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ESSAYS ON INTERNATIONAL CAPITAL FLOWS

by

Selen Sarisoy Guerin

Submitted to the Department of Economics in fulfillment of the requirements for the degree of Ph.D.

at

University of Dublin
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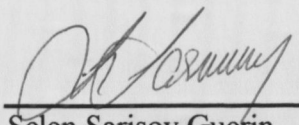

Selen Sarisoy Guerin

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SUMMARY

This thesis is a collection of essays on international capital flows. The main motivation for this work was to address a number of relatively unexplored issues within this subject. Four topics were empirically analyzed utilizing a variety of econometric techniques and diverse data sources.

Chapter 1 examines the relationship between current accounts and capital accounts in a set of industrial and developing countries. Specifically, the focus is on the link between net private capital inflows and the current account. In the first part of this chapter, panel fixed-effect regressions are employed to test the effect of cyclical net inflow volatility on current account volatility. In the second part, cointegration techniques and causality tests are used to establish causal links between net inflows and current account imbalances. The results indicate that the relationship between current account and net capital inflows differs across industrial and developing countries.

Chapter 2 is an empirical examination of the relationship between deposit insurance and private capital inflows in an effort to find support for the hypothesis that the existence of explicit insurance may encourage gross private capital inflows to a country. However, the results of the regression analyses, utilising four different variables to measure private capital inflows, fail to find any statistically significant result to support this hypothesis.

Chapter 3 investigates the determinants of FDI flows with an emphasis on FDI as a financial flow. FDI has increased in importance in the 1990s and is concentrated in the North and a few South countries as destinations. We try to explain the geographical concentration of FDI inflows by examining North-North, North-South and South-North flows. The results indicate that different host country characteristics have, in general, the same direction of impact but they are different in magnitude for South host countries than they are for North. The standard gravity variables and additional geographical and trade–related variables are significant determinants of bilateral FDI inflows.

Chapter 4 examines the role of geography in explaining the spatial allocation of foreign direct investment flows vis à vis patterns in trade flows and portfolio investment. In the empirical part of this chapter, we examine the determinants of North-North, North-South and South-North FDI, trade and portfolio investment flows using a modified gravity model, which allows a direct comparison of the geographical factors that affect each group of bilateral flow. Specifically, we examine the effect of standard gravity variables on trade and portfolio investment flows to highlight any similarities with patterns of FDI flows. Our results indicate that standard gravity variables have the same impact on each bilateral trade and portfolio investment as their impact on FDI. We conclude that geographical factors can explain the spatial allocation of FDI, trade and portfolio investment flows.

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INTRODUCTION

International capital flows to emerging markets have become a highly debated topic in international economics and policy making over the past decade. Some issues on the subject remain relatively unexplored and this thesis sets out specifically to address a number of topics on international capital flows that have been heavily debated in the aftermath of the 1997 Asian crisis.

Recent trends indicate that the large scale of international capital flows to emerging markets was only a return to their pre-debt-crisis level in the 1990s, and the majority of capital flows are two-way flows among the industrial countries. Over the past two decades, capital mobility has increased due to the growing emergence of non-bank institutional intermediaries as international investors. Management of these firms focused on portfolio diversification to support pension funds and retirement accounts for the baby-boom generation. Portfolio diversification was greatly facilitated by advancements in telecommunication technologies, by the availability of new investment instruments, and also by reduced barriers to capital flows in both developed and developing countries.

The internationalization of pension and retirement funds help domestic country savers to channel their resources to borrower countries for higher returns where investment projects are liquidity constrained. Portfolio diversification by investing in foreign assets may also provide the lender country with the benefit of reduced risk, while for the borrowers foreign capital can be used to smooth consumption and to finance investment. These are some of the benefits from the free flow of capital. However, as the 1997 Asian crisis unfolded, it became apparent that there are also costs from increased capital mobility. Integration in international financial markets may possibly render a country more vulnerable to the contagion of a financial crisis.

After the Latin American debt-crisis of the 1980s, the heavily indebted emerging markets were abruptly cut off from international capital markets. By early 1989, private capital flows to these markets were primarily restricted to concerted lending or arrears. It was on

this basis that many observers in the 1990s were surprised by the surge in international capital flows to emerging markets. Although large capital flows to developing countries heralded the re-integration of these countries into international financial markets, the 1994-1995 Mexican crisis and global financial crises of 1997-98 re-illustrated that there are significant costs as well as benefits from international capital flows.

A brief description of the recent global financial crises of 1997-98 can provide insight into how global integration in financial markets comes at the cost of increased probability of contagion and real economic costs in the event of a crisis. The Asian crisis started in July 1997 in Thailand when the government had to abandon its currency peg to the US dollar under severe speculative attacks. By November, the crisis had spread to Malaysia, Indonesia, the Philippines, Singapore, Taiwan and Korea, mostly due to competitive pressures in export markets. Net private capital inflows to the crisis countries were US$74.1 billions in 1996. These countries observed net capital outflows in the six years that followed from 1997 up to 2002. Largest net private capital outflows occurred immediately after the crisis, US$31.9 billions in 1998. The scale of depression that followed in Asia was largest in Indonesia, which experienced 13.7 percent contraction in real GDP in 1998, followed by 8 percent in Thailand, and 6.8 percent in Malaysia.

The initial spread of the crisis in the region from Thailand to other countries was due to trade linkages. Since the export composition of these countries is similar, devaluation in one country affects the competitiveness of the other countries. The crisis, however, spread to Russia, which devalued the rouble and also announced a temporary moratorium on private debt payments, despite a US$22 billion official package organized by the international community. Latin America came also under pressure when Brazil had to abandon its crawling-peg exchange rate in January 1998. Most countries in Latin America experienced sharp economic slowdown during the second half of 1998 as a result of the decline in private capital inflows and the weakening of the prices of commodity exports.

Industrial countries also became vulnerable to the crisis, through financial linkages. For example Japanese banks were heavily exposed to the wider Asia market, and the currency crisis increased the share of non-performing loans. The bail-out of Long-Term Capital Management (LTCM), a US hedge fund, raised doubts over the health of the financial sectors of Western economies and their exposure to emerging markets. J.P. Morgan statistics indicated that European commercial banks were heavily exposed to the emerging markets in Asia (48.5 percent of banks capital, end 1997), whereas US was more exposed to a crisis in Latin America.

The fragility and instability in financial markets raised serious policy issues. A well-balanced policy response requires an understanding of the causes. Although some even blamed the IMF for the crisis, arguments generally centered around two competing views of the crisis. One view sees 'the overborrowing syndrome' as the underlying reason of the crisis. In the early 1990s, East Asian countries attracted major capital inflows, largely due to credible structural/economic reforms backed by fixed exchange rates at a time when the world interest rates, especially in Japan were low. Implicit or explicit government guarantees introduced an element of overconfidence in the profitability of the projects among foreign lenders and domestic investors were encouraged to invest in riskier projects. Much of the investment was in the non-traded sector, especially the property market. Before the unfolding of the crisis, the currencies in the region had over-appreciated, not only due to a real appreciation of the US$ vis-à-vis the yen and European currencies but also due to massive short-term capital inflows. In summary, the 'overborrowing' view argues that inconsistent government policy caused real exchange rate misalignments and an investment boom in wrong sectors. This view claims that the crisis was a readjustment of bad fundamentals.

The alternative view argues that 'financial panic' was the driving force behind the Asian financial crisis. Sudden changes in market expectations and confidence may lead to financial panic that is based on cyclical reasoning. In other words, the crisis is the outcome of the self-fulfilling actions of the financial markets. The panic view denies that the crisis is justified by misaligned fundamentals alone and emphasizes that the crisis was

unpredictable. Indeed, very few people could have predicted the Asian crisis. The confidence in the domestic economy of East Asian countries was shared by international investors who enjoyed high returns to their investment and disregarded weaknesses in the financial institutions (Lane and Sarisoy, 1998).

Part 1 of this thesis consists of two chapters that were directly motivated by issues raised in debates on the causes of the crisis. Proponents of the view that the crisis was caused by bad fundamentals (i.e. first-generation models) focused on the evolution of such economic indicators as the exchange rate, GDP, the growth rate, fiscal deficit of the government and the current account deficit (see for example Corsetti *et al*, 1999). Examining the evolution of these variables before and during the crisis was part of an effort to find good predictors of crisis. Studies that focused on the causes of the Asian crisis include large and sustained current account deficits among one of the early warning signals. Sharp reductions or reversals in current account deficits are often accompanied by reversals in international capital flows. Chapter 1 examines the link between net capital flows and the current accounts in a set of industrial and developing countries[1]. The first part of the analysis focuses on the effect of net inflow cyclical volatility on the current accounts. In the second part of this chapter, using time-series analysis, we search for answers to the question whether net inflows cause current account imbalances. If private capital flows cause current account imbalances or volatility in the current account, this may have policy implications.

The current account is not a policy variable. However, it does reflect information regarding a complex set of variables. For this reason, policymakers focus on the current account as an important macroeconomic variable. Recent trends of international capital flows to the developing countries indicate that large capital flows that were directed to emerging markets were easily reversible, suggesting that these flows were highly volatile. Sharp capital outflows from and/or sudden cessation of foreign capital inflows (i.e. sudden stops) to emerging markets have been commonly observed characteristics of

[1] Chapter 1 was presented at the Summer Meeting of Young Economists in Leuven, Belgium in April 2003, and the author greatly acknowledges helpful comments.

several recent financial crises. Recent trends indicate that an increasing proportion of capital flows is financing current account deficits as reserve accumulation is slowing (IMF, 2001). To the extent that these flows finance current account deficits, volatility in capital flows may explain cyclical behaviour of current account balances.

Chapter 2 is an empirical examination of the relationship between deposit insurance and international capital flows to developing countries[2]. Increased risk taking behaviour due to moral hazard is another factor commonly encountered in crisis countries. The existence of implicit or explicit government guarantees encouraged domestic investors to invest in riskier projects and this introduced an element of overconfidence in the profitability of the projects among foreign lenders. One of the factors that weaken the financial system is the prevalence of informational problems in international financial markets. Moral hazard that is encouraged by the existence of a government guarantee, in the form of deposit insurance, was common among the crisis countries. Some economists argued that a strong government guarantee of the financial system through implicit or explicit deposit insurance rather than interest rate differentials may better explain the surge in international capital flows to emerging markets.

Part 2 of this thesis focuses on foreign direct investment (FDI) and also includes two chapters. Both chapters are motivated by the recent trends observed in FDI and its characteristics that separate it from other types of capital flows. Foreign direct investment as a financial flow attracts special attention. Recent trends indicate that FDI flows has been growing faster than merchandise trade and accounts for the majority of capital flows for most developing countries (OECD, 1998). In fact, the change in the composition of capital flows to developing countries has been dramatic. There has been a major shift from official flows to private capital flows. Among the private capital flows to the developing countries, FDI constituted the majority of capital flows in the 1990s. FDI has become important not only because it is the major source of foreign finance for most developing countries, but also because it is more resilient relative to other types of capital flows in times of crisis. During the 1994 Mexican crisis and recent Asian crisis, FDI has

[2] A version of Chapter 2 is published in the Economics Letters journal in 2000 joint with Philip R. Lane.

been more resilient than portfolio equity and bank loans, which actually turned negative. Sudden reversals of massive (portfolio) capital flows have proved extremely unstabilizing for recipient countries and forced them to take preventative measures. Introducing capital controls, taking fiscal measures or sterilized intervention are the most common policy measures applied to address this instability (Ul Haque *et al*, 1997). However, all these measures come at a cost. As Rogoff (1999) claims, possible measures to ensure stability in the international capital and financial markets are either politically or economically infeasible. Encouraging FDI (an equity flow) might be a better strategy than encouraging highly volatile debt creating flows (e.g. portfolio bond flows, bank loans, and other official loans).

OECD defines foreign direct investment as capital invested for the purpose of acquiring a lasting interest in an enterprise, and of exerting a degree of influence on that enterprise's operations (OECD, 1998). Therefore, FDI is different than portfolio investment because it involves the control of the asset in question. Markusen (1995) uses the terms "multinational enterprise" and "foreign investment" interchangeably since it is the multinationals that engage in FDI by acquiring a controlling interest in a foreign firm or setting up a subsidiary in a foreign country. Another frequently encountered definition in literature is that FDI is a composite bundle of capital, managerial know-how and technology (Balasubramanyam *et al* 1997). Unlike other types of capital flows, FDI creates positive spillover effects such as transfer of managerial skills and technological know-how.

OECD countries, in the second half of the 1980s, actively liberalized restrictions on foreign investment by removing supply-side constraints to boost productive capacity and stimulate economic growth (OECD, 1998). A number of promotion programs in OECD countries encompass government-sponsored investment insurance, equity and loans, information providing, matchmaking and feasibility studies, in order to encourage FDI into developing countries (OECD, 1993). Many developing countries also promote market-oriented policy measures in competition for foreign investment. Privatization of state-owned enterprises in developing countries, especially in Eastern Europe, attracted

the majority of foreign investment in these countries. All efforts of promoting foreign investment recognize FDI as an engine of growth and a force for global integration (OECD, 1998, 1993).

Early literature on the determinants of foreign direct investment depends heavily on understanding the behavior of multinationals. The theory of international production as developed by Dunning (1981), known as the Ownership-Location-Internalization (OLI) paradigm is the most pervasive theory explaining why and when a local firm would prefer foreign direct investment over other modes of internationalization (Markusen, 1995, Greenaway, 1992, Morsink, 1998). The popularity of the theory is based on its ability to generalize and explain a wide range of empirical cases. According to the OLI paradigm, in order for a firm to pursue international production, it must have a combination of ownership and locational advantages. However, although it is a necessary condition for a firm to have ownership and /or location advantages, it is not a sufficient condition for the firm to prefer FDI over franchising or licensing[3]. Therefore, the third condition of internalisation must also be present.

Both theoretical and empirical literature on the determinants of FDI associate direct investment flows strictly to the activities of the multinationals. However, the theoretical literature that examines multinational activity in an organizational industry framework (i.e. Dunning's OLI paradigm) fails to account for the increasing amount of financial transfers within multinationals that involve no production, or no transfer of physical capital but only transfer of management and technology. Mergers and acquisitions, although not entirely financed by FDI, account for a significant share of FDI flows in the developed countries (UNCTAD, 1998). Retained earnings and intra-company loans also constitute a significant amount of what is measured as FDI. For example, an increasing share of the US FDI outflows are comprised of retained earnings (Lipsey, 2000). For this reason, the emphasis of Chapters 3 and 4 is on the determinants of FDI as a financial flow.

[3] See Lawrence (1993) for why foreign investors prefer to license in Japan rather than to invest directly.

Chapter 3 examines the role of geography in explaining the spatial allocation of foreign direct investment (FDI) flows[4]. The majority of bilateral FDI flows from industrial to developing countries concentrated in a few developing countries in Latin America and East Asia. This chapter concentrates on the differential impact of standard gravity and other control variables on bilateral FDI flows from industrial to industrial countries (North-North), from industrial to developing countries (North-South) and from developing to industrial countries (South-North).

To explain the role of geography on bilateral FDI flows the gravity model is used. Recently, gravity models have presented a new approach to analyzing the determinants of FDI inspired by the success of 'geography' or gravity theories in explaining trade. The use of gravity theory in trade came as a natural extension of the new trade theory (such as the work of Helpman and Krugman 1985). The theory of geography, according to Krugman (1991), deals with the organization of economic activities in geographical space in view of spatial differences in available endowments. Examining the spatial dimension (location) of the host or home country in trade or FDI theory has become very popular.

The history of gravity theory has its origins in physical science. The Law of universal gravitation as formulated by Sir Isaac Newton states that two bodies in the universe attract each other in proportion to their masses and inversely with the square of their distance. It is claimed that the gravity model was first used in social sciences in 1858-59 to analyze human interaction. The use of gravity models in international trade flows is a more recent phenomenon. In the early 1960s, Tinbergen was among the first to present such models.

Tinbergen's model was simple (Tinbergen, 1962). He presented a model in which the volume of trade between any two countries is determined by gross national product (GNP) in home country, GNP in the host country and the geographic distance between their main economic centers. Later the model was augmented by other economists and

[4] The main findings of Chapter 3 were presented at the LACEA conference in Madrid in October 2002. The author acknowledges useful comments by the participants.

was based on economic theory (Morsink, 1998). There is substantial literature that indicates that bilateral trade increases strongly with proximity, and is even higher between countries sharing borders and still higher between countries sharing a border and a common language (Ghosh and Wolf, 1998).

Extending the use of gravity models to explain FDI patterns can be based on similar arguments. For example, another issue in international capital markets is the existence of information costs. Several studies on international financial flows recognize that there are information costs to international asset trade. The cost of information for cross-border investment is magnified compared with domestic financial markets, due to geographical and cultural proximity.

Chapter 4 extends the discussions on the geographical allocation of FDI in Chapter 3, and examines the role of geography in explaining bilateral trade and portfolio investment flows. Having established spatial patterns of bilateral FDI in Chapter 3, the first question that arises is: to what extent bilateral trade and FDI are similar? The relationship between trade and FDI is much-debated, in particular the question of whether they are substitutes or complements. FDI may be substituting exports if there are significant barriers to trade. Although, it may appear that trade and FDI are two distinct ways of serving a market, recent theoretical and empirical work has shown that the relationship can also be complementary. The decision of a firm to produce in a foreign market does not necessarily indicate that trade will decline. In his theoretical analysis, Mundell (1957) demonstrates that in a two-country, two-commodity two-factor model, substitution of commodity trade for factor movement is complete[5]. When Mundell's analysis was applied to foreign direct investment, it was found to be "trade-destroying" (Kojima, 1975)[6].

However, there has been both theoretical work and empirical evidence indicating that foreign direct investment can also be trade creating. Purvis (1972) shows that commodity

[5] Mundell assumes homogeneous (first degree) and identical production functions, different factor proportions in the production and equal factor endowments in both countries.
[6] As cited in Morsink (1998).

trade and FDI can be complementary when the assumption of identical production functions in Mundell's two-country model is relaxed[7]. Kojima (1975) argues that FDI is justified when one country has a comparative disadvantage in the production of a commodity and another country is able to produce the same commodity more productively. Therefore, transfer of production to the host country will be welfare enhancing and trade creating.

When Helpman and Krugman (1985) showed that the gains from international trade in the presence of increasing returns and imperfect competition can be systematically examined (discarding the prior assumptions of constant returns to scale and perfect competition), this provided another link between trade and FDI. They showed that comparative advantage alone no longer could explain the patterns of trade. In the presence of increasing returns and imperfect competition, economies of scale was shown to provide additional incentive for trade even if countries are identical in tastes, technology and factor endowments. It is now well established that industries that are characterized by scale economies and imperfect competition are often dominated by multinationals, and this suggests a complementary relationship between trade and FDI (Markusen, 1995).

Chapter 4 is not specifically motivated to find empirical evidence on whether FDI and trade are substitutes or complements. However, the results highlight the issue of whether the spatial patterns of FDI are also observed in trade. Further, similar analysis is extended to identify portfolio investment patterns as portfolio investment is often observed to be highly volatile compared to FDI. Finally, FDI, trade and portfolio investment patterns and their respective sensitivity to the standard gravity variables are examined[8].

This thesis concludes with a brief section outlining the broad results from each chapter.

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[7] Purvis (1975) as cited in Morsink (1998).

[8] Chapter 3, together with Chapter 4 was presented at the Summer Meeting of Young Economists in Paris in April 2002, and the Irish Economic Association meeting in April 2002. The author acknowledges helpful comments on earlier versions of these chapters.

PART 1

Chapter 1

THE RELATIONSHIP BETWEEN CAPITAL FLOWS AND CURRENT ACCOUNT: VOLATILITY AND CAUSALITY

1.1 Introduction

This chapter examines the relationship between net private capital inflows and the current account in a set of industrial and developing countries. International capital flows among industrial countries soared in the 1980s, and the flows from industrial to developing countries resumed their pre-debt crisis levels in the 1990s. This surge in international capital flows to developing countries coincided with widening current account deficits in many of these countries. Running large current account deficits also became common among industrial countries. Australia, New Zealand, Portugal and the US have been running large current account deficits for the most part of the 1990s. At the end of 2000, the US current account deficit reached to $415.5 billion, equivalent to 4.5 percent of US GDP (IMF, 2001). The empirical evidence suggests that inflows are increasingly used to finance current account deficits in some developing countries, and reversals in current accounts are often accompanied by reversals in international capital inflows[1].

Although the current account is not directly a policy variable, it reflects information regarding a complex set of variables. For this reason, it is important to understand determinants of the current account, not only for economists, but also for policy makers. There is an extensive literature on current account, both theoretical and empirical, which has evolved with changes in the international environment. Inclusion of international capital mobility is a *relatively* recent development in current account determination. There are few empirical studies that examine the relationship between capital inflows and the current account.

Theoretical models of capital flows and empirical evidence suggest that while foreign capital can stimulate growth, smooth consumption, provide portfolio diversification

[1] Milesi-Ferretti and Razin (1996, 1998, 1999) study the probability of a crisis in the face of current account reversals, which are often associated with reversals in capital flows.

and productive efficiency, they also incur some costs[2]. Free flow of capital possibly comes at the cost of increased contagion, monetary instability and a loss of independence on domestic policies[3]. Calvo *et al* (1996) argue that widening current account deficits is one of the less desirable macroeconomic effects of large capital inflows to the debtor countries. In the first half of the 1990s, larger shares of capital inflows were allocated to reserve accumulation in developing countries[4]. Recent trends indicate that reserve accumulation is slowing as an increasing proportion of capital flows is financing current account deficits (IMF, 2001).

Current account imbalances are not strictly a phenomenon of the 1990s. Following the oil price shocks in the 1970s, there have been large swings in the current account balances of most countries. Persistent current account deficits raised concern over their sustainability. The empirical evidence suggested that while some countries such as Ireland, Australia, Israel, Malaysia and South Korea were able to sustain large current account deficits for many years, other countries such as Chile and Mexico suffered severe losses[5]. Excessive current account deficits in crisis countries were also a prevalent feature of the 1997 Asian crisis.

Large private capital inflows may affect the behaviour of the current account through their effect on savings and investment. Current account imbalances are caused by a mismatch between savings and investment. Periods of large capital inflows are generally accompanied by increased rates of investment. If international capital inflows are used to increase investment, assuming savings remain stable, this may imply an increase in the current account deficit. When capital flows are reversed, there may be sharp reductions (or reversals) in the current account, as well as macroeconomic costs[6].

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[2] The theoretical benefits from capital flows were based on a benchmark of perfect capital mobility as was assumed in neoclassical trade and economic growth theories.
[3] See, for example, Calvo *et al* (1996), and Goldstein *et al* (1994) for a discussion on trends in capital flows in 1990s and costs and benefits from them.
[4] From 1990 to 1994, the share of capital flows that were accumulated in reserves was 59 percent in Asia and 35 percent in Latin America (Calvo *et al* 1996).
[5] See Milesi-Ferretti and Razin (1996).
[6] See Hutchison and Noy (2002) for output costs of sudden-stop crises, and see WEO (1999), Claessens *et al*(1995); Sarno and Taylor (1997); Bacchetta and Wincoop (1998) for volatility in capital flows.

The first question addressed in this chapter is whether cyclical volatility in net inflows has any effect on current account volatility. Using panel fixed-effect regression analysis, the volatility of the capital flows and the current account in a set of industrial and developing countries are examined. The second question addressed is whether capital flows cause current account imbalances. As a first step, cointegration techniques are used to establish whether capital inflows and current account imbalances are related. The direction of causality is then tested by standard Granger causality tests and causality tests on ECM (error correction model). Finally, cointegrating regressions are estimated between the current account imbalances and net inflows.

The remainder of this chapter is organized as follows. Section 1.2 briefly summarizes the evolution of literature on current account determination. Section 1.3 provides the theoretical and empirical background for the relationship between capital flows and the current account. Section 1.4 examines the (unconditional) volatility of the current account and the components of the capital account for individual countries. Section 1.5 presents the results of the panel fixed-effects data estimation. Section 1.6 addresses the question whether capital flows cause current account imbalances by using cointegration and causality tests, and estimates cointegrating regressions for the countries where the causality runs from inflows to the current account. Section 1.7 concludes.

1.2 Current Account Determination

The current account is not a policy variable. However, it does reflect information regarding a complex set of variables. By definition, the current account is the sum of net exports of a country and its net factor income from abroad. A current account imbalance occurs when there is a saving-investment mismatch. In a sense, the movements in the current account reflect the dynamic evolution of the net foreign asset position of a country, adjusting for valuation effects. For this reason, policymakers focus on the current account as an important macroeconomic variable.

Theories of current account dynamics have evolved with concurrent developments in international macroeconomics. Obstfeld and Rogoff (1995), Edwards (2001) and Knight and Scacciavillani (1998) review both the theory of current account determination and its policy implications. Early theories of the current account concentrated on the trade balance and largely disregarded net foreign income, due to low levels of international transactions following World War II until the 1980s. The 'elasticities' approach argues that relative international prices are the main determinants of the current account. This approach had led many developing countries at the time to believe that the current account, or the external position of their country could be altered by exchange rate adjustments[7]. International capital flows were only secondary, where they were determined by a static price elasticity of demand and supply (Obstfeld and Rogoff, 1995).

Another theory that has enjoyed great popularity is the Mundell-Fleming model. This model, which is an extension of the IS-LM analysis to an open economy, has been very popular among policy-makers since the 1960s. The Mundell-Fleming model explicitly formulates markets for goods, money balances and foreign exchange, while it implicitly assumes capital mobility. The major short-coming of the Mundell-Fleming model is that it is a static model, in the sense that it concentrates on the short-run, and disregards the longer-term evolution of the current account and associated changes in international assets and liabilities (Knight and Scacciavillani, 1998).

The consumption smoothing approach to the current account, which became common in the early 1980s, grew out of a need to explain the intertemporal sustainability of the current account. According to this approach, current account balance is the outcome of forward-looking dynamic saving and investment decisions of rational private agents (Obstfeld and Rogoff, 1995; Knight and Scacciavillani, 1998). This approach gained prominence during the period when large current account imbalances became common in the second half of the 1970s (Edwards, 2001).

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[7] This approach led many policy makers to devalue their currency to improve their current account balance in many developing countries (Edwards, 2001). Empirical support for such devaluations was formalized in a study by Cooper (Edwards, 2001).

The intertemporal approach to the current account implies that when future growth prospects are positive, domestic residents smooth consumption by importing some of their future consumption today. In other words, with high capital mobility, rational agents seek to fully smooth consumption by borrowing abroad in the face of temporary shocks, such as negative shocks to the national income, investment or fiscal policy. As a result, a temporary unfavourable shock to the *national cash flow*, as referred by Ghosh and Ostry (1995), has no impact on the consumption decision of domestic resident, but is rather reflected in the changes in the net foreign asset position of a country[8].

Since the consumption smoothing model of the current account assumes perfect capital mobility, some economists have used this model as a benchmark for predicting optimal capital flows and compare it to the actual flows to assess the extent of capital mobility among countries (Ghosh and Ostry, 1995; Ghosh and Ostry, 1993). Some of the results from these studies suggest there is excess capital mobility among major industrial countries, and also high and efficient capital mobility between industrial and developing countries. However, these studies and their results stand in sharp contrast to the well-known finding of Feldstein-Horioka (1980) and *home bias* literature. Feldstein and Horioka (1980) argued that if capital mobility is high among countries, then domestic investment should not be constrained by domestic saving. In fact, if capital mobility is high, the correlation between domestic savings and domestic investment should be close to zero. Their findings of significantly large correlation coefficients between domestic savings and investment in 21 OECD countries were interpreted as indicating low capital mobility and low levels of financial integration.

The intertemporal approach itself has evolved by many modifications to the model to incorporate more realistic assumptions. For example, the introduction of informational asymmetries in the international capital markets is one such modification to the consumption-smoothing model[9]. Obstfeld and Rogoff (1996) provide a framework

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[8] See Glick and Rogoff (1995) for the differential effect of global versus country, and temporary versus permanent shocks on the current account.

[9] The extentions to the consumption smoothing model is surveyed in Obstfeld and Rogoff (1995).

model for the study of international capital flow behaviour in the face of moral hazard caused by informational asymmetries at the microeconomic level. They find that in the case of informational asymmetries, a borrower will pick an investment level below the optimal full-information investment level. They conclude that the intertemporal approach may predict the directions of net international capital flows correctly but overstate the magnitudes. At the macroeconomic level, the sovereign risk, they argue, will also have qualitatively similar effects.

1.3 Theoretical and Empirical Background

In a closed economy, the current account balance is zero, as savings must equal investment. In open economies, however, domestic agents can borrow or lend in international capital markets in the face of shocks to income and smooth consumption. Savings can be allocated to accumulating domestic assets or foreign assets, and investment can be financed by accumulating domestic assets or by issuing foreign liabilities. The resultant current account deficit is the outcome of an intertemporal decision of consumption and saving in an open economy with capital mobility, in the tradition of Irving Fisher (Calvo *et al* 1996).

Calvo *et al* (1996) argue that the effect of capital inflows on the current account can be derived from standard open economy models, such as Irving Fisher's model. In such a model, a fall in interest rate will induce income and substitution effects, for debtor countries, which results in a consumption boom and a widening in the current account deficit. For capital-importing countries, a decline in interest rates reduces the present value of its debt and also makes further borrowing cheaper. Thus, standard open economy models suggest that increased capital inflows are likely to be accompanied by a rise in consumption and investment, and a widening in the current account[10]. This effect of capital inflows is similar to the effect of a decrease in interest rates.

[10] Calvo and Vegh (1993) offer an alternative approach with a focus on monetary economy with similar implications.

These models imply that investment and saving, and ultimately the current account balance, may depend on capital flows. It is also likely that the capital inflows a country receives are endogenously determined by its macroeconomic fundamentals. There are some studies such as the well-known study by Feldstein and Horioka (1980) that derive conclusions on international capital mobility from theories on the current account. Since widening current account deficits were usually accompanied with increased investment and a fall the in rate of savings, this was accepted as a sign of the high integration of capital markets. Feldstein and Horioka (1980) interpreted the slope coefficient of a regression of investment on savings as a measure of international capital mobility. The high correlation between investment and saving led them to argue that there is less than perfect capital mobility.

The relationship between capital inflows and current account dynamics is formalized by the consumption-smoothing theory. The consumption-smoothing approach combines the assumptions of high capital mobility and permanent income theory of consumption in a small, open economy to predict what capital flows would be if agents behave in accordance with the permanent income theory. According to this approach, a country's current account will be in deficit whenever national cash flow (i.e. GDP less investment less government spending), is expected to rise over time. It will be in surplus whenever national cash flow is expected to fall. Ghosh and Ostry (1995) argue that the intertemporal model of the current account therefore provides a benchmark for judging what capital flows should be, given specific shocks affecting economy.

In an empirical study, Ghosh and Ostry (1993) use the consumption-smoothing model as a benchmark for calculating optimal capital flows, i.e. flows that can smooth consumption in the face of shocks to the national cash flow. They compare the actual series to the benchmark series and conclude that flows to the developing countries were determined by economic fundamentals to a significant degree. Ghosh and Ostry (1995), in another paper, calculate optimal current account levels for a sample of forty-five developing countries, using a vector autoregression analysis, and conclude

that actual current account levels suggest consumption smoothing, or high capital mobility.

Other empirical studies on the determinants of current account, such as Calderon *et al* (2002), Chinn and Prasad (2000), and Freund (2000) find that net foreign assets have significant power in explaining the CA/GDP ratios in developing and industrialized countries. Recent studies by Kraay and Ventura (2000, 2002) introduce a new rule to assess the response of the current accounts in debtor and creditor countries following a temporary income shock. The current account response, they propose, equals the savings generated by the shock multiplied by the country's share of foreign assets in total assets. One important implication of this study is that this new rule implies that favourable shocks lead to deficits in debtor countries and surpluses in creditor countries. In the long-run, they find that countries invest a marginal unit of wealth in domestic and foreign assets in the same proportion as their initial portfolio, which implies that country portfolios are remarkably stable. In the short-run, a marginal unit of saving is mostly invested in foreign assets.

A study by Bosworth and Collins (1999) examines the relationship between capital flows to developing countries and the current account. They use a panel data set that includes 58 developing countries over 17 years (1979-1995) to analyse the effect of capital flows on investment and savings and the current account. They conclude that a large proportion of capital flows to the developing countries over the past two decades have been used to finance current account deficits. These resource transfers were primarily used to finance investment, not to increase consumption. When they examine different types of capital flows, they find that FDI has highly beneficial effects on investment, whereas portfolio flows have no impact.

Lane and Milesi-Ferretti (2001) examine how net foreign asset positions affect the behaviour of the trade balance. This relationship is tested in a panel data set that includes 20 industrial and 38 developing countries for the sample period 1970-1998. Their results from panel fixed-effect regressions conclude that there is a statistically significant relationship between the (transfer adjusted) trade balance and the dynamics of the net foreign assets position in both industrial and developing countries. Holding

fixed the fundamentals and short-run fluctuations from the long-run equilibrium, the trade balance is negatively correlated to returns on the outstanding net foreign asset position. This relationship is found to be stronger in developing countries than it is in industrial countries.

Above, a number of papers that examine the relationship between current account and capital flows are summarized. These theoretical and empirical studies provide a rich background on which this chapter aims to build on. The contribution of this chapter to the existent literature is in examining causal links between the volatility of capital flows and the current account. The study by Claessens *et al* (1995), which examines Granger causality between capital account and current account imbalances, is the closest study to this chapter. They focus on FDI flows to 46 developing countries and test whether such flows are autonomous or accommodating vis-à-vis the current account and other capital flows. This chapter extends on their study by including industrial countries as well as a set of developing countries in the sample and the data period covers the surge in international capital flows of the1990s. This chapter also differs from the study of Claessens *et al* (1995) since it combines the volatility of capital flows with causality between capital flows and the current account.

1.4 Current Account and Capital Account Volatility

Recent trends of international capital flows to the developing countries indicate that large capital flows that were directed to emerging markets were easily reversible, suggesting that these flows were highly volatile. Sharp capital outflows from and/or sudden cessation of foreign capital inflows (i.e. sudden stops) to emerging markets have been commonly observed characteristics of several recent financial crises. Such extreme volatility is often associated with severe consequences for the economy. For example, a sudden reversal of foreign capital inflows may cause a sharp drop in domestic investment, domestic production and employment (Hutchinson and Noy, 2002)[11]. Besides the loss of output caused by sudden stops of international capital

[11] Recent theoretical literature emhpasizes the linkages between sudden stops and output losses (e.g. Aghion *et al.*, 2001; Mendoza, 2001).

flows, volatility of international capital flows creates instability by introducing uncertainty to the economy. For this reason, economists concentrated on the factors that may contribute to volatility in international capital flows.

One particular focus was based on analysing characteristics of different types of capital flows. This approach was partly justified by the emergence of a new combination of international capital flows that dominated the 1990s compared to the 1980s. First, the majority of capital flows in the 1990s to the developing countries were private flows, unlike the official flows of the 1980s. Second, portfolio equity and foreign direct investment flows constituted the majority of private capital flows to emerging markets, which were facilitated by the liberalization of emerging market economies and technological developments. The increased reliance on portfolio equity capital for foreign finance in these markets and the short-term nature of these flows, compared to long-term commitment characteristic of direct investment, also justified concerns on increased volatility.

The experience of the 1997 Asian crisis indicated that portfolio equity capital flows have been highly volatile and have turned negative, while foreign direct investment has remained stable (World Bank, 1999). Analysis of the volatility of international capital flows in some studies (e.g. Turner, 1991) was based on Meade's distinction between 'temporary' and 'continuing' capital movements. Meade (1951) described 'temporary' flows as short-term funds attracted by interest rate differentials. This definition implied that capital pulled in by certain temporary factors was reversible once the attraction disappeared. Turner (1991) found that for the period 1975-82, the elements of the capital account with greatest volatility were public sector and short-term banking flows, in a sample of five industrial countries[12]. For the period 1983-89, Turner found that the volatility of bonds and equity investment was much higher. In terms of hierarchy of volatility, direct investment flows have been among the least volatile, whereas portfolio equity flows have been particularly volatile.

Osei *et al* (2002) study the volatility of capital flows to a sample of 60 developing countries over the period 1970 to 1997. Their results indicate that volatility has

[12] The sample included the US, Japan, Germany, Canada and the UK.

increased in the 1990s, relative to the 1980s, but not to the 1970s. A study on the volatility of portfolio capital flows by Claessens *et al* (1995) focus on the speculative and unstable behaviour of portfolio capital flows, compared to direct investment. Using time-series analysis, their results, perhaps surprisingly, indicate that one cannot tell the difference between long-term and short-term flows in terms of volatility. In a sample of ten industrial and developing countries, they find that long-term flows are as volatile as short-term flows. Sarno and Taylor (1997) also analyse the persistence of portfolio flows to a group of Latin American and Asian developing countries. They conclude that portfolio flows to these countries over the sample period (1988-92) may be regarded as entirely temporary.

These studies highlight the importance of the volatility of international capital flows and its policy implications. The focus of this chapter, however, is not based on identifying the volatility of different types of capital flows. The issue that we seek to address is the relationship between volatility of the current account and the volatility of the capital account. It is often mentioned in the literature that one important feature of the recent trends in capital flows to developing countries is that private equity and bond flows as opposed to official capital flows are increasingly a crucial source of financing of large current account imbalances (e.g. Sarno and Taylor, 1997). This may have policy implications in terms of the sustainability of recent current account deficits.

In this section, the balance-of-payments identity is used to analyse current and capital account volatility. The balance-of-payments accounting relates current account transactions to capital account transactions. Hence, any international transaction requires two offsetting entries to the balance of payments: One entry on the current account and the other entry on the capital account. In theory, the current account and capital account should add up to zero, but almost always a discrepancy item, called errors and omissions, is required as described below:

$$\text{Balance of Payments} = \text{Current Account} + \text{Capital Account} = 0, \qquad (1.1)$$

or

$$0 = \text{Current Account} + \text{Inflows} + \text{Outflows} + \Delta\text{Reserves} + \text{Errors}^{13} \qquad (1.2)$$

The equation (1.2) is based on the balance of payments identity in the fifth edition of IMF's Balance of Payments Manual. By convention, the sources of foreign exchange, such as exports and inflows are denoted as positive, and uses of foreign exchange, such as imports and outflows, are denoted as negative. This identity requires that a current account transaction can be offset by a capital account transaction, via any of the components. Inflows do not always finance current account deficits. They can be used to increase outflows and to build reserve assets. This suggests that the volatility in international capital inflows need not always be transferred one-for-one to the current account, if the inflows are channelled into outflows or reserves[14].

As a first step, we examine the unconditional volatility in the current account and components of capital account. From equation (1.2), the variance of the current account (CA) can be shown to be equal to the variance of the capital account (KA), and its components:

$$var\,(CA) = var\,(KA) \qquad (1.3)$$

$$\begin{aligned} var(CA) = {} & var\,(In) + var\,(Out) + var\,(\Delta Res) + var(Err) + 2covar(In, Out) \\ & + 2covar(In, \Delta Res) + 2covar(In, Err) + 2covar(Out, \Delta Res) \\ & + 2covar(Out, Err) + 2covar(\Delta Res, Err) \end{aligned} \qquad (1.4)$$

Equation (1.4) implies that the individual components of the capital account can be more or less volatile than the current account. For example, capital inflows and outflows can be highly volatile, as suggested by the empirical literature[15]. However, if gross inflows are negatively correlated with gross outflows, the impact of net inflows on the current account may be stabilizing. Conversely, net inflows can add to the

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[13] We have included the capital account (a new item that records capital transfers and transactions related to the purchase and sale of used equipment) in the errors and omissions item.

[14] We refer to private outflows by the use of the word 'outflows'. Reserve account, which can be categorized as public outflows is treated separately.

[15] See Turner (1991) for an account of the volatility of different capital flows in the 1980s, and WEO (1999) for the volatility in capital flows in the 1990s.

volatility in the current account, if net inflows are positively correlated with official reserves[16].

Tables 1.1a and 1.1b present results of the volatility analysis of the current account and the components of the capital account for a set of industrial countries and developing countries (See Appendix 1.1 for the list of countries). The sample was determined by data availability. The data for industrial countries cover all major financial investor with the exception of Ireland and Greece. In terms of the data on developing countries, the set of developing countries includes the major recipients of international capital flows. The sample period differs for each country. The annual data on the balance-of-payments statistics are taken from IMF's International Financial Statistics (2001) database. The current account and the components of the capital account are all expressed as a percent of the GDP. The volatility of each series is calculated as the standard deviations of the ratios. All variables are in 1996 constant US$, deflated by the US GDP deflator. Both Tables 1.1a and 1.1b report results from HP (100) filtered series that enable us to concentrate on the cyclical component of the series[17]. Another alternative is first-differencing the series. The results are qualitatively similar to the results of HP (100) filtered series. We chose to report results only from HP (100) series since this method helps us concentrate on the cyclical volatility without loss of degrees of freedom and valuable information on the long-run trends.

For the industrial countries, a country-by-country examination of unconditional volatility suggests four general points regarding volatility of the current and capital account (Table 1.1a). First, within the capital account, inflows and outflows are the most volatile components. Australia and New Zealand are the exceptions, with reserve accounts as volatile as gross inflows. For Austria, Belgium-Luxembourg, Germany and Switzerland, capital outflows are more volatile than inflows. Second, with the

[16] The errors and omissions is an equilibrating item in the capital account, therefore it is endogenously determined.

[17] Hodrick-Prescott filter is used in empirical studies to identify the business-cycle component of the macroeconomic time-series. HP filter minimizes the variance of the cyclical component subject to a penalty for the variation in the second difference of the growth component, where a smoothness parameter penalizes the variability in the growth component. Recently, the use of HP filter and the somewhat arbitrary choice of the smoothness parameter has been criticized (King and Rebelo, 1993; Harvey and Jaeger (1993); Baxter and King (1995); Guay and St-Amant (1997)).

exception of Australia, Denmark, Spain, Sweden, Switzerland and the UK, the reserve accounts of industrial countries are more stable than their current accounts. Third, capital flows are more volatile than the current account. However, for Australia and Iceland, the current account is more volatile than outflows. For New Zealand, Portugal and Norway, the current account is more volatile than both inflows and outflows. Finally, net inflows are less volatile than gross inflows and outflows. For Australia, Iceland, New Zealand, and the US net inflows are more volatile than gross outflows. Only for Italy and Portugal, net inflows are more volatile than both inflows and outflows.

For the developing countries, inflows and /or outflows are the most volatile components of the capital account, with the exception of China, Costa Rica, Egypt, India, Israel, Malaysia and Venezuela, where reserve account is more volatile than both inflows and outflows (Table 1.1b). Outflows compared to inflows are more stable (one exception is Philippines). With the exception of Philippines and Singapore, gross outflows have been more stable than reserve accounts. In the cases of Argentina, Brazil, Chile, Costa Rica, Egypt, India, Israel and Mexico, reserves have been more volatile than the current account. The current account is more volatile than outflows in most countries. In the cases of China, Colombia, Israel, Malaysia, Korea, and Venezuela the current account is more volatile than both inflows and outflows. Net inflows are, in general more stable than gross inflows. In China, Costa Rica, Egypt, Indonesia, Malaysia, Mexico, Thailand and Venezuela, net inflows are more volatile than both gross inflows and outflows.

There are clear differences between industrial and developing countries in our sample. For the industrial countries, inflows and outflows are more volatile than the current account, whereas for the developing countries outflows are more stable than both inflows and the current account. This may suggest that inflows are mostly offset by outflows in industrial countries. The (unconditional) correlations indicate that inflows and outflows are highly correlated for most industrial countries (Table 1.2A.1). Among the developing countries, only in Singapore are the inflows and outflows strongly correlated (Table 1.2A.2). Although many developing countries started liberalizing their capital accounts, restrictions such as capital controls imply that these

countries do not have fully open financial markets[18]. Even for industrial countries, capital account liberalization came as late as the 1980s, where barriers were lowered and controls were abolished. By the late 1980s, there were only six industrial countries in the world with fully open financial markets: Canada, Germany, Netherlands, Switzerland, UK and US.

The relatively high volatility of reserves in the developing countries, compared to the industrial countries is another difference. During a surge period of capital inflows, policymakers in emerging markets often intervened to limit the expansionary consequences of capital inflows. Often, sterilization of capital inflows was the policy tool used. This involved a swap of international reserves for public bonds or increased reserve requirements. During the early 1990s in Chile, sterilization meant that over three quarters of capital inflows (7 percent of GDP) went to international reserves accumulation in the central bank every year (Caballero and Krishnamurthy, 2001). Bosworth and Collins (1999) also show that for developing countries, around one-third of capital inflows were channelled into reserves. Aizenman and Marion (2002) argue that, following a crisis, countries that have increased perceived sovereign risk will increase their demand for international reserves, as was the case for East Asia after 1997[19]. Today developing countries hold 60.4 percent of total global reserves.

Japan holds the world's largest reserves (US$411.6 billion at the end of May 2002). However, there is a very low correlation between its reserve account and gross inflows, and a low correlation coefficient (-0.22) between reserves and net inflows (Table 1.2A.1). China is second in reserve holdings and the correlation coefficient between net inflows and reserves is –0.35 (Table 1.2A.2). Among the industrial countries, for Denmark and Sweden, and among the developing countries, for Argentina, Brazil, Chile, Egypt and Singapore the reserves (to GDP ratios) are strongly correlated with net inflows (to GDP ratios).

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[18] Johnston and Tamirisa (1998) show that controls on capital outflows are more prevalent than controls on inflows on all types of transactions, except in the case of FDI and real estate purchase.

