negative)* for vertical FDI than it is for horizontal FDI[8].

5.2.1 Dynamic Effects

Our discussion thus far has focussed on static effects that may influence the FDI-exports relationship. Undoubtedly, however, there will be myriad dynamic effects. For instance, the establishment of a foreign subsidiary motivated by vertical FDI assumes efficiency gains for the firm[9]. This should lead to a reduction in the price of the firm's final good and a corresponding increase in demand. Besides the welfare effect this should confer on the home economy, it should also result in an increase in intermediate good exports as production is increased in the foreign subsidiary to meet higher demand.

In the case of horizontal FDI, the establishment of a foreign subsidiary in a market that was previously served solely by exports may induce a market for the firm's other products (assuming it has multiple products). This may be because the foreign presence improves brand loyalty in the foreign market, or because the firm gains more market intelligence from having a local presence, or because the establishment of the foreign subsidiary has included more advanced marketing and distribution services which can be utilised for other products, or for a number of other reasons. To the extent that these

[9] Obviously this will not always be the case as there will inevitably be instances where foreign investment fails to meet expectations.

other products are supplied by home-country exports, the relationship between FDI and exports may become less negative; even complementary.

On the other hand, it is quite possible that direct investment by one multinational may encourage rival firms from the home market to also undertake FDI so as to protect market share in the overseas market. In fact, rival firms may feel forced to replace exports with local foreign production even when the cost considerations do not favour FDI. Under this scenario, initial FDI by a single firm could potentially result in significant copy-cat behaviour and a considerable reduction in exports from the home industry.

Hopefully we have demonstrated the ambiguity inherent in the relationship between exports and FDI. Theory is inconclusive as to the exact nature of this relationship and so we must turn to empirical approaches to try to resolve the issue. Next we review Graham (1995), and related literature, as he employs an empirical approach which we intend to build on for our own empirical analysis.

5.3 REVIEW OF GRAHAM (1995) AND RELATED LITERATURE

We reviewed the empirical literature concerning the relationship between FDI and trade as part of the broader literature review of chapter 2. Recall that the majority of the literature can be criticised for failing to adequately address the fact that FDI and exports may be simultaneously determined. Studies which neglect to control for potential common causal factors are at risk of reporting a complementary relationship between FDI and exports without being able to rule out the possibility that they are in fact simply spuriously correlated.

Graham (1995) employs a methodology that allows him to examine the relationship between FDI and exports after removing the influence of a range of variables that may potentially simultaneously determine both. This is a two stage process: step one involves running separate gravity model regressions for FDI and exports; step two regresses the residuals from the stage one regressions against one another. The assumption made is that stage one removes any simultaneity bias, leaving the coefficient in stage two to give an unbiased indication of the nature of the relationship between FDI and exports.

Graham (1995) applied this methodology to test the relationship between FDI and exports for both the US and Japan. His sample comprised 40 destination countries for US FDI and exports, and 36 destination countries for Japanese FDI and exports. For both the US and Japan, the samples were further subdivided into three subsets: only those countries located in Europe; only those countries located in the western hemisphere; only those countries located in East Asia. The two-stage process was repeated for three separate years (1983, 1988 and 1991) with roughly consistent results (Graham therefore elected only to report and discuss the results pertaining to the 1991 data).

Graham's regression results from step one reveal that the gravity model specification provides a good overall fit for the US sample and subsamples. Tables 5.1 and 5.2 repeat his results for FDI and exports respectively.

Although the gravity methodology employed in the previous two chapters differs from Graham's (i.e. our analysis utilises panel data and includes multiple source countries and additional explanatory variables), it is interesting to contrast our results with his. For the world sample, Graham found that variability in host per capita income, host population, and distance can explain 60% of the variability in US FDI. This is slightly higher than the R^2 values reported in chapter 3 (despite the inclusion of additional explanatory variables in our specification), suggesting that the gravity model is a better descriptor of FDI for the US than it is for developed countries in general[18]. As expected, the coefficient on host per capita income is positive and statistically significant[19]. The coefficient on host population is positive (although not statistically significant) which is at odds with the negative (statistically significant) coefficient reported in chapter 3. Given that host population is likely to be correlated with the income per capita variable in Graham's specification (causing multicollinearity problems) it is not surprising that the coefficient is not statistically significant. Encouragingly, the reported coefficient of -0.77 for the distance variable is very similar to the range of values (-0.64 to -0.50) reported in table 3.5 of chapter 3).

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[18] Alternatively, the higher R^2 reported by Graham may simply reflect differences in methodology and dataset (i.e. Graham uses cross-section data for a single year whereas we employ pooled cross-section time-series data for 13 years).

[19] Although we did not include per capita income as an explanatory variable, the coefficients on income and population (see Table 3.5 of chapter 3) indicate that its inclusion (in place of income and population separately) would have yielded a positive coefficient.

Table 5.1 Stage-one Results for US Foreign Direct Investment Abroad, Graham (1995)

	Host per capita income	*Host population*	*Distance*	R^2
World	0.92 (0.14)	0.17 (0.13)	-0.77 (0.29)	0.60
Europe	0.86 (0.47)	0.80 (0.39)	-9.57 (3.6)	0.66
Western Hemisphere	1.31 (0.22)	0.10 (0.20)	-0.31 (0.28)	0.96
East Asia	0.93 (0.30)	-0.15 (0.16)	1.09 (2.5)	0.49

Notes: The dependent variable is US FDI (1991). Figures in parentheses are standard errors.
Source: Graham (1995)

Table 5.2 Stage-one results for US exports, Graham (1995)

	Host per capita income	*Host population*	*Distance*	R^2
World	0.66 (0.11)	0.11 (0.10)	-0.38 (0.22)	0.54
Europe	0.29 (0.88)	0.60 (0.64)	-1.56 (2.3)	0.63
Western Hemisphere	0.46 (0.61)	0.41 (0.42)	-0.98 (0.31)	0.93
East Asia	0.89 (0.50)	-0.23 (0.46)	-0.77 (2.4)	0.40

Notes: The dependent variable is US exports (1991). Figures in parentheses are standard errors.
Source: Graham (1995)

The results for the Europe, Western Hemisphere and East Asia subsamples are interesting because they suggest that different factors are important in attracting US FDI depending on the location of the host nation. For Europe, income per capita is not statistically significant and distance has an implausibly large negative coefficient of -9.57. Population appears to be the most important determinant of US FDI[21]. For the Western Hemisphere and East Asia subsamples, income per capita is dominant while population and distance are not statistically significant.

For the world sample applied to US exports, Graham reports an R^2 of 0.54. It is somewhat surprising that this is lower than the R^2 for his FDI regression as the gravity model typically performs better when applied to trade than to investment. Indeed, we report significantly higher R^2 values for our export model of between 0.81 and 0.83 (see Table 4.2 of chapter 4). As for the FDI regression, the coefficient on income per capita is positive and statistically significant, but the population coefficient is positive and lacks statistical significance. The distance coefficient has a negative coefficient that is roughly half of the magnitude of those reported in Table 4.2 (they vary between -0.76 and -0.64 depending on which additional explanatory variables are included).

The gravity model appears much less successful at explaining the location of US exports in the three subsamples (although Graham seems to pay this little regard). Although the

[21] Graham suggests that the seeming unimportance of income per capita may be due to the fact that this variable differs little between countries within this subsample and so cannot be accurately estimated. This may also be an explanation for the reported distance coefficient (as the relative distance between the US and each European country varies little).

independent variables are jointly significant for the Europe and East Asia subsamples (as evidenced by F-tests), none of the variables are individually significant. Only distance is statistically significant for the Western Hemisphere sample. It would appear that the subsamples (and possibly the sample as a whole) is either plagued by multicollinearity, or suffers from too few observations (or perhaps both).

Table 5.3 below repeats Graham's results for the second-stage regressions for the US sample and subsamples. To recount, the residuals from the gravity equations in stage one are regressed against each other: a positive coefficient is interpreted as evidence of complementarity; a negative coefficient as evidence of substitutability.

The positive coefficient for the world sample indicates that US exports and US outward FDI are global complements (the coefficient is statistically significant at the 5% level). A similar result is found for the Europe and East Asia subsamples, but a statistically significant negative coefficient is reported for the Western Hemisphere.

Table 5.3 Second-stage Regression of Residuals on Residuals, Graham (1995)

	Coefficient	*Standard Error*
World	0.486	0.207
Europe	0.479	0.126
Western Hemisphere	-0.866	0.253
East Asia	0.524	0.228

Notes: Regression of (stage one) gravity equation export residuals on gravity equation FDI residuals.
Source: Graham (1995)

Graham suggests that the sign for the Western Hemisphere sample may be negative (indicating that US exports and FDI are substitutes in relation to Western Hemisphere countries) because of the legacy of import-substituting industrialisation (ISI) policies adopted in many Latin American countries during the 1970s and early 1980s. Under these policies, multinationals were induced to establish local production facilities which operated behind protectionist walls (sourcing most, if not all, intermediate goods from local firms). This type of foreign investment is therefore more likely to substitute for exports than the type of foreign investment undertaken by US multinationals in countries located in Europe and East Asia. Although most Latin American countries abandoned their ISI policies during the later 1980s, Graham believes that their effect may have survived into the 1990s. He supports this argument by citing results for the Western Hemisphere sample with Canada removed – the coefficient on the second stage regression becomes greater in magnitude (-0.955 instead of -0.866) and achieves greater statistical significance.

Graham's Japanese sample comprises 36 host countries, which he further subdivides into East Asia and non-East Asia samples[22]. Tables 5.4 and 5.5 report the stage-one results for Japanese outward FDI and Japanese exports respectively. The gravity model appears to successfully model Japanese exports, but performs inadequately when applied to FDI. Given the small number of observations (particularly for the subsamples) the poor fit for FDI is perhaps not surprising if we recall that the gravity model typically performs better for trade data than it does for investment data.

[22] Australia and New Zealand are included in the East Asia subsample.

Table 5.4 Stage-one results for Japanese Foreign Direct Investment Abroad, Graham (1995)

	Host per capita income	*Host population*	*Distance*	R^2
World	0.48 (0.20)	0.45 (0.20)	0.01 (0.45)	0.18
Non-East Asia	0.66 (0.34)	0.63 (0.33)	3.44 (2.05)	0.41
East Asia	0.32 (0.33)	0.31 (0.47)	0.61 (1.02)	0.088

Notes: The dependent variable is Japanese overseas FDI (1991). Figures in parentheses are standard errors.
Source: Graham (1995)

Table 5.5 Stage-one Results for Japanese Foreign Exports, Graham (1995)

	Host per capita income	*Host population*	*Distance*	R^2
World	0.808 (0.13)	0.62 (0.13)	-1.39 (0.29)	0.61
Non-East Asia	0.89 (0.18)	0.88 (0.18)	-0.37 (1.11)	0.69
East Asia	0.83 (0.22)	0.42 (0.21)	-0.98 (0.41)	0.74

Notes: The dependent variable is Japanese exports (1991). Figures in parentheses are standard errors.
Source: Graham (1995)

The second stage results for Japan are in Table 5.6 below. As with the results for the US, we interpret the positive and statistically significant coefficients for the World and Non-East Asia samples as indicating that Japanese FDI and exports are both global complements, as well as complements with respect to Non-East Asia nations[23]. The coefficient for the East Asia sample however, although positive, is not statistically significant. Graham argues that this result is driven solely by the presence of Indonesia in the subsample; when it is removed from the East Asia sample the second-stage coefficient becomes statistically significant at the 99% confidence level (a value of 1.15 with a standard error of 0.23). To this he attributes a similar explanation as to that for US FDI in the Western Hemisphere - Indonesia has long been a recipient of Japanese FDI that has been motivated in response to import substituting industrialisation (ISI) policies.

Using the same methodology as was applied to the US and Japan, Graham and Liu (1998) investigate the relationship between FDI and exports for Taiwan and South Korea. Over the last decade relative labour costs in these countries have risen and in response Taiwanese and Korean firms have moved towards more capital intensive activities, moving some of their more labour intensive production activities offshore. As a result, the trade impact of FDI has become an important question for policymakers in these countries.

[23] Notice that the magnitude of the coefficient is greater for Non-East Asia than for the World sample. Interpreting this literally would suggest that the relationship between Japanese FDI and exports is more complementary with respect to Non-East Asia countries than it is globally. Furthermore, Japanese FDI and exports would seem to have a more complementary relationship than US FDI and exports.

Table 5.6 Second-stage Regression of Residuals on Residuals (Japan), Graham (1995)

	Coefficient	*Standard Error*
World	0.97	0.20
Non-East Asia	1.35	0.28
East Asia	0.31	0.39

Notes: Regression of (stage one) gravity equation export residuals on gravity equation FDI residuals.
Source: Graham (1995)

Table 5.7 shows the second-stage results for both Taiwan and South Korea. In addition to estimating the stage one gravity model using the three explanatory variables employed by Graham (1995), the authors include a series of dummy variables they suspect may be relevant in determining both FDI and exports[24]. In each instance the coefficient is positive and statistically significant at the 99% confidence level. The evidence therefore indicates that outward FDI and exports, for both Taiwan and Korea, are complements. Furthermore, given that the magnitude of these coefficients is greater than those for either the US and Japan (except for South Korea when compared with Japan's non-East Asia subsample), it would seem that the complementary relationship is stronger for the two Tiger economies than it is for either the US or Japan[25].

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[24] Three dummy variables are included to try to capture the effects of a common language, development status, and geographical location.
[25] To reiterate, however, we should be cautious making literal interpretations based on the magnitude of the coefficients.

Table 5.7 Second-stage Regression of Residuals on Residuals (Taiwan and South Korea), Graham and Liu (1998)

	Coefficient	*t-statistic*
Taiwan[a]	1.81	5.99
Taiwan[b]	1.47	4.82
South Korea[a]	1.25	5.45
South Korea[b]	1.09	3.89

Notes: Regression of (stage one) gravity equation export residuals on gravity equation FDI residuals. [a] *indicates the model without dummies.* [b] *indicates the model with dummies.*
Source: Graham and Liu (1998)

It is also interesting to note that the magnitude of the coefficients for both Taiwan and South Korea fall when dummy variables are included in the stage-one gravity equations. A possible explanation for this is that the unexplained variation remaining following the stage-one regression of FDI and exports using Graham and Liu's simple model (without dummies) is spuriously contributing to inflated stage-two coefficient values. When this unexplained variability is reduced following the inclusion of the three dummy variables in the stage-one regression, the spurious correlation is minimised and the stage-two coefficients fall in magnitude. Of course, given that we cannot completely eliminate unexplained variability (i.e. achieve an R^2 equal to one) it is probable that the stage-two coefficient will incorporate an element of spurious correlation (at least to the extent that FDI and exports are jointly determined by a third factor in practice). The aim therefore becomes to minimise the unexplained variability remaining after the stage-one regressions by ensuring that the model is correctly specified and includes all relevant explanatory variables.

Di Mauro (2000), employing Graham's methodology, introduces some variables linked to economic integration in order to "clean even further the remaining information in the residuals" (p.11/12). Interestingly, Di Mauro considers this a supplementary way of testing the complementarity versus substitutability question. She argues that *prima facie* evidence could be provided by observing the coefficient on a tariff variable in a regression with FDI as the dependent variable. A positive and statistically significant coefficient would support the 'tariff-jumping' argument ("a synonym for exports and FDI being substitutes" (p.12)). In making this argument, however, Di Mauro seems to overlook the possibility that FDI and exports may be substitutes with respect to tariffs, but complements in an aggregate sense. As we have discussed, tariff-jumping is just one of several possible motives for undertaking foreign investment. While this motive may displace exports to some extent, other motives may actually encourage exports to such a degree that the overall relationship is one of complementarity. Furthermore, the finding of a negative or statistically insignificant tariff coefficient does not necessarily imply that FDI and exports are complements. We should not therefore rely on such evidence as indicating complementarity of substitutability, but rather interpret with regard to the existence or otherwise of one particular motive for FDI (i.e. the tariff-jumping motive).

Di Mauro employs the following model for her stage-one regressions:

$$\ln Y_{ij} = \alpha + \beta_1 SUMGDP_{ij} + \beta_2 SIMSIZE_{ij} + \beta_3 RELENDOW_{ij} \\ + \beta_4 DIST_{ij} + \beta_5 TAR_{ij} + \beta_6 NTB_{ij} + \beta_7 ERV_{ij} + \beta_8 CI_j + \varepsilon_{ij}$$

where: Y_{ij} represents either FDI or exports from country i (home) to country j (host); *SUMGDP* represents the sum of GDPs of the home and host economies; *SIMSIZE* is a measure of how similar the home and host are in terms of GDP; *RELENDOW* is a measure of the difference in per capita incomes of the home and host; *DIST* is the relative distance between home and host; *TAR* is the level of tariff faced by goods and services exported from the home to the host; *NTB* is a measure of non-tariff barriers between home and host; *ERV* is a measure of the exchange rate variability; and *CI* is a measure of corruption in the host country.

Although she argues that her model can easily be recognised as the gravity model, it is a variant of the one typically employed. The inclusion of the *SIMSIZE* and *RELENDOW* variables is intended to capture aspects of both the 'vertical' and 'horizontal' theories of multinational activity.

Di Mauro estimates her stage-one model using cross-section data for three separate years (1998, 1993 and 1996). France, Germany, Italy, UK, Japan, South Korea, Canada and the US constitute her sample of home countries, with both OECD and non-OECD members included as host countries[26]. In general, the exports equation performs better than the FDI equation in terms of goodness of fit (i.e. higher adjusted R^2 and lower standard errors). In both equations the variables *SUMGDP*, *SIMSIZE* and *DIST* are significant and have the expected sign. Evidence that exports are positively affected by similarity in size between home and host is taken as support for the Helpman and Krugman (1985) theory of intra-industry trade. The *RELENDOW* variable shows a positive coefficient for exports, but is not statistically significant for FDI. The author interprets this as evidence that both intra-industry trade and inter-industry trade co-exist, but the former is the more dominant of the two. Furthermore, she argues that FDI is not driven by differences in factor endowments, but rather by the similarity of countries. This provides support for the 'horizontal' theory, in favour of the 'vertical' theory, of multinational activity.

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[26] South Korea is included to represent the experience of emerging economies, many of whom are becoming net investors having traditionally been net recipients of FDI. Given the potential difference in motives firms from South Korea may have to undertake outward FDI compared with firms from the group of advanced industrial nations, it would have been interesting had Di Mauro tested her model both with and without South Korea. That would have enabled us to ascertain whether the inclusion of South Korea was in any way influencing the overall results.

[28] As previously mentioned, Di Mauro interprets this as *prima facie* evidence that exports and FDI are in fact complements. However, we would argue that lack of support for the "tariff-jumping" argument does not in itself translate as evidence of complementarity.

As expected, the distance coefficient is greater in magnitude for exports than it is for FDI (indicating that geographical distance has a greater dampening effect on exports than on investment). Exchange rate variability has a negative impact on exports but is never statistically significant with respect to FDI. Its inclusion has little impact on the magnitude of the remaining explanatory variables. The tariff and non-tariff barrier variables (classed as the 'commercial' variables by Di Mauro) both have the expected negative effect on exports. The tariff variable, however, is not statistically significant in the FDI regression, revealing an absence of support for the "tariff-jumping" motive[28]. Furthermore, the coefficient for NTB is negative with respect to FDI[29].

The corruption index (CI) variable is generally positive for both exports and FDI, indicating that perceived corruption can act as a disincentive for both exporters and investors[30]. This result is interesting in highlighting the potential flaw in many of the earlier empirical studies: as FDI and exports are both positively influenced by less corruption, omitting this variable from the stage-one regressions could contribute to a false finding in favour of complementarity in stage two.

Di Mauro's second-stage results are shown in Table 5.8. Although the t-statistic reported for 1996 is 0.13, she states that "for all three years considered the coefficients are positive

[29] Di Mauro suggests the negative sign for the NTB variable could be explained in terms of market accessibility and sunk costs ("when foreign firms invest in a host country, they incur sunk costs in setting up the affiliates; if they cannot access a larger market, not because of tariffs but because of NTBs, their losses can be even greater than for exporters" (p.21)).

[30] The CI variable is constructed so that less corrupt economies have higher ratings. Therefore, a positive coefficient indicates that less corrupt countries (or at least those *perceived* to be less corrupt) attract more exports and investment, all else being equal.

and highly significant" (p.21). This suggests that the t-statistic reported for 1996 is a misprint; the similarity in estimated coefficients suggests that 0.13 is in fact the standard error (which implies that the 1996 coefficient of 0.98 is highly statistically significant). Correcting for the misprint, the relationship between exports and FDI is fairly consistent for all three years, staying close to a one-for-one relationship. The results therefore suggest that FDI and exports are complements, with a given increase in FDI generally leading to a roughly similar increase in exports.

Table 5.9 summarises the findings of the empirical literature discussed above. The support for complementarity (indicated by a '+' symbol) is striking. However, as Graham (1995) observes, many of the earlier studies can be accused of ignoring the possibility that spurious correlation may be behind the finding of a positive relationship between exports and FDI. Although the most recent papers (Graham (1995), Graham and Li (1998), Di Mauro (2000)) provide some comfort that this is not the case, it is still possible that unexplained variation remaining following stage one is clouding the result of stage two.

Table 5.8 Second-Stage Results (Di Mauro, 2000)

	Coefficient	*t-statistic*
1988	1.04	6.42
1993	1.20	9.95
1996	0.98	7.53*

*Notes: Regression of (stage one) gravity equation export residuals on gravity equation FDI residuals. *Actual figure reported in Di Mauro (2000) is 0.13, but it is likely that this is in fact the standard error.*
Source: Di Mauro (2000)

Table 5.9 Summary of the Empirical Literature

Paper	*Relationship*
Gruber et al. (1967)	-
Reddaway (1968)	+
Hufbauer & Adler (1968)	+
Horst (1972)	-
Lipsey & Weiss (1981)	+
Lipsey & Weiss (1984)	+
Blomstrom et al. (1988)	+
Pearce (1990)	+
Grubert & Mutti (1991)	+
Graham (1995)	+
Graham & Li (1998)	+
Di Mauro (2000)	+

When discussing FDI and exports there is a tendency to assume the relationship is either one of complementarity or one of substitutability. However, theory tells us that the relationship is not likely to be so clear cut. Rather, substitutability-driving forces (such as tariff-jumping FDI) and complementarity-driving forces (such as intra-firm trade) coexist and jointly govern the nature and strength of the relationship between FDI and exports[31]. These forces will undoubtedly vary depending on the characteristics of the home and host nations, as well as the characteristics and motives of the firms involved.

It is a common assertion that trade between industrial nations is dominated by intra-industry trade and that multinational enterprises are more likely to be motivated by strategic rather than factor cost considerations. In this case, exports and FDI are liable to be alternative methods of servicing foreign markets[33]. This suggests that the relationship between FDI and exports when the home and host countries are both advanced industrial nations may tend more towards substitutability than complementarity.

In the case where the home country is an industrial nation and the host is a developing country, multinationals are likely to be predominately engaged in efficiency-seeking FDI. Foreign investment allows multinationals to combine their advantage in capital, technology and know-how with natural resources and/or low cost labour that are often abundant in developing countries. Therefore, the motivations behind investment and the

[31] Instead of thinking of the relationship in terms of two discrete states (i.e. complementarity vs. substitutability), let us consider a spectrum of possibilities ranging between the two extremes.
[33] Although FDI may be part of a strategic process (i.e. a response to the activities of a rival) and the decision to invest may be independent of export considerations, there will almost certainly be a post-investment impact on exports.

motivations behind exporting are likely to differ. While FDI is primarily engaged in the production of labour intensive goods or the provision of labour intensive services (e.g. basic assembling activities or call centres), exports will tend to be of capital intensive goods and services (e.g. finished consumer goods, capital goods). Subsequently, an increase in FDI may not result in a corresponding decrease in exports. The relationship is therefore likely to be characterised by a greater degree of complementarity than the relationship between two industrial nations.

For FDI and exports between two developing countries the relationship is likely to be governed by similar forces as those that act between a developed and a developing country. The ability to invest overseas (at least in significant amounts) is typically limited to those developing countries classed as newly industrialising (such as South Korea, Brazil etc). Newly-industrialising countries have proven a popular location for labour intensive production facilities from developed countries, but rising unit labour costs in recent years has seen these countries attempt to move up the 'production ladder' into more capital and knowledge intensive activities. They themselves have begun to move labour intensive production offshore to countries less developed than themselves. The effect of such a transition on exports will depend crucially on the activities of the multinational in the fist instance: if it had originally been producing at home for the domestic market then it will not suffer a loss in exports (though imports are likely to rise and domestic employment may suffer); if it had been producing for both the domestic market and overseas then exports may be displaced[34].

[34] Note, however, that Balance of Payments should not be disadvantaged given that domestic firms will be the ultimate beneficiaries of the activities of their overseas subsidiaries.