[19] Lane and Burke (2001) find that trade openness is by far the most important determinant of reserve holdings in cross-country sample of industrial and developing countries. Trade openness can proxy for vulnerability to external shocks.

The analysis of unconditional volatility discussed in this section suggests that capital flows (gross and net) are the most volatile series. For the countries where gross inflows and outflows are similarly volatile and strongly negatively correlated, their current accounts are relatively stable. Examples for this are Belgium-Luxembourg and Singapore. In the case of developing countries, the inflows volatility is not matched by outflows volatility and, with the exception of Singapore, the correlation between the two components of the capital account is low. In general, the reserve accounts of the developing countries in our sample are highly volatile, and negatively correlated with net inflows. The unconditional volatility and correlations discussed in this section are suggestive of the relationship between net inflows and the current accounts in different countries. The next section concentrates on the conditional response of current account volatility to the cyclical volatility in net inflows.

1.5 Panel Data Analysis

In this section, the relationship between the current account and net capital inflow volatility is examined in a panel fixed-effects regression framework. Panel data analysis concentrates on the effect of (conditional) volatility of capital inflows on the current account in industrial countries versus in developing countries. As the examination of unconditional volatility for individual industrial and developing countries suggests, these two country groups exhibit different dynamics in their current and capital accounts. Pooling cross-country and time-series data often produces more efficient results than examining time-series or cross-country alone (Verbeek, 1999). While a panel fixed-effects estimator concentrates on within variation (i.e. the dynamic response of the current account to net inflows volatility), the country fixed-effects controls for unobserved heterogeneity. The previous section suggests considerable cross-country heterogeneity in the current account and capital account dynamics of both industrial and developing countries. In such a case, fixed-effects panel regression should produce more efficient results compared to pooled OLS estimation[20].

[20] Pooled OLS estimation models do not control for individual heterogeneity, therefore, run the risk of obtaining biased results (Baltagi, 1995).

1.5.1. Model

The volatility of current account is formulated as a function of the volatility of net private inflows as follows:

$$V(CA_{it}) = \alpha_i + \beta_1 (V(Inflow_{i,t})) + t_t + \varepsilon_{i\,t} \qquad (1.5)$$

where:

$V(CA_{it})$: volatility of CA to GDP ratio of country i at time t,

$V(Inflow_{it})$: volatility of inflows to GDP ratio of country i at time t,

t_t: year dummies.

The sample periods for annual data on current account and capital flows vary for each country[21]. The volatility of the current account and capital inflows, measured as standard deviations of respective variables, were calculated over 5-year non-overlapping periods for the sample period 1970-2000[22]. Both current account and net inflows have been normalized by country size (i.e. dividing the respective variables by the GDP of the country). There are different methods of measuring volatility depending on how trend is calculated. Other commonly used measures of volatility include deviations around a trend, which can be interpreted as the percentage of the mean. Here we measure volatility of inflows and the current account as the standard deviation around a detrended series. By removing the growth component, we focus on the cyclical component.

In this model, the focus is on the effect of international capital flows on current account. Net capital flows arise when there is a saving and investment mismatch across countries, and therefore, it involves a transfer of real resources through the current account. However, gross capital flows need not involve any transfer of real resources since they may be offsetting across countries. For this reason, net inflows, rather than gross flows, are used as the independent variable. The positive values of

[21] We choose to use annual data instead of quarterly data since this allows us to work with a larger sample.

[22] The last period includes 6 years and runs from 1995-2000.

this variable indicate net capital inflows, whereas negative values indicate net outflows. For the current account, negative figures indicate a current account deficit.

As the (unconditional) volatility analysis of the previous section indicated, the relationship between private capital flows and the current account differs across countries. For the industrial countries as a group, gross inflows and outflows are highly volatile and strongly negatively correlated, implying little volatility in net inflows[23]. For the developing country group, gross inflows are far more volatile compared to gross outflows, and in most cases weakly correlated. This results in net inflows being as volatile as gross inflows. Overall, the relationship between current account and net inflows may differ across the two groups depending on the relationship between net inflows and reserves. The inflow volatility may be passed on for less than one-for-one, if the cyclical fluctuations in reserves are offsetting net inflow volatility. However, if the reserve account has sufficient independent volatility, the current account may be more volatile than net inflows.

1.5.2. Descriptive Statistics on Panel Data

Before presenting results from panel fixed-effects estimation, we examine the summary statistics for industrial and developing countries. Table 1.2a summarizes descriptive statistics on the current account, net inflows, gross inflows and outflows, and reserves for industrial countries. As the volatility analysis suggested, gross inflows and outflows are nearly equally volatile. Large gross inflows accompanied by large gross outflows have been one of the trends in international capital flows among industrial countries. Figure (1.1) presents the time-series trends in gross inflows, outflows and the current account balance for the industrial countries in our sample. This graph indicates that gross inflows and outflows of industrial countries have become highly correlated starting in the early 1980s, which coincides with capital account liberalizations. Throughout the sample period the current account balances of industrial countries have been stable.

[23] By definition, net inflow volatility is equal to the sum of the variance of gross inflows and outflows plus two times the covariance between inflows and outflows.

Descriptive statistics for the same variables are summarized in Table 1.2b for the developing countries. Gross inflows are more volatile than gross outflows for the set of developing countries, as was reported in Table 1.1b. Figure (1.2) illustrates the time-series evolution of gross inflows, outflows and the current account over a sample period for the developing countries in our sample. One important difference from the trend in industrial countries is that, gross inflows to the developing countries have been more volatile than outflows, and constitute a larger ratio to country GDPs. While gross inflows fluctuate over the years, the outflows have remained at a steady ratio to GDP. Only in the 1990s, has there been an increase in the outflow to GDP ratios. This suggests that net inflow volatility in developing countries is mostly due to gross inflow volatility. The current account of the developing countries has also been more volatile than the current account of industrial countries over the sample period (Figures (1.1) and (1.2)).

1.5.3. Bivariate Relations in the Data

Examining bivariate relations between the volatility of current account and net inflows, and between the volatility of net inflows and reserves can give us some idea on the underlying trends in our data. Figures (1.3a) and (1.3c) illustrate the bivariate relationship between the current account and net inflow volatility in the 1980s versus the 1990s for the developing countries. Figures (1.3b) and (1.3d) provide a cross-section comparison of these scatter plots with the relationship between reserves and net inflow volatility in the 1980s versus the 1990s. As Figure (1.3a) suggests, in the 1980s, developing countries with volatile net inflows also had volatile current accounts. For the same period, the relationship between reserves and net inflows is also positive, but stronger, as indicated by a steeper fitted regression line. Among the developing countries, the ones with higher net inflow volatility also had more volatile reserve accounts. In the 1990s, the relationship between current account and net inflows seems as volatile as in the 1980s (Figure (1.3c)). Again, compared to volatility in current account and net inflows in the 1990s, the relationship between reserves and net inflow volatility is slightly stronger.

Figures (1.4a)-(1.4d) represent the same bivariate relationships for industrial countries. In Figures (1.4a) and (1.4b), we find a positive relationship between current account versus net inflows, and reserves versus net inflows in the 1980s. Among the industrial countries, countries with more volatile net inflows also have more volatile current accounts and reserve accounts. In the 1990s (Figure 1.4c), the relationship between net inflow volatility and the current account is positive but it appears that the relationship is now less strong. The relationship between reserve volatility and net inflows, however, seems to have been stable over the two decades. In the 1990s, there appears to be a strongly positive relationship between reserve and net inflow volatility, whereas the relationship between current accounts and net inflows has become weaker. The fitted regression line for the CA-inflows volatility (Figure 1.4c) is flatter than the one for reserves-net inflows volatility (Figure 1.4d).

1.5.4. Results

Panel fixed-effects estimation results are reported in Table 1.3 in column (1) for the industrial countries and in column (2) for the developing countries. In both columns, CA volatility is regressed on inflow volatility. The regression model includes year dummy variables to control for common global effects. *A priori*, as the inflows volatility increases, current account volatility should also increase (i.e. $\beta>0$). If the inflows are used to finance current account deficits, we expect to see a large positive and significant β coefficient. A small positive, or statistically insignificant β, may indicate that inflow volatility may be offset by other components of the capital account (i.e. reserves).

The results of panel regressions on current account volatility do not indicate that volatility in net inflows has any significant effect on the current account for the industrial country sample (column (1) Table 1.3). Although there is no statistically significant evidence in our data that net inflows have any effect on current account volatility, this specification explains 42 percent of the variation in current account volatility. This may indicate that unobserved heterogeneity accounts for most of the explanatory power of this model.

The results for the developing countries from the panel fixed-effects estimation are reported in column (2) of Table 1.3. The regression results indicate a statistically significant relationship between net inflows and current account volatility. When net inflow volatility increases by one unit, the current account volatility also increases by 0.35 units. This specification explains 65 percent of the variation in current account volatility.

1.5.5 Robustness Checks

1.5.5.1 Test on fixed-effects

The results of the fixed-effects panel regression indicate that the unobserved heterogeneity in the data is soaking up some of the variation in the dependent variable. The statistical significance of the fixed-effects (H_0: $\alpha_i = 0$) is formally tested by a Chow test. The fixed-effects model is the unrestricted model, and the OLS on the pooled sample is the restricted model, where we obtain the unrestricted and restricted residual sum of squares (URSS versus RRSS). For the industrial countries, the observed F-statistics of moving from the restricted to the unrestricted model is 2.82 and is distributed as F(19, 83). The F-test rejects the null hypothesis that the fixed-effects are all equal to zero at 1 percent significance level. This implies that the fixed country effects have explanatory power[24]. The simple OLS regression on panel data, which allows for cross-country variation as well as within variation, indicates that volatility in net inflows has a statistically significant positive effect on the current accounts of industrial countries (column (1) Table 1.4). Pooled OLS estimation models do not control for individual heterogeneity, therefore, run the risk of obtaining biased results (Baltagi, 1995). Also, the results of the Chow test indicate that there is significant cross-country heterogeneity among the industrial countries.

The Chow test on the fixed-effects justifies the use of the fixed-effects model over simple OLS on pooled data for the developing countries as well. The observed F-statistics for the developing countries is 6.81 and distributed as F(18, 66). The F-test rejects the hypothesis that all fixed country effects are equal to zero at 1 percent

[24] This might lead to the question whether the data are, in cross-section dimension, poolable. However, we cannot test for this since we have 5 to 6 observations for each cross-section.

significance level. The results of the simple OLS regressions are reported in Table 1.4. The OLS results also find a statistically significant and positive relation between net inflows and current account for the developing countries (column (2) Table 1.4).

1.5.5.2 Outliers

The results for industrial countries are not robust to the exclusion of outliers (New Zealand, Norway and Portugal[25]) (column (1) Table 1.5)[26]. The volatility of net inflows has a statistically significant and positive effect on current account volatility when the outliers are excluded. The partial correlation coefficient of net inflow volatility indicates that a unit increase in its volatility may induce an increase of 0.24 in current account volatility. The Wald coefficient test confirms that β is significantly different than one. This may suggest that, for the industrial countries, net inflows may be correlated with the reserve account.

The statistical significance of net inflow volatility is robust to the exclusion of outliers for developing countries (Egypt, Korea and Malaysia[27]) (column (2) Table 1.5). The economic significance of net inflow volatility improves only slightly to 0.37. Without the outliers, this model explains 77 percent of the variation in current account volatility.

Overall, the results indicate that there is evidence of a statistically significant relationship between inflows and current account volatility for the industrial countries, only when the outliers are excluded from the sample. For the developing countries the economic significance of inflows on current account volatility is much less than one-for-one. One unit increase in the volatility of inflows increases current account volatility by 0.37 units (Table 1.5). These results lead to another question: do inflows affect reserves volatility?

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[25] In New Zealand the current account and reserves are correlated, and reserves are as volatile as net inflows. In Norway, the current account is likely to be driven by the oil prices. In Portugal, net inflows and reserves are moderately correlated.

[26] The outliers are defined as residuals more than twice the standard error of the regression.

[27] In Egypt reserves are highly volatile and net inflows and reserves are highly correlated. In Korea, both reserves and net inflows are highly correlated with the current account, reinforcing volatility in the current account. In Malaysia, both reserves and net inflows are highly volatile and not strongly correlated, indicating that reserves do not offset inflow volatility.

1.5.6 Net Inflows and Reserves

The relationship between net inflow and reserves volatility is tested by a fixed-effects model, similar to the one presented previously. On this occasion, however, the dependent variable is reserve volatility. The reserve volatility is calculated as the standard deviation of HP (100) filtered reserve series over non-overlapping 5-year periods from 1970 to 2000. Table 1.6 reports results for the industrial countries in column (1) and for the developing countries in column (2).

The results for the industrial countries indicate that the effect of net inflows on reserve volatility is both economically and statistically significant. The coefficient for inflow volatility indicates that one unit increase in the volatility of inflows leads to an increase of 0.43 units in reserve volatility. This coefficient is much smaller (0.28), however, when the outliers (New Zealand, Norway, Portugal and Switzerland) are excluded from the sample (Table 1.7). This specification explains 63 percent of the within variation in reserve volatility in our sample.

The results for the developing countries also suggest a statistically and economically significant relationship between inflows and reserves. One unit increase in net inflow volatility leads to an increase of 0.57 units in reserves volatility (Table 1.6). The statistical significance of net inflows is robust to the exclusion of outliers (Egypt and Venezuela), however, the economic significance is lower ($\beta_1 = 0.49$) (Table 1.7). The net inflow volatility explains 56 percent of the within variation in reserve volatility in the developing countries.

For the developing countries, the effect of net inflow volatility on current account volatility is positive and significant. However, net inflows and current account are less than perfectly correlated. This may be explained by the significant impact of net inflows on reserve volatility. Precautionary motives for reserves accumulation have been important for developing countries. For the industrial countries, net inflow volatility also has a statistically significant effect on the within variation in current account volatility. The economic impact of inflow volatility on current account volatility is larger for the developing countries than it is for the industrial countries in our sample. The impact of net inflow volatility on reserve volatility is also larger for

the developing countries than it is for industrial countries. These results suggest that inflows to the developing countries have been used to finance the current account deficits and to build international reserves, more so than in industrial countries, reminiscent of results from Bosworth and Collins (1999).

1.6 Net Capital Inflows and Current Account Imbalances: Causality

In this section we address the question of whether net inflows cause current account imbalances[28]. The first step in answering this question is to look for evidence of a relationship between net inflows and the current account. In other words, as a precursor to establishing causality between these two variables, we need to ask whether inflows and current account imbalances are related. Once the relationship is established, the second step is to test for the direction of causality. The method of analysis involves three steps: first, a check on the stationarity of net inflows and current account imbalances, then, tests of cointegration for non-stationary series, and finally tests of Granger causality and causality tests on error correction models (ECM).

Unlike the previous section on panel data, our focus here is on individual countries. The argument is that each country, industrial or developing, has country-specific experiences, and examining individual countries may add to our understanding of the dynamics of capital flows and the current account imbalances. Although this section does not refer to the question of volatility directly, establishing causal links may help explain the different experience of industrial countries compared to developing countries. If the direction of causality for most industrial countries is from current account to capital inflows, or bi-directional, the panel data results present problems of endogeneity[29].

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[28] Unlike the previous section, the focus is on the question of causality between net inflows and current account imbalances. For this reason, the remainder of econometric analyses utilises non-filtered data.

[29] The tests of panel causality are unapplicable to our data sets because of the shortness of the time-series dimension. Panel unit root and cointegration tests, as suggested by Kao (1999) have large size distortions when T is small (T is at maximum 6, and mostly less for the majority of the countries in our sample).

1.6.1. Stationarity

The concept of stationarity is important in establishing a causal link between time-series variables[30]. In models where a time-series variable is regressed on another time-series variable, one may get very high R^2 results, although there is no meaningful relationship. This presents the problem of a spurious relationship between these two variables, where the strong relationship is due to a common trend (Gujarati, 1995). For this reason, the stationarity of current account imbalances (ratio to GDP) and net inflows (ratio to GDP) was tested and the results are reported in Tables 1.8a and 1.8b. When the error term is white noise, the OLS estimator is best linear unbiased estimator, and when the two series are stationary, OLS estimation is valid.

Ultimately, we can test for causality between current account imbalances and net inflows in those countries, where both series are either stationary, I(0), or integrated of the same order, I(*d*). When the two series are found to be nonstationary processes but are integrated of the same order, I(*d*), then even though the underlying series are nonstationary, they can be cointegrated, if the residuals from the cointegrating regression are I(0). When the two variables are cointegrated, they have a long-run equilibrium relationship.

We examine stationarity in our data by employing Augmented Dickey Fuller (ADF) tests of unit roots. Although ADF tests have been criticized for having low power (especially in finite samples), they are the most commonly used unit root tests. Traditional unit root tests, like the ADF tests, were criticised for their shortcoming of not being able to distinguish between unit roots and near unit root stationary processes. Alternatively, one can test the null hypothesis of stationarity[31]. However, since the consequences of non-stationarity are so important, it is better to take a conservative approach with non-stationarity as the maintained hypothesis (Harris, 1995).

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[30] By stationarity, we refer to weak stationarity, i.e. constant mean, variance and autocovariance of the series.

[31] New methods suggest testing the null of stationarity against unit roots (e.g. Kwiatkowski *et al*, 1992). Alternatively, non-parametric variance ratio tests can also be used to test for unit roots, as proposed by Cochrane (1988).

Assuming that the data generating processes for current account (ratio to GDP) and net inflows (ratio to GDP) can be written as follows:

$$\Delta(\text{Inflow}_t) = \alpha + \beta\text{Inflow}_{t-1} + \lambda_1\Delta\text{Inflow}_{t-1} \ldots \lambda_{p-1}\Delta\text{Inflow}_{t-p+1} + u_t \qquad (1.6)$$

$$\Delta(CA_t) = \mu + \gamma CA_{t-1} + \delta_1 \Delta CA_{t-1} \ldots\ldots \delta p\, \Delta CA_{t-p+1} + e_t \qquad (1.7)$$

then ADF tests,

H_o: $\beta = 0$, H_1: $\beta<0$

H_o: $\gamma = 0$, H_1: $\gamma<0$

The null hypothesis is that the series has unit root (i.e. nonstationary), against the alternative hypothesis that the series is stationary. ADF tests involve parametric corrections for higher-order correlation by assuming the series follows AR(*p*) process, at which lag the error term is white noise[32]. The lag length of the ADF tests was determined by using the general-to-specific methodology starting at a lag length of 3. The model selection was based on the Akaike information criterion (AIC). Tables 1.8a and 1.8b report results of ADF tests on current account to GDP (CA/GDP) and net inflow to GDP (Inflow/GDP) ratios in columns (1) and (3). Columns (2) and (4) report results of ADF tests for first-differenced series.

Among the industrial countries, both current account and inflow series are stationary, I(0) processes for Canada, Japan, New Zealand, Spain, Sweden and UK. For Austria, Belgium-Luxembourg, Iceland and US, both series are I(1). For those industrial countries, where current account and inflow series are integrated of a different order (i.e. Australia, Denmark, Finland, France, Germany, Italy, Netherlands, Norway, Portugal and Switzerland), we cannot estimate economically meaningful relationships[33]. For the industrial countries, where net inflows and current account

[32] Although ADF tests restricts the series to be an AR(p) process, ADF test remain valid even when the series is an MA process (Said and Dickey, 1984). For this reason, we prefer ADF tests over Phillips-Perron unit root tests.

[33] The reserves account of these industrial countries are I(0) processes. This presents a problem in explaining why the two series are integrated of a different order in Australia, Finland, Germany, Netherlands, Norway and Portugal. The examination of the CA series for these countries suggest that

imbalances are integrated of different order, a long-run steady-state relationship does not exist. These two series may be diverging in time, violating the condition of white noise error term, and invalidating the OLS estimator.

Among the developing countries, Argentina, Colombia, Egypt, Korea, Malaysia, Morocco, Turkey and Venezuela have stationary processes for both current account and net inflow series. Brazil and Singapore's current account and net inflow series are both I(1). Since the two series are integrated of a different order for Chile, China, Costa Rica, India, Israel, Mexico, Philippines and Thailand, these countries are left out of further analysis[34]. The Phillips-Perron unit root tests on stationary I(0) series confirm the results of ADF tests, except for Denmark and Japan among industrial countries, and India, Morocco, Philippines, Mexico and Thailand among the developing countries (See Appendix 1.3).

1.6.2 Cointegration

In this section, the question of whether current account imbalances and net inflows are related is addressed. If the two series are cointegrated, these series are said to have a long-run equilibrium relationship. Cointegration was tested for those countries where both series were found to be non-stationary and integrated of the same order by two different tests. The first test procedure involves a two-step test suggested by Engle-Granger (1987). The first step is to estimate a cointegrating regression as equation (1.8):

$$CA_t = \alpha + \beta Inflw_t + u_t \qquad (1.8)$$

The second step is to apply an ADF test on the residuals, u_t, obtained from a cointegrating regression as follows:

$$\Delta\hat{u}_t = \rho\hat{u}_{t-1} + \varepsilon_t \qquad (1.9)$$

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there may be structural breaks in the series, in which case, ADF tests will have low power (Harris, 1995).

[34] The examination of the reserve account for these countries indicated I(0) prcesses, except for Costa Rica. For Chile, Israel, Mexico and Thailand, the CA series may have structural breaks.

If the residuals are I(0), current account imbalances and net inflows are cointegrated. In other words, current account imbalances and net inflows have a long-run equilibrium relationship. Since the residuals are an estimate of the actual population disturbances, the correct asymptotic critical values are computed by Davidson and MacKinnon (1993), whereas the critical values for small sample sizes are found in MacKinnon (1991).

Table 1.9a reports the test statistics in column (1) for the unit root test on the estimated residuals for industrial countries. The lag lengths satisfy the criteria of lowest AIC, and are reported in column (2). For most countries, the null of unit root is rejected at 1 percent significance level. For the US, the ADF test statistic is significant at 5 percent level. Among the developing countries, both for Brazil and Singapore, the current account and net inflows have a long-run equilibrium relationship and this relationship is statistically significant at 1 percent level (column (1) Table 1.9b). In summary, for the countries that the unit root tests found both series non-stationary and integrated I(1), the Engle-Granger test strongly suggests the presence of a long-run equilibrium relationship.

The second test on cointegration involves a method developed by Johansen (1991, 1995). The Johansen test is a vector autoregression (VAR) based cointegration test, where the restrictions imposed by cointegration on the unrestricted VAR are tested. If the data can be represented as a VAR model of the following form:

$$y_t = A_1 y_t + \ldots. + A_k y_{t-k} + u_t \qquad (1.10)$$

where y_t is a k-vector of non-stationary I*(1)* series, and u_t is a vector of innovations. Following Harris (1995), equation (1.10) can be rewritten as a vector error correction model (VECM):

$$\Delta y_t = \Gamma_1 \Delta y_{t-1} + \ldots.. + \Gamma_{k-1} \Delta y_{t-k+1} + \Pi y_{t-k} + u_t \qquad (1.11)$$

where $\Gamma_i = -(I - A_1 - \ldots.. A_i)$, $(i = 1, \ldots.., k-1)$, and $\Pi = -(I - A_1 - \ldots.. -A_k)$. The estimates of Γ_i and Π, respectively, convey information on the short- and long-run

adjustments to changes in y_t. $\Pi = \alpha\beta$, where α represents the speed of adjustment to disequilibrium, while β is a matrix of long-run coefficients. The Johansen test estimates α and β using the procedure known as reduced rank regression. Specifically, Π has reduced rank when there are $r \leq (n-1)$ cointegrating vectors. The objective of this test is to find the number of cointegrating vectors, or the rank of Π.

The results from Johansen cointegration test on net inflows and current account imbalances are reported in column (3) of Tables 1.9a and 1.9b. The test is carried out on the same set of industrial and developing countries as the ones used in Engle-Granger cointegration test. The same lag lengths are used in the VAR specification, as in the Engle-Granger cointegrating regressions (column (2))[35]. The choice of VAR and cointegration equation specifications is based on the lowest AIC, which invariably indicated no deterministic trend in the data[36]. The cointegrating equation is assumed to have a constant but no trend. The test statistic is λ_{trace}, which is based on the eigenvalues. The null hypothesis is of no cointegrating equations against the general alternative of cointegration.

For the industrial countries, the calculated λ_{trace} statistic is greater than the critical value at 1 percent significance level for Austria and 5 percent significance level for Iceland (column (3) Table 1.9a). The Johansen test statistic cannot reject the null of no cointegrating equations for Belgium-Luxembourg and the US at the lag lengths specified by the Engle-Granger test. However, there is evidence of cointegration for both of these countries at lag length of 5 for Belgium-Luxembourg and at 7 lags for the US. The Johansen test fails to reject the null of no cointegrating equations for both Brazil and Singapore at the lag length specified by the Engle-Granger test. For both of these countries, there is evidence of cointegration at 3 lags. In summary, the Engle-Granger test finds cointegration between current account imbalances and net inflows for all the countries in this sub-sample, whereas Johansen test finds sporadic evidence

[35] For the regressions where the Engle-Granger test suggest a lag length of zero, the Johansen test is carried out on the first lag.

[36] The only exception is Singapore. The AIC is lowest when a linear deterministic trend is assumed in the data for this country. Johansen tests are performed by the Eviews econometrics package. This program offers five options: (1) no deterministic trend in data, no constant, no trend in the cointegrating equation (CE), (2) no deterministic trend in data, constant but no trend in CE, (3) linear deterministic trend, and constant in CE only, (4) linear deterministic trend, constant and trend in CE, (5) quadratic trend in data, linear trend in CE.

of cointegration. Given that we are estimating a bivariate relationship, the Engle-Granger test is probably more appropriate than the Johansen technique, which is also more data demanding.

1.6.3 Causality Tests

The results of unit root and cointegration tests prepared the background for causality tests. For those countries with stationary series, the OLS is the best linear unbiased estimate and the regression expresses an economically meaningful relationship. In the case of countries, where current account imbalances and inflows are cointegrated, the fully modified OLS proposed by Phillips-Hansen is the preferred method of estimating the cointegrating relationship[37]. Before estimating the economic significance of the cointegrating relations, we test for the direction of causality by using two different methods. We use simple Granger causality tests to establish the direction of causality for those countries where both series are stationary. For the countries where current account and inflows are cointegrated, error correction mechanism (ECM) is used to detect the direction of causality.

1.6.3.1 Granger Causality Test

The Granger causality test (1969) involves assessing whether, by introducing lagged values of x, we can improve the explanatory power of the model that regresses lagged values of y on current y.

$$CA_t = \alpha + \beta_1 CA_{t-1} \ldots + \beta_p CA_{t-p} + \gamma_1 Inflow_{t-1} \ldots + \gamma_p Inflow_{t-q} \qquad (1.12)$$

$$Inflow_t = \mu + \delta_1 Inflow_{t-1} \ldots + \delta_{t-p} Inflow_{t-p} + \varepsilon_1 CA_{t-1} \ldots + \varepsilon_p CA_{t-q} \qquad (1.13)$$

The null hypothesis for the first equation is that inflows do not cause current account imbalances, and for the second, it indicates that the current account does not cause inflows. This hypothesis is tested by a Wald test, where the estimated F-statistics are calculated for the joint significance of the coefficients:

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[37] In finite samples, OLS can have a large bias when I(1) variables are used in the regression (Harris, 1995).

$\gamma_1 = \ldots\ldots \gamma_q = 0$ and $\varepsilon_1 = \ldots\ldots \varepsilon_q = 0$

The results from the Granger causality tests are reported in Tables 1.10a and 1.10b. There are four possibilities. The direction of causation can be running from inflows to current account imbalances (i.e. inflows cause current account imbalances), or from current account imbalances to inflows. There can also be a feedback between the two variables, or they can be independent. The lag lengths of the independent and dependent variables in the model are chosen to minimize the AIC.

There is no evidence of net inflows causing current account imbalances in any of the industrial countries (Table 1.10 a). In Japan, New Zealand and the UK, there is evidence of current account imbalances causing net inflows. In Canada, Sweden and Spain, these two variables are independent. In Argentina, Venezuela and Egypt, net inflows cause current account imbalances (Table 1.10b). Only in Malaysia, do current account imbalances cause net inflows. In Korea, the causation is bi-directional, whereas for Colombia, Turkey and Morocco, the current account and net inflows are independent.

1.6.3.2 Causality tests on Error Correction Models

For the countries that have current account and inflows series with I(1) processes, cointegration tests suggest there is a statistically significant long-run equilibrium relationship between these variables. In the short-run, there may be disequilibrium. The error correction mechanism (ECM) incorporates the short-run disequilibrium into the long-run behaviour of the current account and inflows, using the error term as "equilibrium error" (Gujarati, 1995). Since all terms in the ECM model are stationary, standard regression techniques are valid. Granger's representation theorem implies that if two variables are cointegrated, then there must exist an ECM (and vice versa). The relationship between inflows and current account can be formulated as an ECM model as follows:

$$\Delta CA_t = \alpha + \theta\,(CA_{t-1} - \nu - \lambda Inflow_{t-1}) + \sum \beta_p \Delta CA_{t-p} + \sum \gamma_p \Delta inflow_{t-p} \qquad (1.14)$$

$$\Delta Inflow_t = \mu + \rho\,(CA_{t-1} - \nu - \lambda Inflow_{t-1}) + \sum \delta_{t-p} \Delta Inflow_{t-p} + \sum \varepsilon_p \Delta CA_{t-p} \qquad (1.15)$$

The term in parenthesis is the error term estimated from the cointegrating regression (i.e. error correction term), and it represents a short-run deviation from the long-run equilibrium[38]. When the error correction terms are ignored, equations (1.14) and (1.15) are Granger causality equations. In fact, if error correction terms are not included when there is cointegration between the variables, then the model is misspecified (Granger, 1988). We perform three different Granger causality tests. The first test of causality is based on the significance of the error correction term, which can be interpreted as long-run causality (Wald 1). The second test is an F-test on the joint significance of the lagged independent variable, i.e. standard Granger causality test (Wald 2). The final test involves testing for the joint significance of the error correction terms and the lagged independent variables (Wald 3)[39].

The ECM was estimated for four industrial countries: Austria, Belgium-Luxembourg, Iceland and the US (Table 1.11a). For Austria, the error correction term is statistically significant in both equations and both long-run causality tests (Wald 1) are significant at 10 percent level. When CA is the dependent variable the error correction term is negative, and when inflow/GDP is the dependent variable, the error correction term is positive. There is also evidence that there is significant short-run causality running from CA to inflows. The lagged independent variables have the expected negative sign. When the inflows/GDP is the dependent variable, all three Wald tests are significant, but since the error correction term is positive, it is ambiguous in Austria whether CA imbalances cause net inflows[40]. For Belgium-Luxembourg and the US, the direction of causality is also from CA imbalances to net inflows. Both Wald 1 tests are significant only when inflows/GDP is the dependent variable. On the other hand, in Iceland, the causality runs from net inflows to CA. The error correction term is the only statistically significant term and the Wald 1 test suggests that it is significantly different than zero.

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[38] The choice of the dependent variable in the cointegration regression is arbitrary (Enders, 1995).
[39] The lag length of the dependent and independent variables in the model are chosen to minimize the AIC.
[40] The negative and statistically significant lagged dependent variables for Austria also may indicate misspecification.

The causality tests involving the ECM model are reported for Brazil and Singapore in Table 1.11b. For Brazil, the long-run causality test (Wald 1) is significant when the dependent variable is the CA imbalance, and the error correction term is significant. This suggests that net inflows cause current account imbalances in Brazil[41]. For Singapore, the direction of causality is the opposite. Both the error correction term and the lagged independent variables are significant when net inflow is the dependent variable. The causality tests indicate that there is only evidence of long-run causality from current account imbalances to inflows. For Singapore, the sign of the lagged independent variable is positive, which is counter- intuitive[42].

The results of standard Granger causality tests and ECM equations indicate that the country experiences are varied. However, broadly, there is evidence in our sample that net inflows cause current account imbalances in developing countries, whereas in industrial countries there is no such evidence, except in Iceland. Among the industrial countries, only in Iceland, net inflows cause current account imbalances. In Argentina, Brazil, Egypt and Venezuela there is evidence of causality running from net inflows to current account imbalances. Singapore, however, is similar to industrial countries, like the US, Belgium-Luxembourg, New Zealand and the UK, where its causality runs from CA to net inflows.

1.6.4 Economic Significance

The previous sections have established that for a subset of industrial and developing countries, net capital inflows and current account imbalances are related. The causality tests identified the direction of causality in these countries. In this section, the economic significance of the relationship between net inflows and current account imbalances are tested. Since the focus in this chapter is on the effect of inflows on the current account, this relationship is estimated only for countries in which the direction of causality is from inflows to the current account.

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[41] The lagged independent variable (Inflw) has a positive sign, contrary to expectations, but the Wald 2 test is not significant.

[42] The positive and significant coefficient for the independent variable for Singapore can be the result of model misspecification.

The economic significance of the relationship is estimated by standard OLS for the countries where both series were found to be stationary processes, I(0). For the countries where both series are I(1), standard OLS coefficients are consistent, however, in finite samples, the bias may be large and the asymptotic distribution of t-statistics depend on nuisance parameters. Phillips-Hansen Fully Modified OLS (FMOLS) corrects for this problem by applying nonparametric corrections to the OLS estimator (Harris, 1995).

Tables 1.12a and 1.12b report results of the relationship between net inflows and current account imbalances. For Iceland and Brazil, the results are from FMOLS estimation, whereas, for Argentina, Venezuela and Egypt, standard OLS coefficients are reported. The FMOLS estimated coefficients are both statistically and economically significant. Both for Iceland and Brazil, net inflows and current account imbalances are negatively correlated[43]. The standard OLS coefficients for Argentina, Egypt and Venezuela are also negative, however, they are not statistically significant at 10 percent significance level for Argentina and Egypt. For Venezuela the coefficient for net inflows is economically significant, indicating that a unit increase in net inflows causes a 1.16 unit current account deficit. The economic impact of net inflows is also large in Iceland, but less than unity, where a unit increase in net inflows causes 0.82 unit decrease in the current account imbalance. Compared to Venezuela and Iceland, the economic impact of net inflows on the current account imbalance in Brazil is moderate.

1.6.5 Summary

In summary, the cointegration and causality tests indicate that net inflows and current account imbalances have a long-run steady-state relationship in a sub-set of industrial and developing countries. The focus in this section was to answer the question whether net inflows cause current account imbalances. Among the industrial countries, there is evidence of causality running from net inflows to the current account imbalance only in Iceland. Among the developing countries in our sample, in Argentina, Brazil, Egypt and Venezuela net inflows cause current account imbalances.

[43] Both series are entered into the regression equation in levels.

Claessens *et al* (1995) also find evidence of capital account causing current account imbalances in Argentina, Brazil and Venezuela for the period 1970-1992[44]. Our results indicate that the direction of the relationship in these countries remained stable throughout the 1990s. Contrary to the results in this chapter, Claessens *et al* (1995) show that capital account and current account are independent in Egypt. The difference in results may be based on the specific time periods captured. Most developing countries progressively liberalized their capital account in the 1990s.

Claessens *et al* (1995) further investigate the predictability of the direction of causality in their sample of 46 developing countries. They find that high levels of debt (foreign and domestic) reduce the likelihood that capital account Granger-causes the current account and increase the likelihood of no causality. This may explain our results on Turkey, Morocco and Colombia. The existence of restrictions on capital account payments reduces the likelihood of causality running from current account to capital account. This may explain why in Singapore, and some industrial countries, causality runs from current account to net inflows[45]. Overall, the balance-of-payments regime of a country may define the causal relationship between its current account and net inflows.

1.7 Conclusion

This chapter has examined the relationship between net private capital inflows and the current account in a set of industrial and developing countries. The relationship between international capital inflows and the current account has been implied in the models of current account determination, and recently in the 'sustainability' literature. However, this relationship has remained relatively unexplored. The aim of this chapter was to answer two specific questions regarding the relationship between net private capital inflows and the current account. The first question has asked whether the cyclical volatility in current accounts could be explained by the volatility of

[44] The capital account in Claessens *et al* (1995) is equivalent to net inflows variable used in this study.
[45] Singapore's capital account is one of the most liberal among the developing countries.

capital flows. The second question addressed the causal link between net capital inflows and current account imbalances.

The results indicate that country experiences vary. The evidence implies that inflows do not cause current account imbalances in the industrial countries, nor does the inflow volatility affect current account volatility. This may be explained by the fact that most industrial countries have liberalized capital accounts. Domestic markets are open to foreign capital inflows and domestic agents are also free to invest abroad. This may mean that in industrial countries, there are fewer barriers to borrowing and lending internationally, compared to developing countries. Although, some developing countries have undertaken structural reforms and liberalized their current accounts, capital controls would have been prevalent for the most part of the time period analysed. Such institutional barriers may be the reason why inflows cause imbalances or volatility in the current account.

Another distinction between industrial and developing country current and capital inflow dynamics may be based on their ability to borrow in the international capital markets. Most industrial countries can borrow and lend freely, whereas most developing countries are liquidity constrained. The ability to borrow in international markets is restricted for developing countries, and mostly determined by foreign investors willingness to lend. In favourable times, there may be overlending, exceeding the optimal amount required by the consumption-smoothing hypothesis. During an economic downturn, sudden reversals in inflows can induce a liquidity crisis. This may explain the relationship between volatility in inflows and current accounts in developing countries.

Finally, it is worth remembering the consumption-smoothing hypothesis of the current account. The consumption-smoothing approach combines the assumptions of high capital mobility and permanent income theory of consumption in a small, open economy to predict what capital flows would be if agents behave in accordance with the permanent income theory. According to this approach, a country's current account will be in deficit whenever national cash flow, is expected to rise over time. It will be in surplus whenever national cash flow is expected to fall. One important implication

of this theory is that all countries are expected to behave the same under the same circumstances. Our results indicate that the experience of the industrial and developing countries are quite different. This may be closely linked to the fact that developing countries are credit-constrained in contrast with industrial countries.

Further research is required to explore if the volatility in capital inflows is responding to smooth consumption. If the change in net foreign assets is only responding to smooth consumption, there should be no more volatility beyond the amount required to smooth the national cash flow. This chapter suggests that the behaviour of the capital inflows is different in industrial countries compared to developing countries. This implies that comparative research on the consumption smoothing effects of capital inflows in industrial versus developing countries would be worthwhile.

Table 1.1a. Current Account Volatility – Industrial Countries

Volatility	CA	Inflows	Outflows	Reserve	Net Inflows	Year
Australia	0.012	0.013	0.007	0.013	0.012	1960-2000
Austria	0.012	0.023	0.024	0.010	0.012	1967-2000
BEL	0.011	0.209	0.210	0.007	0.012	1975-2000
Canada	0.012	0.017	0.014	0.006	0.012	1948-2000
Denmark	0.014	0.053	0.050	0.025	0.028	1975-2000
Finland	0.020	0.038	0.032	0.019	0.027	1975-2000
France	0.007	0.029	0.028	0.006	0.007	1975-2000
Germany	0.013	0.016	0.023	0.008	0.016	1971-2000
Iceland	0.021	0.026	0.012	0.010	0.013	1976-2000
Italy	0.015	0.020	0.020	0.013	0.024	1970-2000
Japan	0.010	0.016	0.016	0.006	0.010	1977-2000
Netherlands	0.014	0.042	0.037	0.007	0.016	1967-2000
New Zealand	0.031	0.023	0.017	0.023	0.022	1972-2000
Norway	0.037	0.034	0.033	0.026	0.032	1975-2000
Portugal	0.035	0.034	0.028	0.026	0.037	1975-2000
Spain	0.016	0.037	0.037	0.020	0.020	1975-2000
Sweden	0.013	0.047	0.031	0.017	0.026	1970-2000
Switzerland	0.014	0.061	0.071	0.019	0.024	1977-1999
UK	0.013	0.078	0.075	0.014	0.016	1970-2000
US	0.008	0.011	0.008	0.001	0.009	1970-2000

Notes: All variables are expressed as a ratio to GDP. The volatility measure is the standard deviation of HP(100) filtered series.

Table 1.1b. Current Account Volatility – Developing Countries

Volatility	CA	Inflows	Outflows	Reserve	Net Inflows	Year
Argentina	0.020	0.033	0.011	0.031	0.031	1976-2000
Brazil	0.012	0.017	0.005	0.017	0.016	1975-2000
Chile	0.028	0.069	0.026	0.061	0.063	1975-2000
China	0.020	0.014	0.009	0.017	0.017	1982-2000
Colombia	0.029	0.021	0.007	0.018	0.021	1968-2000
Costa Rica	0.024	0.027	0.014	0.034	0.032	1977-1999
Egypt	0.026	0.049	0.020	0.055	0.059	1977-2000
India	0.006	0.006	0.004	0.008	0.005	1975-2000
Indonesia	0.020	0.027	0.001	0.015	0.037	1981-1999
Israel	0.030	0.029	0.022	0.031	0.029	1952-2000
Korea	0.040	0.032	0.011	0.024	0.028	1976-1999
Malaysia	0.061	0.047	0.025	0.048	0.055	1974-1999
Mexico	0.025	0.028	0.013	0.027	0.032	1979-2000
Morocco	0.027	0.043	0.005	0.019	0.043	1975-1999
Philippines	0.033	0.033	0.048	0.031	0.043	1977-2000
Singapore	0.031	0.108	0.103	0.022	0.048	1972-2000
Thailand	0.035	0.039	0.007	0.027	0.042	1975-2000
Turkey	0.015	0.022	0.010	0.011	0.019	1974-2000
Venezuela	0.069	0.032	0.020	0.044	0.035	1970-2000

Notes: All variables are expressed as a ratio to GDP. The volatility measure is the standard deviation of HP(100) filtered series.

Table 1.2.a. Descriptive Statistics – Industrial Countries

	CA	Net Inflows	Inflows	Outflows	Reserves
Median	0.0004	0.0001	0.0002	0.0003	0.0003
Maximum	0.0672	0.0808	0.5061	0.3508	0.0544
Minimum	-0.1158	-0.0708	-0.3558	-0.5095	-0.0627
Std. Dev.	0.0177	0.0194	0.0554	0.0542	0.0149
Observations	580	580	580	580	580
Cross sections	20	20	20	20	20

Table 1.2.b. Descriptive Statistics – Developing Countries

	CA	Net Inflows	Inflows	Outflows	Reserves
Median	-0.0010	0.0005	0.0010	0.0002	-0.0010
Maximum	0.1665	0.1189	0.3458	0.2144	0.2096
Minimum	-0.1306	-0.2204	-0.3136	-0.3399	-0.1329
Std. Dev.	0.0333	0.0367	0.0429	0.0298	0.0318
Observations	462	462	462	462	462
Cross sections	19	19	19	19	19

Table 1.3. Fixed-Effects Estimation on Current Account Volatility

Dependent Variable: (CA) volatility	**(1)** Industrial countries	**(2)** Developing countries
Net Inflow volatility	0.17	0.35
	(1.38)	(5.13)***
N	109	91
Adj R^2	0.42	0.65
s.e	0.008	0.01

*, **, and *** indicate statistical significance at 10, 5 and 1 percent level.

Table 1.4. OLS Panel Estimation on Current Account Volatility

Dependent Variable: (CA) volatility	**(1)** Industrial countries	**(2)** Developing countries
Net Inflow volatility	0.47	0.40
	(4.74)***	(3.77)***
N	109	91
Adj R^2	0.27	0.21
s.e	0.01	0.02

*, **, and *** indicate statistical significance at 10, 5 and 1 percent level.

Table 1.5. Robustness Checks- Panel Fixed-Effects Estimation
(Outliers excluded)

Dependent Variable: (CA) volatility	**(1)** Industrial countries	**(2)** Developing countries
Net Inflow volatility	0.20	0.37
	(3.13)***	(5.61)***
N	94	87
Adj R^2	0.66	0.77
s.e	0.005	0.008

*, **, and *** indicate statistical significance at 10, 5 and 1 percent level.

Table 1.6. Fixed-Effects Estimation on Reserve Volatility

Dependent Variable: (RES) volatility	**(1)** Industrial countries	**(2)** Developing countries
Net Inflow volatility	0.43	0.57
	(3.41)***	(4.05)***
N	109	91
Adj R^2	0.49	0.55
s.e	0.007	0.01

Table 1.7. Robustness Checks- Panel Fixed-Effects Estimation
(Outliers excluded)

Dependent Variable: (RES) volatility	**(1)** Industrial countries	**(2)** Developing countries
Net Inflow volatility	0.28	0.49
	(4.03)***	(3.84)***
N	105	89
Adj R^2	0.63	0.56
s.e	0.005	0.01

*, **, and *** indicate statistical significance at 10, 5 and 1 percent level.