Note from our earlier discussion of the empirical literature that there is some support, albeit limited, for the hypothesis that the relationship will vary according to the characteristics of the two countries involved. Using a Tobit model on a pooled data set, Carr et al. (2001) find that a "bilateral increase in parent and host-country trade costs…generally decreases affiliate production when the non-US country is a developing country ('complements') but increases affiliate production when the non-US country is another high-income country ('substitutes')" (p.705).

Although Lipsey & Weiss (1984) find in favour of overall complementarity, the second stage coefficient is greater in magnitude for the developing countries subsample than it is for the developed countries subsample. The authors state that this "suggests that much of the relationship to worldwide parent exports may involve exports to the less developed areas" (p.306)[35].

The results of Carr et al. (2001) and Lipsey & Weiss (1984) support our contention that the relationship between FDI and exports will be more substitutable (or at least less complementary) when both home and host are developed nations, than when the host is a developing country. However, Graham (1995) reports a result that is at odds with this hypothesis. He finds a complementary relationship in aggregate, but reports a negative relationship for US FDI to the Western Hemisphere. When Canada is removed from the Western Hemisphere sample (leaving only developing countries or newly industrialising

[35] Although we have cautioned against making a literal interpretation of the magnitude of the coefficients, let us do so here to illustrate the point. The author's results imply that an increase in net affiliate sales of $1 will lead, ceteris paribis, to an increase in exports of 6 cents to a developed country but of 21 cents to a less developed country.

countries) the second stage coefficient becomes increasingly negative. This suggests that the relationship between two industrial countries may be complementary, while the relationship between an industrial country and a developed one may be governed by substitutability. Note, however, Graham himself suggests that this finding may result from the legacy of import-substituting industrialisation adopted by many Latin American countries during the 1970s and 1980s. Furthermore, his results are based on limited observations and apply specifically to the case of outward FDI from the US.

5.4 EMPIRICAL ANALYSIS

We now turn to our own empirical analysis of this issue. As discussed, the main focus will be to investigate whether the relationship between FDI and exports is dependent on the characteristics of the countries involved. This is a departure from most previous studies which seem to implicitly assume that the relationship is constant across countries and time.

In the preceding section we discussed how the relationship between FDI and exports may vary depending on the status of the home and host countries (i.e. developed or developing). Due to data limitations (specifically the lack of reliable outward FDI data for developing countries) we are unfortunately unable to empirically test situations in which the home country is a developing country. This means that we are limited to developed-to-developed and developed-to-developing cases. Given that, in aggregate, developed nations accounted for approximately 92% of global outward FDI in 2004 and approximately 63% of global exports, we are still being afforded a fairly accurate picture of the general global situation despite the absence of developing countries in the list of home nations. However, developing countries are becoming increasingly important outward investors, and so the consistent collection of accurate data for these countries should be a priority.

In order to try to minimise the problem that FDI and exports may be simultaneously determined by a third factor, we follow the methodology used by Graham (1995). As discussed previously, this involves a two-stage process. First, separate gravity model regressions are estimated with FDI and exports as the dependent variables. The residuals (i.e. unexplained variability) from these two regressions are then regressed against each other. A positive coefficient in the second-stage regression is taken as evidence of complementarity; a negative coefficient as evidence of substitutability. By adopting a two-stage process we attempt to remove all observable factors which may simultaneously determine both exports and FDI before then examining the direction, if any, of the remaining correlation.

Having previously analysed the effects of regional integration agreements on FDI and exports (chapters 3 and 4), we have already ascertained our favoured gravity model specification for estimating the stage-one regressions:

$$[5.1]$$
$$\ln FDI_{ijt} = \alpha_0 + \beta_1 \ln Y_{it} + \beta_2 \ln Y_{jt} + \beta_3 \ln n_{it} + \beta_4 \ln n_{jt} + \beta_5 \ln d_{ij} + \beta_6 EU_{ijt} + \beta_7 NAFTA_{ijt} + \beta_8 nonEU_i EU_j$$
$$+\beta_9 nonNAFTA_i NAFTA_j + \beta_{10} EU_i nonEU_j + \beta_{11} NAFTA_i nonNAFTA_j + \beta_{12} CL_{ij} + \beta_{13} CB_{ij} + \mu_{ijt}$$

$$[5.2]$$
$$\ln X_{ijt} = \alpha_0 + \beta_1 \ln Y_{it} + \beta_2 \ln Y_{jt} + \beta_3 \ln n_{it} + \beta_4 \ln n_{jt} + \beta_5 \ln d_{ij} + \beta_6 EU_{ijt} + \beta_7 NAFTA_{ijt} + \beta_8 nonEU_i EU_j$$
$$+\beta_9 nonNAFTA_i NAFTA_j + \beta_{10} EU_i nonEU_j + \beta_{11} NAFTA_i nonNAFTA_j + \beta_{12} CL_{ij} + \beta_{13} CB_{ij} + \mu_{ijt}$$

Where the dependent variables FDI_{ijt} is outward investment from country *i* to country *j* at time *t*, and X_{ijt} is exports from country *i* to country *j* at time *t*. The independent variables (ignoring country and time subscripts) are defined as follows: *Y* is gross domestic product; *n* is population; *d* is great circle distance between capital cities. These are the standard 'gravity variables'. The remaining variables are a series of dummy variables intended to capture various factors thought to influence both FDI and exports: EU_{ij} is unity when both home and host countries are members of the European Union; $NAFTA_{ij}$ is unity when home and host are both members of NAFTA; nEU_iEU_j is unity when the home country is not a member of the EU but the host is; nNA_iNA_j is unity when the home country is not a member of NAFTA but the host is; EU_inEU_j is unity when the home country is a member of the EU but the host country is not; NA_inNA_j is unity when the home country is a member of NAFTA but the host is not; CL_{ij} is unity when the home and host countries share a common language; CB_{ij} is unity when the home and host countries share a common border.

We may recall from the previous chapters that we experimented with a wide range of explanatory variables to investigate which factors have a statistically significant influence on FDI and/or exports[37]. Not all of the variables that proved to be statistically significant have been included in equations [5.1] and [5.2] as we favoured a parsimonious model. In this manner, we hope to leave as little unexplained variability as possible following the stage-one gravity regressions, while avoiding the temptation to simply data mine[38].

Columns 5.1a and 5.1b of Table 5.10 report the first-stage results when equations [5.1] and [5.2] are estimated using our entire panel dataset spanning the period 1992 to 2003. Although such a comprehensive sample would often be referred to as a 'world' sample in the literature (i.e. from the results general inferences concerning the determinants of FDI and exports at a 'world' or 'global' level would be made), it is important to remember that the home countries in our sample consist solely of advanced industrial nations[39].

The results shown in columns 5.1a and 5.1b have already been reviewed in detail in chapters 3 and 4 so we do not intend to repeat this discussion here. However, let us summarise the main findings: first, the 'standard gravity variables' are all statistically significant (with the exception of home population in the exports regression) and have the expected sign; second, common membership of the EU exhibits a positive effect on both FDI and exports, but the effect is stronger for FDI; third, common membership of NAFTA does not have a statistically significant effect; fourth, sharing a common language has a positive effect on both FDI and exports, but again the effect is stronger

[37] In addition to the standard gravity variables, we tested variables including a measure of corruption, the rate of inflation, economic growth etc. For an exhaustive account see chapters 3 and 4.
[38] Ideally, all unexplained variability remaining following the first stage FDI regression would be due solely to the influence of exports (and vice versa). Obviously this will not be the case in reality and we must be mindful of this when interpreting the second stage coefficient.
[39] To restate, the home countries in the sample are: US, Belgium/Luxembourg, Germany, UK, France, Italy, Netherlands, Sweden, Spain, Austria, Denmark, Finland and Norway.

for FDI; fifth, sharing a common border has a positive effect on both FDI and exports, but the effect is stronger for exports.

As we have discussed, in order to try to ensure that the second-stage results do not suffer from spurious correlation, it is important to minimise, as far as possible, the unexplained variability that remains following the stage-one regressions. With this in mind, the adjusted R^2 for the exports regression is encouraging as it indicates that 83% of the variability in exports is explained by the explanatory variables specified in [5.2]. The adjusted R^2 for the FDI regression is not as high, however, with 51% of the variability in FDI explained by the independent variables[40]. This means that 49% of the variability in FDI is unexplained, not an inconsiderable amount[41]. Unfortunately, there is no simple solution to this problem – the gravity model is simply not as successful at modelling investment as it is at modelling trade.

Having estimated equations [5.1] and [5.2] we are able to calculate the residuals for both FDI and exports[42]. Figure 5.1 plots the residuals against one another. There is a clear positive relationship between the residuals. The first row ('total sample') of Table 5.11 reports the second-stage results when the export residuals are regressed against the FDI residuals. The coefficient is positive (0.83) and statistically significant at the 1% level. Therefore, FDI and exports from developed countries to the rest of the world appear to be complements.

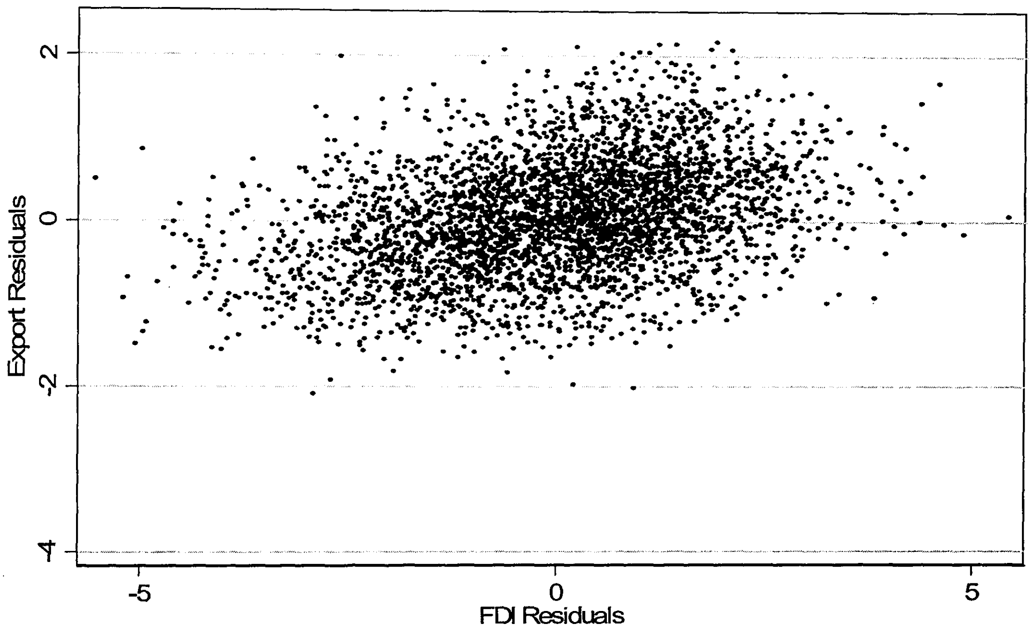
[40] This is broadly consistent with previous empirical studies.
[41] It is not surprising that there is a considerable amount of unexplained variability for FDI. The decision to invest (compared to the decision to export) is likely to be more nuanced, depending on such intangible concepts as strategy, and expectations of the future political and economic environment of the host country. That it is difficult to capture all such effects with readily-measurable variables is perhaps to be expected.
[42] Residuals are the difference between the actual and fitted values.

Table 5.10 First-stage Regression Results

Explanatory Variables	*5.1a*	*5.1b*	*5.2a*	*5.2b*	*5.3a*	*5.3b*
	FDI (total sample)	**Exports (total sample)**	**FDI (OECD)**	**Exports (OECD)**	**FDI (non-OECD)**	**Exports (non-OECD)**
$ln\ Y_i$	2.82 (19.13)	0.94 (14.58)	2.60 (14.32)	0.97 (14.78)	3.19 (12.97)	0.93 (7.91)
$ln\ Y_j$	0.74 (24.29)	0.82 (66.70)	0.72 (14.95)	0.75 (44.77)	0.96 (13.84)	1.04 (35.53)
$ln\ N_i$	-2.04 (13.99)	-0.08 (1.29)	-1.82 (10.24)	-0.20 (3.08)	-2.34 (9.50)	0.06 (0.52)
$ln\ N_j$	-0.17 (7.16)	-0.12 (12.04)	-0.13 (2.56)	0.002 (0.11)	-0.31 (8.60)	-0.29 (17.57)
$ln\ d_{ij}$	-0.51 (15.04)	-0.64 (46.07)	-0.78 (18.01)	-0.69 (47.23)	-0.07 (0.97)	-0.70 (21.00)
EU_{ij}	1.13 (8.84)	0.46 (8.83)	1.08 (8.46)	0.48 (9.08)	dropped	dropped
$NAFTA_{ij}$	0.15 (0.40)	0.27 (1.53)	0.52 (1.33)	0.37 (2.52)	dropped	dropped
nEU_iEU_j	0.33 (2.70)	0.01 (0.30)	0.47 (3.34)	0.17 (3.65)	dropped	dropped
nNA_iNA_j	0.43 (3.47)	-0.32 (6.35)	0.84 (6.50)	-0.22 (4.94)	dropped	dropped
EU_inEU_j	0.67 (6.26)	0.29 (6.71)	0.69 (4.97)	0.19 (3.99)	0.52 (3.10)	0.50 (6.90)
NA_inNA_j	0.07 (0.53)	-0.20 (3.64)	0.56 (3.26)	-0.36 (6.12)	-0.66 (3.13)	0.06 (0.67)
$Lang_{ij}$	1.32 (13.32)	0.53 (12.04)	1.09 (8.46)	0.51 (10.78)	1.54 (10.03)	0.55 (7.24)
Border	0.38 (3.51)	0.62 (12.86)	0.23 (2.01)	0.66 (15.96)	dropped	dropped
F-statistic	176 (24,3859)	1,022 (24,4873)	106 (24,2423)	784 (24,2912)	68.5 (19,1408)	349 (19,1933)
$\bar{R}^2$	0.52	0.83	0.51	0.86	0.47	0.77
Obs.	3,884	4,898	2,448	2,937	1,428	1,953

Notes: Dependent variable is either the natural log of FDI or the natural log of exports from country i to country j. Figures in parentheses are absolute t-ratios. Year dummies are not reported. The 't' subscript has been dropped from the explanatory variable descriptions for simplicity.

Figure 5.1 Plot of FDI Residuals against Export Residuals



[46] As we have commented previously, we would ideally like to test the relationship to changes in both the home and host country, but limitations in data availability mean that this is not an option.

Table 5.11 Stage-Two Regressions of FDI Residuals against Export Residuals

	Coefficient	*t-statistic*
total sample	0.83	23.76
OECD	1.12	22.23
non-OECD	0.57	10.47
'developed'	1.13	23.30
'developing'	0.57	11.25
Relative per capita income < 1	1.28	14.96
Relative per capita income ≥1	0.69	17.69
Urbanisation ratio < 1	0.91	15.43
Urbanisation ratio ≥1	0.78	18.13

In terms of magnitude, the coefficient is approximately twice the value of that reported by Graham (1995) for US FDI and exports, but slightly less than the coefficient he reports for Japanese FDI and exports and less than the coefficients reported by Di Mauro (0.98 to 1.20).

Finding in favour of complementarity at an aggregate, or 'global', level is common to most studies on this topic. What we want to do now is investigate whether this relationship changes depending on the nature of the host country[46]. To begin, we follow a similar approach to Graham (1995) and divide our dataset into different subsamples. Whereas Graham selects his samples according to geographical region, however, we select our sample according to the level of development of the host country[47]. Accordingly, we divide our dataset into OECD and non-OECD subsamples (i.e. if the host country is an OECD member it will be part of the OECD subsample, if not it will be part of the non-OECD sample)[48]. The first-stage results for the two subsamples are given in columns 5.2a to 5.3b of Table 5.10.

Columns 5.2a and 5.2b report the results for the OECD subsample. All of the coefficients have the expected sign and are of a similar level of statistical significance as in the full sample. The only exception is the coefficient on host population for the exports regression, which has gone from being highly statistically significant in the full sample to being statistically insignificant. This suggests that the presence of a few heavily

[47] We choose to make level of development the decision criteria (rather than region) because it is this that we think may affect the relationship between FDI and exports.

[48] The OECD sample accounts for 63% and 60% of total observations (from our full sample) for FDI and exports respectively. Accordingly, the non-OECD sample accounts for 37% and 40% respectively.

populated non-OECD countries (such as China and India) may be driving the negative coefficient in the full sample results[49].

The results for the non-OECD subsample are reported in columns 5.3a and 5.3b of Table 5.10. Again, the results are in line with those for the full sample. Note that some of the dummy variables have been automatically dropped because of insufficient observations. Interestingly, the coefficient on the distance variable is not statistically significant with respect to FDI. This suggests that distance does not act as a deterrent for investment to non-OECD countries.

Having estimated the first-stage regression for both sub-samples we now turn to the second-stage regressions of residuals against residuals. The results are reported in rows 2 and 3 of Table 5.11. Both coefficients are positive and statistically significant at the 1% level. However, the OECD coefficient is twice the magnitude of the non-OECD coefficient. Although previously we have cautioned against interpreting the magnitude of these second-stage coefficients literally, this is nevertheless an indication that the complementary relationship between FDI and exports is stronger when the home and host nations are both developed countries than when the home country is developed but the host is developing.

The above statement relies on OECD membership being an accurate classification of whether a country is developed or developing. Perhaps this is not ideal classification

[49] This is supported by the results for the exports non-OECD subsample (column 5.3b) which reports a coefficient for host population that is high in both magnitude and statistical significance.

criteria. As an alternative we choose an arbitrary cut-off of US$10,000 (constant 2000 dollars) for host country per capita income. All observations for which the host country has a per capita income greater than this will be classed as developed; observations below this threshold will be classed as developing[50]. The first-stage regression results are very similar to those for the OECD and non-OECD subsamples (and so are not reported here for brevity). Table 5.11 reports the second-stage results in rows 5 and 6. They too are very similar to the previous results and continue to support the notion that the relationship between FDI and exports is stronger for developed-developed interactions (coefficient of 1.13) than it is for developed-developing interactions (coefficient of 0.57).

Unfortunately, our analysis is still far from ideal. We have results that clearly support the hypothesis that the relationship between FDI and exports (at least the strength of that relationship if not the direction also) is dependent upon the home and host countries involved. Instead of imposing an arbitrary criterion to categorise the host countries however, we would somehow like the data itself to tell us what the correct criteria should be. To this end, we now experiment with allowing the sub-samples to 'self-select' themselves based on the relative value of various variables.

In chapter 3 we introduced a number of additional explanatory variables (in addition to the ones utilised in specifications [5.1] and [5.2] in this chapter). Although these variables proved not to be strong determinants of FDI or exports, they are useful in allowing us to divide our sample for the purposes at hand. Table 5.12 describes the

[50] The 'developed' sample accounts for 57% and 55% of total observations (from our full sample) for FDI and exports respectively. Accordingly, the 'developing' sample accounts for 43% and 45% respectively.

variables that we have used to partition our full sample into subsamples. The variables are GDP per capita, unit labour costs, a measure of electrical efficiency, urbanisation, and the number of internet connections per thousand population.

In order to allow the sample to 'self-select', we calculate the bilateral ratio for each variable (i.e. home country value divided by host country value). If the ratio is equal to or greater than one then the observation is assigned to one group and if the ratio is less than one the observation is assigned to another group. In this manner we create a series of dual sub-samples partitioned according to the relative values of these variables for the home and host countries.

Given the similarity in results, we chose to report and discuss only those for the sub-samples divided according to the ratio of per capita incomes and urbanisation (the results for the subsamples 'self-selected' according to energy efficiency, unit labour costs, and internet connections are not materially different). The first-stage results for the per capita income subsamples are shown in Table 5.13. The majority of the coefficients are statistically significant and correspond well with previous results. An interesting effect has occurred for the second subsample however, with a statistically significant negative coefficient for host income and statistically significant positive coefficient for host population for both the FDI and exports regressions (see columns 5.4a and 5.4b)[51]. This indicates that when the investing country has lower per capita income than the recipient

[51] By 'first' subsample we mean the sample containing those observations for which the home country has a lower per capita income than the host country.

economy, contrary to our usual findings, higher host income actually discourages FDI and exports, whereas high host population encourages both.

The first-stage results for the urbanisation subsamples are given in Table 5.14. They are broadly consistent with the results for the full sample (as reported in Table 5.10). The second-stage results are reported in rows 6 to 9 of Table 5.11. The results for the per capita income subsamples indicate that the relationship between FDI and exports is more complimentary when the host country has a higher per capita income than the country that is the source of the investment. Similarly, the results for the urbanisation subsamples suggest that the relationship is more complimentary when the host is more urbanised than the investor. These findings are consistent with the OECD/non-OECD and 'developed'/'developing' subsample results in that they suggest that the complementary relationship between FDI and exports is stronger the more developed the host nation.

The second-stage results reported in Table 5.11 are contrary to *a priori* expectations. We hypothesised that the relationship between outward FDI and exports would be stronger for developed-developing interactions than for developed-developed interactions due to the different motivations multinationals have for investing abroad. However, our empirical results suggest the opposite is true. This suggests that the complementary forces acting between FDI and exports (such as intra-firm trade, demonstration effects, marketing synergies etc) are greater when the countries involved are both developed countries. Regardless of the countries involved, the finding of positive, statistically significant second-stage coefficients for the total dataset and all subsamples implies that complementarity-driving forces are more powerful that substitutability-driving forces.

Table 5.12 Selection of Variables used for Sub-sample 'Self-selection'

	Units	*Observations*	*Mean*	*Standard Deviation*	*Minimum*	*Maximum*
GDP p.c.$_i$	US$	5,048	24,503	6,590	11,313	40,527
ULC$_i$	US$	4,414	0.77	0.12	0.54	1.19
EE$_i$	%	3,897	93.97	1.65	90.14	97.67
Urban$_i$	%	5,037	75.17	9.40	60.72	89.11
Internet$_i$	Number of users	4,461	205.0	183.2	0.70	573.1
GDP p.c.$_j$	US$	5,033	14,158	11,137	323	40,527
ULC$_j$	US$	2,418	0.65	0.27	0.09	1.5
EE$_j$	%	3,340	90.4	4.99	72.9	97.7
Urban$_j$	%	3,884	69.6	18.2	26.0	100
Internet$_j$	Number of users	3,547	96.2	136.5	0.001	647.9

Notes: GDP p.c. is gross domestic product per capita in constant 2000 US$; ULC is unit labour cost; EE is electricity transmission efficiency; Urban is the percentage of the population living in urban areas; Internet is the number of internet users per thousand population. The i subscript denotes source country; the j subscript denotes host.

Sources: All data is from the World Development Indicators online database, with the exception of unit labour costs which are taken from the International Labour Organisation's KILM database.

Table 5.13 First-stage Results for Relative per capita income Sub-samples

	5.4a	*5.4b*	*5.5a*	*5.5b*
sample selection criterion	**Relative per capita income ≥1**		**Relative per capita income < 1**	
	FDI	**Exports**	**FDI**	**Exports**
ln Y$_i$	2.45 (13.49)	0.63 (7.60)	3.56 (11.31)	1.91 (18.35)
ln Y$_j$	0.84 (19.29)	0.95 (53.23)	-1.48 (4.27)	-0.91 (7.95)
ln N$_i$	-1.62 (8.97)	0.27 (3.38)	-2.93 (9.53)	-1.20 (11.84)
ln N$_j$	-0.31 (10.36)	-0.20 (15.74)	2.30 (6.33)	1.64 (13.68)
ln d$_{ij}$	-0.43 (11.21)	-0.71 (43.43)	-1.09 (13.27)	-0.59 (22.24)
EU$_{ij}$	0.86 (5.91)	0.19 (2.99)	0.33 (0.94)	0.27 (2.33)
NAFTA$_{ij}$	-0.31 (0.82)	-0.03 (0.18)	dropped	dropped
nEU$_i$EU$_j$	0.10 (0.81)	-0.24 (4.30)	0.74 (1.42)	0.44 (2.49)
nNA$_i$NA$_j$	-0.31 (2.09)	-0.53 (8.21)	1.02 (4.69)	-0.31 (4.51)
EU$_i$ nEU$_j$	0.61 (5.19)	0.21 (4.19)	0.60 (2.03)	0.39 (4.07)
NA$_i$ nNA$_j$	-0.12 (0.87)	-0.23 (4.05)	1.32 (2.52)	-0.28 (1.49)
Lang$_{ij}$	1.33 (12.25)	0.54 (10.53)	0.88 (3.95)	0.26 (3.44)
Border	0.70 (4.99)	0.56 (8.61)	-0.13 (0.74)	0.79 (12.83)
F-statistic	145 (24,2858)	777 (24,3748)	49.0 (23,977)	303 (23,1101)
$\bar{R}^2$	0.54	0.83	0.52	0.86
Obs.	2,883	3,773	1,001	1,125

Notes: Dependent variable is either the natural log of FDI or the natural log of exports from country i to country j. Figures in parentheses are absolute t-ratios. Year dummies are not reported. The 't' subscript has been dropped from the explanatory variable descriptions for simplicity.