Table 1.8.a. Unit Root Tests (Augmented Dickey Fuller test)
Sample: Industrial Countries

	CA	ΔCA	Net Inflow	ΔNet Inflow	Period
Australia	-1.77	-5.37***	-3.30**		1960-2000
Austria	-2.45	-6.16***	-1.76	-8.16***	1967-2000
BEL	-0.05	-3.51***	-0.42	-3.26***	1975-2000
Canada	-2.86*		-3.68***		1948-2000
Denmark	-2.00**		-1.13	-8.48***	1975-2000
Finland	-1.09	-3.72***	-3.11***		1975-2000
France	-1.78*		-1.38	-5.59***	1975-2000
Iceland	-1.91	-5.88***	-2.04	-5.08***	1976-2000
Germany	-1.58	-4.25***	-2.19***		1971-2000
Italy	-2.79***		-2.38	-3.52***	1970-2000
Japan	-3.68**		-4.11***		1977-2000
Netherlands	-2.55	-5.97***	-4.58***		1967-2000
New Zealand	-2.75*		-2.22**		1972-2000
Norway	-2.42	-3.62***	-3.10***		1975-2000
Portugal	-2.57	-4.28***	-3.17**		1975-2000
Spain	-4.08***		-3.38**		1975-2000
Sweden	-1.89*		-2.98***		1970-2000
Switzerland	2.28	-6.50***	-1.69	-1.36	1977-1999
UK	-2.99**		-2.51**		1970-2000
US	0.33	-3.90***	-1.27	-6.01***	1970-2000

Table 1.8.b. Unit Root Tests (Augmented Dickey Fuller test)
Sample: Developing Countries

	CA	ΔCA	Net Inflow	ΔNet Inflow	Period
Argentina	-4.10***		-2.36**		1976-2000
Brazil	-1.43	-4.56***	-1.41	-4.85***	1975-2000
Chile	-0.75	-5.84***	-2.40**		1975-2000
China	-2.55**		-2.10	-4.67***	1982-2000
Colombia	-3.10**		-2.67*		1968-2000
Costa Rica	-1.48	-6.43***	-2.12**		1977-1999
Egypt	-2.17**		-3.01***		1977-2000
India	-3.53**		-2.22	-7.45***	1975-2000
Israel	-2.00	-7.34***	-3.31**		1952-2000
Korea	-2.06**		-1.93*		1976-1999
Malaysia	-2.57**		-1.70*		1974-1999
Mexico	-2.34	-2.54**	-3.06**		1979-2000
Morocco	-2.60**		-3.60***		1975-1999
Philippines	-1.73*		-1.29	-4.41***	1977-2000
Singapore	-0.40	-3.82***	-1.41	-5.29***	1972-2000
Thailand	-1.47	-4.52***	-1.86*		1975-2000
Turkey	-1.84*		-4.93***		1974-2000
Venezuela	-5.32***		-2.15**		1970-2000

Notes: All variables are expressed as a ratio to GDP. The lag length and the choice to include a constant or not are based on AIC. The test statistics (τ) are significant at 1 percent (***), 5 percent (**) and 10 percent (*).

Table 1.9.a. Engle-Granger and Johansen Cointegration Tests
Cointegrating regression: CA = a + b(Inflw)
Sample: Industrial Countries

	(1) ADF Test Statistic	(2) Number of Lags	(3) λ_{trace}
Austria	-4.22***	0	29.52***
Belgium-Luxembourg	-3.79***	0	13.36
Iceland	-4.01***	3	20.33**
US	-2.61**	1	9.80

Notes: All cointegrating models include a constant.
ADF test includes no constant and no trend.

Table 1.9.b. Engle-Granger and Johansen Cointegration Tests
Cointegrating regression: CA = a + b(Inflw)
Sample: Developing Countries

	(1) ADF Test Statistic	(2) Number of Lags	(3) λ_{trace}
Brazil	-2.70***	0	13.19
Singapore	-3.37***	2	14.96

Notes: All cointegrating models include a constant.
ADF test includes no constant and no trend.

Table 1.10.a. Standard Granger Causality tests
Sample: Industrial countries

	Y	Y_{t-1}	Y_{t-2}	Y_{t-3}	X_{t-1}	X_{t-2}	X_{t-3}	F-stat	Decision
Canada	*CA*	0.59			0.04			0.03	Independent
		(2.27)**			(0.16)				
	Net	0.35			-0.07			0.05	
	Inflows	(1.30)			(-0.27)				
Japan	*CA*	0.44			-0.39			2.31	CA⇒Inflw
		(1.77)*			(-1.52)				
	Net	0.02	-0.24		-1.05	0.51		3.68**	
	Inflows	(0.08)	(-0.70)		(-2.56)**	(1.56)			
New	*CA*	0.56			0.09	-0.29	0.19	0.84	CA⇒Inflw
Zealand		(3.77)***			(0.48)	(-1.52)	(1.03)		
	Net	0.58			0.26			3.30***	
	Inflows	(3.73)***			(1.82)*				
Spain	*CA*	0.87	-0.28	-0.27	-0.01			0.01	Independent
		(3.83)***	(-0.98)	(-1.24)	(-0.10)				
	Net	0.26			-0.21			0.60	
	Inflows	(1.22)			(-0.77)				
Sweden	*CA*	0.77			0.02			0.07	Independent
		(4.95)***			(0.26)				
	Net	0.51			-0.06			0.05	
	Inflows	(2.75)***			(-0.22)				
UK	*CA*	0.57			-0.20			1.60	CA⇒Inflw
		(3.22)***			(-1.26)				
	Net	0.06			-0.54			3.73***	
	Inflows	(0.24)			(-1.93)*				

Table 1.10.b. Standard Granger Causality tests *Sample: Developing countries*

	Y	Y_{t-1}	Y_{t-2}	Y_{t-3}	X_{t-1}	X_{t-2}	X_{t-3}	F-stat	Decision
Argentina	*CA*	0.22	-0.22	0.06	-0.36			20.96***	Inflw⇒CA
		(1.42)	(-1.43)	(0.42)	(-4.58)***				
	Net Inflows	0.63			0.35			1.33	
		(3.27)***			(1.15)				
Colombia	*CA*	0.34			-0.55			2.56	Independent
		(1.36)			(-1.60)				
	Net	0.55			-0.19	0.24		1.37	
	Inflows	(2.01)**			(-0.84)	(1.66)			
Egypt	*CA*	-0.31			-0.36	-0.22	-0.23	8.81***	Inflw⇒CA
		(-1.47)			(-3.98)***	(-2.60)**	(-2.58)**		
	Net	0.39			-0.11			0.09	
	Inflows	(1.70)			(-0.30)				
Korea	*CA*	-0.20			-1.24			15.99***	CA⇔Inflw
		(-0.79)			(-4.00)***				
	Net Inflows	1.09			0.39			3.31*	
		(4.09)***			(1.82)*				
Malaysia	*CA*	0.55	-0.19	-0.40	-0.42			1.74	CA⇒Inflw
		(1.99)*	(-0.59)	(-1.49)	(-1.32)				
	Net Inflows	0.28			-0.46			3.28***	
		(1.01)			(-1.81)*				
Morocco	*CA*	0.51			-0.27	0.34	-0.32	2.15	Independent
		(2.55)**			(-1.18)	(1.56)	(-2.48)**		
	Net	0.82	-0.40	0.19	-0.10			0.23	
	Inflows	(3.26)***	(-1.68)	(1.37)	(-0.48)				
Turkey	*CA*	0.27	-0.29	0.41	0.33			1.97	Independent
		(1.04)	(-1.30)	(1.97)*	(1.40)				
	Net Inflows	0.08			0.47			2.83	
		(0.33)			(1.68)				
Venezuela	*CA*	0.05			-0.75			3.42***	Inflw⇒CA
		(0.23)			(-1.85)*				
	Net Inflows	0.67	-0.20	-0.30	0.16			2.33	
		(3.15)***	(-0.95)	(-1.61)	(1.53)				

Table 1.11.a. Error Correction Model

Sample: Industrial countries

	Y	X	e_{t-1}	ΔY_{t-1}	ΔY_{t-2}	ΔY_{t-3}	ΔX_{t-1}	ΔX_{t-2}	ΔX_{t-3}	Wald1	Wald2	Wald3
Austria	*CA*	*INFLW*	-0.80**	0.36			0.51**	0.36		4.77**	2.18	1.87
			(-2.19)	(1.40)			(2.09)	(1.65)				
	INFLW	*CA*	0.39+	-0.97*	-0.67*		-0.76*			3.35+	36.76*	22.74*
			(1.83)+	(-6.14)	(-4.85)		(-6.06)					
BEL	*CA*	*INFLW*	0.01	0.34			0.05			0.00	0.05	0.05
			(0.04)	(1.00)			(0.22)					
	INFLW	*CA*	-0.84*	0.04			0.10			6.63**	0.06	4.13**
			(-2.57)	(0.12)			(0.25)					
Iceland	*CA*	*INFLW*	-1.03**	0.18			0.33			5.82**	0.67	2.93+
			(-2.41)	(0.40)			(0.82)					
	INFLW	*CA*	0.03	-0.14			-0.07			0.00	0.02	0.00
			(0.05)	(-0.27)			(-0.14)					
US	*CA*	*INFLW*	-0.12	0.25			-0.01			0.16	0.00	0.19
			(-0.40)	(0.71)			(-0.05)					
	INFLW	*CA*	-0.53+	-0.19			-0.32			2.93+	0.53	2.37
			(-1.71)	(-0.71)			(-0.73)					

Notes: Wald 1 is an F-test on the statistical significance of the error correction term, Wald 2 tests the joint significance of the coefficients of the lagged independent variable, and the Wald 3 is an F-test on the joint significance of the error correction term and the coefficients of the lagged independent variable

Table 1.11.b. Error Correction Model

Sample: Developing countries

	Y	X	e_{t-1}	ΔY_{t-1}	ΔY_{t-2}	ΔY_{t-3}	ΔX_{t-1}	ΔX_{t-2}	ΔX_{t-3}	Wald1	Wald2	Wald3
Brazil	*CA*	*INFLW*	-0.60*	0.22			0.08			9.24*	0.15	6.56*
			(-3.04)	(1.14)			(0.39)					
	INFLW	*CA*	0.41	-0.35			-0.18			1.41	0.67	0.93
			(1.19)	(-1.44)			(-0.82)					
Singapore	*CA*	*INFLW*	-0.20	-0.19			-0.02	0.17		2.51	1.39	2.03
			(-1.58)	(-1.09)			(-0.12)	(1.36)				
	INFLW	*CA*	-0.48*	0.20			0.62**	0.18		9.31*	0.53	4.51*
			(-3.05)	(1.03)			(2.57)	(0.58)				

Notes: Wald 1 is an F-test on the statistical significance of the error correction term, Wald 2 tests the joint significance of the coefficients of the lagged independent variable, and the Wald 3 is an F-test on the joint significance of the error correction term and the coefficients of the lagged independent variable

Table 1.12a . Fully Modified OLS estimation

$CA_t = \alpha + \beta(Inflow)_t$

Country	β	Sample Period
Iceland	-0.82 (-8.89)***	1977-2000
Brazil	-0.55 (-4.91)***	1975-2000

Note: Bartlett Weights, 2 lags, no trend. t-statistics in parantheses. Significance levels at 1, 5 and 10 percent are indicated by ***, **, *.

Table 1.12b . OLS estimation

$CA_t = \alpha + \beta(Inflow)_t$

Country	β	R^2	DW	Sample Period
Argentina	-0.12 (-1.27)	0.28	1.87	1977-2000
Egypt	-0.19 (-1.66)	0.51	1.98	1977-1999
Venezuela	-1.16 (-3.68)***	0.37	1.75	1970-2000

Note: Newey-West heteroskodasticity and autocorrelation consistent t-statistics in parantheses. Significance levels at 1, 5 and 10 percent are indicated by ***, **, *. AR(1) correction included.

Figure 1.1
CA, Inflows and Outflows : Industrial Countries

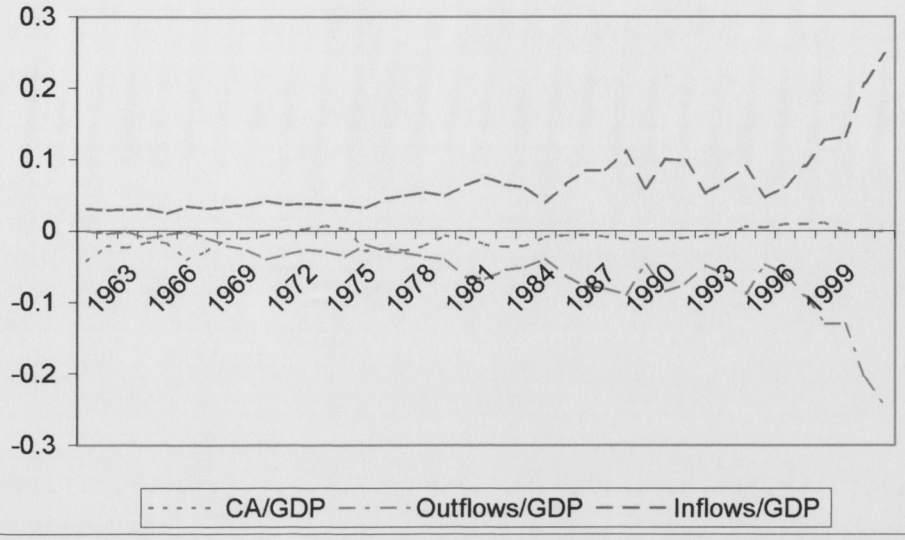


Figure 1.2
CA, Inflows and Outlfows : Developing Countries

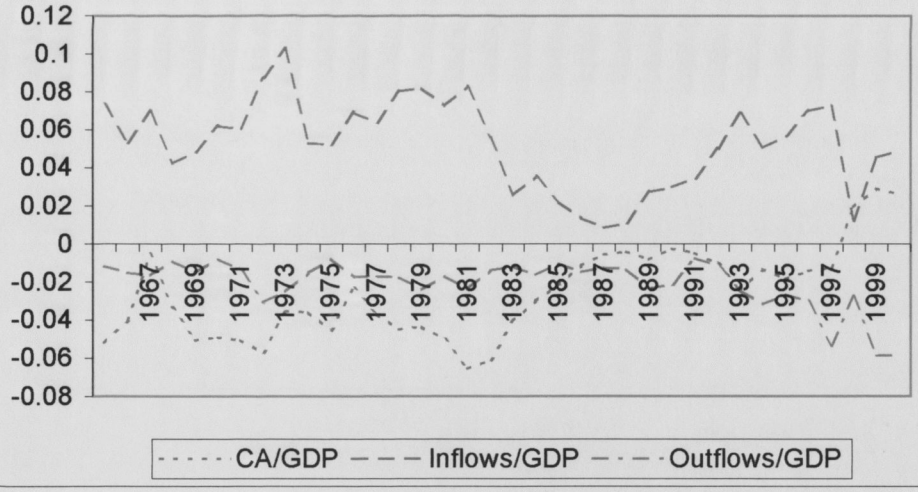


Figure 3(A):
Volatility of Current Account and Inflows: Developing Countries (1980s)

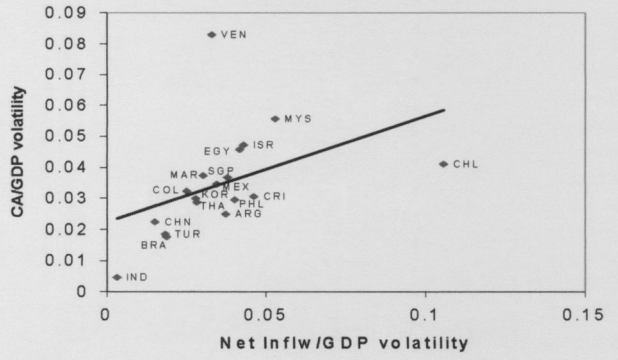


Figure 3 (B):
Volatility in Reserves and Inflows: Developing Countries (1980s)

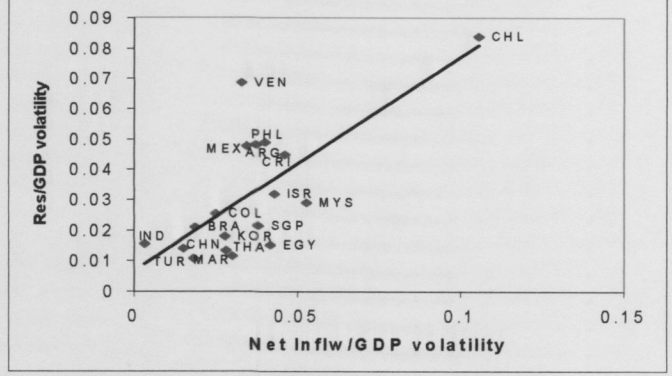


Figure 3(C):
Volatility in Current Account and Inflows: Developing Countries (1990s)

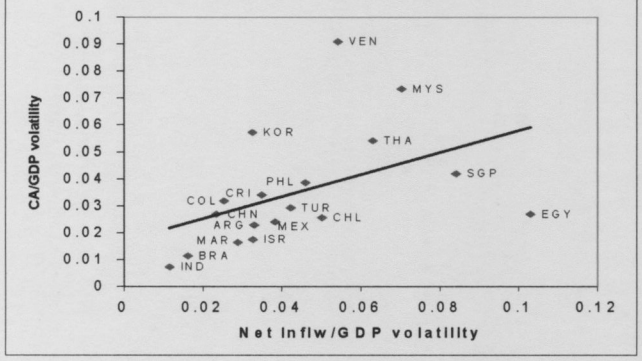


Figure 3 (D):
Volatility in Reserves and Inflows: Developing Countries (1990s)

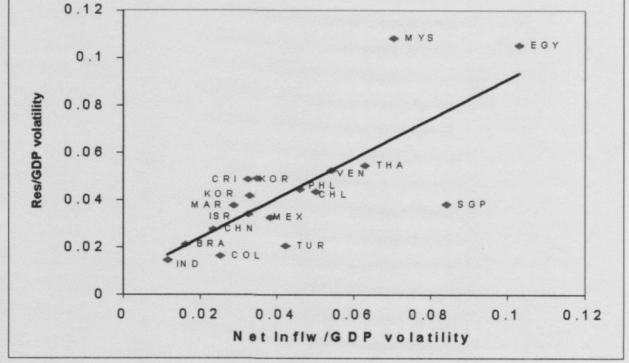


Figure 4(A):
Volatility in Current Account and Inflows:
Industrial Countries (1980s)

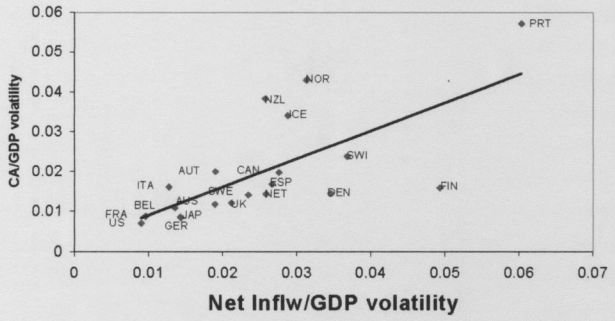


Figure 4(B):
Volatility in Reserves and Inflows:
Industrial Countries (1980s)

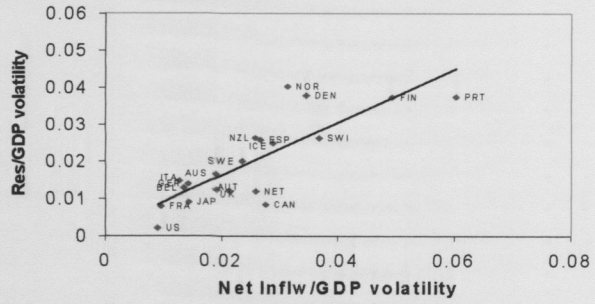


Figure 4 (C):
Volatility in CA and Inflows:
Industrial Countries (1990s)

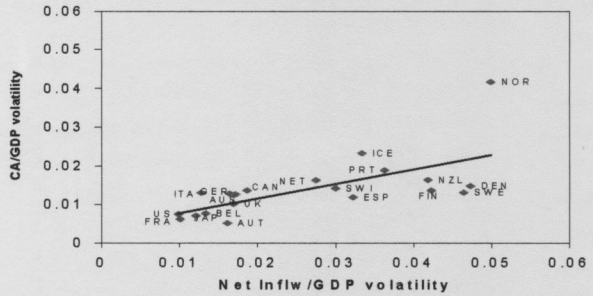
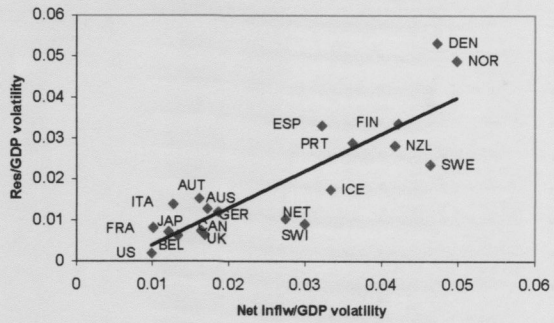


Figure 4 (D):
Volatility in Reserves and Inflows:
Industrial Countries (1990s)



APPENDIX 1.1

List of Countries

Industrial Countries

Australia (AUS)
Austria (AUT)
Belgium-Luxembourg (BEL)
Canada (CAN)
Denmark (DEN)
Finland (FIN)
France (FRA)
Germany (GER)
Iceland (ICE)
Italy (ITA)
Japan (JAP)
Netherlands (NET)
Norway (NOR)
New Zealand (NZL)
Portugal (PRT)
Spain (ESP)
Sweden (SWE)
Switzerland (SWI)
United Kingdom (UK)
United States (US)

Developing Countries

Argentina (ARG)
Brazil (BRA)
Chile (CHL)
China (CHN)
Colombia (COL)
Costa Rica (CRI)
Egypt (EGY)
India (IND)
Indonesia (IDN)
Israel (ISR)
Korea (KOR)
Malaysia (MYS)
Mexico (MEX)
Morocco (MAR)
Philippines (PHL)
Singapore (SGP)
Thailand (THA)
Turkey (TUR)
Venezuela (VEN)

APPENDIX 1.2 Table 1.2A.1 Correlations – Industrial Countries

Australia	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.52	-0.40	-0.31	-0.33
NET INFLOWS		1.00	-0.52	0.24	0.83
RESERVES			1.00	-0.01	-0.50
OUTFLOWS				1.00	-0.35
Austria	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.61	-0.04	-0.09	-0.21
NET INFLOWS		1.00	-0.66	0.37	0.12
RESERVES			1.00	-0.28	-0.04
OUTFLOWS				1.00	-0.88
Belgium-Luxembourg	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.82	-0.33	-0.03	-0.01
NET INFLOWS		1.00	-0.11	0.12	-0.06
RESERVES			1.00	0.08	-0.09
OUTFLOWS				1.00	-1.00
Canada	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.83	-0.21	-0.19	-0.44
NET INFLOWS		1.00	-0.24	0.19	0.56
RESERVES			1.00	-0.06	-0.12
OUTFLOWS				1.00	-0.70
Denmark	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.41	-0.09	-0.18	-0.05
NET INFLOWS		1.00	-0.83	0.17	0.37
RESERVES			1.00	-0.20	-0.25
OUTFLOWS				1.00	-0.85
Finland	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.47	-0.27	0.10	-0.42
NET INFLOWS		1.00	-0.65	0.20	0.55
RESERVES			1.00	-0.17	-0.33
OUTFLOWS				1.00	-0.71
France	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.69	-0.50	0.06	-0.23
NET INFLOWS		1.00	-0.20	-0.06	0.30
RESERVES			1.00	-0.14	0.08
OUTFLOWS				1.00	-0.97
Germany	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.80	-0.19	-0.57	0.02
NET INFLOWS		1.00	-0.37	0.72	-0.04
RESERVES			1.00	-0.25	0.00
OUTFLOWS				1.00	-0.72
Iceland	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.77	-0.28	0.16	-0.79
NET INFLOWS		1.00	-0.33	0.10	0.88
RESERVES			1.00	-0.31	-0.16
OUTFLOWS				1.00	-0.39

Table 1.2A.1 (cont.)

Italy	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.72	-0.44	-0.31	-0.16
NET INFLOWS		1.00	-0.20	0.38	0.28
RESERVES			1.00	-0.05	-0.08
OUTFLOWS				1.00	-0.78
Japan	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.75	-0.42	-0.10	-0.37
NET INFLOWS		1.00	-0.22	0.28	0.34
RESERVES			1.00	-0.12	-0.02
OUTFLOWS				1.00	-0.81
Netherlands	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.73	0.09	0.24	-0.49
NET INFLOWS		1.00	-0.18	-0.12	0.48
RESERVES			1.00	-0.02	-0.05
OUTFLOWS				1.00	-0.93
Norway	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.73	-0.51	-0.30	-0.41
NET INFLOWS		1.00	-0.17	0.47	0.50
RESERVES			1.00	-0.27	0.10
OUTFLOWS				1.00	-0.53
New Zealand	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.29	-0.67	-0.01	-0.26
NET INFLOWS		1.00	-0.09	0.27	0.73
RESERVES			1.00	0.02	-0.10
OUTFLOWS				1.00	-0.47
Portugal	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.66	-0.11	-0.34	-0.43
NET INFLOWS		1.00	-0.52	0.48	0.68
RESERVES			1.00	-0.45	-0.19
OUTFLOWS				1.00	-0.32
Spain	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.43	-0.37	0.23	-0.46
NET INFLOWS		1.00	-0.66	0.29	0.26
RESERVES			1.00	-0.52	0.16
OUTFLOWS				1.00	-0.85
Sweden	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.59	0.22	0.08	-0.38
NET INFLOWS		1.00	-0.80	-0.36	0.79
RESERVES			1.00	0.35	-0.68
OUTFLOWS				1.00	-0.85
Switzerland	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	0.04	-0.28	-0.02	0.04
NET INFLOWS		1.00	-0.41	0.53	-0.23
RESERVES			1.00	-0.18	0.05
OUTFLOWS				1.00	-0.95

Table 1.2A.1 (cont.)

UK	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.63	-0.24	0.03	-0.16
NET INFLOWS		1.00	-0.49	-0.12	0.33
RESERVES			1.00	0.04	-0.14
OUTFLOWS				1.00	-0.98
US	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.85	-0.17	-0.21	-0.54
NET INFLOWS		1.00	0.29	0.18	0.68
RESERVES			1.00	0.32	0.00
OUTFLOWS				1.00	-0.59

Notes: All variables are HP(100) filtered.

Table 1.2A.2 Correlations –Developing Countries

Argentina	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.38	-0.29	0.16	-0.40
NET INFLOWS		1.00	-0.77	-0.04	0.94
RESERVES			1.00	-0.09	-0.68
OUTFLOWS				1.00	-0.38
Brazil	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.34	-0.40	-0.28	-0.25
NET INFLOWS		1.00	-0.71	-0.02	0.96
RESERVES			1.00	0.27	-0.76
OUTFLOWS				1.00	-0.29
Chile	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.30	-0.17	-0.08	-0.25
NET INFLOWS		1.00	-0.88	-0.04	0.93
RESERVES			1.00	0.08	-0.84
OUTFLOWS				1.00	-0.41
China	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.52	-0.59	-0.25	-0.49
NET INFLOWS		1.00	-0.35	0.61	0.86
RESERVES			1.00	-0.34	-0.22
OUTFLOWS				1.00	0.12
Colombia	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.81	-0.77	-0.04	-0.77
NET INFLOWS		1.00	0.28	0.07	0.95
RESERVES			1.00	-0.07	0.29
OUTFLOWS				1.00	-0.25
Costa Rica	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.03	-0.60	0.33	-0.21
NET INFLOWS		1.00	-0.69	0.56	0.90
RESERVES			1.00	-0.64	-0.49
OUTFLOWS				1.00	0.14
Egypt	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.28	-0.19	-0.15	-0.28
NET INFLOWS		1.00	-0.87	0.63	0.95
RESERVES			1.00	-0.51	-0.84
OUTFLOWS				1.00	0.35
Indonesia	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.77	0.13	0.39	-0.84
NET INFLOWS		1.00	-0.60	-0.55	0.89
RESERVES			1.00	0.61	-0.60
OUTFLOWS				1.00	-0.49

Table 1.2A.2 (cont.)

India	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	0.13	-0.79	0.27	-0.05
NET INFLOWS		1.00	-0.61	0.07	0.81
RESERVES			1.00	-0.34	-0.32
OUTFLOWS				1.00	-0.53
Israel	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.56	-0.36	-0.38	-0.26
NET INFLOWS		1.00	-0.36	0.37	0.70
RESERVES			1.00	0.16	-0.48
OUTFLOWS				1.00	-0.39
Korea	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.78	-0.71	0.46	-0.84
NET INFLOWS		1.00	0.14	-0.21	0.94
RESERVES			1.00	-0.46	0.28
OUTFLOWS				1.00	-0.52
Morocco	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.71	-0.28	-0.07	-0.70
NET INFLOWS		1.00	-0.37	-0.01	0.99
RESERVES			1.00	0.03	-0.37
OUTFLOWS				1.00	-0.11
Mexico	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.75	-0.13	-0.47	-0.64
NET INFLOWS		1.00	-0.48	0.47	0.92
RESERVES			1.00	-0.09	-0.50
OUTFLOWS				1.00	0.09
Malaysia	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.77	-0.45	-0.52	-0.62
NET INFLOWS		1.00	-0.19	0.51	0.89
RESERVES			1.00	0.18	-0.31
OUTFLOWS				1.00	0.06
Philippines	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.77	-0.35	-0.57	-0.19
NET INFLOWS		1.00	-0.07	0.63	0.30
RESERVES			1.00	0.02	-0.16
OUTFLOWS				1.00	-0.53
Singapore	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.24	0.15	0.09	-0.19
NET INFLOWS		1.00	-0.73	0.12	0.33
RESERVES			1.00	-0.02	-0.30
OUTFLOWS				1.00	-0.90

Table 1.2A.2 (cont.)

Thailand	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.81	-0.04	-0.34	-0.79
NET INFLOWS		1.00	-0.53	0.38	0.98
RESERVES			1.00	-0.17	-0.53
OUTFLOWS				1.00	0.21
Turkey	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.74	-0.32	0.22	-0.71
NET INFLOWS		1.00	-0.20	-0.17	0.91
RESERVES			1.00	-0.22	-0.07
OUTFLOWS				1.00	-0.56
Venezuela	**CA**	**Net Inflows**	**Reserves**	**Outflows**	**Inflows**
CA	1.00	-0.64	-0.81	-0.29	-0.53
NET INFLOWS		1.00	0.19	0.47	0.82
RESERVES			1.00	0.00	0.21
OUTFLOWS				1.00	-0.12

Notes: All variables are HP(100) filtered.

APPENDIX 1.3

Table 1.3A.1 Unit Root Tests (Phillips-Perron test)
Sample: Industrial Countries

	CA	Net Inflow	Period
Australia		-3.20**	1960-2000
Canada	-2.90*	-3.74***	1948-2000
Denmark	-1.29		1975-2000
Finland		-3.06***	1975-2000
France	-1.75*		1975-2000
Germany		-2.29**	1971-2000
Italy	-2.84***		1970-2000
Japan	-1.93	-2.55	1977-2000
Netherlands		-4.60***	1967-2000
New Zealand	-3.73***	-2.21**	1972-2000
Norway		-2.29**	1975-2000
Portugal		-3.18**	1975-2000
Spain	-2.07**	-3.34**	1975-2000
Sweden	-2.05**	-2.95***	1970-2000
UK	-2.15**	-3.58***	1970-2000

*, **, and *** indicate statistical significance at 10, 5 and 1 percent level.

Table 1.3A.2 Unit Root Tests (Phillips-Perron test)
Sample: Developing Countries

	CA	Net Inflow	Period
Argentina	-2.68*	-2.44**	1976-2000
Chile		-2.37**	1975-2000
China	-2.54**		1982-2000
Colombia	-2.25**	-2.76*	1968-2000
Costa Rica		-2.13**	1977-1999
Egypt	-2.07**	-3.00***	1977-2000
India	-1.11		1975-2000
Israel		-3.35**	1952-2000
Korea	-2.20**	-1.95*	1976-1999
Malaysia	-2.09**	-1.82*	1974-1999
Mexico		-2.48	1979-2000
Morocco	-1.21	-1.46	1975-1999
Philippines	-1.10		1977-2000
Thailand		-1.47	1975-2000
Turkey	-3.54**	-4.96***	1974-2000
Venezuela	-3.34***	-3.08***	1970-2000

*, **, and *** indicate statistical significance at 10, 5 and 1 percent level.

Chapter 2

AN EMPIRICAL ANALYSIS OF THE RELATIONSHIP BETWEEN DEPOSIT INSURANCE AND CAPITAL FLOWS

2.1 Introduction

The unpredictable nature of capital flows has been the subject of much interest and analysis among many eminent economists. Recently, there has been renewed interest in the factors behind capital flows. This is primarily due to the unexpected surge in private capital flows to developing countries that have previously been excluded from world capital markets after the debt crisis of 1982, and the reversal of fortune resulting from the Asian crises of 1997-98. The benefits from increased capital mobility are well established. However, it is the heavy cost of sudden reversals in capital flows that create a more pressing need to identify the factors that drive capital flows into the developing countries in the first place.

The Asian crisis and its contagion to Brazil and Russia, bolstered a fresh look at the competing arguments that explain the factors behind the sudden surge in capital flows and the subsequent banking and currency crises. Traditional first generation models indicate that it is the conflict between government's exchange rate commitments and its monetary/fiscal policy that is the driving force behind balance of payments crises (Krugman, 1996). Therefore, this theory proposes that bad fundamentals cause the crisis. However, the ERM (Exchange Rate Mechanism) crises in 1992 and the Mexican crisis of 1994 did not fit first-generation model in the sense of obvious inconsistency between fiscal and monetary policy. Second-generation models emphasise that capital markets are prone to multiple equilibria, and it is the self-fulfilling behaviour of investors that brings about crisis (Obstfeld, 1996).

Dooley (1997) indicated that a massive surge in gross capital inflows prior to crisis seem to be the only common factor among these developing countries. This common factor cannot be explained by the traditional first-generation models, nor by second-

generation models. If it were deteriorating fundamentals behind such crisis, it would have been more likely to observe net private capital outflows prior to crisis[1]. However, increased inflows, coupled with increases in reserves, cushion the country against negative shocks and sudden changes in expectations.

Some argue that recent capital inflows to the emerging markets are affected by a strong government insurance of the financial system through an explicit or implicit deposit insurance scheme (Dooley, 1994, 1997, Chinn *et al*, 1999). Dooley (1997) suggests that a first generation model that is based on a policy conflict between the desire of a credit-constrained government to hold reserve assets as a form of self-insurance and the government's desire to insure financial liabilities of residents, may better explain the balance of payments crises. This policy conflict is an example of the two objective-one policy tool problem. The government's net reserves support both the exchange rate regime and the financial system. Because the government is credit-constrained, in order to avert a future crisis, it accumulates reserves. On the other hand, government's desire to insure the financial system generates incentives for investors to buy the government's liquid assets when yield differentials are optimal.

In fact, the sudden surge in private capital flows to emerging markets may be explained by the existence of a formal government guarantee. Dooley (1994) argues that investors' interest in the recipient market does not reflect their confidence in the investment climate of emerging markets. Rather, the basic motivation behind recent capital flows to these markets is to exploit a government subsidy or guarantee. Large capital inflows simply reflect that investors recognize that there is a financial arbitrage opportunity created by the government guarantee (explicit deposit insurance). Such government guarantees become more credible if the government is wealthy enough to support a guarantee. Also, these emerging markets have to be accessible to the investors, in order for them to take advantage of higher rates of return.

[1] Proponents of second-generation models indicate that capital inflows prior to crisis are inconsistent with first-generation models (Dooley, 1997).

According to Dooley's insurance model, the availability of free insurance raises the market yield on a set of liabilities issued by residents. Yields rise as residents compete in order to exploit the insurance. Sellers of such liabilities are residents because only residents' liabilities are covered by the insurance[2]. Investors buy residents' liabilities because they are insured and competition among residents forces them to share a part of their appropriation with (non-resident) creditors. Consequently, the yield differential between insured domestic 'deposits' and the international risk free rate generates a private gross capital inflow (Chinn *et al*, 1999). Dooley also argues that the decline in international interest rates after 1989 helped generate a stock of assets (i.e. insurance fund) to support a credible insurance commitment in the developing countries[3]. In other words, the capital inflows were not motivated by a simple interest differential but by a much more powerful insurance incentive (Dooley, 1997)[4].

The introduction of deposit insurance may be expected to increase the attractiveness of a country to international investors, especially because international capital inflows are largely intermediated through banks in the developing countries and other means of financial intermediation are poorly developed. Theoretical and empirical work by Levine (1997) emphasised the liquidity creating role of banks for the investors, by offering demand deposits contracts. This role of the banks is magnified in developing countries because, in most cases, the banking system is the only method of financial intermediation that is available to residents as well as non-residents. Calvo (1998) indicates that the existence of explicit or implicit deposit insurance helps enhance the quality of the banks' liquidity providing services. This allows banks to offer their clients interest rates below the bond market. Therefore, to the extent that financial intermediation increases liquidity for investors and enhances the quality of the banks'

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[2] Yields are the same for both domestic currency and foreign currency liabilities of residents if both types of domestic liabilities are covered (Dooley, 1997).

[3] A frequently cited factor as the driving force behind capital flows to developing countries (Arias-Fernandez, 1996, World Bank, 1997, Calvo, *et al*, 1996).

[4] Giannetti (2002) argues that overlending problems are not always due to investor moral hazard and guarantees on deposit insurance. Instead, capital inflows cause soft budget constraint distortions, if investors have incomplete information and firms are financed by a main bank.

liquidity providing services by explicit or implicit deposit insurance, one can expect to see an increase in capital inflows to an economy[5].

The aim of this chapter is to empirically test the relationship between explicit deposit insurance and capital inflows to developing countries. There are four measures of private capital inflows utilised in this analysis: *gross private capital inflows* from the IMF's International Financial Statistics database, *syndicated loans* and *international bond issues* from OECD's International Capital Markets Statistics database, and *net private capital flows* from World Bank's World Development Indicators. The data for deposit insurance are obtained from an IMF survey conducted among member states (Kyei, 1995). The remainder of this chapter is comprised of three sections. In Section 2.2, a definition and different aspects of deposit insurance are outlined. Section 2.3 introduces some basic summary statistics and OLS regression results, and finally Section 2.4 outlines conclusions to this analysis.

2.2 Deposit Insurance

Deposit insurance is defined as a guarantee on all or a limited amount of the principal and the interest accrued on protected accounts. This guarantee may be explicitly stated in law or regulation (i.e. explicit insurance) or may be based on the past behaviour of the government or verbal promises (i.e. implicit insurance) (Garcia, 1996). Explicit deposit insurances identify clearly the types of deposits and institutions covered and coverage limits. For example, in Argentina the explicit deposit insurance was enacted in 1979 to protect all local and foreign currency demand, time and savings deposits (per depositor) up to US$ 10,000. In contrast, implicit insurance schemes have no written law to state coverage limits, covered deposits and institutions. The survey results indicate that implicit deposit insurance is more prevalent among developing countries, whereas, with the exception of Australia and New Zealand, all industrial countries have adopted explicit deposit insurances (Kyei, 1995).

[5] See Goldfajn and Valdes, 1997, for a discussion on the role of financial intermediation on capital flows.

In the past two decades, many countries that have experienced banking crises, have adopted some form of deposit insurance in order to protect their financial system[6]. A study by Kyei (1995) on deposit insurance practices revealed that there were 47 countries that adopted explicit deposit insurance and 55 that did not. A recent study by Garcia (1999), reveals that there are now 69 countries with explicit deposit insurance schemes, 20 of which switched from implicit to explicit, all within the past three years. Although explicit deposit insurance has become popular, whether to adopt an explicit deposit insurance system and how to design it depend on the financial and supervisory environment in which it functions (Demirguc-Kunt and Kane, 2001).

The theoretical explanation for the popularity of deposit insurance was well established by the seminal work of Diamond and Dybvig (1983). Since banks' assets are long-term loans and liabilities are short-term deposits, this maturity mismatch puts banks into high risk in case of a bank run. Diamond and Dybvig showed that traditional demand deposit contracts which provide liquidity have multiple equilibria, one of which is a bank run. When government deposit insurance is in place, bank runs are averted since government guarantees that insured deposits will be paid at par on demand[7]. Therefore, one of the objectives of the deposit insurance is to assure the continuity of the payments system and avoid real economic costs. The other objective is to protect depositors. Depositors, especially small ones, do not have the power to monitor their banks' financial health. Since a different set of incentives drives the bank managers and owners, the depositors may be prone to high risk if the managers are aiming for high up-side returns by making high-risk loans (Garcia, 1997). In fact, the very existence of deposit insurance can encourage them to do so.

Explicit deposit insurance, if designed according to best practices, should reduce the risk of bank runs and risk-taking behaviour by bank managers, by establishing the limit of coverage and announcing the covered deposits and institution and how this guarantee will be funded. However, deposit insurance with an ill-conceived incentive

[6] See Kane (2000) for a discussion on designing financial safety nets suitable for each country.

structure (e.g. ambiguous coverage, non risk-based premium, voluntary membership) introduces moral hazard problems (Garcia, 1996, 2000, Calomiris, 1997). It is argued that deposit insurance operates like a put option on a bank's assets (World Bank, 1997, Garcia 1996) by making up the difference when the value of the bank's assets falls below the value of its liabilities. If the riskiness of the asset portfolio increases, this raises the value of the guarantee to the bank owner (World Bank, 1997). This happens because greater risk increases the potential for large up-side profits, while deposit insurance guarantees depositors against downside losses (Cull, 1998, World Bank, 1997)[8].

The fiscal cost of moral hazard, which culminated in the banking crises in Mexico in 1994, was 8 percent of GDP. In the US, the combination of increasing competition in banking services and under-priced deposit insurance have led to riskier banking portfolios without commensurate increases in bank capital (Cull, 1998)[9]. The S&L crisis in the US is the most prominent example of moral hazard emanating from implicit or explicit government guarantees (Akerlof and Romer, 1993, Calomiris, 1997, Dooley, 1996)[10]. Financial crises in Chile, Uruguay and Argentina in the late 1970s-early 1980s (Corbo, *et al*, 1986, Diaz-Alejandro, 1985), Mexico in 1994, Japan in 1990s (Calomiris, 1997), and finally the Asian crises of 1997-98 (Corsetti *et al*, 1999) all demonstrate risk-taking behaviour encouraged by the existence of implicit or explicit government guarantees.

Chinn *et al* (1999) test the insurance model focusing on the 1995 Latin American and the 1997 Asian East Asian crises. The key variables (ratio of foreign exchange reserves to bank loans extended to the private sector, ability of the private sector to appropriate government assets, and appropriation measured as capital flight) evolve consistently with the insurance model. They also find statistical evidence in favour of the model

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[7] See Dowd (2000) for a re-evaluation of Diamond-Dybvig model, where deposit insurance is unnecessary.

[8] Khorassani (2000) tests the hypothesis that in the 1980s and early 1990s depositors did not react to bank risk because of the informal policy of protecting all deposits in large banks.

[9] Barth, *et al* (cited in Cull 1998) pointed out that many of the largest US banks had capital to asset ratios between 3-5% in the late 80s and 90s, far from Basel CAR ratio of 8%.

using panel regressions. In an empirical analysis of 61 countries during 1980-1997, Demirguc-Kunt and Detragiache (2000) find that explicit deposit insurance is detrimental to bank stability, especially where bank interest rates are deregulated and the institutional environment is weak. Garcia (2000) argues that a poorly designed deposit insurance system can foster a financial crisis, and makes recommendations for creating and running a limited, incentive-compatible deposit insurance system to avoid crisis. Cecchetti and Krause (2000) examine the relation between explicit deposit insurance and external finance, and find that countries with explicit deposit insurance have smaller equity markets. On the other hand, Giannetti (2002) presents a model where shallow financial markets, lack of transparency and large capital inflows may be more important in explaining banking crises in emerging markets, rather than moral hazard due to deposit insurance.

2.3 Summary Statistics and Regression Analyses Results

2.3.1 Summary Statistics

This section outlines summary statistics and the results of cross-country OLS regression analyses. Four different variables are used to measure private capital inflows. In the initial analysis, gross private capital inflows (GPCI) from the IMF's International Financial Statistics, are utilized as the dependent variable[11]. Gross private capital inflows include direct investment inflows, portfolio investment liabilities and other investment liabilities[12].

Syndicated loans and International bond issues from the OECD's International Capital Markets Statistics are used to measure gross capital inflows. Syndicated loans (SYNL) are loans with an original maturity of at least one year, which have been granted by a syndicate of commercial banks. International bond issues (IBI) include gross public and private placements of euro-bond issues and foreign bond issues.

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[10] Both Calomiris and Akerlof and Romer agree that similar trends were prevalent in the behaviour of Dallas real estate and thrifts, which led to boom-bust cycles.

[11] This variable was calculated by adding line 78bed, 78bgd and 78bid from IFS, March 1998.

[12] Other investment liabilities include transactions in currency and deposits, loans and trade credits.

Finally, net private capital flows (NPCF) from the World Bank's World Development Indicators database are used as another measure for private capital flows (i.e. the dependent variable). Net private capital flows are comprised of private debt and non-debt flows that include commercial bank lending, bonds and other private credits, as well as foreign direct investment and portfolio equity investment. For all four variables, the data are adjusted into 1990 constant US dollars utilising US CPI as deflator.

The data on deposit insurance are provided by an IMF survey reported in Kyei (1995). The survey had identified the countries with explicit deposit insurance as countries which have explicit guarantees stated in a statute in the constitution, Central Bank law or banking law, specifying the types of institutions and deposits covered, and the coverage limits. The combined dataset (IMF, WB and OECD) is comprised of 31 developing countries included in the deposit insurance survey[13] (Appendix 2.1). The time period is 1990-95, to capture the surge in private capital flows to developing countries after 1989 and before the recent financial crisis[14]. All developing countries with an explicit insurance in the sample have adopted the scheme at a date prior to 1990, and have remained in the scheme throughout the sample period.

For all measures of the capital flows except syndicated loans, private capital flows to countries with explicit deposit insurance are higher than countries with no explicit insurance. However, an examination of basic statistics (Table 2.1) reveals that the difference between average per capita gross capital inflows to countries with explicit deposit insurance and without is not large, approximately only US$4 higher for countries with explicit insurance. Average per capita international bond issues for countries with explicit deposit insurance is nearly three times that of countries without explicit insurance, whereas, contrary to prior expectations, average per capita

[13] The sample size is restricted by the availability of deposit insurance data.