Table 5.14 First-stage Results for Urbanisation ratio Sub-samples

	5.6a	*5.6b*	*5.7a*	*5.7b*
sample selection criterion	**Urbanisation ratio ≥1**		**Urbanisation ratio < 1**	
	FDI	**Exports**	**FDI**	**Exports**
ln Y_i	3.47 (19.28)	1.00 (12.09)	2.39 (9.52)	1.00 (9.86)
ln Y_j	0.61 (17.16)	0.72 (47.14)	0.71 (9.94)	1.07 (41.58)
ln N_i	-2.56 (14.51)	-0.11 (1.34)	-1.72 (6.91)	-0.18 (1.84)
ln N_j	-0.17 (5.53)	-0.03 (2.39)	0.04 (0.56)	-0.35 (14.94)
ln d_{ij}	-0.54 (12.52)	-0.63 (33.84)	-0.50 (8.45)	-0.65 (28.67)
EU_{ij}	1.20 (7.63)	0.67 (10.04)	0.97 (4.43)	0.32 (3.74)
$NAFTA_{ij}$	0.50 (1.05)	0.74 (3.27)	-0.58 (0.94)	-0.48 (1.81)
nEU_iEU_j	0.43 (2.69)	0.19 (2.78)	0.15 (0.80)	-0.18 (2.40)
nNA_iNA_j	1.10 (6.19)	-0.19 (2.53)	-0.21 (1.18)	-0.47 (6.65)
$EU_i\,nEU_j$	0.74 (5.57)	0.42 (7.65)	0.63 (3.53)	0.21 (3.20)
$NA_i\,nNA_j$	-0.55 (3.23)	-0.33 (4.70)	0.71 (3.28)	0.04 (0.52)
$Lang_{ij}$	1.06 (8.55)	0.38 (6.63)	1.55 (9.58)	0.64 (9.54)
Border	0.45 (3.19)	0.71 (11.14)	0.27 (1.62)	0.51 (7.13)
F-statistic	1,120 (24,2191)	541 (24,2781)	70.0 (24,1643)	543 (24,2066)
$\bar{R}^2$	0.56	0.82	0.50	0.86
Obs.	2,216	2,806	1,668	2,091

Notes: Dependent variable is either the natural log of FDI or the natural log of exports from country i to country j. Figures in parentheses are absolute t-ratios. Year dummies are not reported. The 't' subscript has been dropped from the explanatory variable descriptions for simplicity.

5.5 CONCLUSION

Despite the widely perceived benefits of globalisation, with its accompaniment of foreign direct investment and free trade, there are those who fear that it will irreparably damage their livelihood. A particular concern is that outward FDI will displace exports to the host country and therefore lead to a loss of domestic employment and, in the extreme, possibly even result in deindustrialisation. Although such thinking may be in the minority, to the extent that such a minority can exert disproportionate influence on policymakers (e.g. via special interest groups), it should be of concern to all those who believe that free trade and free movement of capital are powerful mechanisms for fostering economic growth in all countries of the world.

To this end, this chapter has focussed on the relationship between FDI and exports. The majority of the extant empirical literature finds in favour of complementarity (which would suggest that outward FDI is not harmful to domestic net employment). However, much of the literature can be criticised for failing to take proper account of the possible effects should FDI and exports be simultaneously determined. This omission may have biased some studies towards finding in favour of a complementary relationship. To avoid this potential pitfall, Graham (1995) employs a two-stage regression approach that allows him to investigate the relationship between FDI and exports after removing a range of factors that might simultaneously determine exports and FDI. Graham finds that US exports and US FDI are complements at the global level (i.e. using data from his 'world' sample), and with respect to Europe and East Asia. However, his results indicate that US exports and US FDI are substitutes with respect to western hemisphere countries.

Having utilised a gravity model specification to investigate the impact of regional integration agreements on FDI and exports in the two preceding chapters, it was a relatively simply exercise to extend Graham's methodology to our panel dataset. By using panel data we have been able to include many more observations than Graham (who analysed the outward FDI and exports of a single country for a single year), which should afford more confidence in the statistical significance of our results[52].

Our second-stage results (for the regressions of FDI residuals on export residuals) are reported in Table 5.11. The coefficient for the 'total sample' is 0.83, statistically significant at the 1% level. This is in keeping with Graham's results and provides strong support for arguing that FDI and exports are complements at a 'global' level. Having mitigated the possibility that FDI and exports are being jointly determined by a third independent variable, we still report evidence in support of complementarity. This suggests that perhaps we should not be too quick to disregard the findings of other empirical studies simply because they failed to take account of the possibility of spurious correlation between FDI and exports.

Although the empirical evidence points to FDI and exports being complements in a 'global' sense, we hypothesised that the relationship between FDI and exports may vary depending on the nature of the countries involved. If this is true, then it would be possible for FDI and exports to be complements at a global level, but substitutes with

[52] Although Graham (1995) has data for three separate years, he does not pool the data, but rather estimates his model for each year separately and only reports and discusses the results for a single year.

respect to interactions between certain countries[53]. Should this be the case, minorities may be justified in their fears, despite evidence indicating that higher global FDI is associated with higher global exports.

In order to test our hypotheses we divided our dataset into different samples, based broadly on the level of development of the host country. Our results were supportive of our first hypothesis, with the strength of the relationship between FDI and exports apparently fluctuating depending on whether the host was more or less developed. However, contrary to our second hypothesis, we found the relationship between FDI and exports to be more (rather than less) complementary between two developed countries than it is between a developed and a developing country. For instance, the second-stage correlation coefficient for the OECD sample was 1.12 compared with 0.57 for the non-OECD sample. Further analysis (based on dividing the dataset according to the relative value of various variables) did not alter this finding.

It therefore appears that complementarity-driving forces (such as intra-firm trade, marketing synergies etc) have more prominence in developed-developed interactions than they do in developed-developing interactions. In both cases, however, the positive second-stage coefficient indicates that complementarity-driving forces outweigh substitutability-driving forces (such as tariff-jumping FDI). We therefore find no evidence to support the concern that outward FDI may be accompanied by an overall

[53] Furthermore, stemming from the underlying motivations driving firms to export and make foreign investments, we hypothesised that FDI and exports between two developed countries may be less complementary than between a developed and developing country. There is some evidence, albeit limited, in the literature to support this contention (see for example Carr et. al. (2001) and Lipsey and Weiss (1984)).

reduction in exports from the home country. This should provide comfort to those who believe that free trade and free movement of capital are forces working for the benefit of all.

However, this does not mean that we should simply dismiss the concerns of those who feel threatened by the increasing integration of the world's economies. Our results do not preclude the possibility that outward FDI may be accompanied by a fall in exports within some industries and sectors. Even though FDI may encourage exports in aggregate (and vice versa), it is possible that some groups may suffer loss of employment due to the exports of their industry being replaced by overseas foreign production. It would be interesting to examine this further in future work, providing it proves possible to assemble a suitable database disaggregated at the industry and sector level. For now, we would urge policymakers to be cognizant of the fact that while FDI and exports appear to promote one another at the aggregate level, it is quite possible that certain groups of people, or even industries, may be disadvantaged. Policies designed to compensate those that suffer an economic loss may provide an attractive solution to this problem[54].

Although the analysis undertaken here has gone beyond that commonly conducted in the literature, there are other further advancements that would be interesting to explore. For instance, having laboured the point regarding the importance of minimising the unexplained variability remaining following the stage-one regressions, it would be valuable to identify some additional explanatory variables that have an influence on

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[54] Such a policy was included in the NAFTA agreement to try to ensure that those who suffered economically as a result of NAFTA received adequate compensation.

FDI[55]. Secondly, as developing countries are increasingly becoming net outward investors it is imperative that they collect reliable data so that the nature of the FDI/exports relationship can be explored from their perspective.

[55] The unexplained variability remaining following the stage-one FDI regression was nearly 50%, compared with less than 20% for the stage-one exports regression.

7. CONCLUSION

7.1 CONTEXT

We have explored the relationships between foreign direct investment, international trade and regional integration agreements in the context of endogenous growth theory. Whereas classical and neoclassical growth theory has little to offer in the way of policy recommendations, new growth theory is more promising as it seeks to incorporate a range of elements to better explain the causes of long-run economic growth.

Of particular interest is the role of FDI in the growth process. Its ability to confer technology and know-how from source to host country sets it apart from domestic investment, portfolio investment and aid (all of which provide capital to the host economy) and offers developing countries, in particular, the opportunity to bridge the *technology* or *ideas gap.*[1]

The promise shown by FDI for stimulating economic growth, combined with the phenomenon known as *globalisation (*which has engendered a remarkable increase in global investment, trade and integration) raises many questions that warrant further investigation. Indeed, the myriad issues raised are too numerous to all be addressed here. Instead, we have chosen to tackle a handful of interrelated topics in the hope of making a

[1] It is spillovers and externalities from FDI that allow the technology or ideas gap to be broached. Spillovers are thought to primarily occur through imitation and competition effects, human capital acquisition and export spillovers.

useful, and *focussed*, contribution to the fields of foreign direct investment, integration and economic growth.

The first question to be addressed was the impact of regional integration agreements on flows of foreign direct investment. Integration agreements are at the heart of the debate regarding the merits of regionalism versus multilateralism as mechanisms for harnessing the benefits to be gained from free trade. Although multilateralism is the favoured solution in a theoretical sense, regionalism is probably the more realistic approach[2]. Not only has the number of integration agreements increased rapidly in recent years, but their structure has also evolved considerably. Whereas early RIAs were typically negotiated solely between hegemons, contemporary RIAs often count both hegemons and non-hegemons as members. It is now also common for RIAs to include investment provisions (i.e. policies to promote intra-regional investment) as well as trade provisions in their articles of association. It is therefore probable that RIAs will influence the volume and pattern of FDI between both developed and developing countries. By altering the opportunities available within the region, RIAs will also have an impact on flows of FDI between 'insider' and 'outsiders'.

In order to investigate the effects of RIAs on FDI we chose to focus on the two most significant integration agreements in effect today, the EU and NAFTA. By explicitly examining these agreements we are able to draw useful conclusions that apply to specific

[2] In permitting the formation of regional trading agreements under Article XXIV (which would otherwise be prohibited), the WTO is implicitly acknowledging that regionalism may provide a preferable route to global free trade than multilateralism.

countries and circumstances[3]. Furthermore, as the most advanced and 'deep' integration agreements in existence, the EU and NAFTA are those most likely to have had an impact on FDI flows.

In addition to investigating the effects of integration agreements on FDI, we also examined their impact on exports. This not only allows us to estimate the effect of the EU and NAFTA on trade, but also affords greater understanding (and comparability) of our empirical methodology. As it happens, it was also a prerequisite for the empirical work we undertook in chapter 5 on the relationship between FDI and exports.

Exploring the relationship between FDI and exports is critical because of its importance (or perhaps more importantly its *perceived* importance) in determining the potential cost to the investing country of outward FDI. A common concern is that outward FDI may displace exports and hence lead to a loss of jobs, and possibly even deindustrialisation, in the home country. This argument rests on the assumption that exports and FDI are substitutes; when FDI increases, exports are expected to fall. Unfortunately, the nature of the relationship between FDI and exports is indeterminate from theory. We are therefore forced to investigate the relationship empirically in the absence of a concrete theoretical prediction.

In order to further investigate some of the issues addressed in our empirical analyses of chapters 3, 4 and 5, we concluded by undertaking a case study analysis of foreign direct

[3] Between them, the members of the EU and NAFTA accounted for 61% of world FDI inflows and 84% of outflows in 2003.

investment in Mexico. Mexico provides an interesting case study because it has undergone substantial economic liberalisation since pursuing import-substituting industrialisation (ISI) policies during the 1970s and early-1980s. As it is one of the three members of NAFTA, it also affords the opportunity to assess whether our empirical results are in accordance with reality.

7.2 METHODOLOGY

For the empirical chapters, the gravity model was selected as the favoured empirical framework. Although its most popular, and successful, application is in respect of trade flows, in recent years the model has increasingly been applied to investment flows. The gravity model assumes that bilateral FDI or exports (whichever is the dependent variable of interest) can be explained by home and host country GDPs, home and host country populations, and the geographical distance between the two countries. These are the 'standard gravity variables', to which can be added additional explanatory variables if thought relevant (e.g. common language, common border etc). In chapters 3 and 4 we include integration dummy variables in order to investigate the impact of the EU and NAFTA on FDI flows and exports respectively.

We require a slightly more sophisticated approach in order to properly assess the relationship between FDI and exports. Much of the extant empirical literature can be criticised for failing to take account of the fact that FDI and exports may be spuriously correlated by a third independent variable. In order to mitigate this risk, we follow the approach favoured by Graham (1995). This involves a two-stage process: in stage one the gravity model is used to perform separate regressions for FDI flows and exports[4]; in stage two the residuals from stage one are regressed against one another. A positive stage-two coefficient indicates that FDI and exports are complements; a negative coefficient implies that they are substitutes.

Our dataset was constructed as a panel with 13 home and 48 host countries for the years 1992 to 2003 inclusive. With a complete, balanced dataset this would give 8,112 observations (i x j x t = 13 x 48 x 13). However, as with all studies in this area of economics, the size of the dataset has been restricted due to the availability of data for the dependent variables[5].

7.3 KEY FINDINGS

Initial OLS results, for the analysis of the impact of RIAs on FDI, indicated that integration agreements (proxied by a combined EU and NAFTA intercept dummy) increase FDI flows between members by 60%. However, when the effects of the EU and NAFTA were separately estimated, only the EU seemed to exert a positive influence on intra-regional investment (i.e. the NAFTA dummy was not statistically significant). It was also interesting to note that both a common language and common border also

[4] Conveniently, these very regressions have been performed as part of the analysis conducted in chapters 3 and 4.
[5] Data for exports is more widely available than FDI data – for the FDI analysis of chapter 3 we have 3,884 total observations; for the exports analysis of chapter 4 we have 4,898 observations.

encouraged increased FDI flows. We estimated that a common language increases FDI flows by around 270%, and a common border increases FDI by approximately 35%[6].

In order to test the sensitivity of the OLS results, a range of additional explanatory variables were introduced into the analysis. Although inclusion of some of these variables resulted in the disappearance of the EU effect, we concluded that this was due to a reduction in the number of available observations rather than inclusion of any of the additional variables *per se*. This finding suggested that the EU effect may be being driven primarily by behaviour in the early nineties (notably the implementation and completion of the Single European Market (SEM) program). To test this hypothesis, regressions were performed on cross-sections of data for each individual year. These results indicated that the EU exerted a positive influence on FDI flows between members for the years 1992 to 1996, but this influence seemed to disappear from 1997 onwards[7]. This would seem to suggest that it is not integration agreements per se that influence FDI flows, but rather the policies and environmental changes that result from such agreements. A similar conclusion was reached by Balasubramanyam et. al. (2002).

In addition to affecting member countries, the formation of a RIA is likely to impact non-member countries. To test for this possibility, we constructed a number of additional dummy variables to capture the effect on 'insider-outsider' and 'outsider-insider' FDI flows. The results indicated that both the EU and NAFTA encouraged additional FDI

[6] Although the common language dummy is implausibly high (reflecting the fact that it is probably capturing other effects such as similarity in institutions and legal framework, colonial ties and other common factors), it is likely that a common language does substantially encourage investment.
[7] In accordance with the results for the entire panel, the NAFTA dummy was not statistically significant for any individual years.

inflows from *outsiders* than would otherwise have been the case. This is not surprising given that the enlarged internal markets of both the EU and NAFTA will prove attractive to firms from non-member countries. It also resonates with anecdotal evidence of member countries (e.g. Ireland, Mexico) enjoying significant increases in inward FDI following membership of the RIA. Evidence was also reported that the EU stimulates FDI from *insiders* to *outsiders*. A similar effect was not detectable for NAFTA however.

Our analysis of the impact of RIAs on FDI has provided results which indicate that the EU has acted as a stimulant to intra-regional FDI, but that NAFTA has not. It is also clear that RIAs have a marked effect on non-member countries as they encourage greater *outsider-insider* and *insider-outsider* flows[8]. Unfortunately, it is not possible to say with certainty whether the (lack of a) NAFTA result is an accurate reflection of reality, or whether the model simply failed to detect the true effect (owing, perhaps, to the absence of outward FDI observations for Canada and Mexico).

In Chapter 4 we again employed the gravity model to perform an analysis of the impact of RIAs on exports. Initial OLS results implied that the EU has resulted in increased in intra-regional trade of 30% (compared with the case in the absence of the EU), whereas NAFTA increased trade by approximately 40%. This suggests that the EU provides a slightly greater stimulant to FDI than it does to exports, but NAFTA provides a greater boost to exports than it does to investment.

[8] As noted, there was no detectable *insider-outsider* effect due to NAFTA.

It was also interesting to compare the estimated exports and FDI coefficients for some of the other explanatory variables. The absolute magnitude of the distance coefficient was greater for the exports than the FDI regression, supporting the belief that geographical distance is a greater deterrent to trade than it is to investment. The common border dummy was roughly twice the magnitude in the exports regression as it was in the FDI regression, providing further evidence that distance is a more important determinant of the volume of exports than of FDI. Common language proved a much greater stimulant to FDI than to exports, which is not surprising given that a common language is likely to be relatively more important in facilitating FDI than it is in facilitating exports.

As in Chapter 3, additional integration dummies were included to capture the possible effects on *outsiders*. The results indicated that exports from *outsiders* to *insiders* were reduced in the cases of both the EU and NAFTA (although the result for the EU was not statistically significant). This may be due to displacement by non-member FDI. In other words, the formation of the RIA leads to an expanded internal market which makes it more attractive for non-member firms to service by establishing a subsidiary in one of the member countries rather than exporting to each country from home.

There is also evidence that the EU has encouraged higher exports from members to non-members than would otherwise have been the case. The estimated coefficient indicates that exports from an EU member are 34% greater than exports between two *outsiders*. NAFTA, on the other hand, appears to discourage exports from *insiders* to *outsiders*. This suggests that FDI diversion is taking place, with some intra-regional investment opportunities becoming more favourable than external opportunities solely due to the prevalence of more favourable investment provisions.

Our analysis of the relationship between FDI and exports found in favour of complementarity (i.e. a positive second-stage coefficient), which is consistent with Graham (1995) and the majority of extant literature. We therefore find no evidence to support the contention that outward FDI harms net domestic employment; on the contrary, increased FDI is associated with greater exports which should promote domestic employment.

In an extension of the analysis, we found that the relationship between FDI and exports appears to be more complementary for *developed-developed* interactions than it is for *developed-developing* interactions. Although this supports our hypothesis that the nature and strength of the relationship will depend on the countries involved and the motivation for undertaking investment and trade, it is at odds with our expectation that *developed-developing* interactions will have a stronger relationship than *developed-developed* interactions. It therefore appears that complementarity-driving forces (such as intra-firm trade, marketing synergies etc) have more prominence in developed-developed interactions than they do in developed-developing interactions.

Although Mexico had enjoyed increasing inward FDI for over four decades, there was a dramatic increase in the nineties. Contrary to expectations, the catalyst for this influx does not appear to have been the formation of NAFTA. Rather, the increase in FDI seems to have been a response to the dramatic policy liberalisation forced upon Mexico in

1985 due to its sovereign debt crisis. This perhaps explains why the analysis of Chapter 3 did not detect a *NAFTA effect* on *insider* FDI flows.

It is clear from the case study however, that membership of NAFTA has had a considerable impact on the Mexican economy. By deepening and legitimising Mexico's liberalisation policies, and providing a gateway for accessing the US market, NAFTA has made Mexico more attractive to inward FDI from *outsiders* (particularly European and Japanese investors). This is supported by the analysis of Chapter 3.

7.4 IMPLICATIONS AND POLICY ISSUES

Although the initial analysis of chapter 3 reported a positive coefficient for the EU integration dummy, further analysis showed that this effect was being driven purely by the early years of our sample. Although regional integration agreements should in their own right prove attractive to foreign investors (as investors expect them to be accompanied by policy liberalisation, larger internal market, and reduced uncertainty), it seems apparent that it is the policies that accompany the agreement (and the degree of environmental change engendered by those policies) that have the real impact on investor behaviour. In other words, a RIA is likely to have a greater influence on flows of FDI to a member country when the agreement results in a substantial alteration in the prevailing environment. For instance, the Single European Market (SEM) program is likely to have had a considerable influence on both FDI and exports within the EU. Although work on the SEM continues today, its biggest impact will surely have been during the years of implementation (1985 to 1992) and in the years immediately following its official completion. Unfortunately we do not have bilateral FDI data prior to 1992 otherwise we would have been able to explore the impact of the SEM further.

In the case of Mexico, the policies that had the greatest influence on FDI flows actually came some years before the implementation of NAFTA. The true catalyst for the marked increases in inward FDI would seem to be the dramatic policy reorientation forced upon Mexico in 1985 due to its sovereign debt crisis. This crisis forced Mexico to stop pursuing import-substitution industrialisation (ISI) and instead liberalise trade and investment policies. The apparent success of this in attracting FDI emphasises how important a conducive environment is to attracting investors. It also offers a possible explanation for our inability to detect a positive NAFTA ('insider') effect on FDI in the empirical work of chapter 3: it is not NAFTA that has led to increased FDI, but rather the economic liberalisation undertaken by Mexico nearly a decade earlier

NAFTA also seems to have had a pronounced *spatial* effect on the Mexican economy, the attraction of the US market having pulled Mexican manufacturing activity towards the US-Mexico border. Policymakers should be cognizant of this effect as it may be detrimental to long-run growth and give rise to increasing income inequality. Policies to try to attract FDI to the southern regions of Mexico are unlikely to be very successful given that a number of factors (e.g. transport costs, agglomeration economies) are likely to dictate that foreign investment continues to be located along the US-Mexico border or near Mexico City. Future integration among the Southern Hemisphere economies may serve to offset this trend, but such effects are difficult to predict. This would be an interesting topic for future research.

Given its proximity to the US and membership of NAFTA, Mexico should not fear that it will be unable to attract FDI. It should therefore resist the temptation to 'artificially' attract FDI (e.g. by offering tax incentives) and instead concentrate on fostering a conducive economic environment through investment in education, physical and financial infrastructure, and 'sound' institutions. This would ensure maximum social return from foreign investment, both by maximising *absorptive capacity* and limiting the ability of multinationals to privately capture the benefits of FDI.

These policy recommendations apply equally to all developing countries. Even those that do not have a large hegemon for a neighbour should shy away from offering inducements to foreign investors. By offering a 'distortion-free' environment countries maximise their opportunity to both attract and benefit from FDI in the long run.

In chapter 5 we investigated the relationship between FDI and exports. For all samples analysed (total dataset and all subsamples) we found evidence of a complementary relationship. Therefore, at least at an aggregate level, we find no support for the argument that outward FDI leads to a loss of employment in domestic export sectors. Policymakers should therefore resist making concessions to special interest groups in this regard. However, this does not mean that we should simply dismiss the concerns of those who feel threatened by the increasing integration of the world's economies. Our results do not preclude the possibility that outward FDI may be accompanied by a fall in exports within some industries and sectors. Even though FDI may encourage exports in aggregate (and vice versa), it is possible that some groups may suffer loss of employment due to the exports of their industry being replaced by overseas foreign production. We would recommend policymakers be cognizant of this possibility. For future integration agreements, policies designed to compensate those who are economically disadvantaged by the integration agreement might prove desirable (such a policy was included in the NAFTA agreement). Countries should be mindful of the effects on both *insiders* and *outsiders*, and the possibility of marked *spatial* effects, when negotiating their inclusion in an integration agreement.

7.5 FUTURE RESEARCH

Although we have addressed a number of questions in this thesis, many more have arisen that would be worthy of further attention in future research. For instance, it would be useful to extend the analysis of the effects of RIAs on FDI and exports to include additional integration agreements to test whether the results we report are unique to the EU and NAFTA, or are more widely applicable. Future research should also assess the effect of the EU expansion (to include the Accession countries) when appropriate data becomes available.

Although we found no evidence to support the assertion that outward FDI (via its relationship with exports) harms domestic employment in the investor country, further work (and data) is needed in order to adequately analyse the relationship between FDI and exports in cases where the 'home' country is an LDC. The relationship is also likely to vary by industry and sector, and it would be useful to explore this possibility in greater depth.