[14] Sub-Saharan Africa is excluded from the sample. We dropped countries that adopted explicit insurance only after 1991. The sample includes El Salvador which adopted explicit insurance in 1991. Peru is excluded from the sample since it adopted explicit insurance in 1993. No significant difference was found in regression results from samples with and without Peru. We also dropped the oil economies (United Arab Emirates, Syria, Kuwait and Saudi Arabia). Two separate time periods of 1990-94 and 1990-1993 have also been used in further analysis.

syndicated loans for countries with explicit insurance is actually lower than that for countries without. Finally, average per capita net private capital flows are nearly 50 percent higher for countries with explicit deposit insurance compared to countries without explicit insurance. This might suggest a statistically significant effect of explicit deposit insurance on the scale of private capital flows, which will be further examined with the OLS regression analyses.

Basic statistics reveal a profile of the countries with explicit deposit insurance versus countries without explicit insurance that were sampled. The countries with explicit insurance schemes in our sample have higher per capita GDP compared to countries that do not have explicit insurance (Figure 2.1). Therefore, the countries with explicit deposit insurance are richer countries among the developing countries in our sample. This may be an indication that richer developing countries are at a more advanced stage of financial development. Countries with explicit deposit insurance have lower levels of external indebtedness in comparison to countries that do not have explicit insurance schemes (Figure 2.2).

Summary statistics indicate that countries with explicit deposit insurance have lower levels of openness (Figure 2.3). This is primarily due to the fact that countries with explicit insurance are larger economies, therefore their exports and imports are relatively a smaller fraction of their GDP. Higher average population for countries with explicit insurance supports this argument (Figure 2.4).

2.3.2 Regression Results

Cross-country OLS regression analyses are carried out to test whether there is a distinguishable effect of explicit deposit insurance on the capital inflows into a country. A general log specification is applied for all measures of the dependent variable, to reduce the weight of extreme cases. Also, a double-log specification enables us to interpret the coefficients as elasticities.

The basic regression specification is the log of average per capita private capital inflows regressed on a constant and the explicit insurance dummy variable. In this model, the dependent variable is expressed in per capita terms. Justification for this approach is based on the dynamics of how explicit insurance attracts private capital inflows, discussed in Section 2.1. To the extent that private capital inflows are attracted to the liabilities issued by residents, population can be a plausible approximation of the size of the liabilities that can be made available to the foreign (non-resident) creditors[15]. Some minor changes are made to the basic specification by introducing control variables, which are commonly used as determinants of capital flows in competing models, and is defined as follows:

$$\log(INFLOW_i) = \alpha + \delta DEP_i + \beta Z_i + u_i \qquad (2.1)$$

where:

$INFLOW_i$ = per capita gross private capital inflow ($GPCI_i$)
or
per capita syndicated loans ($SYNL_i$)
or
per capita international bond issues (IBI_i)
or
per capita net private capital flow ($NPCF_i$),

DEP_i = explicit deposit insurance dummy for country i, (*a priori* $\delta_i > 0$),

Z_i = {POP_i, $GDP\text{-}PC_i$, $OPEN_i$, $DEBT_i$},

u_i = error term [16].

The explicit deposit insurance dummy variable (DEP) is used to measure the effect of explicit deposit insurance:

where: $DEP_i = 1$ if country i has explicit insurance,
0 otherwise[17]

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[15] Population is often used as a proxy for potential market size, whereas GDP is a measure of the actual market.

[16] All regression equations and coefficient covariances are calculated assuming an unknown form of heteroskedasticity for the error terms (u_i) by using White's covariance matrix estimator.

[17] In our sample, all developing countries without explicit insurance have implicit insurance.

The following control variables are introduced to isolate their effect on the dependent variable:

Population (POP) is used in order to control for the size of the country. A larger country may represent more opportunity for investment compared to a smaller country. There is theoretical evidence that fixed costs are important in international investment decisions (Calvo and Mendoza, 2000).

GDP per capita (in constant 1987 US dollars) (GDP-PC) can serve as an indicator of the development level of the country and can explain changes in per capita capital flows to a country.

Openness (OPEN) control variable measured as a percentage of imports and exports to GDP, can proxy for a country's financial integration into the international economy. Openness is often associated with better macroeconomic indicators, such as low inflation and high per capita income. In that sense, it may improve creditworthiness and may be a positive indicator of future growth (Lane, 2000).

External debt levels (DEBT) measured as a percentage of total external debt to GNP, is included to proxy the default risk for a country. A heavily-indebted country is more likely to default on its debt, therefore, capital flows to this country may be restricted.

In the second specification, GDP per capita is introduced into the model in log form. The third specification introduces log of population (POP) to check the importance of size. The fourth specification includes the initial (1990) level of openness and the fifth specification includes the initial (1990) debt level[18]. The sixth specification jointly enters all variables. The results of the regression analysis using gross private capital inflows (GPCI) are summarised in Table 2.2.

Column (1) in Table 2.2 indicates that the relationship between explicit deposit insurance dummy variable and per capita gross private capital inflows is statistically insignificant. The explicit insurance dummy variable remains statistically insignificant throughout the other five specifications. In column (2), the control variable GDP per

capita (GDP-PC) demonstrates a statistically significant and positive relationship. In other words, countries with higher GDP per capita levels (i.e. more developed countries among the developing countries) would expect to see higher levels of gross private capital inflows. The adjusted R^2 value indicates that 55 percent of the variation in per capita gross private capital inflows is explained by this specification.

The control variable, initial level of openness (OPEN) in column (4) is statistically significant and positive at 5 percent. Initial level of debt (DEBT) in column (5) is, however, statistically insignificant. In column (6), only GDP-PC and OPEN indicate statistically significant relationships. The adjusted R^2 for specifications (1)-(6) indicate that only the specifications that include GDP per capita have explanatory power. Other specifications, with negative R^2s, suggest that these specifications' explanatory power is zero.

Tables 2.3 and 2.4 summarise the results of the regression analysis with the same specifications utilising the OECD's measures for syndicated loans and international bond issues as the dependent variable. Overall, the results regarding the explicit insurance dummy variable are statistically insignificant in all six columns at 5 percent level in both tables. However, explicit insurance dummy variable is statistically significant, at 10 percent level, in column (4) in Table 2.4. In column (4), countries with explicit insurance may observe nearly four times higher per capita international bond issues than countries that do not have explicit schemes, holding the level of openness constant[19]. Overall, this specification explains only 5 percent of the variation in per capita international bond issues.

In both tables, in column (2), GDP per capita (GDP-PC) is quantitatively stronger and statistically significant compared to the results in Table 2.2. In Table 2.3, in column (3), population (POP) is statistically significant at 10 percent, whereas in column (4), OPEN is statistically significant at 5 percent. In column (6) of Table 2.3, GDP-PC and

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[18] We used the initial levels of openness and debt to avoid endogeneity.
[19] $e^{1.58} - 1 = 3.85$

OPEN are both statistically significant at 10 percent, whereas for Table 2.4, GDP-PC and POP are statistically significant at 5 percent, for the same specification.

Further analysis has been carried out on the OECD dataset, by constructing a new variable: total funds (FUND) are calculated by adding gross international bond issues (IBI) and syndicated loans (SYNL) (Table 2.5). There is no significant difference in results when compared with results from Tables 2.3 and 2.4. In summary, explicit deposit insurance (DEP) is statistically insignificant at 10 percent level in all specifications. GDP-PC is, as before, significant at 5 percent level on both columns (2) and (6). The control variable DEBT, unlike in previous analyses, is statistically significant at 10 percent level, and indicates a negative relationship between the initial level of debt and gross total funds. The results of column (6) is similar to that of Table 2.4: GDP-PC and POP both significant at 5 percent.

Finally, when net private capital flows are used as the dependent variable, the explicit insurance dummy variable is again statistically insignificant throughout all specifications (Table 2.6). This result is less surprising compared to the results from other measures of private international capital flows, since any additional deposits placed in local banks may be reinvested in foreign markets (Dooley, 1997). As before, the control variable GDP per capita (GDP-PC) (column (2)) demonstrates a statistically significant and positive relationship. Adjusted R^2 value indicates that 63 percent of the variation in per capita net private capital flows is explained by this specification.

The control variable, initial level of openness (OPEN), in column (4), is statistically significant and positive at 10 percent. However, the magnitude of the relationship is trivial compared with GDP per capita (GDP-PC). The initial level of external debt (DEBT), in column (5), is statistically insignificant at both 5 percent and 10 percent levels. In column (6), population (POP), GDP per capita (GDP-PC) and openness (OPEN) remain statistically significant, with GDP per capita economically significant.

Results on the deposit insurance dummy (DEP) were tested and found to be robust to the exclusion of outliers in all four datasets[20]. Further analyses have been carried out by restricting the samples for all four variables (GPCI, SYNL, IBI and NPCF) to only middle income countries (Appendix 2.2). The results have not changed for the deposit insurance dummy (DEP) for all four datasets, and remained insignificant at 10 percent level. GDP-PC indicated a statistically significant relationship in specifications (2) and (6) for gross private capital flows (GPCI), international bond issues (IBI) and net private capital flows (NPCF).

All four measures of the dependent variable have also been further analysed by restricting the sample to the periods of 1990-94 and 1990-93[21]. None of the outcomes indicated a statistically significant relationship between the deposit insurance dummy and private capital flows.

In summary, for all measures of private capital flows (dependent variables), it remains difficult to distinguish the effect of explicit deposit insurance on capital flows. However, the results indicate that there is an economically significant and positive relationship between GDP per capita and per capita gross inflows, syndicated loans, international bond issues and net capital flows. Perhaps unsurprisingly, the specifications that include GDP per capita as an explanatory variable (columns (2) and (6) in Tables 2.2-2.6) are also the specifications that best explain cross-country variation in international (per capita) capital flows in our sample of developing countries. Higher levels of GDP per capita among the developing countries may indicate a more developed financial system and more stable economic environment. It is widely accepted that finance and economic development are related. There is some empirical evidence that better financial systems result in higher economic growth, and also that growth accelerates the development of the financial system (Levine, 1997).

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[20] Residuals that lie beyond two standard errors are categorised as outliers.

[21] The period 1990-94 excludes 1995 due to massive capital outflows from Latin America following the Mexican crisis, and the period 1990-93 excludes 1994 for the doubling of US interest rates in 1994.

2.4 Conclusion

This chapter is motivated by the theory that private capital flows to developing countries are attracted by a powerful deposit insurance guarantee rather than any other external or domestic factors. The OLS regression analyses carried out to distinguish the effect of explicit deposit insurance found no evidence that the existence of formal deposit insurance has (statistically significant) effect on private capital flows.

Lack of more prevalent evidence may be explained by three main reasons. The first two are related to the design of explicit deposit insurance. First, if an explicit deposit insurance is not clearly outlined in law, specifying the types of deposits that are insured and the coverage limits, then the explicit insurance is not only more prone to moral hazard but is indistinguishable from the lack of it. Furthermore, non-compulsory membership and non-risk-adjusted premium calculations only strengthen the ambiguity, where lack of proper supervision and prudential regulations weaken the overall safety net.

Second, even if explicit deposit insurance is designed according to the best practices, the guarantee has to be credible. The insurance should be able to credibly guarantee the deposits under coverage but under no circumstances should it rescue any uninsured deposits of a bank. However, as in many examples, including the rescue of Long-Term Capital Management, if the failure of a bank/financial institution threatens the general payments system, the "too-big-to-fail" clause provides universal coverage. In a too-big-to-fail case, the explicit insurance is extended to uninsured deposits with an unlimited coverage just as it would have been had there been no explicit deposit scheme.

Finally, the interrelationship between financial institutions and the corporate world in some developing countries can be detrimental to the financial stability of the country

nullifying the safety nets. As long as banks are owned by corporations, it is more likely that there will be self-lending policies. To the extent that these conglomerates have political ties, they will be extended a rescue if needed, again making the distinction between explicit insurance, or lack of it, ambiguous[22].

These three reasons provide some potential answers as to why no evidence was found on the effect of explicit deposit insurance on private capital flows to developing countries. However, explicit deposit insurance is only one aspect of a safety net of a country, and there is much room for more investigation. Other aspects of the safety net that warrant further analysis include lender of last resort facilities, prudential regulations and supervision.

[22] Laeven (2000) find that throughout 1990s banks were subsidized by their governments and large subsidies (i.e. risk-taking) were associated with banks that were affiliated with business groups.

Table 2.1 Average Capital Flows During 1990-95 (in 1990 constant US $)

Summary Statistics	Explicit			Without Explicit		
	Mean	St. Dev	Obs	Mean	St.Dev	Obs
Per Capita Gross Capital Inflows (GPCI)	76.96	78.08	11	73.08	75.92	16
Per Capita Syndicated Loans (SYNL)	9.78	8.74	10	12.93	19.48	9
Per Capita International Bond Issues (IBI)	26.39	26.42	10	9.80	13.04	12
Per Capita Net Private Capital Flow (NPCF)	62.56	63.72	12	44.27	80.44	17
GDP per capita*	1668.57	1187.26	12	1298.12	792.51	19
Population (millions)	116.06	258.77	12	106.74	270.91	19
Openness (% of GDP)	43.44	19.19	12	67.56	36.47	19
Debt (% of GNP)	48.58	12.62	12	71.76	53.64	18

* in constant 1987 US$.

Table 2.2 Cross-Country Regression Using Gross Private Capital Inflows (IMF)

Dependent Variable: Log of Per Capita Gross Private Capital Inflows, 1990-95 (1990 constant US$)

	1	2	3	4	5	6
Constant	3.88	-3.79	6.29	3.17	4.10	-7.88
	(17.16)	(-3.55)	(3.04)	(7.97)	(10.58)	(-2.80)
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
Explicit Insurance	-0.21	-0.19	-0.11	0.08	-0.23	-0.09
Dummy (DEP)	(-0.44)	(-0.64)	(-0.23)	(0.18)	(-0.47)	(-0.30)
	(0.66)	(0.53)	(0.82)	(0.86)	(0.64)	(0.77)
log(GDP-PC)		1.09				1.17
		(6.84)				(5.83)
		(0.00)				(0.00)
log (POP)			-0.14			0.17
			(-1.18)			(1.57)
			(0.25)			(0.13)
OPEN				0.01		0.01
				(2.06)		(2.07)
				(0.05)		(0.05)
DEBT					-0.00	0.00
					(-0.64)	(0.46)
					(0.53)	(0.65)
Adj R^2	-0.03	0.55	-0.02	0.03	-0.06	0.54
S.E. of regression	1.11	0.74	1.10	1.08	1.12	0.74
N	27	27	27	27	27	27

* White heteroskedasticity-consistent standard errors and covariances calculated.

t-statistics and p-values in parentheses.

Table 2.3 Cross-Country Regression Using Syndicated Loans (OECD)

Dependent Variable: Log of Per Capita Syndicated Loans, 1990-95 (1990 constant US$)

	1	2	3	4	5	6
Constant	1.10	-8.83	8.26	-0.29	2.35	-5.14
	(1.72)	(-3.98)	(2.21)	(-0.41)	(2.26)	(-0.53)
	(0.10)	(0.00)	(0.04)	(0.68)	(0.04)	(0.60)
Explicit Insurance	0.41	0.24	0.47	0.97	-0.05	0.37
Dummy (DEP)	(0.47)	(0.37)	(0.58)	(1.25)	(-0.06)	(0.54)
	(0.64)	(0.71)	(0.57)	(0.23)	(0.96)	(0.60)
log(GDP-PC)		1.43				1.01
		(4.70)				(1.90)
		(0.00)				(0.08)
log (POP)			-0.40			-0.02
			(-1.94)			(-0.06)
			(0.07)			(0.96)
OPEN				0.02		0.02
				(2.56)		(1.95)
				(0.02)		(0.07)
DEBT					-0.01	-0.03
					(-1.25)	(-1.69)
					(0.23)	(0.12)
Adj R^2	-0.05	0.37	0.02	0.05	-0.05	0.48
S.E. of regression	1.88	1.46	1.82	1.79	1.80	1.27
N	19	19	19	19	18	18

*White heteroskedasticity-consistent standard errors and covariances calculated.

t-statistics and p-values in parentheses.

Table 2.4 Cross-Country Regression Using International Bond Issues (OECD)

Dependent Variable: Log of Per Capita International Bond Issues, 1990-95 (1990 constant US$)

	1	2	3	4	5	6
Constant	0.95	-12.86	2.14	0.33	2.03	-29.97
	(1.64)	(-5.12)	(0.49)	(0.33)	(2.15)	(-5.99)
	(0.12)	(0.00)	(0.63)	(0.75)	(0.04)	(0.00)
Explicit Insurance	1.38	0.77	1.39	1.58	1.34	0.44
Dummy (DEP)	(1.64)	(1.24)	(1.62)	(1.79)	(1.59)	(0.68)
	(0.12)	(0.23)	(0.12)	(0.09)	(0.13)	(0.51)
log(GDP-PC)		1.96				2.91
		(5.70)				(6.75)
		(0.00)				(0.00)
log (POP)			-0.07			0.63
			(-0.28)			(3.45)
			(0.78)			(0.00)
OPEN				0.01		0.00
				(0.81)		(0.35)
				(0.43)		(0.73)
DEBT					-0.02	-0.01
					(-1.46)	(-0.60)
					(0.16)	(0.55)
Adj R^2	0.07	0.52	0.03	0.05	0.10	0.72
SE. of regression	1.97	1.42	2.02	1.99	1.94	1.09
N	22	22	22	22	22	22

*White heteroskedasticity-consistent standard errors and covariances calculated.

t-statistics and p-values in parentheses.

Table 2.5 Cross-Country Regression Using Total Funds Raised in International Markets (OECD)

Dependent Variable: Log of Per Capita Total Funds, 1990-95 (1990 constant US$)

	1	2	3	4	5	6
Constant	1.02	-12.17	1.44	0.42	2.69	-30.67
	(1.77)	(-4.83)	(0.37)	(0.40)	(2.78)	(-5.42)
	(0.09)	(0.00)	(0.71)	(0.69)	(0.01)	(0.00)
Explicit Insurance	1.30	1.00	1.31	1.53	0.84	0.54
Dummy (DEP)	(1.46)	(1.58)	(1.44)	(1.65)	(0.93)	(0.93)
	(0.16)	(0.13)	(0.16)	(0.11)	(0.36)	(0.37)
log(MGDP-PC)		1.89				2.75
		(5.67)				(7.76)
		(0.00)				(0.00)
log (POP)			-0.02			0.75
			(-0.11)			(3.37)
			(0.92)			(0.00)
OPEN				0.01		0.01
				(0.70)		(0.73)
				(0.49)		(0.47)
DEBT					-0.03	-0.01
					(-1.95)	(-0.88)
					(0.06)	(0.39)
Adj R^2	0.04	0.44	0.00	0.02	0.10	0.66
S.E. of regression	2.24	1.72	2.29	2.27	2.13	1.32
N	26	26	26	26	25	25

* White heteroskedasticity-consistent standard errors and covariances calculated.

t-statistics and p-values in parentheses.

Table 2.6 Cross-Country Regression Using Net Private Capital Flows (World Bank)

Dependent Variable: Log of Per Capita Net Private Capital Flows, 1990-95 (1990 constant US$)

	1	2	3	4	5	6
Constant	3.01	-8.86	5.55	1.75	3.54	-20.14
	(10.61)	(-4.66)	(2.14)	(2.43)	(5.86)	(-4.78)
	(0.00)	(0.00)	(0.04)	(0.02)	(0.00)	(0.00)
Explicit Insurance	0.08	-0.28	0.12	0.48	-0.12	-0.23
Dummy (DEP)	(0.12)	(-0.69)	(0.18)	(0.77)	(-0.17)	(-0.60)
	(0.91)	(0.49)	(0.86)	(0.45)	(0.87)	(0.56)
log(GDP-PC)		1.72				2.07
		(6.32)				(7.08)
		(0.00)				(0.00)
log (POP)			-0.15			0.47
			(-0.98)			(3.30)
			(0.34)			(0.00)
OPEN				0.02		0.01
				(1.96)		(3.08)
				(0.06)		(0.01)
DEBT					-0.01	0.00
					(-0.95)	(0.03)
					(0.35)	(0.97)
Adj R^2	-0.04	0.63	-0.05	0.05	-0.06	0.76
S.E. of regression	1.61	0.97	1.62	1.54	1.64	0.78
N	29	29	29	29	28	28

* White heteroskedasticity-consistent standard errors and covariances calculated.

t-statistics and p-values in parentheses

Figure 2.1

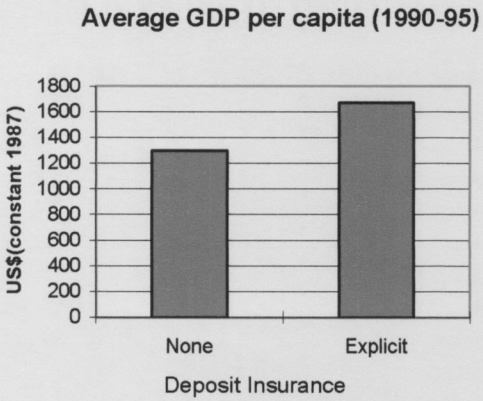


Figure 2.2

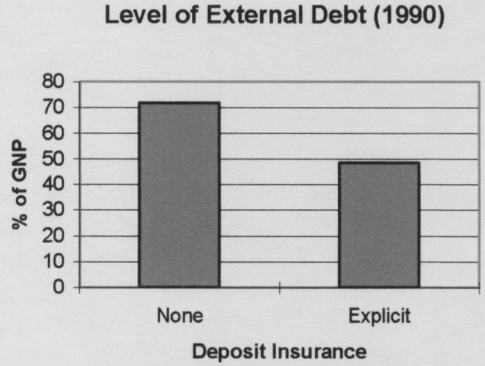


Figure 2.3

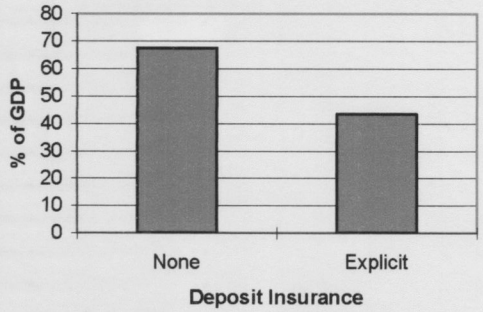
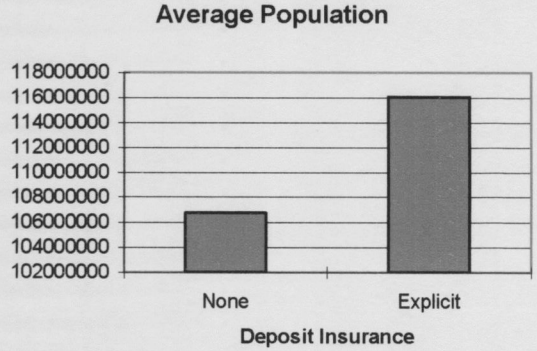


Figure 2.4



APPENDIX 2.1

List of Countries

Country	Classification	Explicit Deposit Insurance	Dataset
Argentina	Middle income	Yes	IMF, OECD, WB
Bangladesh	Low income	Yes	IMF, OECD, WB
Bolivia	Middle income	No	IMF, OECD, WB
Brazil	Middle income	No	IMF, OECD, WB
Chile	Middle income	Yes	IMF, OECD, WB
China	Low income	No	IMF, OECD, WB
Colombia	Middle income	Yes	IMF, OECD, WB
Costa Rica	Middle income	No	IMF, OECD, WB
Dominican Republic	Middle income	Yes	IMF, WB
Ecuador	Middle income	No	OECD, WB
Egypt	Middle income	No	OECD, WB
El Salvador	Middle income	Yes	IMF, OECD, WB
Guatemala	Middle income	No	IMF, OECD, WB
Honduras	Low income	No	IMF, WB
India	Low income	Yes	IMF, OECD, WB
Indonesia	Middle income	No	IMF, OECD, WB
Iran	Middle income	No	IMF
Jamaica	Middle income	No	IMF, OECD, WB
Jordan	Middle income	No	IMF, OECD
Malaysia	Middle income	No	IMF, OECD, WB
Mexico	Middle income	Yes	IMF, OECD, WB
Pakistan	Low income	No	IMF, OECD, WB
Paraguay	Middle income	No	IMF, WB
Philippines	Middle income	Yes	IMF, OECD, WB
Sri Lanka	Low income	No	IMF, WB
Thailand	Middle income	No	IMF, OECD, WB
Trinidad and Tobago	Middle income	Yes	OECD, WB
Turkey	Middle income	Yes	IMF, OECD, WB
Uruguay	Middle income	No	IMF, OECD, WB
Venezuela	Middle income	Yes	IMF, OECD, WB
Vietnam	Low income	No	WB

APPENDIX 2.2

Table 2.2A.1 Cross-Country Regression Using Gross Private Capital Inflows (IMF)-middle income only

Dependent Variable: Log of Per Capita Gross Private Capital Inflows, 1990-95 (1990 constant US$)

	1	2	3	4	5	6
Constant	4.19	-3.25	1.67	3.83	4.30	-8.78
	(18.18)	(-1.48)	(0.62)	(10.07)	(13.32)	(-2.60)
	(0.00)	(0.16)	(0.54)	(0.00)	(0.00)	(0.02)
Explicit Insurance	-0.08	-0.10	-0.17	0.06	-0.08	(-0.03)
Dummy (DEP)	(-0.19)	(-0.28)	(-0.37)	(0.14)	(-0.18)	(-0.07)
	(0.85)	(0.78)	(0.71)	(0.89)	(0.86)	(0.95)
log(GDP-PC)		1.02				1.06
		(3.27)				(3.33)
		(0.00)				(0.00)
log (POP)			0.15			0.26
			(0.92)			(1.85)
			(0.37)			(0.08)
OPEN				0.00		0.01
				(1.02)		(2.11)
				(0.32)		(0.05)
DEBT					-0.00	0.01
					(-0.46)	(1.41)
					(0.65)	(0.18)
Adj R^2	-0.05	0.29	-0.05	-0.07	-0.10	0.34
S.E. of regression	0.92	0.76	0.92	0.93	0.94	0.73
N	21	21	21	21	21	21

* White heteroskedasticity-consistent standard errors and covariances calculated.

t-statistics and p-values in parentheses.

Table 2.2A.2 Cross-Country Regression Using Syndicated Loans (OECD)-middle income only

Dependent Variable: Log of Per Capita Syndicated Loans, 1990-95 (1990 constant US$)

	1	2	3	4	5	6
Constant	1.62	-6.79	3.68	0.54	3.28	4.31
	(2.00)	(-1.04)	(0.71)	(0.50)	(2.32)	(0.37)
	(0.07)	(0.32)	(0.49)	(0.63)	(0.04)	(0.72)
Explicit Insurance	0.66	0.45	0.69	1.11	0.24	0.83
Dummy (DEP)	(0.75)	(0.57)	(0.73)	(1.20)	(0.26)	(0.93)
	(0.47)	(0.58)	(0.48)	(0.25)	(0.80)	(0.38)
log(GDP-PC)		1.15				0.10
		(1.37)				(0.10)
		(0.20)				(0.93)
log (POP)			-0.12			-0.16
			(-0.37)			(-0.44)
			(0.72)			(0.67)
OPEN				0.01		0.03
				(1.38)		(2.42)
				(0.20)		(0.04)
DEBT					-0.03	-0.04
					(-1.55)	(-2.29)
					(0.15)	(0.05)
Adj R^2	-0.03	0.07	-0.12	-0.02	0.12	0.26
S.E. of regression	1.63	1.56	1.69	1.62	1.51	1.38
N	14	14	14	14	14	14

* White heteroskedasticity-consistent standard errors and covariances calculated.

t-statistics and p-values in parentheses.

Table 2.2A.3 Cross-Country Regression Using International Bond Issues (OECD)-middle income only

Dependent Variable: Log of Per Capita International Bond Issues, 1990-95 (1990 constant US$)

	1	2	3	4	5	6
Constant	1.22	-15.26	-5.27	1.07	2.92	-29.38
	(1.87)	(-2.79)	(-0.97)	(0.89)	(2.37)	(-4.96)
	(0.08)	(0.01)	(0.35)	(0.39)	(0.03)	(0.00)
Explicit Insurance	1.45	0.91	1.34	1.50	1.33	0.65
Dummy (DEP)	(1.67)	(1.26)	(1.53)	(1.54)	(1.60)	(0.93)
	(0.11)	(0.23)	(0.15)	(0.14)	(0.13)	(0.37)
log(GDP-PC)		2.27				2.64
		(3.12)				(4.29)
		(0.01)				(0.00)
log (POP)			-0.07			0.72
			(-0.28)			(3.04)
			(0.78)			(0.01)
OPEN				0.00		0.00
				(0.17)		(0.40)
				(0.87)		(0.70)
DEBT					-0.03	-0.01
					(-1.83)	(-0.84)
					(0.09)	(0.42)
Adj R^2	0.09	0.45	0.16	0.03	0.21	0.69
S.E. of regression	1.91	1.49	1.88	1.97	1.78	1.12
N	19	19	19	19	19	19

* White heteroskedasticity-consistent standard errors and covariances calculated.

t-statistics and p-values in parentheses.

Table 2.2A.4 Cross-Country Regression Using Net Private Capital Flows (WB)-middle income only

Dependent Variable: Log of Per Capita Net Private Capital Flows, 1990-95 (1990 constant US$)

	1	2	3	4	5	6
Constant	3.34	-8.78	0.53	2.47	3.85	-19.04
	(9.52)	(-2.66)	(0.17)	(3.18)	(5.21)	(-3.58)
	(0.00)	(0.02)	(0.86)	(0.00)	(0.00)	(0.00)
Explicit Insurance	0.39	-0.02	0.35	0.67	0.26	0.18
Dummy (DEP)	(0.67)	(-0.04)	(0.58)	(1.08)	(0.43)	(0.45)
	(0.51)	(0.97)	(0.57)	(0.29)	(0.67)	(0.66)
log(GDP-PC)		1.69				1.89
		(3.65)				(4.43)
		(0.00)				(0.00)
log (POP)			0.17			0.47
			(0.91)			(3.07)
			(0.38)			(0.01)
OPEN				0.01		0.02
				(1.21)		(5.38)
				(0.24)		(0.00)
DEBT					-0.01	0.00
					(-0.87)	(0.22)
					(0.40)	(0.83)
Adj R^2	-0.03	0.45	-0.04	0.00	-0.05	0.65
S.E. of regression	1.34	0.98	1.35	1.32	1.36	0.79
N	22	22	22	22	22	22

* White heteroskedasticity-consistent standard errors and covariances calculated.

t-statistics and p-values in parentheses.

PART 2

Chapter 3

FOREIGN DIRECT INVESTMENT AS A FINANCIAL FLOW: THE ROLE OF GEOGRAPHY

3.1 Introduction

The surge in international capital flows to the developing countries and the change in composition has attracted a large interest in understanding the factors that drive such flows of capital. The financial and currency crises of the 1990s, particularly the 1997 Asian crisis, have altered the focus to sustaining stability in international capital markets. These crises have proven that reversal of large inflows can have high macroeconomic costs not only for the countries of origin but also for countries that are affected through contagion. Examining the individual behaviour of different types of capital flows before, during and after crisis revealed that portfolio investment and loans have been much more volatile and have even turned negative, whereas direct investment flows have remained stable (Lipsey, 2001; World Bank 1999; UNCTAD, 1998). Some scholars have argued that providing stability in international markets could be achieved through encouraging foreign direct investment (FDI), rather than highly volatile debt-creating flows (Rogoff, 1999). As a result, studies on the determinants of individual types of capital flows, particularly on FDI and portfolio investment, have gained a new momentum.

In this chapter, we aim to analyse the determinants of FDI. There is vast literature, both theoretical and empirical, on the determinants of FDI which associate direct investment flows strictly to the activities of the multinationals. However, the theoretical literature that examines multinational activity in an organizational industry framework (i.e. Dunning's OLI paradigm) fails to account for the increasing amount of financial transfers within multinationals that involve no production, or no transfer of physical capital but only transfer of management and technology. Mergers and acquisitions, although not entirely financed by FDI, account for a significant share of FDI flows in the developed countries (UNCTAD, 1998). Retained earnings and intra-company loans also constitute a significant amount of what is measured as FDI. For example, an increasing share of the US FDI outflows are comprised of retained

earnings (Lipsey, 2000). For this reason, the emphasis of this chapter is on the determinants of FDI as a financial flow.

Some recent trends of FDI are noteworthy. Foreign direct investment flows have been growing faster than world GDP and merchandise trade. The great majority of these flows are concentrated in the developed countries. Although the importance of foreign direct investment has risen in total private capital flows to the developing countries, it only constitutes one quarter of total world FDI flows. Among the developing countries, only a few countries in Latin America and East Asia attract the majority of total developing country FDI flows, while Sub-Saharan Africa performs poorly.

The analysis of UNCTAD data on FDI net inflows shows that total net inflows of FDI into developing countries were US$187 billions in 1997, US$188 billions in 1998, US$222 billions in 1999, and US$240 billions in 2000 (UNCTAD, 2001). Out of US$240 billions in 2000, US$134 was invested in Asia and US$95 was invested in Latin America. In terms of percentages, 80 percent of world FDI inflows in 1999-2000 took the form of two-way FDI flows among developed countries, 17.9 percent accounted for FDI inflows to the developing countries. The distribution of total world FDI inflows among developing countries emphasizes the strong spatial concentration of FDI inflows (9.2 percent was invested in Asia, 7.9 percent in Latin America and only 0.8 percent in Africa).

Studies on the determinants of FDI as a financial flow are rare and this chapter aims to improve the existing literature by examining the FDI flows with an emphasis on the role of geography. There is a growing body of literature that links economic activity and development to geographical location of countries[1]. Such geographical factors have been introduced to economics in gravity models and have had some empirical success in explaining bilateral trade flows. In the empirical part of this chapter, we examine the determinants of North-North, North-South and South-North FDI flows using a modified gravity model, which allows a direct comparison of the geographical factors that affect each group of bilateral flows.

The remainder of this chapter is organised as follows. In Section 3.2, the role of geography on FDI is discussed and some results from relevant literature are summarised. Section 3.3 introduces the pooled least squares model, the data sources and some introductory bivariate relation in our data. Section 3.4 reports regression results from pooled least squares. Section 3.5 follows with extensive robustness checks. Section 3.6 reports results of pooled OLS regression analysis of two-way FDI flows. Finally, Section 3.7 concludes.

3.2 FDI and Geography

3.2.1 The Role of Geography

In a perfect world, one would expect to see capital flow from where it is abundant to where it is scarce to reap the benefits of efficiency and high-returns, regardless of borders or foreign cultures. Despite obvious benefits from diversification, investor portfolios still suffer from the 'home bias' puzzle. In an age of information, with day-to-day advances in telecommunications, the cost of investing in a foreign market has decreased with lower costs of acquiring information. However, international capital markets are prone to informational asymmetries and also to default risks, which may explain why there is still no perfect capital mobility and information costs remain significant[2].

In this chapter, it is argued that FDI flows exhibit strong signs of geographical concentration. Such concentration suggests that geography may have a role to play in attracting financial flows to certain countries in certain regions. Some recent work on economic development argues that geography matters directly for macroeconomic growth (Henderson *et al*, 2000; Gallup *et al*, 1999). Gallup *et al* (1999) found that location and climate have large effects on the level of development and income

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[1] See Sachs (2000), and Mellinger *et al* (1999).

[2] Expropriation, in the 1970s, was a commonly encountered risk for foreign direct investors, and it is well documented (e.g. see Ingram, 1974; Baklanoff, 1975 for expropriation of US direct investment in the Latin America). However, outright expropriation risk seems to have disappeared. There have been only 11 cases identified from 1981 to 1992, compared to 83 cases identified in 1975 alone (Wells, 1998).

growth. However, studies on the role of geography and the spatial allocation of FDI flows (or other financial flows) have been rare.

In the empirical part of this chapter, a modified gravity model is used to analyse the locational determinants of FDI flows. Such models have a proven empirical success in explaining bilateral trade flows and recently, cross-border equity flows (Portes and Rey, 2000). The ability of gravity models to incorporate both macroeconomic and geographical factors makes it an obvious choice for modelling FDI flows. Such models have had both empirical and theoretical success in explaining bilateral trade flows. The use of gravity models in bilateral trade flows is a relatively recent phenomenon. Tinbergen (1962) was among the first to present such models. He presented a model in which the volume of trade between any two countries is determined by gross national product (GNP) in home country, GNP in the host country and the geographic distance between their main economic centers.

Extending the use of gravity model to analyse the determinants of FDI flows can be based on two arguments. First, the connection between FDI and trade is mostly accepted to be complementary[3]. Countries with relatively high bilateral trade shares tend to have relatively high bilateral FDI shares. Ghosh and Wolf (1998) argue that trade linkages not only lead to short-term financial linkages through trade financing, but also in the long-term, create demand and supply channels through which domestic firms can access foreign capital. In other words, trade linkages provide information about the host countries through growing familiarity, and making it less costly (i.e. cost of information gathering or cost of familiarity) to invest directly in the same countries[4]. Calvo and Mendoza (2000) argue that fixed costs are important in international investment decisions and several authors emphasize at least part of the information cost is fixed (Ghosh and Wolf, 1998)[5]. Goldstein and Razin (2002) argue that there are some fixed set-up costs to investing directly, such as costs of information acquiring. We examine the geographical determinants of foreign direct

[3] In some cases, for example in the presence of trade barriers, it is argued that trade and FDI may be substitutes (Markusen, 1995).
[4] See Honohan and Lane (2000) on a case study of Ireland.
[5] Ghosha and Wolf (1998) quote Hobson (1914) arguing that "*the greater the amount of capital invested abroad, the easier it is to obtain information relevant to investments abroad*".

investment in the context of international capital flows. As such, we are specifically interested in the trade variable as a factor facilitating information between investor and host countries: to the degree that FDI follows trade flows, the link between distance and trade can be extended to FDI flows.

Second, the distance component of gravity models not only reflects physical distance but also the familiarity effect. It is commonly observed that the familiarity effect causes investors to favour close-by countries with similar characteristics and legal systems over more distant and institutionally different countries. Ghosh and Wolf (1998) cite Senior, in his Political Economy (published in 1850), stressing the importance of familiarity with customs, and Cairnes (published in 1874) emphasizing geographical distance, differences in political institutions, language, religion and social customs as barriers to capital flows. In other words, location matters for financial flows as well as for real activity. Besides the familiarity effect, distance can also reduce investors' control. FDI is defined as capital invested with long-lasting interest in an enterprise. Therefore, the concept of control is inherent in this type of investment. In such a case, distance would play a significant role in determining which host countries receive the majority of bilateral FDI flows.

In the international trade literature, the distance variable is used to proxy for transport costs, implying reduced trade with increased distance[6]. However, transport costs would likely play an insignificant role in the asset trade, even for the FDI flows. Most North-North FDI flows are in the form of mergers and acquisitions, implying no physical transfer of assets except in the form of human capital[7]. However, distance may also proxy for information costs. The cost of information gathering would likely increase with distance, as familiarity with the host country's investment opportunities, customs and culture decreases.

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[6] Remoteness is another variable that is used in gravity models to measure distance. It aims to capture a dependence of the effect of bilateral distance on the proximity of third trading partners. This variable may be more appropriate in studies using aggregate FDI data.

[7] See World Investment Report 1998 (UN).

3.2.2 Literature Review

Although interest in the role of geography in economic activity is growing, it is still in early stages of development and few studies have been done, especially in relation to international financial markets. There are relatively few studies using a gravity approach in explaining international capital flows and FDI flows. In this section, a selection of relevant literature is reviewed.

Ghosh and Wolf (1998) examine the 1994 outward FDI stock, as well as bank loans, debt and equity, from G-7 in a gravity model framework, in order to assess which host country characteristics are significant. They show that when FDI is regressed on the explanatory variables (bilateral distance, dummy for common borders and common language, a measure of remoteness and market size of the recipient country (GDP) and its development level (GDP per capita)), all distance elasticities have a negative sign. This, they conclude, indicated that proximity is important in monitoring FDI[8].

Hausman and Fernandez-Arias (2000) use a modified gravity model to explain the reasons behind the sudden surge of FDI flows to Latin America, using average FDI inflows over the 1996-1998 period. They use standard gravity variables (size, level of development, and distance) as well as other controls such as stability indicators and quality of institutions. Their findings indicate that there is no evidence that FDI favors larger countries. The level of development also has an ambiguous effect on the FDI/GDP ratio. Distance has a positive and robust relationship with FDI. They conclude that the sudden surge of FDI flows over other types of capital flows is not a sign of good health for the Latin economies. On the contrary, they concur that the share of FDI in total flows tends to be larger in countries that are riskier, more distant, financially underdeveloped and institutionally weak.

Eaton and Tamura (1994) apply a modified gravity model to analyse Japanese and US bilateral FDI positions. Their model incorporates measures of income, population, land-labor ratio, average level of education and region in a sample of 100 countries for the period 1985-1990. Instead of the distance variable, they use region dummies in maximum likelihood tobit estimations. They argue that in their regional fixed

effects model, they capture the effect of distance and other regional factors. Their findings indicate that both US and Japan's FDI relationship is stronger with countries that are nearby. Overall, this study indicates that factors that affect trade also affect FDI flows.

Chunlai (1997) questions the success of China in attracting FDI flows and compares China's host country characteristics to the location determinants of FDI in other developing countries. Their results show that location factors are important in determining the distribution of FDI flows. Countries with larger markets, and higher per capita income attract relatively more FDI flows, whereas greater remoteness from the world deters FDI inflows.

De Menil (1999) also finds that the gravity model is a good fit to analyse intra-EU FDI. This study aims to determine the level of integration of real capital markets in the EU, therefore a stock-adjustment gravity model is used. Standard gravity variables perform well: GDP of the source and host country is positive and significant, and the distance elasticities are negative and statistically significant.

Finally, Wei (1997, 2000) investigates the effect of corruption on the level of FDI. This study uses a gravity model to control for other factors that may affect FDI inflows. GDP and linguistic ties have positive and significant elasticities. Distance variable has a negative elasticity in excess of unity. Mody *et al* (2002) utilize the gravity model to examine the role of information in driving FDI. Their results indicate that for a sample of 12 source (all industrial) and 45 host countries (industrial and developing countries) over the 1980s and 1990s, the effects of gravity variables are as expected. The coefficients of scale variables (proxied by population) are positive and significant, and the effect of distance is negative, but not significant. The effect of financial development of the host country in attracting FDI is also insignificant .

Overall, the results from these studies indicate that the behaviour of standard gravity variables is similar to the results from international trade studies. FDI is attracted to countries with larger markets, and higher levels of development. The distance variable

[8] Ghosh and Wolf (1998) use the word 'monitoring' in the sense of controlling the investment.

has a negative effect on FDI inflows, as it does on bilateral trade. These results are in general dependent on the specification used. For example, the study by Hausman and Fernandez-Arias (2000) show contradictory results. A table summarising the main findings from these studies is provided for simplicity of comparison in the appendices (Appendix 3.1).

3.3 Modelling FDI Inflows – Pooled Least Squares Model

3.3.1 Model 1

The empirical analysis of the determinants of North-North, North-South and South-North bilateral FDI flows, is carried out by applying a modified gravity model. In the first part of this econometric analysis, the emphasis is placed on the host country characteristics. Model 1 aims to identify the significant determinants that make a host country attractive to FDI inflows and is specified as follows:

Model 1:

$$Inflow_{ijt} = \alpha + \beta_1 \ln(POP_{i,t}) + \beta_2 \ln(GDPPC_{i,t}) + \beta_3 \ln(DIST_{ij}) + \beta_4 Z_{ij} + t_t + d_j + \varepsilon_{ij,t} \quad (3.1)$$

where:

$Inflow_{ij,t}$:	Gross bilateral FDI inflows to host country i from partner country j at time t as percentage of the GDP of the country i[9],
$POP_{i,t}$:	Population of receiving country i at time t,
$GDPPC_{i,t}$:	GDP per capita of receiving country i at time t,
$DIST_{ij}$:	distance between country i and j,
$Z_{ij,t}$:	other control variables,
t_t :	time dummies (t_1=1980-84, t_2=1985-89, t_3=1990-94, t_4=1995-98),
d_j :	source country dummies,
$\varepsilon_{ij,t}$:	error term[10].

[9] For North-North FDI inflows, the set of source and home countries are identical. Only this group suffers from mirror statistics discrepancies where the same data is reported by two different sources (e.g. US reporting inflows from Japan and Japan reporting outflows to US). For this reason, North-North FDI flows are calculated as the average of the two values reported by the source and host countries.

Model 1 is a pooled OLS model that regresses FDI/GDP on the log of size, log of GDP per capita of the host country, the distance between the host and source country and a set of control variables. The model also includes time and source country dummies. While time dummies control for the effect of common global events, source country dummies control for such source country characteristics that may affect outward FDI, as size and level of development. Although the model is estimated by OLS on pooled time-series cross-section data, it is, in a sense, a quasi-fixed effects model because it includes source country dummies.

The dependent variable is expressed as a percentage, and POP, GDP per capita and distance variables are in logs. The coefficients for the variables in logs can, therefore, be interpreted as semi-elasticities. Alternatively, a double-log specification could have been applied, as is common in gravity models of bilateral trade. However, this would mean losing considerable efficiency since quite a number of negative observations would have been dropped. Occasionally, there are negative FDI inflows into a host country, which may suggest that the source country is repatriating earnings. In order to avoid losing these observations, the dependent variable is expressed as a percentage throughout the regression analyses.