Given the benefits that inward FDI is believed to confer on the host economy, it is surprising that the empirical analysis of section 6.5 found little evidence to support this. The potential spatial effects of FDI may offer an explanation for this. It is possible that FDI results in substantial agglomeration economies, which could result in the benefits to the host economy being restricted to specific geographical locations or sectors. We may therefore find a stronger effect of inward FDI on Mexican economic growth if the data permitted the regional growth patterns in Mexico to be analysed. The review of Mexico also demonstrated the value of case studies, specifically their ability to complement and add texture to the results obtained from panel datasets based on international cross-section and time-series data. Future research will benefit from the continued combination of empirical and case study techniques.

REFERENCES

Abramovitz, M. (1986), "Catching Up, Forging Ahead, and Falling Behind", *Journal of Economic History*, 46(2), 385-406.

Abramovitz, M. (1993), "The Search for the Sources of Growth: Areas of Ignorance, Old and New", *Journal of Economic History*, 53(2), 217-243.

Aitken, B., G. Hanson, and A. Harrison (1997), "Spillovers, Foreign Investment and Export Behaviour", *Journal of International Economics*, 43(1-2), 103-132.

Aitken, H., A. Harrison, and R. Lipsey (1996), "Wages and Foreign Ownership: A Comparative Study of Mexico, Venezuela and the United States", *Journal of International Economics*, 40(3-4), 345-371.

Aitken, N.D. (1973), "The Effect of the EEC and EFTA on European Trade: A Temporal Cross-Section Analysis", *American Economic Review*, 63(5), 881-892.

Anderson, J.E. (1979), "A Theoretical Foundation for the Gravity Equation", *American Economic Review*, 69(1), 106-116.

Balasubramanyam, V.N. and M. Salisu (1991), "EP, IS and Direct Foreign Investment in LDCs", *In:* A. Koekkoek and L.B.M. Mennes, eds. *International Trade and Global Development,* London: Routledge, 191-207.

Balasubramanyam, V.N., M. Salisu and D. Sapsford (1996), "Foreign Direct Investment and Growth in EP and IS Countries", *Economic Journal*, 106(434), 92-105.

Balasubramanyam, V.N., M. Salisu and D. Sapsford (2001), "FDI and Economic Growth in LDCs: Some Further Evidence", *In:* H. Block and P. Kenyon, eds. *Creating an Internationally Competitive Economy*, London: Macmillan, 233-249.

Balasubramanyam, V.N., D.J. Griffiths and D. Sapsford (2002), "Regional Integration Agreements and Foreign Direct Investment: Theory and Preliminary Evidence", *The Manchester School*, 70(3), 460-482.

Balasubramanyam, V.N. and Y.A. Wei (2004), *Foreign Direct Investment: Six Country Case Studies*, Cheltenham: Edward Elgar.

Barro, R.J. and X. Sala-i-Martin (1995), *Economic Growth*, New York: McGraw-Hill.

Barro, R.J. and X. Sala-i-Martin (1992), "Public Finance in Models of Economic Growth", *Review of Economic Studies*, 59(4), 645-661.

Bayoumi, T. and B. Eichengreen (1999), "Is Asia an Optimum Currency Area? Could It become One?: Regional, Global and Historical Perspectives on Asian Monetary Relations", *In:* S. Collingnon, J. Pisani-Ferry and Y.C. Park, eds. *Exchange Rate Policies in Emerging Asian Countries,* London: Routledge, 347-67.

Bergstrand, J.H. (1985), "The Gravity Equation in International Trade: Some Microeconomic Foundations, and Empirical Evidence", *Review of Economics and Statistics*, 67(4), 474-481.

Bergstrand, J.H. (1989), "The Generalized Gravity Equation, Monopolistc Competition, and the Factor-Proportions Theory in International Trade", *Review of Economics and Statistics,* 71(1), 143-153.

Bernard, A.B. and J.B. Jensen (1999), "Exceptional Exporter Performance: Cause, Effect, or Both?", *Journal of International Economics*, 47(1), 1-25.

Bernard, A.B. and J. Wagner (1997), "Exports and Success in German Manufacturing," *Weltwirtschaftliches Archiv*, 133(1), 134-157.

Bhagwati, J. (1964), "The Pure Theory of International Trade," *Economic Journal*, 74(3), 1-78.

Bhagwati, J. (1978), *Anatomy and Consequences of Exchange Control Regimes, Vol. 1,* Studies in International Economic Relations, No. 10, New York: National Bureau of Economic Research.

Bhagwati, J. (1992), "Regionalism and Multilateralism: An Overview", *Columbia University Discussion Paper No. 603.*

Blomstrom, M. and H. Persson (1983), "Foreign Investment and Spillover Efficiency in an Underdeveloped Economy: Evidence from Mexican Manufacturing Industry", *World Development*, 11(6), 493-501.

Blomstrom, M. (1986), "Foreign Investment and Productive Efficiency: The Case of Mexico", *Journal of Industrial Economics*, 35(1), 97-110.

Blomstrom, M., R.E. Lipsey and K. Kulchycky (1988), "US and Swedish Direct Investment and Exports", *In:* R.E. Baldwin ed. *Trade Policy Issues and Empirical Analysis*, Chicago: University of Chicago Press.

Blomstrom, M. and N. Wolff (1994), "Multinational Corporations and Productivity Convergence in Mexico", *In:* W. Baumol, R. Nelson and N.

Wolff eds. *Convergence of Productivity: Cross National Studies and Historical Evidence,* Oxford: Oxford University Press.

Blomstrom, M. and A. Kokko (1997), "Regional Integration and Foreign Direct Investment", *NBER Working Paper 6019.*

Blomstrom, M. and A. Kokko (1998), "Multinational Corporations and Spillovers", *Journal of Economic Surveys*, 12(3), 247-277.

Blonigen, B.A., R.B. Davies and K. Head (2003), "Estimating the Knowledge-Capital Model of the Multinational Enterprise: Comment", *American Economic Review*, 93(3), 980-994.

Bougheas, S., P.O. Demetriades and E.L.W. Morgenroth (1999), "Infrastructure, Transport Costs, and Trade", *Journal of International Economics*, 47(1), 169-189.

Bowen, H.P., E. Leamer and L. Sveikauskas (1987), "Multifactor, Multicountry Tests of the Factor Abundance Theory", *American Economic Review*, 77(12), 791-809.

Brainard, S.L. (1993a), "A Simple Theory of Multinational Corporations and Trade with a Trade-Off Between Proximity and Concentration", *NBER Working Paper 4269.*

Brainard, S.L. (1993b), "An Empirical Assessment of the Factor Proportions Explanation of Multinational Sales", *NBER Working Paper 4583.*

Brainard, S.L. (1997), "An Empirical Assessment of the Proximity-Concentration Trade-off between Multinational Sales and Trade", *American Economic Review*, 87(4), 520-544.

Brenton, P., F. Di Mauro and M. Lucke (1999), "Economic Integration and FDI: An Empirical Analysis of Foreign Direct Investment in the EU and Central and Eastern Europe", *Empirica*, 26(2), 95-121.

Buckley, P.J. and M.C. Casson (2001), "The Moral Basis of Global Capitalism: Beyond the Eclectic Theory", *International Journal of the Economics of Business*, 8(2), 303-327.

Carkovic, M. and R. Levine (2002), "Does Foreign Direct Investment Accelerate Economic Growth?", *University of Minnesota Working Paper.*

Carr, D. L., J.R. Markusen and K.E. Maskus (2001), "Estimating the Knowledge-Capital Model of the Multinational Enterprise", *American Economic Review*, 91(3), 693-708.

Caves, R. (1999), "Spillovers from Multinationals in Developing Countries: the Mechanisms at Work", *University of Michigan Working Paper 247.*

Chamarbagwala, R., S. Ramaswamy and P.V. Wunnava (2000), "The Role of Foreign Capital in Domestic Manufacturing Productivity: Empirical Evidence from Asian Economies", *Applied Economics*, 32(4), 393-398.

Chase, K.A. (2005), "Multilateralism Compromised: The Mysterious Origins of GATT Article XXIV", *World Trade Review*, 5(1), 1-30.

Chen, E. K. Y. (1983), *Multinational Corporations, Technology and Employment*, London: Macmillan.

Cheng, I-H and H.J. Wall (2002), "Controlling for Heterogeneity in Gravity Models of Trade", *Federal Reserve Bank of St. Louis*, Working Paper 1999-010C.

Council of Economic Advisors (1995), *Economic Report of the President*, Washington D.C.: U.S. Government Printing Office.

Crawford, J. and R.V. Fiorentino (2005), "The Changing Landscape of Regional Trade Agreements", *World Trade Organisation*, Discussion Paper No. 8.

Deardoff, A.V. (1998) "Determinants of Bilateral Trade: Does Gravity Work in a Neoclassical World?", *In:* J. Frankel, J. ed. *The Regionalization of the World Economy*, Chicago: University of Chicago Press.

Di Mauro, F. (2000), "The Impact of Economic Integration on FDI and Exports: A Gravity Approach", *Centre for European Policy Studies*, Working Document 156.

Dunning, J. (1977), "Trade, Location of Economic Activity, and the Multinational Enterprise: A Sear for an Eclectic Approach", *In:* B. Ohlin, P.O. Hesselborn, and P.M. Wijkman eds. *The International Allocation of Economic Activity*, New York: Holmes and Meier.

Eaton, A. and J. Tamura (1994), "Bilateralism and Regionalism in Japanese and US Trade and Direct Foreign Investment Patters", *Journal of Japanese International Economies*, 8(4), 478-510.

Egger, P. (2000), "A Note on the Proper Econometric Specification of the Gravity Equation", *Economic Letters*, 66(1), 25-31.

Ekholm, K. (1998), "Proximity Advantages, Scale Economies, and the Location of Production", *In:* P. Braunerhjelm and K. Ekholm eds. *The Geography of Multinational Firms*, Stockholm: Kluwer.

Feenstra, R. and G. Hanson (1997), "Foreign Direct Investment and Relative Wages: Evidence from Mexico's Maquiladoras", *Journal of International Economics*, 42(3/4), 371-393.

Findlay, R. (1978), "Relative Backwardness, Direct Foreign Investment, and the Transfer of Technology", *Quarterly Journal of Economics*, 92(1), 1-16.

Fosfuri, A., M. Motta and T. Ronde (2000), "Foreign Direct Investments and Spillovers Through Workers' Mobility", *Universitat Pompeu Fabra*, Economics Working Papers 258.

Frankel, J.A. (1997), *Regional Trading Blocks in the World Trading System*, Washington D.C: Institute for International Economics.

Frankel, J.A. and A.K. Rose (2002), "An Estimate of the Effect of Common Currencies on Trade and Income", *Quarterly Journal of Economics*, 117(2), 437-466.

Gerber, J. (2001), "The Structure of US Outward Foreign Direct Investment in Mexico's Export Processing Industry," paper prepared for *International Conference Latin American Studies*, July.

Gerschenberg, I. (1987), "The Training and Spread of Managerial Know-How: A Comparative Analysis of Multinationals and Other Firms in Kenya", *World Development*, 15, 931-939.

Girma, S., D. Greenaway and R. Kneller (2002), "Does Exporting Lead to Better Performance? A Microeconomic Analysis of Matched Firms", *GEP Research Paper 2002/09.*

Glass, A.J. and K. Saggi (2001), "Innovation and Wage Effects of International Outsourcing", *European Economic Review*, 45(1), 67-86.

Globerman, S. and R. Schwindt (1996), "International Trade Agreements and Foreign Direct Investment in the Agri-Industrial Sector," report prepared for *Agriculture and Agri-Food Canada*, mimeo, May.

Görg, H. and D. Greenaway (2004), "Much Ado About Nothing? Do Domestic Firms Really Benefit from Foreign Direct Investment?", *World Bank Research Observer*, 19, 171-197.

Görg, H. and E. Strobl (2000), "Multinational Companies and Productivity Spillovers: A Meta-Analysis with a Test for Publication Bias", *Centre for Research on Globalisation and Labour Markets*, Research Paper 17.

Graham, E.M. and L-G. Liu (1988), "The relationship between Trade and Foreign Investment: Empirical Results for Taiwan and South Korea", *Institute for International Economics*, Working Paper 87-7.

Graham, E.M. and P.R. Krugman (1991), *Foreign direct investment in the United States*, Washington D.C.: The Institute for International Economics.

Graham, E.M. (1995), "On the Relationships Among Direct Investment and Trade in the Manufacturing Sector: Empirical Results for the United States and Japan", *Institute for International Economics*, mimeo.

Graham, E.M. and L.G. Liu (1998), "The Relationship Between Trade and Foreign Investment: Empirical Results for Taiwan and South Korea", *Institute for International Economics*, Working Paper 98-7.

Graham, E.M. and E. Wada (2000), "Domestic Reform, Trade and Investment, Financial Crisis, and Foreign Direct Investment into Mexico", *The World Economy*, 23(6), 777-798.

Griffiths, D.J. and D. Sapsford (2004), "Foreign Direct Investment in Mexico", *In:* Y.A. Wei and V.N. Balasubramanyam eds. *Foreign Direct Investment: Six Country Case Studies*, Cheltenham: Edward Elgar.

Grosse, R. and D. Thomas (2001), "Country-of-Origin Determinants of Foreign Direct Investment in an Emerging Market: the Case of Mexico", *Journal of International Management*, 7, 59-79.

Grossman, G. and E. Helpman (1994), "Foreign Investment with Endogenous Protection", *NBER Working Paper 4876.*

Gruber, W., D. Mehta and R. Vernon (1967), "The R&D Factor in International Trade and International Investment of US Industries", *Journal of Political Economy*, 75(1), 20-37.

Grubert, H. and J. Mutti (1991), "Taxes, Tariffs and Transfer Pricing in Multinational Corporation Decision Making", *Review of Economics and Statistics*, 73(2), 285-293.

Haddad, M. and A. Harrison (1993), "Are there positive spillovers from direct foreign investment?", *Journal of Development Economics*, 42(1), 51-74.

Hamilton, C. and L.A. Winters (1992), "Opening Up International Trade in Eastern Europe", *Economic Policy*, 14(7), 77-116.

Hanson, G. (1996), "US-Mexico Integration and Regional Economies: Evidence from Border-City Pairs", *NBER Working Paper 5425*.

Hanson, G. (1997), "Increasing Returns, Trade, and the Regional Structure of Wages", *Economic Journal*, 107(440), 113 – 133.

Hanson, G. (1998), "North American Economic Integration and Industry Location", *NBER Working Paper 6587*.

Hanson, G. (2001), "Should Countries Promote Foreign Direct Investment", *G-24 Discussion Paper Series*, No. 9.

Head, K. (1998), "Comment on 'Comparing Wages, Skills and Productivity Between Domestically and Foreign-Owned Manufacturing Establishments in the United States", *In:* R. Baldwin, R. Lipsey and J.D. Richardson eds. *Geography and Ownership as Bases for Economic Accounting*, Chicago: Chicago University Press.

Heckscher, E. (1919), "The Effects of Foreign Trade on the Distribution of Income," *Ekonomisk Tidskrift*, Vol. 21, 497-512.

Helpman, E. (1984), "A Simple Theory of International Trade with Multinational Corporations", *Journal of Political Economy*, 92(3), 451-471.

Helpman, E. and P. Krugman (1985), *Market Structures and Foreign Trade*, Cambridge: MIT Press.

Hermes, N. and R. Lensink (2000), "Foreign Direct Investment, Financial Development and Economic Growth", *University of Groningen*, SOM Reports.

Horst, T. (1972a), "Firm and Industry Determinants of the Decision to Invest Abroad: An Empirical Study", *Review of Economics and Statistics*, 54(3), 258-266.

Horst, T. (1972b), "The Industrial Composition of US Exports and Subsidiary Sales to the Canadian Market", *American Economic Review*, 62(1), 37-45.

Horstmann, I.J. and J.R. Markusen (1987), "Licensing Versus Direct Investment: A Model of Internationalization by the Multinational Enterprise", *Canadian Journal of Economics*, 20, 464-481.

Horstmann, I.J. and J.R. Markusen (1992), "Endogenous Market Structures in International Trade", *Journal of International Economics*, 32(1), 109-129.

Huang, H. and C. Xu (1999), "Institutions, Innovations, and Growth", *IMF Working Paper No. 99/34.*

Hufbauer, G.C. and F.M. Adler (1968), "Overseas Manufacturing Investment and the Balance of Payments", *US Treasury Department Tax Policy Research Study No. 1*, US Government Printing Office.

Hufbauer, G.C. and J.J. Schott (2005), *NAFTA Revisited: Achievements and Challenges*, Washington D.C.: Institute for International Economics.

Hymer, S. H. (1960), *"The International Operations of National Firms: A Study of Direct Foreign Investment"*, PhD Dissertation, 1960, Massachusetts Institute of Technology, Cambridge: MIT Press.

International Labour Organization (1981), *Multinationals Training Practices and Development*, Geneva: ILO.

Katz, J. (1987), *Technology Generation in Latin American Manufacturing Industries*, London: Macmillan.

Kokko, A. (1994), "Technology, Market Characteristics, and Spillovers", *Journal of Development Economics*, 43(2), 279-293.

Kokko, A. (1996), "Productivity Spillovers from Competition Between Local Firms and Foreign Affiliates", *Journal of International Development*, 8(4), 517-530.

Kogut, B. and H. Singh (1998), "The Effects of National Culture on the Choice of Entry Mode", *Journal of International Business Studies*, 19, 411-432.

Lehmann, A. (1999), "Country Risks and the Investment Activity of US Multinationals in Developing Countries", *IMF Working Papers*, WP/99/133.

Levy, P.I. (1997), "A Political-Economic Analysis of Free Trade Agreements", *American Economic Review*, 87(4), 506-519.

Lindsey C. W. (1986). 'Transfer of Technology to the ASEAN Region by U.S. Transnational Corporations", *ASEAN Economic Bulletin*, 3, 225-247.

Linneman, H. (1996), *An Econometric Study of International Trade Flows*, Amsterdam: North Holland Publishing Company.

Lipsey, R.E. and M.Y. Weiss (1981), "Foreign Production and Exports in Manufacturing Subsidiaries", *Review of Economics and Statistics*, 63(4), 488-495.

Lipsey, R.E. and M.Y. Weiss (1984), "Foreign Production and Exports of Individual Firms", *Review of Economics and Statistics*, 66(2), 304-308.

List, J.A. and C.Y. Co (2000), "The Effects of Environmental Regulations on Foreign Direct Investment", *Journal of Environmental Economics and Management*, 40(1), 1-20.

Love, J. and F. Lage-Hidalgo (1999a), "Is There Competition for US Direct Investment? A Perspective on NAFTA", *The World Economy*, 22(2), 207-221.

Love, J. and F. Lage-Hidalgo, F. (1999b), "The Ownership Advantage in Latin American FDI: A Sectoral Study of US Direct Investment in Mexico", *Journal of Development Studies*, 35(5), 76-95.

Love, J. and F. Lage-Hidalgo (2000), "Analysing the Determinants of US Direct Investment in Mexico", *Applied Letters*, 32(10), 1259-1267.

Lucas, R. (1988), "On the Mechanics of Economic Development", *Journal of Monetary Economics*, 22(1), 3-42.

Mankiw, G., D. Romer and D. Weil (1992), "A Contribution to the Empirics of Economic Growth", *Quarterly Journal of Economics*, 107(2), 407-437.

Markusen, J.R. (1984), "Multinationals, Multiplant Economies and the Gains from Trade", *Journal of International Economics*, 16(3/4), 205-226.

Markusen, J.R. (1997), "Trade Versus Investment Liberalization", *NBER Working Paper 6231*.

Markusen, J.R. and K.E. Maskus (2002), "Discriminating Among Alternative Theories of the Multinational Enterprise", *Review of International Economics*, 10(4), 694-707.

Markusen, J.R. and A. Venables (1998), "Multinational Firms and the New Trade Theory", *Journal of International Economics*, 46(2), 183-203.

Markusen, J.R. and A. Venables (2000), "The Theory of Endowment, Intra-industry, and Multinational Trade", *Journal of International Economics*, 52(2), 209-234.

Markusen, J.R., A. Venables, D. Konan and K.H. Zhang (1996), "A Unified Treatment of Horizontal Direct Investment, Vertical Direct Investment, and the Pattern of Trade in Goods and Services", *NBER Working Paper 5696.*

Matyas, L. (1997), "Proper Econometric Specification of the Gravity Model," *The World Economy*, 20(3), 363-368.

Matyas, L. (1998), "The Gravity Model: Some Econometric Considerations", *The World Economy*, 21(3), 397-401.

McCallum, J. (1995), "National Borders Matter: Canada-US Regional Trade Patters", *American Economic Review*, 85(3), 615-623.

McPherson, M.Q. and W.M. Trumbull (2003), "What if U.S.-Cuban Trade were Based on Fundamental Instead of Political Policy? Estimating Potential Trade with Cuba", *Papers and Proceedings of the Thirteenth Annual Meeting of the Association for the Study of the Cuban Economy*, ASCE 2003.

OECD (2001), *Regional Integration Agreements*, Paris: OECD Publishing.

Ohlin, B. (1933), *Interregional Trade and International Trade*, Cambridge: Harvard University Press.

Pearce, R. (1990), "Overseas production and exporting performance: Some further Investigations", *University of Reading Discussion Paper in International Investment and Business Studies 135.*

Polak, J.J. (1996), "Is APEC a Natural Trading Bloc?", *The World Economy*, 19(5), 533-543.

Portes, R. and H. Rey (2002), "The Determinants of Cross-border Equity Transaction Flows", *London Business School Working Paper.*

Poyhonen, P. (1963), "A Tentative Model for the Volume of Trade Between Countries", *Weltwirtschaftliches Archiv*, 90(1), 93-100.

Quah, D. (1996), "Twin Peaks: Growth and Convergence in Models of Distribution Dynamics", *Economic Journal*, 106(437), 1045-1055.

Reddaway, W. B. (1968), *Effects of UK Direct Investment Overseas - Final Report,* Cambridge: Cambridge University Press.

Ricardo, D. (1811), *A Treatise on Political Economy and Taxation*, London: John Murray.

Romer, P. (1986), "Increasing Returns and Long-run Growth", *Journal of Political Economy*, 94(5), 1002-1037.

Romer, P. (1993), "Idea Gaps and Object Gaps in Economic Development", *Journal of Monetary Economics,* 32(3), 543-73.

Romer, P.M. (1994), "The Origins of Endogenous Growth", *Journal of Economic Perspectives*, 8(1), 3-22.

Rose, A.K. (2000), "One Money, One Market: Estimating the Effect of Common Currencies on Trade", *Economic Policy*, 15(30), 7-45.

Sachs, J. and A. Warner (1995), "Economic Reform and the Process of Global Integration", *Brookings Papers on Economic Activity*, 25(1), 1-118.

Samuelson, P. (1948), "International Trade and the Equalization of Factor Prices", *Economic Journal*, 58(230), 163-184.

Sapir, A. (1997), "Domino Effects in Western European Trade, 1960-92", *CEPR Discussion Papers 1576.*

Schoeman, V. (2000), "Foreign Direct Investment Flows and Fiscal Discipline in South Africa," South African Journal of Economics and Management Sciences, 3(2), 235-244.

Silver, S. (2002). "US Sneezes, Mexico Catches Cold: Maquiladora Export-Processing Zones are Suffering", *Financial Times*, February 11.

Soloaga, I. and A. Winters (1999), "What's Behind Mercosur's Common External Tariff?", *CEPR Working Paper 2310.*

Sung, H. and H. Lapan (2000). "Strategic Foreign Direct Investment and Exchange Rate Uncertainty", *International Economic Review*, 41(2), 411-223.

Tinbergen, J. (1962), *Shaping the World Economy*, New York: Twentieth Century Fund.

Traxler, F. and B. Woitech (2000), "Transnational Investment and National Labour Market Regimes: A Case of 'Regime Shopping'?", *European Journal of Industrial Relations*, 6(2), 141-160.

United Nations Conference on Trade and Development (2002), *World Investment Report 2002,* New York: UN Publications.

United Nations Development Programme (2003), *"Human Development Report 2003"*, Oxford: Oxford University Press.

US Tariff Commission (1973), "Implications of Multinational Firms", *Report to the Committee on Finance of the US Senate.*

Velde D.W. te (2006), *Regional Integration and Poverty,* London: Ashgate.

Velde D.W. te and M. Fahnbulleh (2005), "Regional Integration and Poverty", *ODI Briefing Paper March 2005.,*

Vernon, R. (1966), "International Investment and International Trade in Product Cycle", *Quarterly Journal of Economics*, 80(2), 190-207.

Viner, J. (1958), "Canada and its Giant Neighbour", *Alan B. Plaunt Memorial Lectures*, Carelton University, Ottowa,

Wang, J.Y. and M. Blomstrom (1992), "Foreign Investment and Technology Transfer: A Simple Model", *European Economic Review*, 36(1), 137-155.

Wooldridge, J.M. (2002), *Econometric Analysis of Cross Section and Panel Data,* Cambridge: MIT Press.