In most gravity models, the size of the host country is proxied by GDP, although there are some studies where population is used instead (see for example, Mody *et al*, 2002). Traditional gravity models of bilateral trade regress bilateral trade on the GDP of the trading economies, their respective GDP per capita and the distance between these two countries. In our specification, we choose to use POP as a measure of size instead of GDP. The rationale behind this approach is that when the relationship between size and level of development is specified as in Model 1, it is easier to observe the effect of growth on FDI. If an increase in GDP takes the form of an increase in GDP per capita, then the effect (the coefficient for GDP per capita) on FDI should be around unity. If the increase in GDP is instead entirely accounted for by an increase in population, then the effect on FDI should be less than unity. This can be

[10] All regression equations and coefficient covariances are calculated assuming an unknown form of heteroskedasticity for the error terms by using White's covariance matrix estimator.

explained by economies of scale setting in as the host country becomes less dependent on FDI. This specification is particularly appropriate when one considers differences in the source of growth of China and Japan, two countries with roughly the same GDP.

The set of control variables that are included in the regression analysis are mostly dummy variables specific to the host-source country pair.

Where:

BOR_{ij}:	1 if the host and source country share a common land border, 0 otherwise,
$LANG_{ij}$:	1 if the host and source country share a common language, 0 otherwise,
LAT_i:	latitude of the capital city of the host country i,
$LAND_i$:	1 if the host country has no access to any seas and oceans, or navigable waters, 0 otherwise,
RTA_{ij}:	1 if the host and source country are in a common regional trade agreement, 0 otherwise,
CU_{ij}:	1 if the host and source countries are in a currency union, 0 otherwise.

3.3.2 Data

The FDI flow data are obtained from the OECD's International Direct Investment Database. One of the challenges in conducting this study was finding comparable data on North-North, North-South and South-North bilateral FDI flows. The OECD's International Direct Investment Database (1999) provides data on bilateral inflows and outflows of FDI over the period 1980-1999[11]. Each OECD member country reports bilateral "outflows to" and "inflows from" other member and a number of partner countries. All values were originally expressed in reporting countries' own national currency units, which were then converted into constant 1987 US$ using

[11] For completeness, it would have been ideal to include South-South FDI flows in this study. However, comparable data do not exist.

OECD's yearly average exchange rates and US GDP deflator. There are 20 developed countries in our sample categorized as 'North' and 30 developing countries, including the three OECD member countries (Korea, Mexico and Turkey) as South (See Appendix 3.2)[12].

Although OECD database provides comparable FDI data, the definition and measurement of FDI still varies from country to country. The OECD's definition of foreign direct investment comprises *capital invested for the purpose of acquiring a lasting interest in an enterprise, and of exerting a degree of influence on that enterprise's operations* (OECD, 1998). OECD recommends that a direct investment be defined as an incorporated or unincorporated enterprise in which a foreign investor owns 10 percent or more of ordinary shares or voting power (Lipsey, 1999). The United Nations' definition includes such items as equity capital, reinvested earnings and intra-company loans (UN, 1998).

Other data on the explanatory variables come from various sources (See Appendix 3.3). The market size and income of the host country are two macroeconomic variables that are used consistently in contemporaneous literature as determinants of FDI. The World Investment Report (UN, 1998) includes size and the level of income as the important host country determinants especially for market seeking FDI. As well as a large market to serve, a larger economy may also present a more diverse opportunity for investment. Ghosh and Wolf (1998) find that host country size is important for FDI, "*reflecting greater fixed costs of compliance with local regulations for financial activity*"[13]. Lane and Milesi-Ferretti (1999) explain that "*a minimum economic scale may be necessary in order to pay the fixed costs required to set up a significant stock market or attract the interest of international investment institutions: holding constant output per capita, these fixed costs are easier to absorb the larger is the total size of the economy*".

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[12] The FDI data are missing for Greece and Ireland and also for recently joined Eastern European members.

[13] In these studies the market size was proxied by GDP. There are other studies where the size is proxied by population. For example, Frenkel *et al* (1997) use population in a gravity model of bilateral trade flows, and Mody *et al* (2002) also use population in a gravity model of FDI flows.

In our model, both population size (scale variable) and the degree of financial development (proxied by host country GDP per capita) are included as well as the distance between the source and host country, to form the standard gravity model. The distance between two countries is proven to be a significant determinant of bilateral trade flows both statistically and economically (Frankel *et al*, 1993; Frankel, 1997). Similarly, distance between a host and source country can be a significant location determinant that helps explain the strong geographical concentration in FDI flows. In this study, the *distance* variable is used to capture the cost of information gathering rather than transport costs as in traditional trade models. Since the relative ease of acquiring information about investment opportunities of a country may decline with distance, one would expect a negative relationship between FDI inflows and distance.

The basic gravity specification is augmented by inclusion of dummy variables for common border (BORDER) and common language (LANG). BORDER and LANG dummy variables take the value of 1 if the country pair shares a common border and language, 0 otherwise. The expected sign for both variables is positive, implying that for a given distance, countries that share a common border and a common language expect to see higher FDI flows than countries that do not[14]. It is not only traditional to include common border and common language variables in a gravity model, but in this case, it is imperative that these factors are controlled for, so that the distance variable can reflect costs of information. As mentioned in Section 3.2.1, distance can be a proxy for the familiarity effect that is increased by sharing a common border and language.

Other control variables are also included in the model to isolate the effect of standard gravity variables, specifically the effect of distance on bilateral FDI flows. One such geographical factor is landlockedness, which is commonly used in gravity models. The effect of this variable on bilateral FDI flows can work through the distance variable, and it has to be controlled for. Being landlocked can also have an indirect effect on FDI, through its effect on trade. To the extent that landlockedness inhibits trade, it may also be a negative factor in attracting FDI (i.e. landlockedness may

[14] Parsley and Wei (2000) argue that the national borders have a negative effect on market segmentation (i.e. the border effect), which may explain the home bias in goods and asset trade.

inhibit information). Henderson *et al* (2000) argue that being landlocked raises transport costs by more than 50 percent. The latitude variable is used in the geography of economic development literature to examine cross-country inequality of per capita income levels (see for example Gallup and Sachs, 1999). By controlling for latitude variable, the effect of location (relative to the equator) on the level of development may be isolated.

Regional Trade Agreements (RTA) and currency union dummy variables are the other control variables used in our augmented gravity model. The effect of host and source countries being in a regional trade agreement can vary. Since we are working with bilateral data, this dummy variable captures the relationship between two countries that are in a RTA, and how that affects FDI flows[15]. Economic integration has a direct effect on internationalization by reducing transaction costs, and information costs are a part of transaction costs. Being in a currency union has been shown to have a significant effect on bilateral trade by Rose (2000). The effect of sharing a common currency is significant even when exchange rate volatility is taken into account. In this chapter, the currency union dummy captures a long-term government commitment to integration and decreased exchange rate uncertainty, and possibly increased financial integration. A list of variable definitions and data sources are outlined in Appendix 3.3.

3.3.3 Bivariate Relations

Before analysing multivariate relations between FDI and explanatory variables, in this section, we focus briefly on bivariate relations. Figure 3.1 displays the bivariate relationship between size of the host country and FDI/GDP in our data for North-North, North-South and South-North FDI inflows. FDI ratios and size (POP) are simple averages over the 1980-98 period. For all three groups, the relationship between the FDI/GDP and size is negative with a few outliers (Figure 3.1). For industrial and developing countries, it is the smaller countries that have a higher share

[15] As such, data excludes extra-regional flows in to the integrated area, hence any tariff-jumping motives. See footnote 20.

of FDI flows to their GDP. As suggested in the World Investment Report (UNCTAD, 2002) examination of FDI flows in absolute sums and in terms of ratio to market size reveal different patterns. This may seem contradictory to the classical 'large market, large FDI flows' relationship (large countries may be receiving larger absolute amounts of FDI flows). One reason for this may be that, in some cases, the policy environment towards FDI can be related to the size of the host country. Larger countries may be less open to FDI with various restrictions and less incentives to attract FDI. For example, among the developing host countries, the largest in size, India and China, have historically had the least liberal and Singapore has one of the more liberal FDI policies.

The level of development (GDP per capita) is generally highly correlated with infrastructure and also is a proxy for relative wages. Wheeler and Mody (1992) in a study on international location decisions of the US manufacturing industry find that infrastructure (which can be proxied by GDP per capita) of the developing countries is more important than market size (proxied by GDP). For the industrial economies, however, market size is ranked higher in importance than GDP per capita. This may suggest that North-South FDI flows are vertical and North-North FDI flows are horizontal (Shatz and Venables, 2001).

Figure 3.2 displays the bivariate relationship between GDP per capita and FDI/GDP in our data for North-North, North-South and South-North flows. Figure 3.2 indicates that North FDI flows to less developed North countries. In other words, it is the poorer North countries that tend to receive the higher FDI as a percent of their GDP. This can be explained as North-North FDI being cost-driven rather than market-driven. This is also reminiscent of the stylized fact that among the industrial countries, the richer (in terms of GDP per capita) countries tend to have more FDI assets and lower FDI liabilities (Lane and Milesi-Ferretti, 1999)[16]. The same negative relationship also applies to South-North flows, indicating that it is the less rich North countries that receive higher percent of FDI flows from South in terms of their GDP (Figure 3.2). However, for the North-South flows, a positive relationship is observed (Figure 3.2). In the cross-sectional dimension, more developed South countries tend to

attract larger amounts of FDI in terms of their GDP. This finding is also in line with stylised facts that among the developing countries, it is the richer that hold higher FDI liabilities (Lane and Milesi-Ferretti, 1999).

An examination of the outliers for North-North, North-South and South-North FDI inflows gives a clear view on which host countries are stars, and which countries are their major creditors. The analysis of data is important in drawing out similarities/ differences between aggregate and bilateral data. The OECD data on bilateral FDI has given us the advantage of disentangling different characteristics of North-North, North-South and South-North FDI, which is often overlooked in aggregate data. It is widely accepted in FDI literature that most North-North FDI is horizontal, whereas most North-South FDI is vertical (see for example, Shatz and Venables, 1999).

In our sample of North countries, Belgium-Luxembourg, Netherlands and New Zealand are the three outliers (in terms of FDI inflows from other North countries) in Figure 3.1, indicating strong signs of gravity attraction: Belgium-Luxembourg receives the largest sum of FDI inflows from its bordering neighbours, Netherlands from UK and the US, and New Zealand from Australia and other English speaking countries. Among the North host countries, Belgium-Luxembourg and Netherlands have the most liberal FDI policies.

Panama, Netherlands Antilles and Singapore are the outliers in North-South dataset. Panama has received substantial amounts of FDI from the US, followed by Switzerland in the 1990. The major areas of FDI in Panama are in banking and services center, however in the 1990s there has been large infrastructure projects such as the privatisation of the telecom company. It is perhaps not surprising that Panama attracts majority of FDI from US since the dollar-based economy protect investors against foreign exchange risk.

For South-North, New Zealand, Belgium-Luxembourg, Netherlands and Canada are the most favoured North host countries by FDI flows from the developing countries. Singapore and Hong Kong are the main source of South FDI flows to the North.

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[16] Lane and Milesi-Ferretti (1999) refer to stock measures rather than flows.

Indonesia is also a major investor in New Zealand. Belgium-Luxembourg receives a large percent of its South FDI from Singapore and Hong Kong. Netherlands, however, attracts a large proportion of FDI from Netherlands Antilles. This suggests that South-North FDI flows are dominated by large financial transactions of major financial centers, such as Hong Kong, Singapore and Netherlands Antilles.

3.4 Pooled Least Square Regression Results

In this section, Model 1 is estimated using Ordinary Least Squares (OLS) method on pooled cross-section and time-series data. Poolability of data is tested for each group and the details are reported in Appendix 3.4. The results of the regression analysis on the determinants of North-North, North-South and South-North FDI inflows are reported in Table 3.1. This table allows for comparison of the differential impact of explanatory variables on each group, in three specifications. In the first column, the results from an OLS regression are reported, where FDI is regressed on size, GDP per capita and the distance between the host and source countries. Columns (2) and (3) augment the standard gravity equation in column (1), first by introducing the common border and language dummy, then by introducing the rest of the control variables. White's heteroskedasticity-consistent standard errors are calculated for all regressions. Time and source country dummy variables are introduced in all columns but not reported.

3.4.1 North-North FDI

The size (population) of the host country has a negative effect on the North-North FDI inflows, but it is not statistically significant in any of the specifications. The level of development (GDP per capita) of the host North country has a negative effect on the inflows; the more developed North countries receive less FDI inflows in terms of their GDP. This result supports the stylized facts mentioned earlier that the richer industrial countries tend to have fewer FDI liabilities (Lane and Milesi-Ferretti, 1999). The statistically significant semi-elasticity for GDP per capita indicates that a 10 percent increase in the level of development of the host country implies a 0.5 percentage

points decrease in FDI inflows relative to GDP (column (2)). However, this relationship is not robust to the inclusion of other controls in column (3).

The distance between the host and source countries has the expected negative sign and is statistically significant for all specifications. As the distance between the host and source country increases by 10 percent, the rates of FDI inflows to GDP decrease by 0.9 percentage points. This result suggests that information costs are important for North-North FDI flows.

Other geographical factors also play a statistically significant role in determining North-North FDI inflows. Sharing a common border and language are significant determinants of North-North FDI. Contrary to prior expectations, sharing a common border has a negative effect on FDI inflows. Controlling for all other factors, if the host country is sharing a common border with the source country it may receive 0.05 percentage points less FDI inflows compared to countries that do not share a border. This may indicate that for neighboring countries trade may crowd out FDI: in other words, the market can be served via trade. Sharing a common language is both statistically and economically significant for North-North FDI inflows. Host countries that share a common language with a source country may expect 0.18 percentage points more inflows than countries that do not have a common language. There is also evidence in our data that host North countries that are high in latitude and are landlocked may expect less FDI[17].

Overall, geographical factors are both statistically and economically significant for explaining North-North FDI. In fact, when all the geographical controls are included in the specification, the size and the level of development of the host country lose their statistical significance. The specification in column (3) explains 32 percent of the variation in North-North FDI.

3.4.2 North-South FDI

The market size of the South host country is a statistically significant determinant of FDI inflows from North to South. As indicated in the bivariate relation between FDI

and size, the relation is negative: among the developing countries it is the smaller ones that have higher FDI inflows from the North in terms of their GDP. A ten percent increase in the size of the host country implies a 0.6 percentage points decrease in the FDI inflows (column (3)). There is some evidence in the data that the level of development of the host country is a significant determinant and is negatively correlated to FDI inflows. This result is contradictory to the stylized facts mentioned earlier in Lane and Milesi-Ferretti (1999) and the bivariate relations presented in Figure 3.2. Results from pooled least square regressions indicate that a ten percent increase in the GDP per capita of the host country implies a 1.1 percentage points decrease in the ratio of FDI to its GDP (columns (1) and (2)). However, the negative effect of GDP per capita on FDI is not robust to the inclusion of other control variables.

The distance between the host and source country has a negative and statistically significant effect on FDI inflows. A ten percent increase in the distance translates as a 1.4 percentage points decrease in FDI inflows to the host country (column (3)). Sharing a common language has a positive effect on inflows of FDI to the South. Other control variables that are also significant determinants of North-South FDI are latitude, RTA and currency union dummies. The latitude of the South host countries is negatively related to the FDI inflows they receive from the North. South host countries that are in a regional trade agreement with a North source country receive less FDI in terms of their GDP. This may be an indication that trade substitutes for FDI[18]. Currency union is both economically positive and statistically significant[19]. However, the South and North countries that are in a currency union are restricted to Panama-US observation in our sample due to lack of bilateral FDI data on other country-pairs in a currency union. That is the currency union dummy is a Panama dummy. The specification in column (3) explains 73 percent of the variation in North-South FDI flows.

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[17] In our sample, the landlocked countries are Austria and Switzerland.

[18] This may raise the question whether trade should be in the model. This question is addressed in section 3.5 under the robustness checks, mainly because of a smaller sample size.

[19] See Rose (2000). See Ito (1999) for a discussion on the effect of exchange rate on Japanese FDI in Asia.

3.4.3 South-North FDI

FDI flows from South to North are negatively and significantly related to the size of the host country indicating that among the industrial countries it is the smaller ones that receive more FDI inflows from the South. The level of development of the North host country is negatively related to inflows from South, though not robust to the inclusion of other control variables.

Distance is not a statistically significant determinant of FDI from South to North. Among other control variables, sharing a common language and being in a currency union are the only significant determinants. North countries that share the same language as the South receive 0.009 percentage points more FDI. Similarly, being in a currency union also has a positive effect on FDI; the North host country (i.e. the US) receives 0.007 percentage points more FDI from the South (i.e. Panama). The specification in column (3) explains only seven percent of the variation in FDI. This result is not surprising considering that majority of South-North FDI is carried out by such financial centers as Hong Kong, Singapore, Panama and Netherlands Antilles. Equity investment in excess of ten percent is by definition accounted as FDI, therefore, large cross-border equity investment in stocks or shares by South financial centers may be driving these results.

3.4.4 Differences/ Similarities among North-North, North-South and South-North FDI Inflows

The standard gravity variables have the same direction of impact on all three groups of FDI (North-North, North-South and South-North), however, the economic significance of the variables differ considerably[20]. As an example, the size of the North host country is not significant for flows from other North countries, whereas, an increase of ten percent in the size of the host country decreases FDI flows by 0.6 percentage points for North-South flows and only 0.02 percentage points for South-North flows. The income level of the host country (GDP per capita) is negatively related to FDI and is statistically significant for all in columns (1) and (2), but this

[20] By the concept of economic significance, the size of the coefficient is referred to. In this chapter only the economic significance of the variable that are statistically significant are emphasized.

relationship is not robust to the inclusion of other variables in column (3). The North-South FDI flows are the most sensitive to the changes in GDP per capita with a semi-elasticity of –0.11, whereas it is –0.05 for North-North FDI and only –0.003 for South-North FDI inflows (column (2)). Distance is economically more significant for North-South FDI than it is for North-North FDI, with a semi-elasticity of -0.14 versus –0.09, and is not significant at all for South-North FDI. This indicates that distance is more important for monitoring North-South FDI than it is for North-North FDI. As argued in section 3.2.1, as distance increases the ability of the investor to control decreases. This result may be an indication of higher information costs between North and South countries.

Sharing a common border is only significant for North-North flows, whereas, sharing a common language is significant for all. Host countries that share the same language as other North countries may expect 0.18 percentage points more FDI from other North countries, compared to 0.14 for North-South and 0.009 percentage points for South-North FDI inflows. The common language dummy reflects the dominance of two-way FDI flows between predominantly English-speaking countries for North-North group, whereas it highlights the importance of colonial ties for North-South FDI[21].

The latitude variable has the same economic impact on North-North FDI as it has on North-South FDI ($\beta^{NN}_{latitude} = \beta^{NS}_{latitude} = -0.002$). This variable may be capturing bilateral FDI flows between Australia and US, UK and Japan for the North-North sample. For the North-South, this result may be driven by Panama, Hong Kong and Singapore. Being landlocked significantly decreases the FDI inflows for North host countries, by 0.09 percentage points, from other North countries, but the relation is not significant for inflows from the South[22]. This result suggests that Austria and Switzerland receive less FDI flows compared to other North countries that are not landlocked.

[21] For North-South group common language dummy is 1 only for countries with past colonial relations.
[22] There are no landlocked South host countries in our sample.

Being in a common RTA is only significant for North-South FDI and is negative[23]. Blomstrom and Kokko (1997) argue that the response to an integration agreement will depend on the environmental change brought about by the regional investment agreements and locational advantage of the country. For example, the creation of the Canada-US Free Trade Agreement (CUSFTA) had little influence on FDI since much of the trade between Canada and US had been liberalized long before, whereas Mexican accession to the NAFTA brought about significant policy changes. The negative sign for North-South RTA may be evidence that North countries prefer trade as a safe alternative to FDI when the restrictions to trade are reduced or eliminated. For North-South country pairs that are not in a common regional trade agreement, the negative sign for the RTA dummy may also suggest evidence for the tariff jumping argument for FDI[24].

Overall, only the geographical factors play a significant role in determining North-North FDI flows. The size and level of development of the host country are not significant. For the North-South inflows, the geographical factors are economically more significant, when currency union is excluded. The specification in column (3) explains 32 percent of the variation in North-North FDI flows, 73 percent of North-South and only 7 percent of South-North FDI inflows[25].

Examining the coefficients for the explanatory variables for each group reveals that standard gravity and additional control variables have different magnitude of impact on North-North versus North-South versus South-North FDI flows. To formally approve that these differences are, in fact, statistically significant, we tested the hypothesis that the coefficients for each group are the same (i.e. $\beta_{NN} = \beta_{NS} = \beta_{SN}$). The results suggest that, indeed, the difference in the coefficients for size, GDP per capita and distance are statistically significant between North-North and North-South

[23] North-South RTA include NAFTA and some unilateral trade agreements: EC/Algeria (1976), EC/Egypt (1977), EC/Iceland (1973), EC/Israel (1975), EC/Morocco (1976), EC/Norway (1973), EC/Turkey (1995), EFTA/Israel (1993), EFTA/Turkey (1992), US/Israel (1985).

[24] We have also examined a variant of the RTA dummy where the dummy variable is '1' if the host country is in a RTA, '0' otherwise. Results indicate that being in a RTA has a statistically significant and negative impact on North-North and positive impact on North-South FDI. This indicates that North-South FDI is motivated by market access.

[25] The adjusted R^2 decreases to 16 percent for North-South FDI when the currency union dummy is excluded. Some of the estimated coefficients also increase in economic significance.

FDI flows. For North-North FDI, size of the host country is not a significant determinant, whereas for North-South FDI it is. This is contrary to the expectations that the majority of North-North FDI is horizontal and North-South FDI is vertical. Market size is important in horizontal FDI. Shatz and Venables (2000) find that FDI in high-income countries (i.e. North-North) is overwhelmingly horizontal, involving production for sale to the host country market. In developing countries, a higher proportion of FDI is vertical, involving manufacture of intermediate stages of the production process.

3.5 Robustness Checks

Table 3.1, as discussed above, highlighted significant determinants of FDI inflows using an augmented gravity model. In this part of the analysis, a number of additional control variables are entered in order to check for the robustness of our results. These variables have been found to be significant determinants of FDI flows, or other types of financial flows, in other studies. To the extent that these variables are significant determinants of bilateral FDI flows, introducing these variables should improve our specification. Since the data for these variables are available for much smaller samples (or for only a few years), their relationship with FDI is examined as robustness tests of our original model.

3.5.1 The Effect of Corruption and Policy on FDI

In Tables 3.2a and 3.2b, we examine the effect of government policy (incentives and restrictions) toward FDI and corruption on FDI flows[26]. The relation between corruption and FDI is extensively investigated by Wei (1997, 2000). In his studies, he finds a statistically significant, negative and robust relationship between corruption and FDI. Table 3.2a presents results from cross-country OLS regressions where average FDI/GDP over 1995-1998 was regressed on the set of control variables together with two separate indices of corruption and dummies for government incentives and restrictions. Both the Transparency International (TI) and Global

Competitiveness Report (GCR) indices are expected to have a negative effect on FDI inflows since higher values indicate higher corruption. The dummies for government incentives and restrictions range from 0-4, with 0 indicating no incentives or no restrictions and 4 indicating all incentives/restrictions. Overall, there is no evidence that corruption has a negative effect on FDI inflows. Both TI and GCR indices are statistically insignificant for all groups.

For comparison with results from Wei (1997, 2000), in Table 3.2b, we test the effect of corruption and FDI policy on FDI, only this time the dependent variable is the logarithm of FDI inflows. The results are in line with results from Wei (1997, 2000). Both TI and GCR corruption indices are statistically significant and negative for North-North and South-North flows. One unit increase in TI corruption index indicates that host North country receives 18.9 percent less FDI from North source countries and 31.6 percent less FDI from South source countries[27]. GCR index indicates a larger impact of corruption on both North-North and South-North FDI. There is also evidence that FDI incentives are statistically significant and positive for North-North FDI (TI index) and for both North-North and South-North (GCR index).

In summary, the results from Table 3.2b concur the results of Wei, indicating that corruption has a negative effect on FDI inflows. The lack of similar evidence in Table 3.2a can, therefore, be attributed to the difference in dependent variables. Corruption has a statistically and economically significant effect on the level of bilateral FDI, but its effect is not significant when FDI is expressed as a ratio to GDP.

3.5.2 The Effect of Legal Code

In Table 3.3, the effect of sharing a common legal code is examined. La Porta *et al* (1998) show that different commercial laws have different levels of protection of corporate shareholders and creditors and quality of law enforcement. In other words, the financial development of a country, and ultimately its growth, may be determined by the origins of its commercial codes. Indirectly, the legal code of a country may play a role in attracting different types of international financial flows. Feldstein

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[26] See Appendix 3.5 for detailed description of incentive and restriction dummy variables.
[27] $Exp^{(-0.21)} - 1 = -0.189; Exp^{(-0.38)} - 1 = -0.316$.

(2000) also argues that global integration of capital markets and increased volume of FDI spread US-UK forms of corporate culture. There is a growing body of literature that Anglo-American law (i.e. common law) improve the efficiency with which capital invested. In our sample, the countries are categorized into sharing four different legal codes: English (i.e. the common law), German, French and Scandinavian (i.e. Roman law).

The common legal code dummy has the expected positive sign for North-North and South-North FDI inflows, but it is only significant for North-North flows. Including legal code as a control in column (1) increases the explanatory power of the standard gravity variables from an R^2 of 21 (Table 3.1 column (1)) percent to 26 percent for North-North. The host North countries that share the same legal code as the source North countries receive 0.04 percentage point more FDI inflows. Other control variables are robust to the inclusion of common legal code dummy for all groups[28].

3.5.3 The Effect of Trade on FDI

Table 3.4 presents results of pooled OLS regressions of FDI/GDP including the bilateral trade flows as a control. It is widely accepted that trade and FDI are related, although whether they are complements or substitutes is ambiguous. The relation between trade and FDI can be complementary if trade is encouraging FDI and vice-versa. Trade channels may provide familiarity with the host country and information on investment opportunities. However, the evidence is mixed (Markusen, 1995). New evidence by Brainard (1993) shows that trade barriers and transport costs cause a substitution effect toward FDI. In any case, since trade and FDI are two ways of serving a market, they may both be driven by the same variables.

As a robustness check, the log of trade is entered into the model (Table 3.4): this serves not only to show the effect of trade on FDI, but also helps isolate the effect of trade from other explanatory variables. The effect of standard gravity variables on

[28] In further detail, when the effect of common law versus Roman law is examined, clear differences appear. North host countries that have adopted common law receive more FDI inflows from other North countries, whereas South host countries receive less FDI inflows, compared to host countries that are of Roman law origin.

FDI may be working through their effect on trade. So, when trade is included in the model, the individual effect of size, level of development, and distance is revealed. In column (2), the inclusion of trade variable has a positive and statistically significant effect on North-North and South-North FDI flows, although for South-North, trade is not robust to the inclusion of other variables (column (3)). In column (3), where all control variables are included, trade is statistically significant for North-North and North-South FDI and it is positive. This indicates that controlling for all other factors, both North-North and North-South FDI increase as bilateral trade increases. In other words, trade encourages FDI, suggesting that trade and FDI are complements.

The economic impact of trade (i.e. trade coefficients) on North-North and North-South FDI are similar. Remembering the earlier discussion on the effect of trade on FDI flows, the trade variable may be capturing two different types of FDI. The positive relationship between trade and FDI, may indicate to the increasing importance of intra-industry trade between multinationals in industrial countries. The positive relationship for North-South FDI and trade may also imply the role of trade in creating familiarity with the host market, and thereby facilitating access of host markets to foreign finance.

The statistical significance of size and GDP per capita are unaffected, with the exception of size for North-North FDI that becomes significant. The economic significance of both size and GDP per capita increase when bilateral trade is included as a control variable. This suggests that size and level of development do have a statistically significant relation with FDI independent of their relation through trade. Both for North-North and North-South FDI, the distance is still a significant determinant although the semi-elasticity of distance decreases when trade is included. This suggests that distance does proxy information costs. As mentioned before, the effect of trade linkages on FDI is treated in this section because of the smaller sample size. The R^2, when trade is included in the model (column (3)), does remain similar to the results from Table 3.1, indicating that the explanatory power of the specification is not improved much.

3.5.4 Telephone Call Traffic

Table 3.5 summarizes the results of cross-country OLS regression checking the robustness of previous results to the inclusion of telephone call traffic. By introducing this variable, measured in minutes from country j to i over 1983-95, we augment the distance variable. In this chapter, distance is used as an indirect measure of information costs between two countries. Telephone call traffic is a direct measure of information flows between countries, which has been used in a study by Portes and Rey (2000) and shown to have a significant and positive relation with portfolio equity flows. The effect of telephone call traffic should also be positive on bilateral FDI. The more telephone calls (in minutes) (i.e. the more the information flow), the higher is FDI[29].

The results of the regression analysis indicate that when telephone call traffic is entered into the equation, the distance variable becomes insignificant for North-North and North-South FDI, suggesting that distance really proxies for information costs (Table 3.5 column (1)). One problem with the telephone call traffic variable is that it is potentially endogenous: more FDI inflows will require more scrutiny.

The size of South and North host are robust to the inclusion of telephone call traffic for North-South and South-North FDI inflows and size becomes significant for North-North FDI. A one percent increase in telephone call traffic increases North-North FDI by 0.05 percentage point and South-North FDI by 0.003 percentage points. In column (2), log of trade is entered together with the telephone traffic and the results indicate that telephone call traffic is no longer statistically significant for North-North FDI. The distance between two North countries has a positive and statistically significant effect on the FDI/GDP ratio as in Table 3.4, which includes trade as a control variable. In column (3) where all control variables are entered together, telephone call traffic remains significant and positive for South-North, and it becomes significant for North-South FDI, however, with opposite impact.

Telephone call traffic is negatively correlated with FDI for North-South, and this result is robust to the exclusion of outliers. Controlling for distance, size and GDP per

capita and other factors, as the telephone call traffic decreases, FDI for the South host country increases. This may be explained by the personal calls made by emigrants to their families back home, telephone call traffic variable does not differentiate between business and personal calls[30].

3.5.5 Other Robustness Checks

We have further examined the effect of outliers as part of robustness checks (Table 3.6) [31]. The outliers from Table 3.4 column (3) were excluded from the regression analysis. The statistical significance of results for North-North flows remain mainly unchanged[32]. The economic significance of all variables declines. The R^2 for North-North FDI improves to 44 percent when the outliers are excluded. The results of North-South FDI flows are generally robust to the exclusion of outliers, however, they all decline in economic significance[33]. The R^2 for North-South FDI is 36 percent compared with 16 percent when US-Panama country pair is dropped from the sample. For the South-North FDI flows, trade, common border and landlocked dummy become significant[34]. The variables that were significant previously decline in economic significance. The R^2 for South-North FDI is 15 percent when outliers are excluded, compared to 7 percent previously.

Next, the effect of zero observations on the results has been examined[35]. Since our left-hand side variable is a ratio, not in logs as in most other studies, zero observations are not dropped out. The regression equations in Table 3.1 are rerun excluding zero

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[29] Telephone call traffic variable is unlikely to be a good approximation for telephone charges.

[30] Workers' remittances can be used as a proxy for personal phone calls, however, it is not available in bilateral form. In aggregate form, Mexico, Turkey and Brazil are among the highest receiver of workers' remittances and also telephone calls (from developed countries).

[31] The residuals that are beyond two standard deviation of the regression are classified as outliers.

[32] The outliers for North-North flows include flows to Australia from Japan and US, to Austria from Germany, to Belgium-Luxembourg from France, Germany, Italy, Japan, Netherlands, and US, to Canada from US, to Finland from Sweden, to Netherlands from Japan, UK and US, to New Zealand from Australia, UK and US, to Norway from UK, to Sweden from Finland and to Switzerland and UK from US.

[33] The outliers for North-South flows include flows from Germany to Argentina, from Japan to Hong Kong, Malaysia and Singapore, from Switzerland to Panama, and from US to Venezuela, Costa Rica, Chile, Panama and Singapore, and from UK to Malaysia and Singapore.

[34] The outliers for South-North flows include flows from Singapore to Australia, Belgium-Luxembourg, and New Zealand, from Indonesia to New Zealand, from Mexico to Belgium-Luxembourg, from Hong Kong to Belgium-Luxembourg, New Zealand, and from Malaysia to New Zealand.

[35] Zero observations indicate to lack of FDI flows, not to missing data.

observations. The single change in the results is that GDP per capita becomes a significant determinant of South-North FDI inflows ($\beta = -0.003$). Finally, sensitivity of the results to method of estimation was checked by using a fixed-effects model instead of pooled OLS. Broadly, the results are the same. The details of the model and results from a two-step fixed-effects model are reported in Appendix 3.6.

3.6 Modelling FDI Flows – Pooled Least Squares Model

In this section of Chapter 3, we examine the effect of the same gravity variables on an alternative model more akin to the models used in international trade. The emphasis of this model is both on source and host country determinants, unlike the previous model, which only includes source country dummies. Model 2 uses the sum of bilateral inflows and outflows as the dependent variable[36]. Since the emphasis is on both the source and host country characteristics, the dependent variable should reflect the true level of FDI activity between the two countries. Inflows of FDI cannot be thought to cancel outflows of FDI, since FDI into a host country is not the same as what leaves as outward direct investment. Each direct investment brings its own benefits and those benefits do not get cancelled out when the same country direct invests in another country. In an effort to capture the determinants of two-way flows, we use the following model:

Model 2:

$$\ln(Flow_{ijt}) = \alpha + \beta_1 \ln(POP_{i,t}\, POP_{j,t}) + \beta_2 \ln(GDPPC_{i,t}\, GDPPC_{j,t}) + \beta_3 \ln(DIST_{ij}) + \beta_4 Z_{ij} + t_t + \varepsilon_{ij,t} \qquad (3.2)$$

where:

$Flow_{ij,t}$: Sum of gross bilateral FDI inflows and outflows between country i and j,

$POP_{i,t}$: population of reporting country i at time t,

[36] Model 2 is the gravity model that is used in most studies explaining bilateral trade, where trade is the sum of imports and exports (See, Frankel *et al*, 1993).

$POP_{j,t}$: population of partner country j at time t,

$GDPPC_{i,t}$: GDP per capita of reporting country i at time t,

$GDPPC_{j,t}$: GDP per capita of partner country j at time t,

$DIST_{ij}$: great circular distance between country i and j,

Z_{ij} : other control variables,

t_t: time dummies.

In Table 3.7 column (1), the log of FDI flows is regressed on the log of size of the reporting and partner country, log of GDP per capita of both countries, and log of the distance between the country-pair in a pooled least square model. In column (2), the common border and language dummy variables are introduced as additional controls. The dependent variable used in the regression analysis reported in Table 3.7 is the log of two-way FDI flow between country pair i and j in constant 1987 US$ millions unlike the dependent variable in Model 1 which is a ratio. All coefficients for variables in logs are elasticities.

3.6.1 North-North FDI Flows

The size of reporting and partner countries is, both economically and statistically, an important determinant for North-North FDI flows. For one percent increase in the size of two countries, the two-way FDI increases by 0.90 percent (Table 3.7 column (2)). The level of development of the same countries is also a statistically significant determinant of FDI flows. As the income of the two North countries increase by one percent two-way FDI flows increase by 0.85 percent.

Distance between the two countries has a negative effect, with -0.79 percent decrease for one percent increase in distance. Sharing a common border is statistically significant and negative for North-North two-way FDI, indicating for neighbouring countries trade may be preferred to serve the other market. Economically, sharing a common language is the most significant determinant of FDI: countries that share a common language trade in assets 4.75 percent more than countries that do not

(column (2))[37]. The standard gravity variables augmented by border and language dummies in column (2) explain 62 percent of the variation in FDI flows.

3.6.2 North-South FDI Flows

The size and level of development of the North and South countries are statistically significant determinants and are both positively correlated to FDI flows. The distance variable is negative and statistically significant for North-South FDI flows, with an elasticity of –0.26 (Table 3.7 column (2)).

Common border and common language dummy variables are both significant and positively correlated to North-South FDI. The US-Mexico country pair is the only observation in our sample with a common land border. Accordingly the common border dummy can be interpreted as US-Mexico dummy. Sharing a common language has a positive effect on FDI flows; North and South countries that share a common language trade in assets 4.21 percent more compared to countries that do not share a common language[38].

3.6.3 Differences/Similarities between North-North and North-South FDI Flows

The results from regression analysis of our data find the standard gravity variables have the same direction of impact on both North-North and North-South FDI flows. In terms of the economic impact of these variables, size is more important for North-North FDI than for North-South FDI indicating that market access may be the major driving factor. The level of development is economically more important for North-South FDI; an increase of one percent in the level of development of North-South country pair suggests an increase of 1.28 percent increase in FDI, whereas it translates to 0.85 percent increase for North-North FDI. These results are similar to the results of Wheeler and Mody (1992) where they find that market size is ranked higher than GDP per capita in importance for industrial countries and vice versa for the developing countries.

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[37] $\text{Exp}^{(1.75)} - 1 = 4.75$

[38] $\text{Exp}^{(1.65)} - 1 = 4.21$

The North-North FDI has larger elasticity of distance than North-South FDI. An increase of 10 percent in distance decreases FDI flows by 0.79 percent for North-North and by 0.29 percent for North-South. Sharing a common land border has the opposite effect; two North countries that share a common border trade less in assets, whereas a North and a South country (US and Mexico) that share a common border trade more in assets compared to countries that are not contiguous. Common language dummy variable has the same direction of impact for both North-North and North-South FDI but economically it is more significant for North-North. Overall, the augmented gravity model explains 62 percent of the variation in North-North FDI and 45 percent of the variation in North-South FDI.

3.6.4 Robustness

When the outliers from column (2) Table 3.7 are excluded, for North-North flows, the economic significance of size, level of development and distance increase whereas the economic significance of common border and language decrease[39] (Table 3.8). The R^2 increases to 70 percent up from 62 percent. The effect of outliers on North-South FDI flows is similar to their effect on North-North FDI; size and GDP per capita and distance increase in economic significance and border decreases, where common language dummy remains the same[40]. The adjusted R^2 increases up to 55 percent from 45 percent previously. The relation between two-way FDI flows and the explanatory variables was also estimated using a fixed-effects model. The details and results are reported in Appendix 3.7.

3.7 Conclusion

The majority of FDI flows have taken the form of two-way flows between industrialized countries. Although the share of FDI in total private capital flows has been increasing for developing countries, only a few countries in certain regions account for the majority of FDI flows to these developing countries. In this chapter we

[39] The outliers for North-North FDI flows are Australia-New Zealand, Belgium-Luxembourg-Netherlands, Finland-Sweden and Norway-Sweden.

[40] The outliers for North-South FDI flows are Australia-Singapore, Canada-Singapore, Netherlands-Singapore, New Zealand-Hong Kong, New Zealand-Indonesia, New Zealand-Malaysia, New Zealand-Singapore, UK-Malaysia, UK-Singapore and US-Panama.

investigated the determinants of FDI flows with an emphasis on the role of geography to highlight the factors that affect the spatial allocation of FDI. Initial analysis concentrated on the characteristics of North-North, North-South and South-North bilateral inflows. We further examined the differential impact of gravity variables on two-way FDI flows between North-North and North-South.

The results from both pooled least squares and panel fixed-effects regression analyses indicate that standard gravity and other control variables have the same impact on each bilateral flow. The significant differences arise in the magnitude of the effect of these variables. For example, the semi-elasticity of FDI with respect to size and level of development is more sensitive for North-South flows than it is for North-North flows. The level of development is only significant as a positive determinant of North-North flow, possibly reflecting the level of financial sophistication that is required for mergers and acquisitions, in panel fixed-effects regression. However, the results from pooled least squares regressions suggest that host country size and income are negatively correlated with the FDI to GDP ratio. The negative sign on the coefficients for these variables indicates that time-dimension in our data dominates the effect of size and income on FDI.

In the pooled OLS model, geographical factors are more important and robust for North-South flows compared with North-North, indicating greater information costs. In the fixed-effects model, the distance variable is equally significant for both North-North and North-South FDI inflows. However, distance variable is more robust to the inclusion of other variables for North-South FDI. In summary, there is evidence in our data that distance is a proxy for information costs and that information costs do have a significant negative effect on asset trade.

In results from pooled OLS regressions, the best specification for all groups of bilateral FDI inflows is the specification augmented with trade and telephone call traffic. This specification suggests that host country size is negatively correlated to the FDI to GDP ratio for all groups. Economically, size matters most for North-South FDI compared to North-North FDI, and least for South-North FDI. This result is not supportive of the distinction between horizontal North-North FDI flows versus

vertical North-South FDI flows. The level of development of the host country is only significant for North-South and South-North FDI, although the economic significance of this variable is negligible on South-North FDI. The lack of statistical significance of the level of development for North-North FDI may indicate that beyond a threshold point, changes in FDI do not rely on changes in GDP per capita. This specification indicates that distance is not significant in our sample of North-North FDI inflows. One explanation for that can be the closer relationship between trade and FDI: bilateral trade patterns explain most of the variation in bilateral FDI patterns. Distance variable is a robust and economically significant determinant of only North-South FDI inflows, suggesting significant information costs.

Finally, we find that (in both pooled OLS and fixed-effects regression results) gravity model for two-way FDI flows are a better fit for North-North than they are for North-South flows. All gravity variables are significant determinants of North-North and North-South FDI flows (with the exception of common border dummy for North-North fixed-effects specification). Distance is economically more important for North-North FDI than it is for North-South FDI. This may suggest that market access and proximity to the market are the motivations for North-North FDI, in line with theory from 'new economic geography' literature. Distance, whereas still a significant determinant of North-South FDI flows, is economically less important than the rest of the other gravity variables. This may indicate that while North-South FDI flows still decrease as distance between a North and a South country increase, in some cases, FDI may be motivated by tariff jumping or obtaining control to curtail informational asymmetries.

It is evident in our data that geography has a significant role to play in determining the spatial allocation of FDI. This may have important implications for host countries in terms of globalization. The pessimists might argue that countries that are disadvantageously located with respect to direct investors, will have few mechanisms to attract FDI. However, such geographic determinism may be overcome in two ways. One way is to choose the right policy combination that will facilitate growth. Another

way to overcome geographic determinism is to provide better information dissemination. Information costs and problems of informational asymmetry may be mitigated by consistent and reliable data sharing.

Table 3.1. Pooled OLS Estimation

Dependent Variable: FDI Inflows as percentage of the GDP of the receiving country (in 1987 US$ constant)

	1			2			3		
	N-N	**N-S**	**S-N**	**N-N**	**N-S**	**S-N**	**N-N**	**N-S**	**S-N**
Ln(POP) of host	-0.003	-0.13	-0.002	-0.002	-0.13	-0.002	-0.004	-0.06	-0.002
	(-0.76)	(-2.55)***	(-2.36)**	(-0.67)	(-2.57)***	(-2.49)***	(-1.04)	(-2.60)***	(-2.01)**
Ln(GDP-PC) of host	-0.04	-0.11	-0.005	-0.05	-0.11	-0.003	-0.002	-0.04	-0.002
	(-3.27)***	(-1.89)*	(-1.87)*	(-4.09)***	(-1.93)**	(-1.63)*	(-0.20)	(-1.45)	(-1.52)
Ln(DIST)	-0.05	-0.08	-0.001	-0.06	-0.10	-0.001	-0.09	-0.14	-0.0008
	(-6.67)***	(-1.71)*	(-1.02)	(-7.26)***	(-1.82)*	(-1.12)	(-7.80)***	(-3.29)***	(-0.75)
Border				-0.03	-0.19	0.003	-0.05	-0.04	0.002
				(-1.13)	(-0.66)	(0.71)	(-1.63)*	(-0.14)	(0.51)
Language				0.20	0.10	0.01	0.18	0.14	0.009
				(6.04)***	(1.72)*	(2.07)**	(4.98)***	(2.98)***	(2.13)**
Latitude							-0.002	-0.002	-0.0001
							(-3.85)***	(-3.37)***	(-1.56)
Landlocked							-0.09		0.003
							(-4.14)***		(0.85)
RTA							-0.01	-0.18	-0.0008
							(-0.89)	(-3.52)***	(-0.61)
Currency Union								11.13	0.007
								(11.68)***	(1.68)*
Adj R^2	0.21	0.12	0.04	0.29	0.12	0.06	0.32	0.73	0.07
S.E. of regression	0.18	0.60	0.02	0.18	0.60	0.02	0.17	0.34	0.02
N	993	1008	762	993	1008	762	993	992	762

Notes: (i) White heteroskedasticity-consistent standard errors and covariances calculated.
(ii) t-statistics in parentheses.
(iii) Time and source country dummies are used in all regressions.
(iv) * indicates 10% significance level, ** 5% significance, *** 1% significance

Table 3.2a. Controlling for Corruption and FDI Incentives & Restrictions - OLS Results

Dependent Variable: FDI Inflows as percentage of the GDP of the receiving country (1995-1998 averages)

	1			2 TI Index			3 GCR Index		
	N-N	N-S	S-N	N-N	N-S	S-N	N-N	N-S	S-N
Ln(POP) of host	-0.09	-0.18	-0.002	-0.10	-0.01	-0.001	-0.09	-0.01	-0.001
	(-3.20)***	(-1.78)*	(-0.92)	(-3.41)***	(-0.20)	(-0.70)	(-3.05)***	(-0.18)	(-0.63)
Ln(GDP-PC) of host	-0.06	-0.18	-0.000009	0.01	0.01	0.002	-0.01	0.01	0.002
	(-1.27)	(-1.60)	(-0.00)	(0.22)	(0.14)	(0.33)	(-0.28)	(0.17)	(0.40)
Ln(DIST)	-0.04	-0.51	-0.001	-0.02	-0.11	-0.002	-0.03	-0.11	-0.002
	(-0.98)	(-1.59)	(-0.80)	(-0.57)	(-1.88)**	(-0.75)	(-0.72)	(-1.79)**	(-0.71)
Corruption Index				0.01	0.001	0.0006	-0.004	0.003	0.002
				(0.98)	(0.05)	(0.69)	(-0.18)	(0.21)	(0.94)
FDI Incentives				0.02	0.01	0.0002	0.02	0.01	0.00002
				(1.11)	(0.42)	(0.04)	(1.22)	(0.41)	(0.00)
FDI Restrictions				-0.04	-0.008	-0.002	-0.03	-0.007	-0.002
				(-1.72)*	(-0.27)	(-1.16)	(-1.20)	(-0.20)	(-1.40)
Border	0.01	-0.35	0.002	0.05	0.25	0.004	0.05	0.25	0.004
	(0.17)	(-0.62)	(0.37)	(0.66)	(1.46)	(0.45)	(0.65)	(1.47)	(0.50)
Language	0.26	0.008	0.008	0.27	0.12	0.008	0.25	0.13	0.009
	(2.71)***	(0.07)	(1.12)	(2.62)***	(1.32)	(1.06)	(2.58)***	(1.32)	(1.06)
Latitude	-0.0001	-0.007	-0.00009	-0.00004	-0.005	-0.0001	-0.0001	-0.005	-0.0001
	(-0.14)	(-2.65)***	(-0.79)	(-0.04)	(-2.39)***	(-1.04)	(-0.13)	(-2.39)***	(-1.00)
Landlocked	-0.09		0.006	-0.11		0.01	-0.10		0.01
	(-1.69)*		(0.88)	(-1.76)*		(0.94)	(-1.61)		(-0.99)
Log(Trade)	0.09	0.04	0.0007	0.07	0.04	-0.0002	0.07	0.04	-0.0002
	(2.66)***	(1.45)	(0.85)	(2.34)**	(1.62)	(-0.17)	(2.20)**	(1.49)	(-0.16)
RTA	-0.09	-0.61	-0.002	-0.06	-0.10	-0.001	-0.06	-0.10	-0.002
	(-1.91)*	(-1.55)	(-0.50)	(-1.39)	(-1.32)	(-0.37)	(-1.37)	(-1.29)	(-0.42)
Adj R^2	0.38	0.17	0.05	0.39	0.19	0.05	0.39	0.19	0.05
S.E. of regression	0.23	0.76	0.02	0.23	0.36	0.02	0.23	0.36	0.02
N	310	333	261	301	273	244	301	273	244

Notes: (i) White heteroskedasticity-consistent standard errors and covariances calculated.
(ii) t-statistics in parentheses.
(iii) Source country dummies are used in all regressions.
(iv) * indicates 10% significance level, ** 5% significance, *** 1% significance

Table 3.2b. Controlling for Corruption and FDI Incentives & Restrictions - OLS Results

Dependent Variable: Log (FDI Inflows) (1995-1998 averages)

	1			2 TI Index			3 GCR Index		
	N-N	N-S	S-N	N-N	N-S	S-N	N-N	N-S	S-N
Ln(POP) of host	0.03	0.25	-0.12	0.19	0.31	0.47	0.15	0.42	0.28
	(0.21)	(1.73)*	(-0.52)	(1.38)	(2.01)**	(1.44)	(1.20)	(2.76)***	(0.96)
Ln(GDP-PC) of host	-0.08	0.15	2.04	0.17	0.37	1.39	0.27	0.34	1.93
	(-0.27)	(0.77)	(3.28)***	(0.50)	(1.90)*	(1.33)	(0.82)	(1.73)*	(2.24)**
Ln(DIST)	-0.31	-0.72	0.18	-0.29	-0.95	-0.45	-0.33	-1.08	-0.36
	(-1.67)*	(-2.61)***	(0.48)	(-1.61)	(-3.19)***	(-1.01)	(-1.84)*	(-3.45)***	(-0.85)
Corruption Index				-0.21	0.11	-0.38	-0.45	-0.04	-0.65
				(-2.83)***	(1.41)	(-2.13)**	(-3.37)***	(-0.43)	(-2.40)**
FDI Incentives				0.36	-0.03	0.42	0.39	-0.00002	0.55
				(3.14)***	(-0.20)	(1.59)	(3.28)***	(-0.00)	(2.03)**
FDI Restrictions				0.02	0.01	-0.07	0.02	-0.04	-0.09
				(0.23)	(0.11)	(-0.25)	(0.18)	(-0.34)	(-0.33)
Border	-0.63	-0.22	0.24	-0.25	-0.66	-0.43	-0.23	-0.44	-0.58
	(-2.55)***	(-0.48)	(0.29)	(-1.01)	(-1.30)	(-0.55)	(-0.95)	(-0.87)	(-0.75)
Language	0.97	1.35	1.64	0.78	1.11	1.30	0.82	1.08	1.23
	(3.34)***	(3.18)***	(3.20)***	(2.70)***	(2.68)***	(2.32)**	(2.96)***	(2.50)***	(2.22)**
Latitude	-0.002	-0.04	-0.01	-0.005	-0.03	-0.01	-0.007	-0.03	-0.01
	(-0.53)	(-7.17)	(-2.21)**	(-0.87)	(-5.22)***	(-1.78)*	(-1.32)	(-5.12)***	(-2.35)***
Landlocked	-0.03		0.51	0.07		0.64	-0.10		0.11
	(-0.13)		(0.98)	(0.26)		(0.71)	(-0.39)		(0.13)
Log(Trade)	1.06	0.60	0.63	0.87	0.58	0.36	0.84	0.51	0.36
	(6.97)***	(4.48)***	(3.41)***	(5.81)***	(6.25)***	(1.50)	(5.63)***	(5.28)***	(1.47)
RTA	-0.64	-0.28	0.44	-0.33	-0.68	-0.20	-0.33	-0.86	0.06
	(-2.54)***	(-0.70)	(0.53)	(-1.29)	(-1.58)	(-0.21)	(-1.29)	(-1.93)**	(0.07)
Adj R^2	0.78	0.62	0.45	0.78	0.68	0.47	0.78	0.67	0.48
S.E. of regression	1.13	1.53	1.86	1.06	1.33	1.85	1.05	1.34	1.84
N	284	296	191	278	245	184	278	245	184

Notes: (i) White heteroskedasticity-consistent standard errors and covariances calculated.
(ii) t-statistics in parentheses.
(iii) Source country dummies are used in all regressions.
(iv) * indicates 10% significance level, ** 5% significance, *** 1% significance

Table 3.3. Controlling for Legal Origin – Pooled OLS Estimation

Dependent Variable: FDI Inflows as percentage of the GDP of the receiving country (in 1987 US$ constant)

	1			2			3		
	N-N	N-S	S-N	N-N	N-S	S-N	N-N	N-S	S-N
Ln(POP) of host	-0.002	-0.14	-0.002	-0.001	-0.14	-0.002	-0.003	-0.07	-0.002
	(-0.45)	(-2.54)***	(-2.38)**	(-0.41)	(-2.60)***	(-2.48)***	(-0.83)	(-3.08)***	(-1.99)**
Ln(GDP-PC) of host	-0.03	-0.11	-0.004	-0.04	-0.11	-0.003	0.0002	-0.04	-0.002
	(-2.52)***	(-1.88)*	(-1.65)*	(-3.57)***	(-1.93)**	(-1.54)	(0.02)	(-1.45)	(-1.24)
Ln(DIST)	-0.04	-0.09	-0.001	-0.05	-0.10	-0.001	-0.08	-0.14	-0.0006
	(-5.61)***	(-1.71)*	(-1.10)	(-6.84)***	(-1.83)*	(-1.08)	(-7.58)***	(-3.38)***	(-0.53)
Common Legal Origin	0.10	-0.03	0.003	0.05	-0.06	0.0001	0.04	0.006	0.0003
	(6.10)***	(-0.60)	(1.42)	(3.79)***	(-1.26)	(0.13)	(2.92)***	(0.27)	(0.25)
Border				-0.04	-0.23	0.004	-0.05	-0.04	0.003
				(-1.41)	(-0.74)	(0.81)	(-1.81)*	(-0.60)	(0.65)
Language				0.17	0.13	0.01	0.16	0.14	0.009
				(4.95)***	(2.71)***	(2.15)***	(4.18)***	(3.14)***	(2.31)***
Latitude							-0.002	-0.002	-0.0001
							(-3.71)***	(-3.57)***	(-1.56)
Landlocked							-0.09		0.003
							(-3.81)***		(0.81)
RTA							-0.01	-0.18	-0.0006
							(-1.13)	(-3.58)***	(-0.49)
Currency Union								11.10	0.007
								(11.63)***	(1.69)*
Adj R^2	0.26	0.12	0.04	0.29	0.12	0.06	0.32	0.73	0.07
S.E. of regression	0.18	0.61	0.02	0.17	0.61	0.02	0.17	0.34	0.02
N	993	977	733	993	977	733	993	961	733

Notes: (i) White heteroskedasticity-consistent standard errors and covariances calculated.
(ii) t-statistics in parentheses.
(iii) Time and source country dummies are used in all regressions.
(iv) * indicates 10% significance level, ** 5% significance, *** 1% significance

Table 3.4. Controlling for Trade – Pooled OLS Estimation

Dependent Variable: FDI Inflows as percentage of the GDP of the receiving country (in 1987 US$ constant)

	1			2			3		
	N-N	N-S	S-N	N-N	N-S	S-N	N-N	N-S	S-N
Ln(POP) of host	-0.003	-0.13	-0.002	-0.09	-0.16	-0.004	-0.05	-0.11	-0.003
	(-0.76)	(-2.55)***	(-2.36)**	(-7.87)***	(-3.69)***	(-2.39)**	(-4.98)***	(-4.92)***	(-2.06)**
Ln(GDP-PC) of host	-0.04	-0.11	-0.005	-0.10	-0.16	-0.006	-0.06	-0.10	-0.003
	(-3.27)***	(-1.89)*	(-1.87)*	(-6.93)***	(-3.17)***	(-2.05)**	(-3.57)***	(-3.98)***	(-2.03)**
Ln(DIST)	-0.05	-0.08	-0.001	0.04	-0.05	0.0008	-0.03	-0.10	0.00006
	(-6.67)***	(-1.71)*	(-1.02)	(3.70)***	(-.084)	(0.66)	(-1.70)*	(-2.48)***	(0.05)
Ln(Trade)				0.11	0.05	0.002	0.06	0.07	0.001
				(8.42)***	(1.77)	(1.89)*	(4.64)***	(3.29)***	(1.59)
Border							-0.05	-0.08	0.002
							(-1.68)*	(-0.35)	(0.33)
Language							0.15	0.12	0.008
							(3.91)***	(2.65)***	(2.09)**
Latitude							-0.0009	-0.003	-0.0001
							(-1.89)*	(-4.13)***	(-1.55)
Landlocked							-0.06		0.003
							(-2.49)***		(0.72)
RTA							-0.03	-0.17	-0.001
							(-2.12)**	(-3.41)***	(-1.02)
Currency Union								11.15	0.007
								(11.69)***	(1.68)*
Adj R^2	0.21	0.12	0.04	0.29	0.12	0.05	0.33	0.74	0.07
S.E. of regression	0.18	0.60	0.02	0.18	0.62	0.02	0.17	0.34	0.02
N	993	1008	762	990	946	723	990	946	723

Notes: (i) White heteroskedasticity-consistent standard errors and covariances calculated.
(ii) t-statistics in parentheses.
(iii) Time and source country dummies are used in all regressions.
(iv) * indicates 10% significance level, ** 5% significance, *** 1% significance

Table 3.5. Controlling for Telephone Traffic – Pooled OLS Estimation

Dependent Variable: FDI Inflows as percentage of the GDP of the receiving country (in 1987 US$ constant)

	1			2			3		
	N-N	N-S	S-N	N-N	N-S	S-N	N-N	N-S	S-N
Ln(POP) of host	-0.04	-0.17	-0.005	-0.10	-0.19	-0.005	-0.06	-0.10	-0.004
	(-4.35)***	(-2.10)**	(-2.17)**	(-7.35)***	(-2.81)***	(-2.11)**	(-4.76)***	(-3.08)***	(-2.32)**
Ln(GDP-PC) of host	-0.05	-0.14	-0.007	-0.10	-0.17	-0.008	-0.06	-0.08	-0.004
	(-3.33)***	(-1.56)	(-2.40)**	(-5.57)***	(-2.30)**	(-2.41)**	(-3.12)	(-1.97)**	(-1.83)*
Ln(DIST)	-0.002	-0.10	0.003	0.05	-0.09	0.003	-0.02	-0.17	0.002
	(-0.18)	(-1.22)	(1.82)*	(3.64)***	(-0.90)	(1.66)*	(-1.08)	(-2.24)**	(1.01)
Ln(Tel)	0.05	-0.02	0.003	0.02	-0.04	0.003	-0.001	-0.06	0.001
	(4.76)***	(-0.60)	(2.50)***	(1.36)	(-1.32)	(2.39)**	(-0.11)	(-2.59)***	(2.33)**
Ln(Trade)				0.10	0.05	-0.0004	0.07	0.12	-0.000004
				(5.23)***	(1.07)	(-0.98)	(3.71)***	(4.69)***	(-0.01)
Border							-0.05	-0.10	0.006
							(-1.55)	(-0.49)	(2.06)**
Language							0.14	0.20	0.006
							(3.28)***	(3.04)***	(1.90)**
Latitude							-0.0009	-0.004	-0.00009
							(-1.59)	(-3.36)***	(-0.99)
Landlocked							-0.06		-0.004
							(-2.21)**		(-2.45)***
RTA							-0.03	-0.22	-0.00005
							(-1.70)*	(-2.49)***	(-0.04)
Currency Union								11.12	0.002
								(11.98)***	(0.99)
Adj R^2	0.27	0.12	0.07	0.31	0.12	0.06	0.34	0.82	0.07
S.E. of regression	0.19	0.76	0.02	0.18	0.78	0.02	0.18	0.36	0.02
N	831	562	617	828	531	587	828	531	587

Notes: (i) White heteroskedasticity-consistent standard errors and covariances calculated.
(ii) t-statistics in parentheses.
(iii) Time and source country dummies are used in all regressions.
(iv) * indicates 10% significance level, ** 5% significance, *** 1% significance

Table 3.6. Robustness Checks- Outliers
Dependent Variable: FDI Inflows / GDP

	1		
	N-N	**N-S**	**S-N**
Ln(POP) of host	-0.03	-0.06	-0.001
	(-5.74)***	(-7.03)***	(-2.99)***
Ln(GDP-PC) of host	-0.04	-0.06	-0.002
	(-3.59)***	(-5.60)***	(-1.84)*
Ln(DIST)	-0.02	-0.06	-0.0008
	(-2.74)***	(-3.58)***	(-1.27)
Ln (Trade)	0.04	0.06	0.0006
	(6.08)***	(6.05)***	(1.79)*
Border	-0.03	0.06	0.003
	(-2.24)**	(0.31)	(1.74)*
Language	0.09	0.10	0.006
	(5.36)***	(3.24)***	(3.60)***
Latitude	-0.0008	-0.002	0.00003
	(-3.47)***	(-6.99)***	(0.18)
Landlocked	-0.03		-0.001
	(-2.10)**		(-1.89)*
RTA	-0.02	-0.08	-0.001
	(-2.77)***	(-3.90)***	(-1.32)
Currency Union			0.005
			(1.67)*
Adj R^2	0.44	0.36	0.15
S.E. of regression	0.09	0.15	0.005
N	960	925	713

Notes: (i) White heteroskedasticity-consistent standard errors and covariances calculated.
(ii) t-statistics in parentheses.
(iii) Time and source country dummies are used in all regressions.
(iv) * indicates 10% significance level, ** 5% significance, *** 1% significance

Table 3.7. FDI Flow – Pooled OLS Estimation

Dependent Variable: Log of FDI flows (in 1987 US$ constant)

	1		2	
	N-N	N-S	N-N	N-S
$Ln(POP_iPOP_j)$	0.88	0.83	0.90	0.83
	(19.91)***	(17.61)***	(22.83)***	(17.88)***
$Ln(GDP\text{-}PC_iGDP\text{-}PC_j)$	0.87	1.31	0.85	1.28
	(6.38)***	(17.34)***	(6.88)***	(17.46)***
Ln(DIST)	-0.61	-0.12	-0.79	-0.26
	(-8.86)***	(-0.93)	(-11.41)***	(-2.06)**
Border			-0.63	1.28
			(-2.98)***	(3.30)***
Language			1.75	1.65
			(8.49)***	(9.56)***
Adj R^2	0.55	0.39	0.62	0.45
S.E. of regression	1.32	1.62	1.19	1.54
N	423	575	423	575

Notes: (i) White heteroskedasticity-consistent standard errors and covariances calculated.
(ii) t-statistics in parentheses.
(iii) Time dummies are used in all regressions.
(iv) * indicates 10% significance level, ** 5% significance, *** 1% significance

Table 3.8. Robustness Checks - Outliers

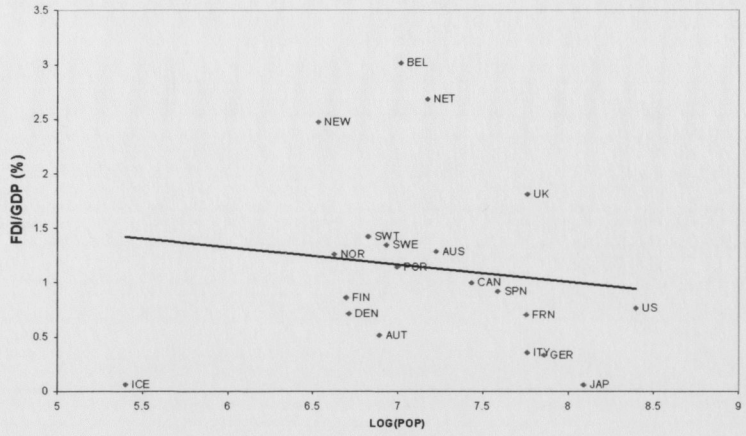
Dependent Variable: Log of FDI flows (in 1987 US$ constant)

	N-N	N-S
$Ln(POP_iPOP_j)$	0.91	0.84
	(25.70)***	(20.25)***
$Ln(GDP\text{-}PC_iGDP\text{-}PC_j)$	0.88	1.30
	(7.47)***	(20.82)***
Ln(DIST)	-0.81	-0.32
	(-12.98)***	(-2.84)***
Border	-0.73	1.11
	(-4.09)***	(3.12)***
Language	1.59	1.65
	(8.78)***	(10.21)***
Adj R^2	0.70	0.55
S.E. of regression	1.01	1.29
N	397	544

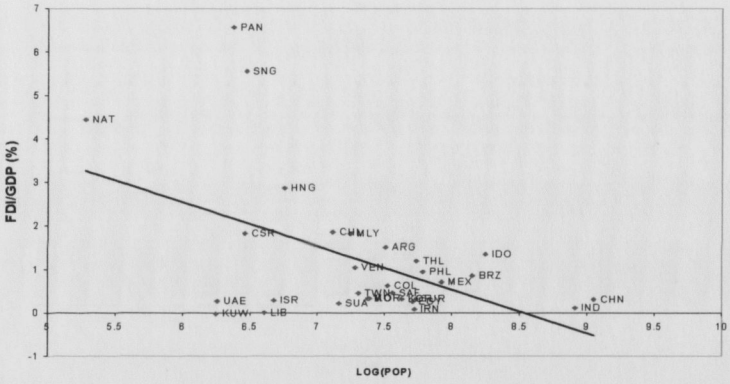
Notes: (i) White heteroskedasticity-consistent standard errors and covariances calculated.
(ii) t-statistics in parentheses.
(iii) Time dummies are used in all regressions.
(iv) * indicates 10% significance level, ** 5% significance, *** 1% significance

Figure 3.1

AVERAGE NORTH-NORTH FDI/GDP AND POPULATION (1980-1998)



AVERAGE NORTH-SOUTH FDI/GDP AND POPULATION (1980-1998)



AVERAGE SOUTH-NORTH FDI/GDP AND POPULATION (1980-1998)

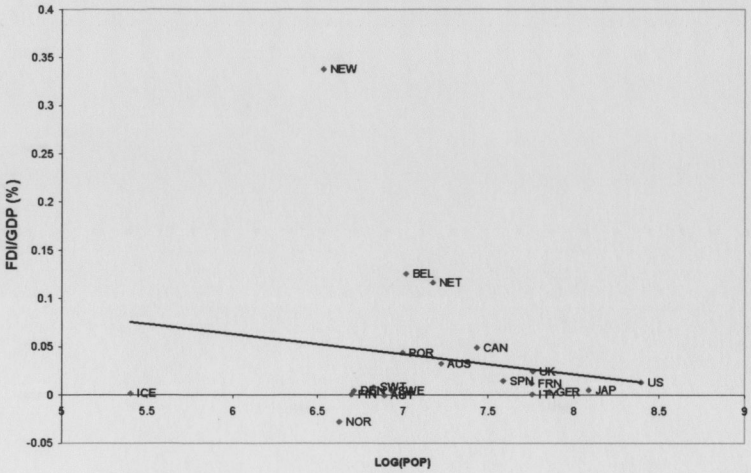
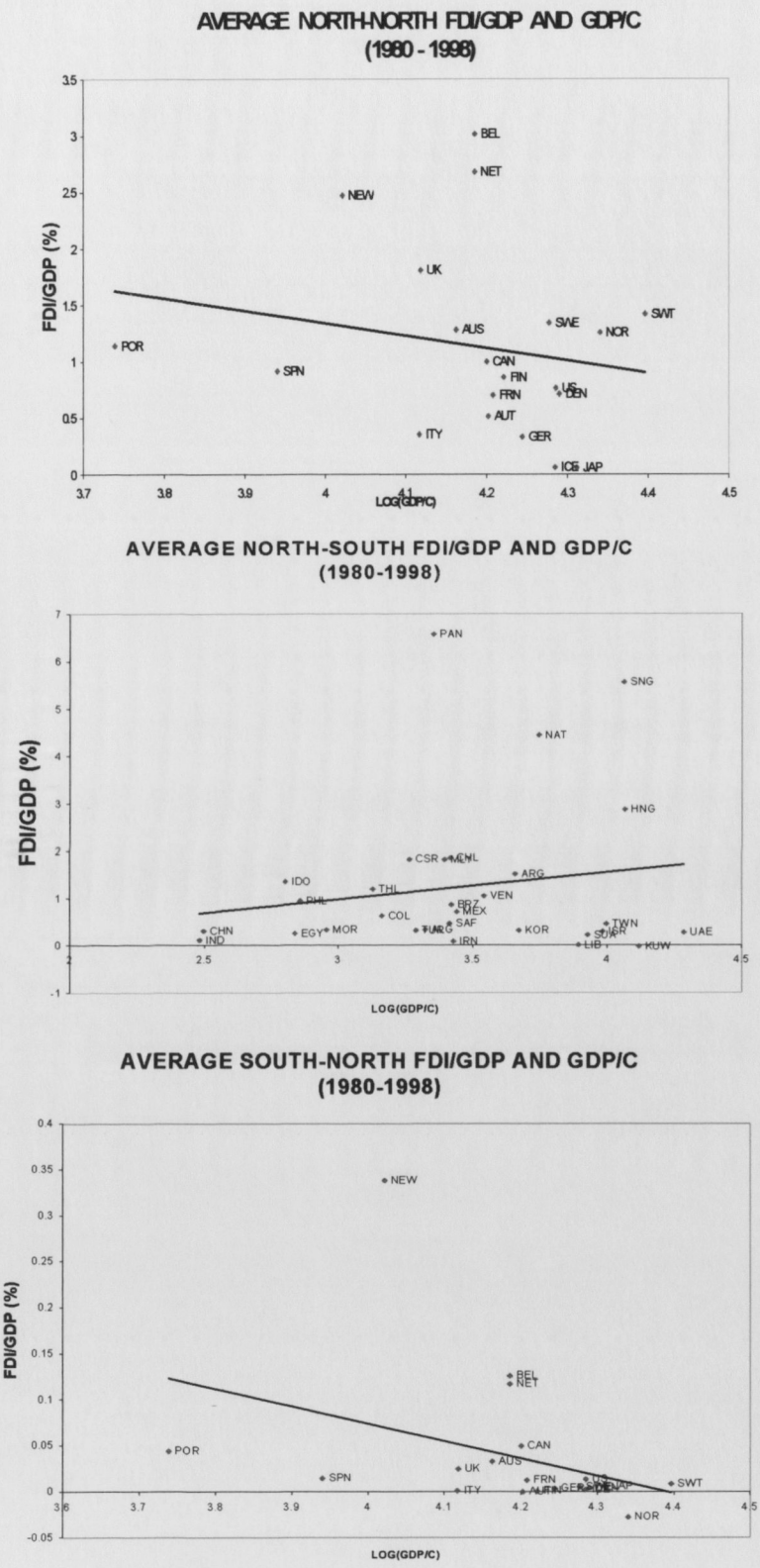


Figure 3.2


AVERAGE NORTH-NORTH FDI/GDP AND GDP/C
(1980 - 1998)
FDI/GDP (%)
LOG(GDP/C)
BEL
NET
NEW
UK
SWE
SWT
AUS
NOR
POR
SPN
CAN
FIN
FRN
DEN
AUT
ITY
GER
JAP
AVERAGE NORTH-SOUTH FDI/GDP AND GDP/C
(1980-1998)
FDI/GDP (%)
LOG(GDP/C)
PAN
SNG
NAT
HNG
ARG
IDO
THL
VEN
COL
MEX
SAF
KOR
TWN
UAE
CHN
IND
EGY
MOR
IRN
LIB
KUW
AVERAGE SOUTH-NORTH FDI/GDP AND GDP/C
(1980-1998)
FDI/GDP (%)
LOG(GDP/C)
NEW
BEL
NET
CAN
POR
AUS
UK
SPN
FRN
ITY
SWT
NOR

APPENDIX 3.1
Summary of Literature using Gravity Model

Author	Sample	Dependent Variable	Model	Results	
Ghosh and Wolf (1998)	G-7	Outward FDI stock (1994)	Single equation cross-section OLS	GDP of host country, ε= {0.68, 1.36} GDPpc of host country, ε={-0.24, 0.74} Distance, ε={-1.70, -0.21}	Distance has the correct sign but only significant for ITY, JAP and UK.
Fernandez and Hausman-Arias (2000)	All the countries excluding Panama and Switzerland	Log((FDI/GDP)+1) (Simple average of 1996-98)	Cross-section OLS	GDP ε={-0.001} GDPpc ε={0.002, 0.006} Distance ε ={-0.00049, 0.002}	
Chunlai (1997)	Developing countries (33)	Log(FDI Inflows) 1987-94	GLS	GDP ε= {0.38, 0.40} GDPpc ε={0.13, 0.15} Remoteness ε={-2.34, -2.10}	Remoteness is used instead of distance
Eaton and Tamura (1994)	100 countries	US and Japanese inward and outward FDI positions (1985-90)	Maximum likelihood, Tobit estimation	GDP and POP (+) Region dummy	For both US and Japan, FDI more w/ closer countries
De Menil (1999)	OECD	Log(FDI) inflows (1982-94)	Pooled OLS estimation	GDP of host and source country ε={0.40, 0.87} Distance ε ={-0.55, -0.59}	
Wei (2000)	14 source country, 53 host country	Log(FDI) stock (Average of 1994-96)	Quasi-fixed effects model	GDP ε ={0.85, 1.04} GDPpc ε={0.28} Distance ε={-0.66, -0.55}	GDP and distance are significant, but GDP/C is not robust
Wei (1997)	14 source country, 45 host country	Log(FDI) flow (Average of 1990-91 outflows)	OLS, modified tobit estimation, IV	GDP ε={0.63} Distance ε={-1.14}	These variables are significant both in OLS and tobit estimations

APPENDIX 3.2

List Of Countries

NORTH	SOUTH
Australia	Korea
Austria	Mexico
Belgium-Luxembourg	Turkey
Canada	Algeria
Denmark	Egypt
Finland	Libya
France	Morocco
Germany	South Africa
Iceland	Argentina
Italy	Brazil
Japan	Chile
Netherlands	Colombia
New Zealand	Costa Rica
Norway	Netherlands Antilles
Portugal	Panama
Spain	Venezuela
Sweden	Kuwait
Switzerland	Saudi Arabia
United Kingdom	United Arab Emirates
United States	Iran
	Israel
	China
	Chinese Taipei
	Hong Kong
	India
	Indonesia
	Malaysia
	Philippines
	Singapore
	Thailand

APPENDIX 3.3

List of Variables

Variable	Definition	Source
The Dependent Variable: FDI/GDP	FDI Inflows (US$ millions) / GDP (US$ millions) * 100	FDI Inflows – OECD Direct Investment Statistics, 1999. GDP – WDI database (World Bank)
GDP	GDP in constant 1987 US$ millions	WDI database (World Bank)
GDP per capita	GDP / population (1987 US$)	WDI
Distance	Greater circle distance in km	Andrew Rose (2000)
Border	Common land border	Andrew Rose (2000)
Language	Common language	Andrew Rose (2000)
Latitude	Latitude of capital city	World Bank
Trade	Bilateral Trade Flows (imports) in constant 1987 US$ millions	IMF Direction of Trade Statistics
RTA	Regional Trade Agreement dummy (EC, EFTA, NAFTA, Australia-New Zealand Closer Economic Relation Trade Agreement and some unilateral trade agreements included*)	World Trade Organization website (http://www.wto.org/english/tratop_e/region_e
Currency Union		Andrew Rose (2000)

* The unilateral trade agreements included in sample: EC/Algeria (1976), EC/Egypt (1977), EC/Iceland (1973), EC/Israel (1975), EC/Morocco (1976), EC/Norway (1973), EC/Turkey (1995), EFTA/Israel (1993), EFTA/Turkey (1992), US/Israel (1985).

TI corruption index	Transparency International Corruption index ranges between 0(most corrupt)-9 (least corrupt)	Transparency International Website (http://www.transperancy.de/documents/cpi/index.html
GCR corruption Index	Index ranges between 0 (least corrupt) to 6 (most corrupt)	Wei (2000)
FDI Incentives	Dummy variable ranges 0 (no incentives) to 4 (all incentives)	Wei (2000)
FDI Restrictions	Dummy variable ranges 0 (no restrictions) to 4 (all restrictions)	Wei (2000)
Telephone Traffic	Log of bilateral telephone call traffic from country j to country i in minutes	Direction of Traffic-Trends in International Telephone Tariffs 1996, International Telecommunication Union
Common Legal Origin	Dummy variable equals 1 if host country shares the same legal origin as the source country, 0 otherwise.	La Porta *et al* (1998) and World Bank

APPENDIX 3.4

Test on Poolability of Panel Data

The data used in this chapter pools a number of cross-sections (i.e. countries) over the time-series (i.e. years) dimension. The use of panel data varying in both cross-sectional and time-series dimension, often produces more efficient estimators compared to cross-section or time-series alone (Verbeek, 1999). For this reason, the regression analysis concentrates on a pooled least squares model. However, before proceeding with the results from regression analysis, we examine the poolability of the cross-sections over the time-series dimension. It is inherently assumed in pooled data that the relationship between the explanatory variables and the dependent variable has been stable over the years: in other words, the variance component is constant over time.

One way of examining the stability of the variables over the time period (i.e. 1980-98) is examining individual sub-periods as in Tables 3.4A.1-3.4A.3. More formally, the poolability of data over time can be tested using a Chow test. In its simple form, the Chow test on the poolability across the time-dimension is a test of the hypothesis that the coefficients (variance component) are constant over time (i.e. $\beta_t = \beta$). This is the Chow test extended to N linear regressions, assuming $u \sim N(0, \sigma^2 I_{NT})$. A generalised Chow test is preferable, however it is not feasible[1]. Nevertheless, since the OLS estimates in Tables 3.4A1-3.4A.3 are corrected for an unknown form of heteroskedasticity, the Chow test is applied assuming homoskedastic variances. For the North-North data set, the Chow test for poolability across time gives an observed F-statistic of 2.21 and is distributed as F(18, 969) under H_o; $\beta_t = \beta$ for t=1...T. The test rejects poolability across time at one percent significance level. The observed F-statistic for North-South is F(18, 984)=0.54 and South-North is F(18, 738)= 1.17. Both tests for North-South and South-North fail to reject the null hypothesis at 10 percent. Although pooling across time for North-North FDI is rejected, estimation using pooled data is more efficient than using time-series or cross-section data alone and is necessary for comparison in our estimations.

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[1] In a similar study on the determinants of cross-border equity flows, Portes and Rey (1998) report infeasibility of performing a Generalized Chow test since a consistent estimate of the country- and time-specific variance components can only be obtained from the fixed effects estimator- an estimator which cannot estimate time-invariant variables like distance.

Table 3.4A.1. North-North FDI: OLS Regression Results for Sub-Periods and Pooled Estimate

Dependent Variable: FDI Inflows as percentage of the GDP of the receiving country (In 1987 US$ constant)
(Period averages used)

	1980-84	1985-89	1990-94	1995-98	Pooled
Ln(POP) of host North	-0.01	-0.01	-0.01	-0.02	-0.02
	(-1.92)*	(-1.92)*	(-2.59)***	(-2.68)***	(-4.22)***
Ln(GDP-PC) of host	-0.01	-0.05	-0.09	-0.02	-0.04
North	(-1.09)	(-2.74)***	(-2.81)***	(-0.63)	(-3.53)***
Ln(DIST)	-0.0007	-0.01	-0.02	-0.04	-0.02
	(-0.11)	(-1.22)	(-1.97)**	(-2.30)**	(-3.36)***
Border	-0.01	-0.02	-0.03	0.07	0.004
	(-0.60)	(-0.55)	(-0.71)	(0.87)	(0.15)
Language	0.07	0.16	0.15	0.30	0.19
	(2.20)**	(3.80)***	(2.89)***	(3.78)***	(5.86)***
Adj R^2	0.10	0.13	0.10	0.15	0.13
S.E. of regression	0.07	0.14	0.17	0.27	0.19
N	160	213	310	310	993

Notes: (i) White heteroskedasticity-consistent standard errors and covariances calculated.
(ii) t-statistics in parentheses.
(iii) Time dummies are used in the pooled regression.
(iv) * indicates 10% significance level, ** 5% significance, *** 1% significance

For North-North FDI inflows, both the direction and magnitude of the relationship between the dependent variable and *POP* have been stable through the years. The *distance* variable has become both economically and statistically significant in the 1990s. The common *language* dummy is a statistically significant determinant of North-North flows through the years. However, it became economically more significant in the second half of the 1990s compared to the 1980s.

Table 3.4A.2. North-South FDI: OLS Regression Results for Sub-Periods and Pooled Estimate

Dependent Variable: FDI Inflows as percentage of the GDP of the receiving country (In 1987 US$ constant)

	1980-84	1985-89	1990-94	1995-98	Pooled
Ln(POP) of host South	-0.04	-0.06	-0.17	-0.19	-0.14
	(-1.74)*	(-2.35)**	(-1.65)*	(-1.64)*	(-2.53)***
Ln(GDP-PC) of host	-0.006	-0.0002	-0.16	-0.18	-0.13
South	(-0.21)	(-0.01)	(-1.40)	(-1.41)	(-1.96)**
Ln(DIST)	-0.02	-0.08	-0.03	-0.03	-0.05
	(-0.51)	(-1.64)*	(-0.51)	(-0.50)	(-1.29)
Border	-0.17	0.05	0.80	0.93	0.43
	(-2.18)**	(0.51)	(8.98)***	(14.99)***	(2.15)**
Language	0.21	0.13	0.11	0.11	0.13
	(2.51)***	(1.59)	(1.22)	(1.28)	(2.90)***
Adj R^2	0.09	0.07	0.05	0.04	0.05
S.E. of regression	0.26	0.33	0.65	0.78	0.63
N	134	157	348	369	1008

Notes: (i) White heteroskedasticity-consistent standard errors and covariances calculated.
(ii) t-statistics in parentheses.
(iii) Time dummies are used in the pooled regression.
(iv) * indicates 10% significance level, ** 5% significance, *** 1% significance

POP of the South host country is also negatively and significantly correlated with FDI inflows. There seems to be a significant change in the economic importance of *POP* in the1990s versus the 1980s. *Distance* has the correct negative sign and is only significant for the second half of the1980s. The statistical and economic significance of sharing a common border has changed dramatically in the1990s. The positive correlation between *common border* dummy and FDI inflows in the 1990s coincides with the ratification of the NAFTA Treaty. Since Mexico and US are the only North-South country pair in our data set to share a common border, this dummy variable is effectively, a Mexico-US dummy variable.

Table 3.4A.3. South-North FDI: OLS Regression Results for Sub-Periods and Pooled Estimate

Dependent Variable: FDI Inflows as percentage of the GDP of the receiving country (In 1987 US$ constant)

	1980-84	1985-89	1990-94	1995-98	Pooled
Ln(POP) of host North	-0.0009	0.0002	-0.004	-0.002	-0.002
	(-1.91)*	(0.36)	(-2.01)**	(-1.49)	(-2.50)***
Ln(GDP-PC) of host	-0.003	-0.006	-0.006	0.003	-0.003
North	(-1.44)	(-1.01)	(-1.61)	(1.30)	(-1.40)
Ln(DIST)	0.001	0.0008	-0.0001	-0.0005	0.0002
	(1.45)	(0.70)	(-0.15)	(-0.03)	(0.24)
Border	0.004	0.005	0.01	0.004	0.008
	(2.07)**	(2.71)***	(3.39)***	(1.22)	(3.20)***
Language	0.00002	0.003	0.02	0.01	0.01
	(0.03)	(0.57)	(1.60)	(1.52)	(2.22)**
Adj R^2	0.17	0.03	0.10	0.03	0.06
S.E. of regression	0.003	0.007	0.02	0.02	0.02
N	82	125	279	276	762

Notes: (i) White heteroskedasticity-consistent standard errors and covariances calculated.
(ii) t-statistics in parentheses.
(iii) Time dummies are used in the pooled regression.
(iv) * indicates 10% significance level, ** 5% significance, *** 1% significance

The relationship between South-North FDI inflows and the *POP* of host North countries was found to be negative over the years but only significant for the first periods in the1980s and 1990s. *Distance* is not a significant determinant of South-North FDI flows. Sharing a common border is positively correlated with FDI for the period from 1980 to 1994. Sharing a common language is not a significant determinant of South-North FDI for cross-section dimension; however, it is statistically significant in the pooled estimate.

APPENDIX 3.5

FDI Incentives and Restrictions Dummy Variables

FDI policy (incentives and restrictions) data are compiled by PriceWaterhouseCoopers[2]. Both restrictions and incentives are dummy variables taking the value of 0-4. FDI restrictions take the value of 1 for each item below if they exist:

a) *Existence of foreign exchange control,*
b) *Exclusion of foreign firms from certain strategic sectors,*
c) *Exclusion of foreign firms from additional sectors that would otherwise be considered harmless in most developed countries,*
d) *Restrictions on foreign ownership*

Similarly, FDI incentives measure the presence or absence of the following:

a) *Existence of special incentives to invest in certain industries or certain regions*
b) *Tax concessions specific to foreign firms*
c) *Cash grants, subsidised loans, reduced rent for land use, or other non tax concessions, specific to foreign firms*
d) *Special promotion for exports*

[2] Kindly provided by Wei (2000).

APPENDIX 3.6

3.6A Panel Fixed-Effects Regression Analysis

3.6A.1 Model 3

In this section we focus on a fixed-effects model of panel data. Fixed-effects models concentrate on the 'within' variation of the individual. In other words, this model seeks to explain the effect of changes in the fundamentals on bilateral FDI inflows within the time-dimension of the data. Besides highlighting the effect of the evolution of the fundamentals, fixed-effects models can control for unobserved heterogeneity in the data. Since our interest is in explaining any differences/similarities between the country-pairs, we can get useful information from a fixed-effects estimator (i.e. the unobserved heterogeneity). The fixed effects model is based on the following model:

Model 3:

$$\text{Inflow}_{ijt} = \alpha_{ij} + \beta_1 \ln(\text{POP}_{i,t}) + \beta_2 \ln(\text{GDPPC}_{i,t}) + t_2 + t_3 + t_4 + \varepsilon_{ij,t} \quad (1a)$$

$$\hat{\alpha}_{ij} = \lambda + \text{source country dummies} + \delta_1 \ln(\text{POP}_i) + \delta_2 \ln(\text{GDPPC}_i) + \delta_3 \ln(\text{DIST}_{ij}) + \delta_4 Z_{ij} + u_{ij} \quad (1b)$$

where:

$\text{Inflow}_{ij,t}$:	Gross bilateral FDI inflows as percentage of the GDP of the receiving country i from partner country j at time t,
$\text{POP}_{i,t}$:	Population of receiving country i at time t,
$\text{GDPPC}_{i,t}$:	GDP per capita of receiving country i at time t,
t_t :	time dummies (t_1=1980-84, t_2=1985-89, t_3=1990-94, t_4=1995-98)
DIST_{ij} :	distance between country i and j
$\hat{\alpha}_{ij}$:	estimated fixed country-pair effects,
$Z_{ij,t}$:	control variables

The equation (1a) is a fixed effects model that regresses FDI/GDP on the log of size, log of GDP per capita of the host country and time dummies. Since fixed effects models cannot be estimated for time-invariant variables, all other control variables have been left out. However, one way of including these time-invariant factors is regressing the estimated fixed country-pair effects on the time-invariant explanatory variables (Hsiao, 1986). The equation (1b) is cross-country OLS in which the dependent variable is the estimated fixed country-pair effects. The equation (1b) regresses these estimated fixed effects on the log of average POP of the receiving country, log of average GDP per capita, the log of the distance between receiving and sending country and a set of other control variables[3]. The equation (1a) exploits the time-series dimension, whereas equation (1b) exploits the cross-country dimension. The dependent variable is expressed as percentage and POP, GDP per capita and distance variables are in logs. The coefficients for the variables in logs can be interpreted as semi-elasticities.

3.6A.2 Test of fixed effect model

In the previous section, we concentrated on the results from pooled OLS regression analysis using source country dummies. The pooled OLS is, in a sense, a restricted model allowing for only source country heterogeneity. However, *a priori*, there is reason to believe that fixed country-pair effects (i.e. an unrestricted model) can explain some of the cross-country variation in FDI inflows to these countries.

To formalise the choice of fixed effects model, we test whether fixed country effects have any explanatory power. The hypothesis to be tested is $H_o = \alpha_1 = \alpha_2 .... = \alpha_{n-1} = 0$, i.e. that the fixed country effects are all equal to zero. The null hypothesis was tested by a simple Chow test with the restricted residual sums of squares (RRSS) being that of OLS on the pooled model including source country and time dummies, and the unrestricted residual sums of squares (URSS) being that of the fixed effects regression (Baltagi, 1999).

Since all the other control variables are time-invariant, POP and GDP per capita are the only variables that can be estimated by a fixed effects model. Therefore, URSS

[3] POP and GDP per capita are averaged over the 1980-1998 period.

and RRSS are obtained by regressing FDI on POP and GDP per capita alone. The observed F statistic for North-North flows is 3.19 and is distributed as F(324, 662). The observed F statistics for North-South flows is F(416, 592) = 2.57 and for South-North flows, it is F(341, 432) = 3.99. For all groups, the F-test rejects the null hypothesis that the country fixed effects are all equal to zero, i.e. the fixed country-pair effects do have explanatory power[4].

3.6A.3 Panel Fixed-Effects Regression Results

The results of the regression analysis on the determinants of North-North, North-South and South-North FDI inflows are reported in Table 3.6A.1. In the first column, the results from a fixed effects regression are reported, where FDI is regressed on size and GDP per capita, exploiting the time-series dimension of the data. The columns (2) and (3) are results from cross-country OLS regression, where estimated fixed country-pair effects are regressed on standard gravity and additional control variables[5]. White's heteroskedasticity-consistent standard errors are calculated for all. Time and source country dummy variables are introduced in columns (1) and (2)-(3) respectively.

3.6A.3.1 North-North FDI

The market size of the host country is a statistically significant determinant of FDI flows from North to North. In the time-series dimension (column (1)), as the host country size increases FDI inflows decreases. In the cross-sectional dimension (columns (2) and (3)), it is the host North countries that are larger in size that attract higher FDI in terms of their GDP. Income of the host country has also a similar impact; FDI and income are negatively correlated in the time-series dimension but it is the richer North host countries that receive higher FDI flows from other North

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[4] A stability test is also applied to check whether the relation between the dependent and explanatory variables have been stable over the two decades (1980s compared to 1990s). Overall, Chow test results imply that we fail to reject the hypothesis that the relation between FDI inflows (for all groups, i.e. North-North, North-South and South-North) and host country variables has been constant over the 1980s and 1990s. An earlier test on the poolability of the data on its time-series dimension rejected that North-North FDI inflows were poolable (Appendix 3.4).

[5] When the average FDI/GDP ratio is used as the dependent variable instead of the estimated fixed country-pair effects, the overall significance of the model is much lower for all three groups. The coefficients for size are significantly smaller and have the opposite sign, whereas time-invariant variables are unaffected.

countries.

Distance between the host and source country has the expected negative effect on FDI inflows; as the distance between two North countries increase, bilateral FDI flows decrease. This relationship is statistically significant and robust to the inclusion of other control variables. Sharing a common language, latitude and whether the host country is landlocked or not are also significant determinants of North-North FDI flows. FDI flows are higher between countries that share a common language, and less for host countries that are landlocked and higher in latitude. The specifications in column (2) and (3) explain over 90 percent of the variation in North-North FDI flows.

3.6A.3.2 North-South FDI

The size of the South country is statistically significant only in the cross-section dimension: among the South host countries, it is the larger ones that receive more FDI in terms of their GDP. The income level of the South host country is not a statistically significant determinant of North-South FDI flows in either the time-series or cross-section dimension. Distance between a South host and a North source country is negatively correlated with bilateral FDI flows between the same. Distance is only statistically significant when other control variables are included in column (3).

Besides the standard gravity variables, other variables that are statistically significant determinants of North-South FDI are common language, latitude, RTA and currency union dummies. Sharing a common language, as for North-North FDI, has a positive effect on FDI flows from North to South. Similarly, it is the South host countries at lower latitudes that attract more FDI. South host countries that are in a regional trade agreement with a North source country receive less FDI in terms of their GDP, reinforcing previous results from pooled OLS analysis. Currency union is both economically positive and statistically significant. The specification in column (3) explains over 90 percent of the variation in North-South FDI flows.

3.6A.3.3 South-North FDI

The size of the North host country is a significant determinant of FDI flows from South. As the North host country increases in size, FDI flows from South decreases in terms of its GDP. Among the North countries, it is the larger ones that receive more

FDI inflows. Other control variables are statistically insignificant for South-North FDI flows.

3.6A.3.4 Differences/ Similarities among North-North, North-South and South-North FDI Inflows

The standard gravity variables have the same impact on each group of FDI flows. The size of the host market is positively correlated to FDI inflows. The difference among North-North, North-South and South-North bilateral FDI flows lies in the economic significance of the variables. The size of the host country is economically most significant for North-South FDI, then for North-North and least for South-North FDI flows. A one percent increase in the size of South host country leads to 1.11 percentage point increase in FDI/GDP ratio, 0.36 percentage point for North-North and 0.03 percentage point for South-North FDI flows (Table 3.6A.1 column (3)).

The income level of the host country (GDP per capita) is not statistically significant for North-South and South-North flows. The fact that the level of development is a significant determinant of North-North FDI flows, in our data, but not for North-South FDI may be empirical evidence of the contrast between two types of FDI. Mergers and acquisitions have increasingly dominated North-North FDI flows, and North-South FDI has been mostly in the form of greenfield investments. This may suggest that heterogeneity of different levels of development among the developing countries is not a significant determinant to attract FDI from the industrial countries so long as the levels are below a threshold point.

Distance has, economically, the same impact on North-North and North-South FDI: a one percent increase in distance decreases North-North and North-South FDI by 0.08 percentage points. Sharing a common language is more important for North-North FDI than it is for North-South FDI. Among other geographical factors, latitude is slightly more important for North-North than it is for North-South FDI.

Being in a regional trade agreement (RTA) is not a significant determinant of North-North FDI but it is significant and negative for North-South FDI. The negative sign for North-South RTA may, again, be interpreted as evidence that North countries still prefer trade as a safe alternative to FDI.

Overall, the specification in column (3) of Table 3.6A.1 explains the majority of the cross-country variation in FDI inflows. The standard gravity variables and additional geographic factors are statistically and economically significant determinants of North-North and North-South. The same specification explains South-North with least success, size being the only significant determinant.

3.6A.4 Robustness Checks on Panel Fixed-Effects Regression Results

In this section, we check the robustness of fixed-effects results to the inclusion of the same set of control variables used in pooled OLS analysis.

3.6A.4.1 The Effect of Common Legal Code

In Table 3.6A.2, the effect of sharing a common legal code is examined. Common legal code dummy has the expected positive sign for North-North and South-North FDI inflows, but it is only significant for North-North flows, the same as in pooled OLS results. The host North countries that share the same legal code as the source North countries receive 0.10 percentage point more FDI inflows. However, the addition of common legal code dummy does not increase the explanatory power of the model (column (1) versus column (2)). Other control variables are robust to the inclusion of common legal code dummy for all groups.

3.6A.4.2 The Effect of Trade on FDI

Table 3.6A.3 presents results of cross-country OLS regression on fixed country-pair effects including bilateral trade flows as a control. In column (2), the inclusion of trade variable has a positive and statistically significant effect on North-North and South-North FDI flows. The statistical significance of size and GDP per capita are unaffected. This suggests that size and level of development do have a statistically significant relation with FDI independent of their relation through trade. Introducing the trade variable, however, changes the significance of the distance variable for North-North flows, unlike the results from pooled OLS. When trade and other control variables are entered, the distance variable becomes statistically insignificant. This result indicates that the effect of distance in explaining cross-country variation in bilateral FDI is not robust to the inclusion of trade. One reason for this may be that

much of this variation is explained by bilateral trade, and distance was capturing the effect of trade. In other words, information costs *per se* do not have a statistically significant effect in explaining cross-country variation in bilateral FDI.

3.6A.4.3 The Effect of Telephone Call Traffic

Table 3.6A.4 introduces the telephone call traffic variable. The results of the regression analysis indicates that when telephone call traffic is entered into the equation, the distance variable becomes insignificant for North-North FDI (Table 3.6A.4 column (1)), while size and level of development remain robust.

The size of South and North host are also robust to the inclusion of telephone call traffic for North-South and South-North FDI inflows. A one percent increase in telephone call traffic increases North-North FDI by 0.04 percentage point and South-North FDI by 0.004 percentage points. In column (2), log of trade is entered together with the telephone traffic and the results indicate that telephone call traffic is no longer statistically significant. The distance between two North countries has a positive and statistically significant effect on the FDI/GDP ratio as in Table 3.6A.3. In column (3) where all control variables are entered together, only South-North telephone call traffic remains significant.

3.6A.4.4 Other Robustness Checks

We have further examined the effect of outliers as part of robustness checks (Table 3.6A.5)[6]. The outliers from Table 3.6A.3 column (3) were excluded from the regression analysis. The statistical significance of results for North-North flows remain mainly unchanged with the exception of the latitude and landlocked dummy variable [7]. The negative sign for the latitude of the host North indicates that a one unit decrease in latitudinal position of the host increases FDI inflows by 0.0006 percentage points. The landlocked dummy becomes insignificant. The size and level of income

[6] The residuals that are beyond two standard deviation of the regression are classified as outliers.
[7] The outliers for North-North flows include flows from France, Germany, Netherlands and Italy to Belgium-Luxembourg, flows from US to Switzerland, UK, Japan, and Netherlands, from Sweden to Finland and from Finland to Sweden, from UK to Netherlands, and New Zealand, and from Australia to New Zealand.

slightly increased in economic significance whereas *trade* and common language decreased.

The results of North-South FDI flows are generally robust to the exclusion of outliers with the exception of the common border dummy, which becomes statistically significant[8]. The *size* of the South country and currency union dummy increased in economic significance and, language, trade and RTA dummy variables decreased.

For the South-North FDI flows, common language and currency union dummy becomes significant[9]. The economic significance of *size* of the host country increased whereas for trade, it decreased. The R^2 for South-North FDI is 98 percent when outliers are excluded, compared to 76 percent. Finally, the regression equations in Table 3.6A.1 are rerun excluding zero observations. The results remain unchanged.

[8] The outliers for North-South flows include flows from Germany to Argentina, from Japan to Hong Kong, Indonesia and Singapore, from Switzerland to Panama, from UK to Singapore, and from US to Venezuela, Kuwait, Hong Kong and Singapore.

[9] The outliers for South-North flows include flows from Singapore to Australia, Belgium-Luxembourg, Norway and New Zealand and from Indonesia to New Zealand.

Table 3.6A.1. Fixed Effects Panel Estimation

Dependent Variable: FDI Inflows as percentage of the GDP of the receiving country (in 1987 US$ constant)

	Fixed-Effects Estimation			OLS			OLS		
	1a			1b			1b		
	N-N	N-S	S-N	N-N	N-S	S-N	N-N	N-S	S-N
Ln(POP) of host	-0.36	-1.17	-0.03	0.36	1.01	0.03	0.36	1.11	0.03
	(-3.31)***	(-1.43)	(-2.12)**	(78.13)***	(11.25)***	(24.47)***	(91.62)***	(39.49)***	(24.03)***
Ln(GDP-PC) of host	-0.17	-0.07	-0.0002	0.13	-0.09	-0.002	0.17	0.03	0.0007
	(-2.87)***	(-0.90)	(-0.05)	(8.15)***	(-0.92)	(-1.00)	(11.32)***	(0.83)	(0.42)
Ln(DIST)				-0.05	-0.09	-0.002	-0.08	-0.08	-0.002
				(-5.55)***	(-1.07)	(-1.23)	(-5.08)***	(-2.27)**	(-1.04)
Border							-0.05	0.07	0.001
							(-1.42)	(0.65)	(0.23)
Language							0.16	0.12	0.01
							(4.82)***	(2.19)**	(1.42)
Latitude							-0.002	-0.001	-0.0002
							(-2.87)***	(-2.61)***	(-1.47)
Landlocked							-0.07		0.001
							(-3.53)***		(0.55)
RTA							0.01	-0.14	0.001
							(0.94)	(-3.97)***	(0.57)
Currency Union								11.23	0.009
								(104.96)***	(1.23)
Adj R^2	0.44	0.43	0.58	0.95	0.87	0.76	0.96	0.98	0.77
Within R^2	0.13	0.15	0.01						
S.E. of regression	0.16	0.66	0.02	0.12	0.60	0.02	0.11	0.22	0.02
F-statistic	275.60	294.92	352.78						
N	993	1015	780	325	407	331	325	391	331

Notes: (i) White heteroskedasticity-consistent standard errors and covariances calculated.
(ii) t-statistics in parentheses.
(iii) Time dummies are used in column (1) and source country dummies are used in columns (2) and (3).
(iv) * indicates 10% significance level, ** 5% significance, *** 1% significance

Table 3.6A.2. Controlling for Legal Origin - OLS on Estimated Fixed Country-Pair Effects

Dependent Variable: Estimated fixed country-pair effects

	1			2			3		
	N-N	N-S	S-N	N-N	N-S	S-N	N-N	N-S	S-N
Ln(POP) of host	0.36	1.01	0.03	0.36	1.01	0.03	0.36	1.11	0.03
	(78.13)***	(11.25)***	(24.47)***	(81.77)***	(11.11)***	(23.07)***	(91.14)***	(39.48)***	(23.63)***
Ln(GDP-PC) of host	0.13	-0.09	-0.002	0.14	-0.09	-0.001	0.17	0.03	0.0008
	(8.15)***	(-0.92)	(-1.00)	(9.17)***	(-0.91)	(-0.55)	(11.58)***	(0.83)	(0.38)
Ln(DIST)	-0.05	-0.09	-0.002	-0.04	-0.09	-0.002	-0.07	-0.08	-0.002
	(-5.55)***	(-1.07)	(-1.23)	(-4.80)***	(-1.05)	(-1.08)	(-4.81)***	(-2.21)**	(-1.01)
Common Legal Origin				0.10	-0.04	0.003	0.04	-0.0002	0.0001
				(4.79)***	(-0.60)	(0.91)	(2.42)**	(-0.01)	(0.06)
Border							-0.05	0.07	0.001
							(-1.62)	(0.63)	(0.23)
Language							0.14	0.12	0.01
							(4.12)***	(2.26)**	(1.55)
Latitude							-0.001	-0.001	-0.0002
							(-2.74)***	(-2.56)***	(-1.46)
Landlocked							-0.06		0.001
							(-3.03)***		(0.54)
RTA							0.01	-0.14	0.001
							(0.78)	(-3.96)***	(0.56)
Currency Union								11.23	0.009
								(104.44)***	(1.22)
Adj R^2	0.95	0.87	0.76	0.95	0.87	0.76	0.96	0.98	0.77
S.E. of regression	0.12	0.60	0.02	0.12	0.60	0.02	0.11	0.22	0.02
N	325	407	331	325	407	331	325	391	331

Notes: (i) White heteroskedasticity-consistent standard errors and covariances calculated.
(ii) t-statistics in parentheses.
(iii) Source country dummies are used in all columns
(iv) * indicates 10% significance level, ** 5% significance, *** 1% significance

Table 3.6A.3. Trade as explanatory variable – OLS on Fixed Country-Pair Effects

Dependent Variable: Estimated fixed country-pair effects

	1			2			3		
	N-N	N-S	S-N	N-N	N-S	S-N	N-N	N-S	S-N
Ln(POP) of host	0.36	1.01	0.03	0.29	1.00	0.02	0.32	1.08	0.02
	(78.13)***	(11.25)***	(24.47)***	(19.51)***	(13.63)***	(5.29)***	(27.21)***	(47.97)***	(7.09)***
Ln(GDP-PC) of host	0.13	-0.09	-0.002	0.08	-0.09	-0.007	0.12	-0.01	-0.002
	(8.15)***	(-0.92)	(-1.00)	(4.21)***	(-1.10)	(-1.54)	(6.44)***	(-0.47)	(-1.19)
Ln(DIST)	-0.05	-0.09	-0.002	0.04	-0.07	0.004	-0.02	-0.04	0.002
	(-5.55)***	(-1.07)	(-1.23)	(2.80)***	(-0.69)	(1.37)	(-0.89)	(-1.79)*	(0.76)
Ln(Trade)				0.10	0.02	0.006	0.06	0.05	0.004
				(6.08)***	(0.43)	(1.79)*	(4.27)***	(1.77)*	(1.88)*
Border							-0.04	0.03	-0.003
							(-1.44)	(0.22)	(-0.50)
Language							0.13	0.11	0.008
							(3.90)***	(2.25)**	(1.24)
Latitude							-0.0008	-0.002	-0.0002
							(-1.56)	(-3.25)***	(-1.45)
Landlocked							-0.04		0.0006
							(-1.77)*		(0.22)
RTA							0.002	-0.13	-0.0004
							(0.18)	(-3.47)***	(-0.21)
Currency Union								11.26	0.009
								(100.86)***	(1.13)
Adj R^2	0.95	0.87	0.76	0.96	0.87	0.75	0.96	0.98	0.76
S.E. of regression	0.12	0.60	0.02	0.11	0.63	0.02	0.10	0.22	0.02
N	325	407	331	325	371	314	325	371	314

Notes: (i) White heteroskedasticity-consistent standard errors and covariances calculated.
(ii) t-statistics in parentheses.
(iii) Source country dummies are used in all columns
(iv) * indicates 10% significance level, ** 5% significance, *** 1% significance

Table 3.6A.4. Controlling for Telephone Traffic – OLS on Fixed Country-Pair Effects

Dependent Variable: Estimated fixed country-pair effects

	1			2			3		
	N-N	N-S	S-N	N-N	N-S	S-N	N-N	N-S	S-N
Ln(POP) of host	0.34	1.01	0.02	0.29	1.00	0.02	0.32	1.10	0.02
	(33.78)***	(10.10)***	(6.85)***	(19.78)***	(11.44)***	(4.14)***	(27.60)***	(60.95)***	(5.89)***
Ln(GDP-PC) of host	0.12	-0.09	-0.007	0.09	-0.09	-0.009	0.12	0.01	-0.004
	(7.24)***	(-0.78)	(-1.48)	(4.59)***	(-0.94)	(-1.56)	(6.68)***	(0.49)	(-1.48)
Ln(DIST)	-0.007	-0.09	0.005	0.04	-0.09	0.007	-0.02	-0.06	0.004
	(-0.49)	(-0.80)	(1.46)	(2.69)***	(-0.65)	(1.52)	(-1.10)	(-1.87)*	(1.31)
Ln(Tel)	0.04	0.01	0.004	0.01	0.0008	0.004	-0.0007	-0.003	0.002
	(3.64)***	(0.43)	(1.67)*	(1.23)	(0.04)	(1.57)	(-0.08)	(-0.24)	(1.68)*
Ln(Trade)				0.09	0.04	0.003	0.06	0.08	0.004
				(4.49)***	(0.81)	(1.73)*	(3.55)***	(3.59)***	(1.69)*
Border							-0.05	-0.08	-0.004
							(-1.50)	(-0.75)	(-0.66)
Language							0.13	0.13	0.005
							(3.77)***	(2.14)**	(0.80)
Latitude							-0.0008	-0.003	-0.0002
							(-1.51)	(-3.99)***	(-1.36)
Landlocked							-0.04		0.001
							(-1.78)*		(0.33)
RTA							-0.0009	-0.10	-0.0002
							(-0.07)	(-3.02)***	(-0.06)
Currency Union								11.34	0.0001
								(129.30)***	(0.03)
Adj R^2	0.95	0.87	0.73	0.96	0.87	0.72	0.96	0.99	0.72
S.E. of regression	0.12	0.62	0.02	0.11	0.65	0.02	0.10	0.17	0.02
N	320	364	300	320	333	287	320	333	287

Notes: (i) White heteroskedasticity-consistent standard errors and covariances calculated.
(ii) t-statistics in parentheses.
(iii) Source country dummies are used in all columns
(iv) * indicates 10% significance level, ** 5% significance, *** 1% significance

Table 3.6A.5. Robustness Checks- Outliers

Dependent Variable: FDI Inflows / GDP

	1		
	N-N	N-S	S-N
Ln(POP) of host	0.34	1.12	0.03
	(48.36)***	(120.94)***	(50.39)***
Ln(GDP-PC) of host	0.13	0.02	-0.0005
	(9.38)***	(1.36)	(-0.46)
Ln(DIST)	-0.01	-0.03	0.0009
	(-1.11)	(-2.09)**	(1.39)
Ln (Trade)	0.04	0.04	0.001
	(4.38)***	(3.31)***	(2.97)***
Border	-0.009	0.15	0.0003
	(-0.45)	(2.64)***	(0.10)
Language	0.07	0.06	0.005
	(3.93)***	(2.29)**	(2.41)**
Latitude	-0.0006	-0.001	0.00005
	(-2.05)**	(-4.06)***	(0.30)
Landlocked	-0.02		-0.0002
	(-1.12)		(-0.15)
RTA	-0.003	-0.07	-0.0004
	(-0.31)	(-3.81)***	(-0.30)
Currency Union		11.45	0.004
		(213.30)***	(2.44)**
Adj R^2	0.99	0.99	0.98
S.E. of regression	0.06	0.09	0.005
N	312	361	309

Notes: (i) White heteroskedasticity-consistent standard errors and covariances calculated.
(ii) t-statistics in parentheses.
(iii) Time and source country dummies are used in all regressions.
(iv) * indicates 10% significance level, ** 5% significance, *** 1% significance

APPENDIX 3.7

3.7A Modelling FDI Flows – Panel Fixed-Effects Regression Results

Model 4 is a fixed-effects model of the sum of bilateral inflows and outflows, the same dependent variable used in Model 2.

Model 4:

$$\text{Ln}(\text{Flow}_{ijt}) = \alpha_{ij} + \beta_1 \ln(\text{POP}_{i,t}\,\text{POP}_{j,t}) + \beta_2 \ln(\text{GDPPC}_{i,t}\,\text{GDPPC}_{j,t}) + t_2 + t_3 + t_4 + \varepsilon_{ij,t} \quad (2a)$$

$$\hat{\alpha}_{ij} = \lambda + \delta_1 \ln(\text{POP}_i\text{POP}_j) + \delta_2 \ln(\text{GDPPC}_i\,\text{GDPPC}_j) + \delta_3 \ln(\text{DIST}_{ij}) + \delta_4 Z_{ij} + u_{ij} \quad (2b)$$

where:

$\text{Flow}_{ij,t}$:	Sum of gross bilateral FDI inflows and outflows between country i and j at time t,
$\text{POP}_{i,t}$:	population of reporting country i at time t,
$\text{POP}_{j,t}$:	population of partner country j at time t,
$\text{GDPPC}_{i,t}$:	GDP per capita of reporting country i at time t,
$\text{GDPPC}_{j,t}$:	GDP per capita of partner country j at time t,
DIST_{ij} :	great circular distance between country i and j
$\hat{\alpha}_{ij}$:	estimated fixed country-pair effects,
$Z_{ij,t}$:	control variables

In equation (2a), the FDI flows is regressed on the size of the reporting and partner country, GDP per capita of both countries, and time dummies in a fixed effects model. In equation (2b), the estimated country-pair fixed effects (estimated by equation 2a) are regressed on the average size of the reporting and partner countries, the average GDP per capita of the two countries, the distance between the two and the common border and language variables. The dependent variable used in the regression analysis

reported in Table 3.7A.1 is the logarithm of FDI flows between country pair i and j. Column (1) concentrates on the time-series dimension of the data set and includes time dummies. Columns (2) and (3), concentrate on the cross-country dimension.

3.7A.1 North-North FDI Flows

The size of reporting and partner countries is both economically and statistically the most important determinant for North-North FDI flows. For one percent increase in the size of two countries, the two-way flows of FDI increases by 1.94 percent (column (3)). The level of development of the same countries is only statistically significant and a positive determinant of FDI flows in the time-series dimension. Distance between the two countries has the same negative effect, with 0.86 percent decrease for one percent increase in distance. The common border is negatively correlated and statistically significant determinant of North-North flows. Sharing a common language positively affects FDI flows. The specification in column (2) explains 90 percent of the cross-country variation in FDI flows.

3.7A.2 North-South FDI Flows

The size and the level of development of the North and South countries are both statistically significant and positive determinant of cross-country FDI flows; economically size being the more important variable. Distance is a significant determinant of North-South FDI flows and has the expected negative sign. Sharing a common border and language has a statistically significant and positive effect on FDI flows. The specification in column (3) explains 23 percent of the cross-country variation in North-South FDI flows.

3.7A.3 Differences/Similarities between North-North and North-South FDI Flows

Size of both country i and j have an economically and statistically significant relationship with two-way FDI flows: North-North flows increase by 1.94 percent and North-South flows increase by 0.43 percent when size increases by one percent. The level of development is only significant for North-South FDI flows.

Distance between the two countries is a significant determinant for both, economically more significant for North-North FDI flows. Distance elasticity for North-North FDI is –0.86 whereas it is –0.34 for North-South FDI flows.

Sharing a common language is positively and significantly correlated to two-way FDI flows for both groups with similar economic impact. Sharing a common border, however has a positive effect on North-South flows but a negative effect on North-North FDI, same as results from pooled OLS.

All variables, with the exception of the level of development, are significant determinants of North-North flows. Size is by far economically the most significant determinant. There is also evidence, in our data, that North-North FDI flows are determined by geographical factors; distance and common border and language are statistically significant. For North-South flows, the economic impact of common border and language play a more significant role compared to the fundamentals. Overall, the model is a better fit for explaining North-North FDI than North-South FDI; R^2 for North-North is 90 percent and for North-South, it is 23 percent.

3.7A.4 Robustness

The significance of the determinants of North-North and North-South FDI flows is robust to the exclusion of outliers (Table 3.7A.2)[10]. When the outliers from column (3) Table 3.7A.1 are excluded, for North-North flows, the size, common border and language dummy variables decrease in economic significance, whereas distance nearly remains unchanged. The R^2 increases to 92 percent from 90 percent.

The only effect of outliers on North-South FDI flows is that the economic significance of common border decreases[11]. The border between US and Mexico facilitates two-

[10] The outliers for North-North FDI flows are Australia-New Zealand, US-Netherlands, Finland-Italy, Austria-Finland, Austria-Italy, Denmark-Italy, Iceland-Italy and Norway-Italy.
[11] The outliers for North-South FDI flows are Austria-Israel, Belgium-Luxembourg-South Africa, Belgium-Luxembourg-Singapore, Italy-Taiwan, Netherlands-Colombia, Netherlands-Indonesia, Netherlands-Malaysia, NewZealand-Indonesia, Portugal-Turkey, Portugal-Hong Kong, Spain-Iran, Spain-Taiwan, UK-Malaysia, and US-Panama.

way direct investment: an example of vertical investment for US-to-Mexico FDI and a way of avoiding trade barriers for Mexico in the US[12].

[12] Most of Mexico's FDI in the US is in the manufacturing sector (BEA).

Table 3.7A.1. FDI Flow - Fixed Effects Panel Estimation

Dependent Variable: Log of FDI flows (in 1987 US$ constant)

	Fixed-Effects Estimation (1b)		OLS (1a)		OLS (1a)	
	N-N	N-S	N-N	N-S	N-N	N-S
$Ln(POP_iPOP_j)$	-0.99	0.44	1.94	0.43	1.94	0.43
	(-1.45)	(0.49)	(30.20)***	(6.36)***	(31.85)***	(6.50)***
$Ln(GDP\text{-}PC_iGDP\text{-}PC_j)$	0.65	1.02	0.34	0.30	0.24	0.27
	(1.88)*	(5.05)***	(1.56)	(2.64)***	(1.15)	(2.47)***
Ln(DIST)			-0.72	-0.22	-0.86	-0.34
			(-6.88)***	(-1.28)	(-8.54)***	(-1.98)**
Border					-0.79	1.22
					(-2.04)***	(3.34)***
Language					1.88	1.89
					(5.49)***	(8.01)***
Adj R^2	0.88	0.78	0.87	0.14	0.90	0.23
S.E. of regression	0.69	0.97	1.31	1.64	1.18	1.56
N	423	580	147	276	147	276

Notes: (i) White heteroskedasticity-consistent standard errors and covariances calculated.
(ii) t-statistics in parentheses.
(iii) Time dummies are used in column (1)
(iv) * indicates 10% significance level, ** 5% significance, *** 1% significance

Table 3.7A.2. Robustness Checks – Outliers (Fixed Effects Estimation)

Dependent Variable: Log of FDI flows (in 1987 US$ constant)

	N-N	N-S
$Ln(POP_iPOP_j)$	1.90	0.47
	(35.57)***	(7.93)***
$Ln(GDP\text{-}PC_iGDP\text{-}PC_j)$	0.28	0.36
	(1.43)	(3.91)***
Ln(DIST)	-0.87	-0.49
	(-9.08)***	(-3.11)***
Border	-0.61	0.89
	(-1.94)**	(2.61)***
Language	1.58	1.95
	(5.12)***	(8.42)***
Adj R^2	0.92	0.31
S.E. of regression	1.00	1.33
N	139	262

Notes: (i) White heteroskedasticity-consistent standard errors and covariances calculated.
(ii) t-statistics in parentheses.
(iii) Time dummies are used in column (1)
(iv) * indicates 10% significance level, ** 5% significance, *** 1% significance

Chapter 4

FOREIGN DIRECT INVESTMENT, TRADE AND PORTFOLIO INVESTMENT FLOWS: THE ROLE OF GEOGRAPHY

4.1 Introduction

The aim of this chapter is to examine the role of geography in explaining the spatial allocation of bilateral foreign direct investment, trade and portfolio investment flows. Foreign direct investment flows to developing countries have increased considerably in the 1990s, and they are now a major source of capital flows. Although trade in assets is still biased towards domestic markets, the surge in international investment has improved financial integration of emerging markets, to levels reminiscent of the late 19th century (IMF, 1997). The financial and currency crises that followed in the 1990s, have altered the focus from explaining the determinants of capital flows to sustaining stability in international capital markets. These crises have proven that reversal of large inflows can have high macroeconomic costs not only for the countries of origin but also for countries that are affected through contagion.

The main motivation for this chapter is to extend the analysis of Chapter 3 to examine specifically the spatial patterns of bilateral trade, and compare them to the patterns of bilateral FDI flows. In the previous chapter, the effect of bilateral trade on FDI was examined. In this chapter, we aim to find answers to two questions. The first question is whether standard gravity variables have the same effect on bilateral trade as on FDI. The second question is whether the degree of sensitivity of trade and FDI to these variables differs. The answers to these questions may have important policy implications, since the degree of economic integration of a country can be measured by its ability to trade and to attract foreign finance. In other words, geography may determine a country's prospects of economic integration.

Another motivation for this chapter is to examine the determinants of bilateral portfolio investment using the IMF 1997 Comprehensive Portfolio Investment Survey. This IMF survey allows us to answer the question whether portfolio investment assets are attracted to host countries with similar fundamentals and location determinants as FDI assets. Examining the individual behaviour of different

types of capital flows before, during and after crisis revealed that portfolio investment and loans have been much more volatile and have even turned negative, whereas direct investment flows have remained stable (Lipsey, 2001; World Bank 1999; UNCTAD, 1998). Among increased support for capital controls, some scholars argued that providing stability in international markets could be achieved through encouraging foreign direct investment (FDI), rather than highly volatile debt-creating flows (Rogoff, 1999). As a result, studies on the determinants of individual types of capital flows, particularly on FDI and portfolio investment, have gained a new momentum.

In the empirical part of this chapter, we examine the determinants of North-North, North-South and South-North FDI, trade and portfolio investment flows using a modified gravity model, which allows a direct comparison of the standard gravity variables and other factors that affect each group of bilateral flow. Specifically, we examine the effect of these variables on trade flows and portfolio investment to highlight any similarities with patterns of FDI flows.

As international capital flows among industrial countries have soared in the 1980s, and the flows from industrial to developing countries have resumed their pre-debt crisis levels, the literature on international capital mobility once again came to the forefront. However, despite large absolute amounts of capital flows, and perceived benefits from capital mobility, the studies on the international capital markets suggest that, in fact, capital is not as mobile as it should be. The home bias literature argues that there is considerable market friction caused by imperfect information, that the countries' foreign asset portfolios are biased towards the domestic market and not optimally diversified (French and Poterba, 1991; Lucas, 1990; Tesar and Werner, 1995)[1]. The home bias remains strong in domestic markets despite increased economic integration facilitated by lower barriers to trade and financial flows.

Some scholars argue that the home bias can be explained by information asymmetries in international capital markets. By nature, the borrowers have superior information on the risk-return prospects of an investment project compared to the lenders, and

[1] Ahearne, Griever and Warnock (2000) show that in the U.S. there is strong evidence of home bias in international portfolios.

information is costly. The cost of information for cross-border investment is further magnified, compared to domestic financial markets, due to geographical and cultural distance. As the physical distance between two countries increase, the cost of information is likely to increase also. Having different legal cultures, accounting principles, and languages complicate accurate information collection and interpretation[2]. The geographical variables that are included in the gravity model can capture such information costs that increase with proximity to the host market, or its accessibility.

The relation between trade and FDI is well established although there is contradictory empirical evidence whether FDI is a substitute for trade, or a complement. Also, to the extent that trade and FDI are driven by the same geographical factors, the economic development of a country that is disadvantageously located may be slow, since both trade and FDI are associated with promoting growth in the host countries (David and Loewy, 1997; Dollar and Kraay, 2001; Borenzstein *et al*, 1998). In this chapter, the impact of standard gravity variables on FDI is compared to their impact on trade. In other words, the aim of this chapter is to establish whether there are differences in the host country characteristics that attract trade versus FDI. Also, among these factors, we ask if geography can explain the spatial allocation of both types of flows. The more interesting question is if international direct investment decisions are more or less affected by location compared to trade flows.

The patterns of portfolio investment are examined in a gravity model to highlight the similarities/differences to FDI, with an emphasis on geographical factors. Following the recent crises, there has been increased interest in individual types of capital flows since they all have different characteristics, in terms of volatility, fungibility or substitutability. For example, FDI is often accepted to be a long-term investment, with positive spillovers of technology and managerial skills. During the recent Asian crisis, FDI was also observed to be less volatile compared to portfolio flows. Fernandez and Hausman-Arias(2000) argue that FDI is often considered to be 'bolted', whereas

[2] Obstfeld and Rogoff (1996), argue that, due to such imperfect information, there are restrictions on the range of financial contracts people can sign and contracts may not always be honoured.

portfolio flows can reverse easily[3]. Our objective in this chapter is to compare portfolio and FDI flows, and specifically to examine the differential impact of gravity variables. In other words, we are not interested in examining which type of flow is more volatile, per se, but to examine what kind of host country characteristics, including geographical factors, affect portfolio versus FDI inflows.

The remainder of this chapter is organised as follows. In Section 4.2, the role of geography on FDI, trade and portfolio flows is discussed and some results from relevant literature are summarised. Section 4.3 introduces the pooled least squares model and the data sources. Section 4.4 reports regression results using pooled least squares on trade and compares it to results on FDI flows. Section 4.5 compares patterns of portfolio flows versus FDI, using results of cross-section OLS regression. Section 4.6 reports results of cross-section OLS analysis comparing FDI, trade and portfolio investment to highlight the differential effect of standard gravity variables. Finally, section 4.7 concludes.

4.2 The Role of Geography

Although gravity models are widely used in international trade, and had considerable empirical success, studies that relate geographical factors to international financial flows are rare. However, there is a growing body of literature on economic activity and geography, which explain international trade by adding elements of increasing returns to scale, imperfect competition and product differentiation (Markusen and Venables, 1998; Markusen, 1995). In a theoretical work, Krugman (1992) extends on an earlier static model to show that economic geography involves a tension between agglomeration (centripetal) and centrifugal forces that pull them apart. Among other factors, he examines the role of 'market access' in determining manufacturing location. In this chapter

[3] However, Claessens *et al* (1995) show that the volatility of capital flows cannot be differentiated by their labels.

Some empirical studies, for example, by Head *et al* (1995), show that there are industry-level agglomeration benefits in location decisions of Japanese investment in the US. In a study on the location decisions of US multinationals, Mody and Wheeler (1992) also find support for agglomeration benefits. In another study, Davis and Weinstein (1998) find empirical support for the importance of increasing returns using OECD data, and highlight the importance of market access, when there is increasing returns with costs to trade.

In this chapter, it is argued that FDI flows exhibit strong signs of geographical concentration (Shatz and Venables, 2001; Ghosh and Wolf, 1998). Such concentration suggests that geography may have a role to play in attracting financial flows (FDI and/or portfolio investment) to certain countries in certain regions. The economic geography literature is not only popular in international trade but also in growth economics. Some recent work on economic development argues that geography matters directly for macroeconomic growth (Henderson *et al*, 2000; Gallup *et al*, 1999). Gallup *et al* (1999) found that location and climate have large effects on the level of development and income growth. This may suggest that geography has an indirect effect on flows, such as FDI, trade and portfolio through its effect on growth of the host economy.

Comparative studies on the role of geography and the spatial allocation of FDI flows, trade and portfolio flows have been rare. In a study by Ghosh and Wolf (1998), outward FDI stock from G-7 is examined, in a gravity model framework, in order to assess which host country characteristics are significant. They show that when FDI is regressed on the explanatory variables (bilateral distance, dummy for common borders and common language, a measure of remoteness and market size of the recipient country (GDP) and its development level (GDP per capita)), all distance elasticities have a negative sign. This, they conclude, indicated that proximity is important in monitoring FDI. They also find evidence that when FDI, trade and portfolio equity are compared, FDI has the highest distance elasticity.

Eaton and Tamura (1994) apply a modified gravity model to analyse Japanese and US bilateral FDI and trade positions. Their model incorporates measures of income, population, land-labor ratio, average level of education and region in a sample of 100

countries for the period 1985-1990. Instead of the distance variable, they use region dummies in maximum likelihood tobit estimations. They argue that in their regional fixed effects model, they capture the effect of distance and other regional factors. Their findings indicate that both US and Japan's FDI relationship is stronger with countries that are nearby. Overall, this study indicates that factors that affect trade also affect FDI flows.

In another study, Di Mauro (2000) examines the effect of economic integration on FDI relative to that on exports. In a gravity style model, log of FDI (or trade) is regressed on the relative distance between countries, the 'economic space' variable and an index of size similarity, as well as a variable that captures differences in relative endowments. Their results indicate that distance elasticity is always negative both for exports and FDI, however, relatively, trade is more sensitive to changes in the distance to the host market.

There are also a small number of studies that examine FDI and portfolio flows using a gravity model (see Literature Review in Chapter 3 for a discussion on empirical work on FDI using gravity models). Portes and Rey (2000) use a gravity-style approach on a panel data of bilateral equity flows. Their findings indicate that gross assets flows positively depend on market size of both the source and host country, and negatively on the distance between the two countries. They interpret the negative sign for distance variable as the existence of information costs for equity transactions as part of trading costs.

Overall, the results from these studies indicate that the behaviour of standard gravity variables is similar to the results from international trade studies. FDI and portfolio equity is attracted to countries with larger markets, and higher levels of development. The distance variable has a negative effect on FDI and portfolio equity inflows, as it does on bilateral trade. These results are in general dependent on the specification used.

4.3 Modelling FDI Inflows – Pooled Least Squares Model

4.3.1 Model

In the empirical part of this chapter, a modified gravity model is used to analyse the locational determinants of FDI, trade and portfolio bilateral flows. The ability of gravity models to incorporate both macroeconomic and geographical factors makes it an obvious choice for our model. Such models have had both empirical and theoretical success in explaining bilateral trade flows. The use of gravity models in bilateral trade flows is a relatively recent phenomenon. Tinbergen (1962) was among the first to present such models. He presented a model in which the volume of trade between any two countries is determined by gross national product (GNP) in home country, GNP in the host country and the geographic distance between their main economic centers.

The gravity model presented below aims to identify the significant determinants that make a host country attractive to FDI, trade and portfolio inflows and is specified as follows:

Model :

$$\text{Ln}(\text{Inflw}_{ijt}) = \alpha + \beta_1 \ln(\text{POP}_{i,t}) + \beta_2 \ln(\text{GDPPC}_{i,t}) + \beta_3 \ln(\text{DIST}_{ij}) + \beta_4 Z_{ij} + t_t + d_j + \varepsilon_{ij,t} \quad (4.1)$$

where:

$\text{Inflw}_{ij,t}$:	Gross bilateral FDI, trade or portfolio inflows to host country i from partner country j at time t in constant dollars[4],
$\text{POP}_{i,t}$:	Population of receiving country i at time t,
$\text{GDPPC}_{i,t}$:	GDP per capita of receiving country i at time t,
DIST_{ij} :	distance between country i and j,
$Z_{ij,t}$:	control variables,
t_t :	time dummies (t_1=1980-84, t_2=1985-89, t_3=1990-94, t_4=1995-98),
d_j :	source country dummies, $\varepsilon_{ij,t}$: error term.

[4] For North-North FDI inflows, the set of source and home countries are identical. Only this group suffers from mirror statistics discrepancies where the same data is reported by two different sources (e.g. US reporting inflows from Japan and Japan reporting outflows to US). For this reason, North-North FDI flows are calculated as the average of the two values reported by the source and host countries.

Model 1 is a pooled OLS model that regresses log of the dependent variable on the log of size, log of GDP per capita of the host country, the distance between the host and source country and a set of control variables. The model also includes time and source country dummies. While time dummies control for the effect of common global events, source country dummies control for such source country characteristics that may affect outward FDI, as size and level of development. Although the model is estimated by OLS on pooled time-series cross-section data, it is, in a sense, a quasi-fixed effects model because it includes source country dummies. The dependent variable, POP, GDP per capita and distance variables are in logs. The coefficients for the variables in logs can, therefore, be interpreted as elasticities.

The set of control variables that are included in the regression analysis are mostly dummy variables specific to the host-source country pair.

Where:

BOR_{ij}:	1 if the host and source country share a common land border, 0 otherwise,
$LANG_{ij}$:	1 if the host and source country share a common language, 0 otherwise,
LAT_i:	latitude of the capital city of the host country i,
$LAND_i$:	1 if the host country has no access to any seas and oceans, or navigable waters, 0 otherwise,
RTA_{ij}:	1 if the host and source country are in a regional trade agreement, 0 otherwise,
CU_{ij}:	1 if the host and source countries are in a currency union, 0 otherwise.

Extending the use of gravity model to analyse the determinants of FDI and portfolio flows can be based on two arguments. Recalling discussion on the use of gravity models in explaining FDI from Chapter 3, the connection between FDI and trade is

mostly accepted to be complementary[5]. Countries with relatively high bilateral trade shares tend to have relatively high bilateral FDI shares. This could be based on the fact that trade linkages provide information about the host countries, thereby making it less costly (i.e. cost of information gathering or cost of familiarity) to invest directly in the same countries[6]. In addition, trade and FDI may be driven by the same factors.

Second, the distance component of gravity models not only reflects physical but also cultural distance. In the international trade literature, the distance variable is used to proxy for transport costs, implying reduced trade with increased distance. However, transport costs would likely play an insignificant role in the asset trade, especially for portfolio investment, and even for the FDI flows. Most North-North FDI flows are in the form of mergers and acquisitions, implying no physical transfer of assets except in the form of human capital[7]. However, distance may also proxy for information costs. The cost of information gathering would likely increase with distance, as familiarity with the host country's investment opportunities, customs and culture decreases.

4.3.2 Data

The FDI flow data are obtained from the OECD's International Direct Investment Database. The OECD's International Direct Investment Database (1999) provides data on bilateral inflows and outflows of FDI over the period 1980-1999[8]. Each OECD member country reports bilateral "outflows to" and "inflows from" other member and a number of partner countries. All values were originally expressed in reporting countries' own national currency units, which were then converted into constant 1987 US$ using OECD's yearly average exchange rates and US GDP deflator. There are 20 developed countries in our sample categorized as 'North' and 30 developing countries, including three OECD member countries (Korea, Mexico and Turkey) as South (See Appendix 4.1)[9].

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[5] In some cases, for example in the presence of trade barriers, it is argued that trade and FDI may be substitutes (Markusen, 1995).
[6] See Honohan and Lane (2000) on case study of Ireland.
[7] See World Investment Report 1998 (UN).
[8] For completeness, it would have been ideal to include South-South FDI flows in this study. However, comparable data do not exist.
[9] The FDI data are missing for Greece and Ireland and also for recently joined Eastern European members.

Bilateral trade data is obtained from IMF's Direction of Trade Statistics CD-Rom (1999). North-North bilateral trade data is imports (c.i.f.) to country i from country j in millions of US$ deflated by the GDP deflator. North-South trade data are exports from North to South (c.i.f.) and South-North data are imports to North from South, as reported by North. The bilateral portfolio investment data is from an IMF survey, 1997 Comprehensive Portfolio Investment Survey. Only this set of data is available in stocks as year end-1997 in US$ millions, including both equity and long-term bond stocks.

The same set of explanatory variables as in Chapter 3 is utilized in this chapter. The data on the explanatory variables come from various sources (See Appendix 4.2). The market size and income of the host country are two macroeconomic variables that are used consistently in contemporaneous literature as determinants of FDI, as well as of trade. The World Investment Report (UN, 1998) includes size and the level of income as the important host country determinants especially for market seeking FDI. As well as a large market to serve to, a larger economy may also present a more diverse opportunity for investment. Ghosh and Wolf (1998) find that host country size is important for FDI, "*reflecting greater fixed costs of compliance with local regulations for financial activity*".

As broadly discussed in the previous chapter, in our model, both size (proxied by population) and income (GDP per capita) are included as well as the distance between the source and host country, to form the standard gravity model. The distance between two countries is proven to be a significant determinant of bilateral trade flows both statistically and economically (Frankel *et al*, 1993; Frankel, 1997). Similarly, distance between a host and source country can be a significant location determinant that help explain the geographical allocation in FDI flows and portfolio investment. In this study, the *distance* variable is used to capture the cost of information gathering rather than transport costs as in traditional trade models. Since the relative ease of acquiring information about investment opportunities of a country will decline with distance, one would expect a negative relationship between FDI inflows/portfolio investment and distance.

The basic gravity specification is augmented by inclusion of dummy variables for common border (BORDER) and common language (LANG). BORDER and LANG dummy variables take the value of 1 if the country pair shares a common border and language, 0 otherwise. The expected sign for both variables is positive, implying that for a given distance, countries that share a common border and a common language expect to see higher FDI flows or portfolio investment than countries that do not[10].

Other control variables that are entered together in the final specification can be categorised as other geographical factors (latitude, landlocked), and trade-related factors (Regional Trade Agreements (RTA) and currency unions). A list of variable definitions and data sources are outlined in Appendix 4.2.

4.4 FDI and Trade – Pooled Least Squares Analysis

In this section, the effect of standard gravity variables on trade is compared to their effect on FDI. Table 4.1 reports results of the regression analysis of the impact of standard gravity variables on trade versus FDI. The dependent variable is log of bilateral trade to country i from country j at time t. In the first column of Table 4.1, the log of trade is regressed on standard gravity variables and common border and language dummies. In the second column all control variables are introduced together. In both columns, the effect of individual variables on FDI versus trade can be compared.

4.4.1 North-North Trade versus FDI

The standard gravity variables, size, income per capita and distance between host and source countries, are all statistically significant and robust to the inclusion of other control variables for North-North trade. The size and income of the host country have a positive relation, whereas distance has the expected negative sign. In the second specification, which includes all control variables, an increase of 10 percent in the size of the host country implies an increase of 7.7 percent in trade. If the income level of the host country increases by 10 percent, trade increases by 8.9 percent. When the

[10] Parsley and Wei (2000) argue that the national borders have a negative effect on market segmentation (i.e. the border effect), which may explain the home bias in goods and asset trade.

distance increases by 10 percent, trade decreases by 9.5 percent. Among all the other control variables, distance is economically the most significant.

When trade and FDI are compared, the results indicate that standard gravity and other control variables have the same direction of impact but their economic significance varies. For example, (Table 4.1 column (2)), the size of the host country is economically more significant for FDI than it is for trade. An increase of 10 percent in size implies that trade flows increases by 7.7 percent whereas FDI increases by 9.4 percent. This finding is in line with the market access theory for FDI, and supports the results of Shatz and Venables (2000) that most North-North FDI is horizontal. The majority of FDI inflows are attracted to North countries with large markets. The theoretical models of horizontal activity imply that the decision to direct invest is a trade-off between the additional fixed costs involved in setting up a new plant, and the saving in variable costs (transport costs and tariffs) on exports.

The income level of the host country is significant and positively related to both trade and FDI. However, economically income is more significant for trade than it is for FDI. When the income of the host country increases by 10 percent trade also increases by 8.9 percent, whereas FDI increases by 4.1 percent. The distance variable is statistically significant and has the same direction of impact: an increase of 10 percent in the distance between host and source country decreases trade by 9.5 percent whereas FDI decreases by 10.9 percent.

Sharing a common border is not significant for trade flows from North to North, however, sharing a common border has a negative effect on FDI. Countries that share a common land border may expect to receive 0.47 percent less FDI from a neighbouring country[11]. In our sample of industrial countries, all North countries that share a common land border are also in a RTA, indicating that there are no tariff costs to exports. If the transport costs are less than fixed costs involved in setting up a plant abroad, the investor would prefer to serve the host market via trade. The negative coefficient for border dummy can be driven by this effect. Sharing a common language increases both trade and FDI. Host countries that share the same language as

[11] $\text{Exp}^{(-0.63)} - 1 = -0.47$

a source country may expect only 0.70 percent more trade compared to 4.47 percent more FDI flows[12]. This result can be explained by the fact that FDI requires more control and scrutiny, and in such a case, sharing a common language (i.e. culture) can be invaluable.

The latitude of the host country, and whether it is landlocked or not, are both significant for trade and FDI. These two variables have the same direction of impact and also similar economic significance. North host countries that are situated at lower latitude may expect to receive both more trade and FDI flows from other North countries. This result may be driven by Australia as a significant host to FDI flows. Similarly, the North countries that are landlocked (i.e. Austria and Switzerland) receive both less trade and FDI from other North countries. The RTA dummy variable, however, is only significant for trade: when the host and source countries are in a RTA, the host country may expect more trade flows from source countries that are a member of the same RTA. Overall, the specification in column (2) explains 92 percent of the variation in trade, compared to 69 percent of the variation in FDI.

4.4.2 North-South Trade versus FDI

The standard gravity variables are significant determinants of both trade and FDI for North-South. Size and income level of the South host country attract more trade and FDI as they increase, whereas as distance increases trade as well as FDI, decrease. As for North-North flows, there are significant differences between trade and FDI in terms of the economic significance of these variables. Size of the South host country is more important for trade than it is for FDI: an increase of 10 percent in the size of the host country implies an increase of 6.0 percent in trade and an increase of 5.1 percent in FDI.

The level of income of the South host, as the size, is economically more significant for trade than it is for FDI: an increase of 10 percent in income implies an increase of 8.8 percent in trade and 7.4 percent in FDI. This may indicate that when 'market access' is the motivation, trade is preferred over FDI by industrial countries. Distance is more significant for FDI; an increase of 10 percent in the distance between South

[12] $Exp^{(0.53)} - 1 = 0.70$; $Exp^{(1.70)} - 1 = 4.47$

and North trading countries implies a decrease of 9.7 percent, whereas it implies a decrease of 5.7 percent in trade.

South host countries that share a common land border with a North trading partner may expect 1.03 percent more trade than countries that do not have a common border[13]. This result is entirely driven by US-Mexico, as this is the single country-pair sharing a common border in our sample. For FDI, common border dummy is not statistically significant. Sharing a common language is, as for North-North, a significant determinant of bilateral trade and FDI: countries that share a common language trade 0.82 percent more in goods and 4.26 percent more in assets[14].

Latitude variable is significant both for trade and FDI, although it has opposite impact on trade than it has on FDI: South countries that are situated in higher latitudes receive more trade, yet fewer FDI inflows. Being in a common RTA is FDI diverting for the South host countries, which may be evidence for tariff-jumping FDI. Sharing a common currency has a negative effect on trade and positive effect on FDI: South countries that share a common currency with a North country (i.e. US-Panama) receive 0.30 percent less trade, but 4.99 percent more FDI[15]. Overall, the specification in column (2) explains 82 percent of the variation in North-South trade compared to 60 percent in FDI.

4.4.3 South-North Trade versus FDI

Standard gravity variables are statistically significant for both South-North trade and FDI, and all have the expected sign. The size of the North host country is positively related to trade and FDI from South. As the size of the North host country increases by 10 percent trade increases by 9.9 percent and FDI increases by 5.9 percent (column (2)). Market size is more important for trade than it is for FDI, as was the case for North-South flows.

The income level of the North country is significant both for trade and FDI and it is positively correlated. Comparatively, the income level of the host country is

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[13] $Exp^{(0.71)} - 1 = 1.03$

[14] $Exp^{(0.60)} - 1 = 0.82$; $Exp^{(1.66)} - 1 = 4.26$

[15] $Exp^{(-0.35)} - 1 = -0.30$; $Exp^{(1.79)} - 1 = 4.99$

economically more important for FDI than it is for trade, in contrast to North-South flows[16]. Distance is economically more significant for trade than it is for FDI; an increase of 10 percent in distance decreases trade by 6.1 percent, FDI by 4.5 percent. In other words, South to North FDI is less sensitive to changes in distance compared to trade.

Sharing a common border and language are both statistically significant determinants of trade and FDI and are both positively correlated to the dependent variable. Sharing a common border and language is economically more important for FDI flows: countries that share a border may expect 1.56 percent more trade, and 3.81 percent more FDI from South (i.e. flows from Mexico to the US)[17]. North host countries that share the same language as a South home country receive 0.80 percent more trade and 5.89 percent more FDI[18].

Latitude of the host country is also statistically significant for trade and FDI, and has a negative sign. The landlocked dummy variable is also significant, however, it has a positive sign, contrary to expectations and results from North-North flows. The landlocked countries (Austria and Switzerland) receive more trade and FDI from South compared to countries that are not landlocked. Especially, for FDI a landlocked country receives 0.93 percent more FDI from South. Being in a currency union is only significant for FDI flows from South to North: countries that are in a currency union may receive 6.32 percent more FDI compared to countries that are not in a currency union (US-Panama). Overall, the specification in column (2) explains 83 percent of the variation in South-North trade compared to 37 percent of the variation in FDI.

4.4.4 Trade versus FDI

The results of the regression analysis on trade and FDI indicate that standard gravity variables have the same direction of impact on both. However, there are significant differences in their economic impact. For all the groups, both the size and income level of the host country are significant determinants of trade and FDI. Both trade and FDI inflows increase as the size and income of the host country increase. For North-

[16] This result is robust to the inclusion of US dummy.
[17] $Exp^{(0.94)} - 1 = 1.56$; $Exp^{(1.57)} - 1 = 3.81$
[18] $Exp^{(0.59)} - 1 = 0.80$; $Exp^{(1.93)} - 1 = 5.89$

South and South-North flows, trade is more sensitive to changes in the size of the host market compared to FDI. This may suggest that trade is preferred over FDI to serve large markets. In contrast, North-North FDI flows have larger size elasticity. Controlling for distance and income, and all other variables, the developed countries may prefer FDI to trade when access to larger markets is the key motivation.

The level of development is economically more significant for trade than it is for FDI for North-North and North-South flows. North source countries trade in goods and assets more with other North or South countries that have a higher level of development. For FDI, income of the host country may also proxy for relative wages, as well as the level of infrastructure. For the North-North FDI flows, income may economically be less significant because of a threshold effect. Since all North countries are high-income earners, they represent a more homogenous group compared to South, evidenced by higher income elasticity of FDI for South host countries than for North host countries. In contrast, for South-North flows income elasticity is higher for FDI than it is for trade.

Distance between the host and source country has a negative effect on both trade and FDI for all groups: as the distance increases both trade and FDI decrease for all groups. However, FDI is more sensitive to changes in distance for North-North and North-South flows compared to trade. Distance is traditionally used as a proxy for transport costs in gravity models that try to explain bilateral trade flows. In this chapter, it is argued that distance may also be a proxy for information costs. The results indicate that there are significant information costs in North-North and North-South asset trade. The elasticity of distance is still large and significant for trade in goods. As the distance increases, the cost of trade in goods increases, as well as the cost of information.

This result is intuitive and in line with discussions on trade-FDI-distance in Chapter 3. It was argued that the relationship between distance and trade is well established, and to the extent that FDI and trade linkages are reinforcing, the same relationship can be extended to distance and FDI. It is also important to remember that FDI involves the ownership and control of the investment (unlike in portfolio equity, where investor only obtains ownership but no control). Trade relations do not require such long-term

commitment, or control. In this case, it is obvious that distance reduces the ability of the direct investor to control.

These results are similar to the findings in Ghosh and Wolf (1998). They show that outward trade flows from G7 to developing countries have distance elasticity of –0.71 versus –0.96 for the same for FDI. In our sample, the distance elasticity for North-South trade is –0.61 and –0.97 for North-South FDI. The South-North distance elasticity displays the opposite relation: trade is more sensitive to distance than FDI. It is more likely that South-North bilateral trade is better explained by the gravity model, in general than is bilateral FDI. This result is likely driven by the weight of FDI from Singapore, Hong Kong and Netherlands Antilles, as such do not represent gravity patterns. For FDI flows from North, distance is an important factor, in choosing host countries, be it an industrial or developing country. As Ghosh and Wolf (1998) suggest, distance is more important in monitoring FDI, an illiquid investment, compared to trade, which requires no commitment.

Common border and language dummy variables are economically more significant for FDI than trade, although between groups they may have opposite signs. For example, sharing a common border decreases the amount of FDI inflows a North host country may receive from another North source country, whereas adjacency encourages FDI flows more than trade from South to North. Sharing a common language is economically the most significant determinant for all the bilateral FDI flows, and compared to its effect on bilateral trade, its differential impact is significantly larger[19]. This also supports the idea that for FDI flows there are significant information costs, which would be reduced if the host and source countries are sharing a common language.

Among other geographical variables, the latitude of the host country has a larger (negative) economic effect on FDI than on trade for North-North and South-North flows. For North-South flows, South host countries that are located at higher latitudes may expect larger trade flows and fewer FDI from North trading partners. Being landlocked for a North host country implies fewer FDI and trade flows from other

[19] One exception to that is the currency union dummy variable, which is economically more significant for North-South and South-North FDI.

North countries, FDI being slightly more sensitive, whereas the same encourages FDI more than trade for flows from South to North[20]. Overall, geographical factors are significant determinants of bilateral FDI, as well as trade flows. In general, FDI is more sensitive to geographical factors, however, the model, indiscriminately, explains bilateral trade better than FDI.

4.4.5 Robustness

As a check for robustness of the results on trade and FDI flows, the outliers were excluded from the specification in column (2) in Table 4.1. The statistical significance of standard gravity and other variables are robust to the exclusion of outliers for all groups of bilateral trade flows (i.e. North-North, North-South and South-North). The R^2s improve only slightly (Table 4.2).

For North-North trade flows, the economic significance of income, landlocked and RTA dummy variables decrease, whereas the economic significance of size increases slightly. For North-South trade, all standard gravity variables are less significant when the outliers are excluded. Common language and latitude also become less significant, while common border and currency union dummy variables are now more significant. For South-North trade, distance is slightly less significant, together with common border and RTA dummy variables. The landlocked dummy becomes economically more significant, as the income variable.

The statistical significance of control variables in FDI regressions is also robust to the exclusion of outliers. However, the goodness of fit for the model improves for all: the R^2 for North-North FDI increases from 69 percent to 74 percent, North-South FDI increases from 60 to 67 percent, and South-North R^2 increases to 47 percent up from 37 percent. The direction of impact of all variables remains the same. The economic significance of variables only changes slightly. Some exceptions exist: the landlocked dummy variable for North-North FDI becomes economically more significant, as its coefficient increases from -0.56 to –0.69. The coefficient for common language dummy, for North-South FDI decreases, whereas the coefficient for RTA dummy increases. The size and common border coefficients in South-North FDI regression

[20] This result is robust to the inclusion of Switzerland as a dummy variable. Switzerland is an important financial center, and it is one of the host countries that is landlocked.

increase, whereas the significance of income and common language dummy decreases when the outliers are excluded.

As part of a robustness check, we tested the sensitivity of our results to the method of estimation, and estimated the same model using a panel fixed effect model. The results are reported in Table 4.3A.1 in Appendix 3. Broadly, the distance, common border and language dummy variables have the same direction of impact on trade and FDI as in OLS estimation. However, the size variable has the opposite impact on trade versus FDI for North-North and South-North flows. For the North-North trade, size has negative effect, whereas for FDI its effect is positive. For South-North flows, the effect of size on trade is positive and on FDI is negative: South source countries prefer larger North countries to trade, and smaller countries to direct invest. Income also is negatively correlated to North-South FDI, contrary to results from OLS estimation. Overall, fixed-effects model is a better fit for FDI, with higher R^2s for all the bilateral groups, also for North-South and South-North trade.

4.5 The Geography of Portfolio Investment

The importance of international portfolio investment has increased both for the industrial and developing countries in the 1990s. This improvement has coincided with the elimination of controls on cross-border portfolio flows together with recent advancements in communications technologies (Tesar, 1999). In this section, we briefly examine the determinants of international portfolio investment and specifically concentrate on its geographical allocation. As for FDI flows, it is argued in this section that geography matters in the allocation of portfolio equity. Geography (e.g. bilateral distance) may determine the information costs, and information costs are important in international investment decisions.

Different types of capital flows have different characteristics. In terms of its liquidity, portfolio equity capital is often documented as being highly volatile compared to FDI, although with limited empirical evidence (Claessens *et al*, 1995). Since stability in international capital markets came to be a priority after the 1997 Asian crisis, it is important to understand the determinants of portfolio flows.

In a recent study by Portes and Rey (2000), the authors show that gross bilateral trade in portfolio equity is strongly and positively correlated to market size and negatively affected by bilateral distance[21]. Ghosh and Wolf (1998) find similar results for the determinants of G7 equity flows: market size of the host country is a statistically significant and positive determinant of equity flows, and distance is negative. Comparing the median elasticity of portfolio equity and FDI with respect to distance, reveals that distance elasticity is larger for FDI than it is for *more liquid portfolio investment*. In a case study of Ireland, Honohan and Lane (2000) show that geographical allocation of Irish portfolio investment closely followed trade ties. These findings suggest that geography matters for portfolio investment flows. Furthermore, portfolio and FDI flows may be driven by the same factors.

In Table 4.3, geographical patterns of North-North, North-South and South-North portfolio investment are examined, by using bilateral portfolio investment positions (stocks as of end-1997)[22]. In the first column, the dependent variable, which is the log of the bilateral portfolio investment stocks, is regressed on standard gravity variables (size, GDP per capita of the host country and the distance between the country-pair) and common border and language dummies[23]. The second column enters all control variables together. These results are compared to geographical patterns observed in FDI stock positions in 1997, for the same groups.

4.5.1 North-North Portfolio Investment versus FDI

The cross-section OLS regression results indicate that the size of host country is a significant determinant and is positively correlated to bilateral portfolio positions. The size of the host market is also a significant determinant of North-North FDI positions. Portfolio investment, in comparison to FDI, is less sensitive to host country market size, as suggested by an elasticity of 0.83 compared with 0.89 percent (column (2)). The level of development is a statistically significant determinant of portfolio investment but not of FDI. Among the North host countries, it is the richer that

[21] Portes and Rey (2000) also use telephone traffic variable to directly measure information flows between countries.

[22] South-North portfolio investment stocks are available from a few source countries: Argentina, Chile, Indonesia, Israel, Korea, Malaysia, Singapore, Thailand and Venezuela.

receive more portfolio investment, indicating a positive correlation between financial sophistication and portfolio flows. When the income of the host country increases by 10 percent, portfolio investment increases by 17 percent (column (2)).

In terms of geographical factors, there is evidence that bilateral distance has a negative effect on portfolio flows. This means that, for countries with similar fundamentals, the residents of North countries tend to hold a larger proportion of their portfolio investment assets in near-by North host countries. However, comparing the distance elasticity of portfolio investment to FDI's, suggests that North-North FDI is more sensitive to bilateral distance than portfolio investment. As the distance between the source and host country increases by 10 percent, portfolio investment decreases by 6 percent and FDI decreases by 15.8 percent (column (2)). This suggests that proximity is more important for FDI, which requires monitoring. FDI, by definition, involves a long-lasting interest and control in the investment, and as such, is more illiquid compared to portfolio investment.

Sharing a common border is only statistically significant for FDI positions, and is negatively correlated. However, the common language dummy is statistically significant both for portfolio and FDI investment. Economically, the common language dummy is more significant for FDI: host countries that share the same language as a North source country receive 5.17 percent more FDI liabilities and 1.34 percent more portfolio liabilities (column (2)). The landlocked dummy is another significant geographical control variable, which is negatively correlated to both portfolio investment and FDI. Landlocked countries receive 0.41 percent less portfolio investment and 0.65 percent less FDI. The RTA dummy is not significant either for FDI or for portfolio investment. Overall, the specification in column (2) explains 85 percent of the variation in portfolio investment compared to 80 percent for FDI investment.

4.5.2 North-South Portfolio Investment versus FDI

The specifications in columns (1) and (2) indicate that standard gravity and other control variables have the same direction of impact on North-South portfolio and FDI

[23] Bilateral portfolio investment data are only available in stocks. We argue that stocks are a good approximation of flows.

investment. The size and level of development of the host market are positively correlated to both portfolio and FDI positions. Portfolio investment is more sensitive to changes in the size and income level of the South host country. The size elasticity of portfolio investment is 1.02, whereas the same for FDI is 0.72. The difference in the economic significance of the income variable is also similar: income elasticity of portfolio investment is 1.55 versus 1.03 for FDI (column (2)). This may suggest that portfolio investment increases in the financial sophistication of the host market more so than is required for FDI. This finding in our sample is similar to the results of Ghosh and Wolf (1998), where they find higher income elasticity (0.99) for portfolio equity flows than for FDI (0.57).

Distance is statistically significant only for FDI investment and is negatively correlated. If the distance between the host and source country increase by 10 percent, FDI stock decreases by 15.3 percent. This suggests that being closer to the host country is more important for FDI, than it is for portfolio investment. FDI requires not only commitment to a long-term investment, in comparison to portfolio investment, but also involves some sunk costs that are not reversible. For this reason, monitoring and control of the investment is more important. These results indicate that when the host country is closer (ceteris paribus) to the source country, monitoring the investment gets easier. In other words, information costs are higher for FDI than they are for portfolio investment.

Adjacency and sharing a common language encourage portfolio investment. Sharing a common border is not statistically significant for FDI. The US and Mexico is the only North and South country-pair that share a common land border in our sample, therefore, this result indicates that US invests in portfolio capital in Mexico more compared to country-pairs that do not share a common border. The common language dummy variable indicates that North countries invest in portfolio assets of South host countries 1.97 percent more if they share a common language. It should be noted that the North-South country-pairs in our sample that share the same language are Latin

American colonies and their European colonizers. For this reason, the common language dummy may be capturing more than the language factor[24].

The latitude variable is significant and negatively correlated to both: North source countries invest more in South host countries that are located at lower latitudes. The economic importance of the latitude variable on portfolio investment is similar to its impact on FDI (column (2)). Being in a RTA discourages FDI, and it is not significant for portfolio investment. Overall, the model (column (2)) explains 81 percent of the variation in North-South portfolio investment compared to 74 percent of the variation on FDI.

4.5.3 South-North Portfolio Investment versus FDI

Among the standard gravity variables, only size and income of the host country are statistically significant for portfolio investment, and distance is not a significant determinant. As the size of the North host country increases by 10 percent, portfolio investment increases by 7 percent from South source countries, whereas size is not a significant determinant for South-North FDI. The income of the host North country is by far economically the most significant determinant for South portfolio and FDI positions. The income elasticity of FDI is 6.28 and the same for portfolio investment is 2.69.

Distance is not a significant determinant of South-North portfolio investment. Contrary to previous results, FDI investment in North countries by the South countries increases as distance increases (β= 1.81). The common language dummy has the expected positive sign but it is only significant for FDI: North host countries that share the same language as the South source country receive 5.30 percent more FDI investment compared to countries that do not. Landlocked North countries (Austria and Switzerland) receive 0.83 percent less portfolio investment. North host countries that are in a common RTA as South countries receive, on average, 42 percent more FDI investment.

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[24] Through historical ties, the legal culture in a country and its ex-colony can be very similar. In a study by La Porta *et al* (1998), the authors show that different commercial laws have different levels of protection of corporate shareholders and creditors and quality of law enforcement.

The specification including standard gravity variables and additional control variables explain 67 percent of the variation in South-North portfolio investment, whereas the same model only explains 41 percent of the variation in FDI flows.

4.5.4 Portfolio Investment and FDI

Overall, the results indicate that there is strong evidence portfolio investment follows the same pattern as FDI investment. The impact of the gravity variables is the same for both types of investment. Portfolio investment is more sensitive to the macroeconomic fundamentals in the model, represented by size and income of the host country, than FDI stocks, except for South-North portfolio investment.

The difference between the two is that distance, as well as other geographical controls, is more important for FDI than portfolio investment[25]. This indicates that there are significant information costs for both types of capital flows, however, for FDI, information is more costly. Controlling for common border and language, distance elasticity for North-North FDI is nearly twice as large as the distance elasticity for portfolio stock. However, the common language dummy, another variable that can measure information costs, has economically different effect when groups are compared. For North-North sharing a common language is more important for FDI than it is for portfolio investment, whereas for North-South flows, the opposite is true. For South-North flows, common language is only significant for portfolio investment.

The impact of common language on North-North flows versus North-South /South-North flows may be explained by the existence of greater informational asymmetries between North and South countries, compared to asymmetries among North countries. The North-South FDI, in that case, may be interpreted as a sign of these informational problems, as suggested by Razin *et al* (1999). They argue that FDI investors have an

[25] The comparative results apply to North-North and North-South flows, since South-North FDI is a poor fit compared to the rest.

informational advantage over portfolio investors by being 'close' to the domestic market[26].

Being the more liquid form of investment, portfolio investment would react faster to the changes in the news than FDI[27]. Sharing a common language helps analyzing a change in the investment environment, as is strongly suggested in our results for North-South and South-North portfolio investment. To the extent that geography facilitates (or impedes) information flows, we can conclude that the spatial allocation of portfolio investment can be explained by the geographical factors of the host country. FDI is also attracted to countries with similar fundamentals and geographical factors. We conclude that distance proxies for information costs, both for portfolio and FDI flows, and that information is more costly for FDI compared to portfolio flows.

Overall the gravity model is a better fit for bilateral portfolio stock. For North-North group, the specification in column (2) explains 85 percent of the variation in portfolio stock versus 80 percent of variation in FDI. For North-South group, the same specification explains 81 percent of the variation in portfolio versus 74 percent of the variation in FDI. The gravity model is relatively a poor fit for South-North FDI, with an R^2 of 41 percent versus 67 percent for South-North portfolio stock.

4.5.5 Robustness

We have rerun the regression in column (2) Table 4.3 excluding the outliers. When the outliers in North-North portfolio stock are excluded, the gravity relations strengthen: the size and income become economically more significant (Table 4.4). The elasticity for distance is smaller. Common language and landlocked dummy variables are also less significant. Without the outliers, this specification explains 88 percent of the variation in North-North portfolio stock. For North-South portfolio stock, the gravity relations weaken: size, common language dummy and latitude

[26] The economic significance of common language dummy for North-North FDI may be explained by the dominance of mergers and acquisitions. North-South FDI, however, is mostly in the form of greenfield investment, where parent company has more control over the operations of the affiliate.
[27] Ghosh and Wolf (1998) find contradictory results. According to their results, distance elasticity of FDI is larger than its portfolio equity counterpart. This, they interpret, as proximity being more important in monitoring for FDI than for portfolio investment.

decrease in economic significance. The common border dummy is the only variable that increases in economic significance: its coefficient increases to 1.53 up from 1.19. RTA dummy becomes significant when outliers are excluded, and is negatively correlated to North-South portfolio stock. There were no outliers in South-North portfolio investment sample.

When the outliers from North-North FDI sample are excluded, the statistical significance of most variables remains the same, with the exception of RTA dummy. RTA dummy becomes significant. The negative coefficient for RTA indicates that for North-North FDI, when trade barriers (and tariffs) are removed, there is less incentive for direct investment. Both sharing a common border and being in the same RTA, have a negative effect on North-North FDI. The negative effect of a common border on North-North FDI is independent of its effect through RTA. This may be explained by the dominance of US as the host to North FDI inflows from all major FDI investors. The size, common language and landlocked dummies are economically less, and distance, common border are more significant. For North-South FDI, the standard gravity variables all have less economic impact. There is only a slight increase in the economic significance of common language dummy, and latitude does not change. Sharing a common border has a positive effect on North-South portfolio, indicating in effect in this analysis that US portfolio investment in Mexico is significant. There are no outliers for South-North FDI. All R^2s improve.

4.6 The Role of Geography on FDI – Trade – Portfolio Flows

In this section, the patterns of FDI, trade and portfolio investment flows are compared[28]. For a comparative analysis, an augmented gravity model is used, similar to the models in the previous sections, only including fewer control variables. The sample sizes in this section are restricted, compared to larger trade and FDI samples. In order to provide an accurate comparison between FDI, trade and portfolio flows, a common sample is used. All of the samples, for all types of flow and each group, are cross-section flow data for a single year (i.e. 1997).

[28] Portfolio investment variable is in stocks. FDI and trade are flows.

The earlier sections examined the patterns of North-North, North-South and South-North trade in a detailed analysis and compared its patterns to FDI. Similar analysis is done in the preceding section for portfolio investment. These sections highlight the differences of trade and portfolio investment patterns from FDI, by allowing the use of a larger sample. Another objective of this chapter is to compared trade, portfolio investment and FDI together. This is done in a much smaller sample and the results may be influenced by change in the sample size.

The results of this analysis are reported in Table 4.5, where the dependent variable, in logs, is regressed on the log of the size of the host country, log of GDP per capita of the host country, the log of distance between host and source countries and two dummy variables, for common border and common language. The coefficients of variables in logs can be interpreted as elasticities. The results are regression output from cross-country OLS.

4.6.1 North-North FDI, Trade and Portfolio Investment

For North-North flows, the gravity variables in our model, have the same direction of impact on all. FDI, trade and portfolio investment flows, all increase as the size of the host country increases, and decrease as distance to the host market increases. The income variable is statistically significant for portfolio and trade flows only.

The economic significance of explanatory variables for each type of flow varies. For example, in our sample, size is economically most significant for portfolio investment, followed by trade and FDI. An increase of 10 percent in the size of the host market increases portfolio investment by 8.1 percent, trade by 7.4 percent and FDI by 6.8 percent. The income of the host country is both statistically and economically significant for portfolio investment flows. When the income of the host increases by 10 percent, portfolio investment increases by 15.5 percent, whereas trade increases by 5.3 percent. This, again, indicates that portfolio investment is encouraged by financial sophistication, whereas there is no evidence in our data that income has such effect on FDI.

Distance is statistically significant for all North-North flows and is negatively correlated. Trade has the largest distance elasticity, followed by FDI and portfolio flows: an increase of 10 percent in distance decreases trade by 7.1 percent, FDI by 6.5 percent and portfolio investment by 5.1 percent. In the common sample, trade is more sensitive than FDI to changes in distance contrary to earlier findings. This may indicate transport costs dominate over information costs, which are both proxied by the distance variable. The distance elasticity of FDI is larger than that of portfolio investment, as previously observed. In this sub-sample, there is evidence that information costs for FDI are higher compared to more liquid portfolio investment.

Common border dummy is only significant for North-North trade flows and has a positive sign, indicating that bilateral trade does increases between countries that share a common border. Common language dummy variable is statistically significant for all. Economically, sharing a common language is most important for North-North FDI; country-pairs that speak the same language as the source country receive 6.03 percent more FDI flows. Language is also important for trade between the developed countries, which has a slightly larger economic impact than on portfolio flows. The model is a better fit for North-North portfolio investment and bilateral trade flows, with an R^2 85 percent and 84 percent respectively. The model explains 54 percent of the variation in North-North FDI flows.

4.6.2 North-South FDI, Trade and Portfolio Investment

The gravity variables also have the same impact on North-South FDI, trade and portfolio investment flows. The size and income of the South host country are statistically significant for all and positively correlated. Size of the host country is most important for portfolio investment, followed by trade and FDI. Portfolio investment from North countries is attracted to large markets, both for industrial and developing host countries.

The income of the host country is economically most important for portfolio, followed by trade and FDI. This result suggests that portfolio flows from North are attracted to richer developing countries, more so than trade and FDI. For portfolio flows, income of the host country may proxy financial sophistication. However, for trade flows from North to South, the income variable may indicate the purchasing power of the

developing countries. North countries trade more with richer developing countries. For FDI, the income level of the South host country is economically the least significant.

Distance is not a statistically significant determinant of North-South FDI or portfolio investment. However, it is significant for bilateral trade flows and has the expected negative sign. Common border and language dummy variables are positively correlated and significant for all. Sharing a common border increases FDI by 4.00 percent, portfolio flows by 3.01 and trade by 1.51 percent. Sharing a common language is more important for portfolio investment compared to FDI, and least important for trade. The common language dummy captures the ease of communication for countries that share the same language. For the North-South group, it also captures past colonial ties. It may appear counter-intuitive that language should be economically more significant for portfolio investment compared to FDI. Mody *et al* (2002) argue that when there are significant information costs, investors would choose FDI over portfolio investment. By being close to the host market, the ability to control is maximized, and problems of informational asymmetries are overcome. However, for portfolio investors, language can greatly facilitate business directed at a distance.

The model is a good fit for bilateral trade, explaining 82 percent of North-South trade, followed by 69 percent R^2 for portfolio investment and 45 percent R^2 for FDI. Overall, North-South trade, FDI and portfolio investment flows are attracted by similar host country fundamentals and geographical factors. There is some evidence in our sample that, individually, fundamentals are more important for portfolio investment compared to FDI, however, geographical factors are more important for FDI than it is for portfolio or trade flows[29].

4.6.3 South-North FDI, Trade and Portfolio Investment

Among the standard gravity variables, income of the host country and the common language dummy are the only variables that are statistically significant for all the flows. Size of the host is significant and positive for portfolio and trade flows, where

[29] Common border dummy is the only variable that is statistically significant for all.

it is slightly more important for portfolio investment. The income of the North host country is economically the most significant determinant for all bilateral flows. Income is most important for encouraging FDI flows from the South, and least important for trade.

The distance variable is not significant for any of the flows. Common language dummy, which can proxy information costs, indicate that it is economically most significant for FDI, followed by portfolio investment and trade. However, the joint significance of these variables indicates that the model is a much better fit for trade and portfolio investment, compared to FDI (R^2 of 83 percent, 64 percent and 23 percent respectively).

4.6.4 FDI – Trade – Portfolio Investment Flows

In our sample, there is evidence that trade, FDI and portfolio flows are all attracted to host countries with similar fundamentals: trade, FDI and portfolio flows are attracted to larger host market, with a higher income and decrease as the distance to the host country increases. Sharing a common border and common language, further reinforces bilateral flows of all three types between country-pairs. In summary, trade and portfolio investment flows follow the same pattern as FDI flows. However, one of the important differences to highlight is that the augmented gravity model used is a better fit for both trade and portfolio investment than it is for FDI.

Differences also arise when the economic significance of individual variables are examined. Among the three types of flows, size of the host country is most important for portfolio flows, for all the groups (i.e. North-North, North-South, South-North). The income of the host is also economically more significant for outward portfolio flows from North, both to other North and South host countries. For South-North flows, host size is not significant for FDI, but slightly more significant for portfolio than it is for trade. Also, income is economically more important for FDI, than it is for portfolio or trade, for South-North flows.

Distance is clearly more important for trade in our common sample, indicating significant transport costs even for North-North flows. Only for North-North flows, distance is significant for FDI and portfolio, indicating significant information costs.

Sharing a common language is more important for North-North FDI, and South-North FDI. However, for North-South flows, language is more important for portfolio than it is for FDI flows.

The augmented gravity model is a better fit for bilateral trade flows or portfolio stock than it is for FDI. For example, for the North-North group, the model explains 54 percent of the variation in FDI, 85 percent of the variation in portfolio stock and 84 percent of the variation in trade. For the North-South and South-North flows, our model is a better fit for bilateral trade, than for portfolio and FDI. The adjusted R^2s indicate that the model explains 45 percent of the variation in FDI, 69 percent of the variation in portfolio (stock) and 82 percent of the variation in North-South trade flows. For the South-North group, 83 percent of the variation in bilateral trade flows, 64 percent of portfolio stock and only 23 percent of FDI flows are explained by the model.

4.7 Conclusion

In this chapter, we investigated the determinants of FDI, trade and portfolio investment flows with an emphasis on the role of geography to highlight the factors that affect the spatial allocation of trade and portfolio investment vis à vis FDI. Some recent trends indicate that the majority of FDI is between industrial countries, and although FDI to developing countries has increased in importance in the 1990s, it is concentrated in a few countries in certain regions. Based on this observation, it is argued that geographical factors, as well as macroeconomic fundamentals, may explain the spatial allocation of FDI. Although there are few studies that examine the geographical allocation of financial flows, to the best of our knowledge, there is no study that provides a direct comparison of the determinants of North-North, North-South and South-North FDI, trade and portfolio flows.

The results from pooled least squares regression analyses indicate that standard gravity variables have the same impact on each bilateral trade and FDI flow. The significant differences arise in the magnitude of the effect of these variables. For example, the elasticity of FDI with respect to distance is more sensitive for North-

North and North-South than it is for trade flows, indicating greater information costs for direct investment. However, for South-North the distance elasticity of trade is larger than it is for FDI.

There is also some evidence of opposite impact of the variables when bilateral groups are compared. For example, for North-North FDI sharing a common border has a negative effect, whereas for North-South trade and South-North trade and FDI, a common land border facilitates trade. The landlocked dummy is another example: for North-North trade and FDI, being landlocked implies less trade and FDI inflows for these countries. However, for South-North, the landlocked North host countries receive both more imports and FDI from the South.

In all groups sharing a common language is more important for FDI than it is for trade, suggesting better information flow is required for the control and monitor of FDI. In summary, there is evidence in our sample that FDI is more sensitive to geographical factors than trade, however, both trade and FDI are attracted by similar factors. In all the groups, the augmented gravity model used is a better fit for bilateral trade than it is for FDI.

There is evidence that portfolio investment follows a similar pattern as FDI. However, portfolio investment is more sensitive to the macroeconomic fundamentals, with the exception of the effect of income on South-North flows. In our sample, there is evidence that geography is more important for FDI than for portfolio investment, both for North-North and North-South flows. For example, distance is more important for FDI than it is for portfolio flows, implying that there may be "cost" motivation for FDI. In addition to that, being landlocked, which is expected to inhibit information flow, is more important for FDI than it is for portfolio investment. Still, portfolio flows are more sensitive to a common language compared to FDI, which has the advantage of reducing informational asymmetries, for North-South flows, but the opposite is true for North-North flows. In their joint significance, the standard gravity and other control variables are more significant for portfolio investment than they are for FDI.

We conclude that geographical factors can explain the spatial allocation of FDI, trade and portfolio investment flows, as well as the macroeconomic fundamentals. Bilateral FDI, trade and portfolio investment flows react to geographical factors in the same way, however, with different degrees of sensitivity. To the extent that a country has advantageous geographical factors, the location may determine its integration in to the world economy. However, especially for FDI and portfolio flows, the location may determine information costs incurred by the investors. In that sense, host countries that have a greater distance to investor countries, can overcome geographic determinism by facilitating information flows.

Table 4.1. Trade – FDI (Pooled OLS Estimation)
Dependent Variable: Log of Trade flows; Log of FDI flows (in 1987 US$ constant)

	1						2					
	Trade	FDI	Trade	FDI	Trade	FDI	Trade	FDI	Trade	FDI	Trade	FDI
	N-N	N-N	N-S	N-S	S-N	S-N	N-N	N-N	N-S	N-S	S-N	S-N
Ln(POP) of host	0.77	0.94	0.62	0.44	0.95	0.50	0.77	0.94	0.60	0.51	0.99	0.59
	(47.98)***	(26.29)***	(20.40)***	(7.23)***	(29.09)***	(6.21)***	(52.82)***	(26.62)***	(18.05)***	(8.55)*	(28.21)***	(6.30)***
Ln(GDP-PC)	0.57	0.04	0.89	0.70	0.90	1.22	0.89	0.41	0.88	0.74	0.88	1.19
of host	(12.26)***	(0.39)	(21.78)***	(7.94)***	(8.20)***	(3.95)***	(20.81)***	(3.80)***	(20.61)***	(8.81)*	(7.65)***	(3.67)***
Ln(DIST)	-0.83	-0.89	-0.70	-0.22	-0.68	-0.54	-0.95	-1.09	-0.57	-0.97	-0.61	-0.45
	(-33.00)***	(-15.28)***	(-15.14)***	(-2.09)***	(-7.14)***	(-2.86)***	(-37.29)***	(-14.17)***	(-9.29)***	(-6.88)*	(-6.17)***	(-2.29)**
Border	0.08	-0.50	0.50	1.45	0.99	1.61	0.003	-0.63	0.71	0.35	0.94	1.57
	(1.36)	(-3.30)***	(1.80)	(3.85)***	(3.02)***	(2.36)**	(0.05)	(-4.20)***	(2.47)***	(0.91)	(3.17)***	(2.27)**
Language	0.68	1.92	0.63	1.54	0.64	2.09	0.53	1.70	0.60	1.66	0.59	1.93
	(10.39)***	(12.82)***	(7.63)***	(6.87)***	(7.00)***	(8.09)***	(10.64)***	(11.54)***	(7.32)***	(8.15)*	(6.22)***	(7.30)***
Latitude							-0.01	-0.02	0.006	-0.03	-0.003	-0.01
							(-16.17)***	(-6.35)***	(4.00)***	(-10.16)*	(-1.79)*	(-2.85)***
Landlocked							-0.57	-0.56			0.29	0.66
							(-9.99)***	(-3.72)***			(2.47)***	(2.13)**
RTA							0.26	0.13	-0.002	-0.38	0.57	0.0003
							(6.53)***	(1.05)	(-0.02)	(-1.65)*	(3.96)***	(0.00)
Currency Union									-0.35	1.79	0.06	1.99
									(-2.29)**	(5.14)***	(0.19)	(1.79)*
Adj R^2	0.89	0.67	0.82	0.54	0.82	0.36	0.92	0.69	0.82	0.60	0.83	0.37
S.E. of regression	0.50	1.27	0.70	1.53	0.66	1.84	0.42	1.24	0.70	1.43	0.65	1.82
N	914	914	812	812	516	516	914	914	812	812	516	516

Notes: (i) White heteroskedasticity-consistent standard errors and covariances calculated.
(ii) t-statistics in parentheses.
(iii) Time dummies are used in column (1) and source country dummies are used in columns (2) and (3).
(iv) * indicates 10% significance level, ** 5% significance, *** 1% significance

Table 4.2. Trade- FDI *(outliers excluded)*

	Trade	FDI	Trade	FDI	Trade	FDI
	N-N	**N-N**	**N-S**	**N-S**	**S-N**	**S-N**
Ln(POP) of host	0.78	0.92	0.57	0.52	0.99	0.65
	(69.17)***	(28.56)***	(19.96)***	(10.19)***	(28.76)***	(9.10)***
Ln(GDP-PC) of host	0.81	0.45	0.84	0.79	0.89	0.89
	(21.73)***	(4.49)***	(22.66)***	(11.19)***	(8.09)***	(3.35)***
Ln(DIST)	-0.95	-1.06	-0.54	-1.03	-0.59	-0.44
	(-42.49)***	(-15.41)***	(-9.26)***	(-8.11)***	(-6.17)***	(-2.49)***
Border	-0.03	-0.61	0.79	0.28	0.85	1.84
	(-0.75)	(-4.46)***	(2.68)***	(0.69)	(3.06)***	(2.95)***
Language	0.53	1.68	0.54	1.52	0.61	1.69
	(11.62)***	(12.28)***	(7.00)***	(9.39)***	(6.53)***	(7.36)***
Latitude	-0.01	-0.02	0.005	-0.02	-0.003	-0.009
	(-18.01)***	(-7.69)***	(4.46)***	(-9.84)***	(-1.97)**	(-2.75)***
Landlocked	-0.49	-0.69			0.39	0.67
	(-10.28)***	(-4.89)***			(3.68)***	(2.83)***
RTA	0.25	0.15	-0.01	-0.73	0.58	0.25
	(7.40)***	(1.44)	(-0.14)	(-3.72)***	(4.09)***	(0.60)
Currency Union			-0.42	1.72	0.06	1.98
			(-2.94)***	(5.11)***	(0.19)	(1.84)*
Adj R^2	0.94	0.74	0.84	0.67	0.84	0.47
S.E. of regression	0.35	1.09	0.61	1.21	0.62	1.50
N	875	881	785	781	511	494

* indicates 10% significance level, ** 5% significance, *** 1% significance

Table 4.3. Portfolio Investment - FDI (Pooled OLS Estimation (1997))
Dependent Variable: Log of Portfolio investment stock; Log of FDI stock

	Portfolio	FDI	Portfolio	FDI	Portfolio	FDI	Portfolio	FDI	Portfolio	FDI	Portfolio	FDI
	N-N	**N-N**	**N-S**	**N-S**	**S-N**	**S-N**	**N-N**	**N-N**	**N-S**	**N-S**	**S-N**	**S-N**
Ln(POP) of host	0.85	0.92	0.93	0.53	1.11	0.33	0.83	0.89	1.02	0.72	0.70	-0.26
	(17.93)***	(7.39)***	(6.59)***	(3.60)***	(4.28)***	(0.86)	(14.99)***	(6.45)***	(7.47)***	(5.82)***	(2.20)**	(-0.47)
Ln(GDP-PC) of host	1.44	-0.40	1.41	0.78	0.98	3.92	1.70	0.10	1.55	1.03	2.69	6.28
	(4.42)***	(-1.13)	(7.97)***	(3.74)***	(0.88)	(1.61)	(4.91)***	(0.30)	(9.05)***	(5.71)***	(2.17)**	(1.97)*
Ln(DIST)	-0.57	-1.05	0.14	-0.18	-0.76	1.20	-0.60	-1.58	-0.28	-1.53	-0.13	1.81
	(-6.83)***	(-8.16)***	(0.49)	(-0.56)	(-0.98)	(1.53)	(-4.51)***	(-6.46)***	(-0.76)	(-3.26)***	(-0.24)	(2.03)**
Border	-0.08	-0.38	1.68	1.02			-0.10	-0.75	1.19	-0.17		
	(-0.30)	(-1.06)	(2.93)***	(157)			(-0.38)	(-2.22)**	(2.06)**	(-0.26)		
Language	0.84	1.90	1.15	0.96	1.74	2.80	0.85	1.82	1.09	0.94	0.85	1.84
	(4.76)***	(5.34)***	(5.22)***	(2.22)**	(1.85)*	(2.13)**	(4.52)***	(5.37)***	(5.02)***	(2.40)**	(0.71)	(1.88)*
Latitude							-0.003	-0.02	-0.01	-0.03	-0.02	-0.02
							(-1.18)	(-2.95)***	(-3.16)***	(-4.59)***	(-1.35)	(-1.24)
Landlocked							-0.52	-1.06			-1.79	-2.69
							(-2.31)**	(-2.24)**			(-2.12)**	(-1.75)
RTA							0.09	-0.63	-0.33	-1.17	0.55	3.76
							(0.36)	(-1.52)	(-0.70)	(-1.83)*	(0.81)	(3.39)***
Adj R^2	0.85	0.77	0.81	0.68	0.60	0.33	0.85	0.80	0.81	0.74	0.67	0.41
S.E. of regression	1.00	1.43	1.12	1.61	1.32	1.80	1.00	1.37	1.11	1.46	1.21	1.69
N	192	192	157	157	36	36	192	192	150	150	36	36

* White heteroskedasticity-consistent standard errors and covariances calculated.
t-statistics in parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%. Source country dummies used.

Table 4.4. Portfolio Investment – FDI (Robustness checks)
Dependent Variable: Log of Portfolio investment stock; Log of FDI

	Portfolio	FDI	Portfolio	FDI
	N-N	**N-N**	**N-S**	**N-S**
Ln(POP) of host	0.84	0.87	0.97	0.69
	(16.75)***	(12.30)***	(10.99)***	(5.72)***
Ln(GDP-PC) of host	1.74	0.37	1.55	1.00
	(5.43)***	(1.22)	(12.93)***	(5.96)***
Ln(DIST)	-0.54	-1.71	-0.30	-1.34
	(-4.14)***	(-10.39)***	(-0.97)	(-3.03)***
Border	0.03	-0.83	1.53	0.06
	(0.12)	(-2.67)***	(3.10)***	(0.11)
Language	0.81	1.62	0.93	0.95
	(4.30)***	(5.58)***	(4.99)***	(2.35)**
Latitude	-0.003	-0.02	-0.008	-0.03
	(-1.02)	(-4.33)***	(-2.46)**	(-4.81)***
Landlocked	-0.45	-0.63		
	(-2.07)**	(-2.39)**		
RTA	0.10	-1.04	-0.60	-1.05
	(0.43)	(-3.61)***	(-1.70)*	(-168)*
Adj R^2	0.88	0.86	0.87	0.78
S.E. of regression	0.89	1.03	0.89	1.27
N	187	182	143	146

* White heteroskedasticity-consistent standard errors and covariances calculated.
t-statistics in parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%. Source country dummies used.

Table 4.5. FDI-Portfolio Investment-Trade (1997)- OLS
Dependent Variable: Log of FDI; Log of Portfolio Investment; Log of Trade

	N-N			N-S			S-N		
	FDI	**Portfolio**	**Trade**	**FDI**	**Portfolio**	**Trade**	**FDI**	**Portfolio**	**Trade**
Ln(POP) of host	0.68	0.81	0.74	0.54	0.88	0.65	0.06	0.84	0.81
	(7.19)***	(16.29)***	(19.12)***	(3.91)***	(7.02)***	(11.10)***	(0.14)	(2.90)***	(6.45)***
Ln(GDP-PC) of host	0.48	1.55	0.53	0.68	1.45	0.95	5.16	3.17	1.77
	(1.33)	(5.07)***	(3.48)***	(3.55)***	(8.19)***	(11.78)***	(3.25)***	(2.79)***	(4.68)***
Ln(DIST)	-0.65	-0.51	-0.71	-0.21	-0.06	-0.67	0.47	-0.47	0.01
	(-4.74)***	(-5.38)***	(-14.68)***	(-0.93)	(-0.27)	(-6.66)***	(0.30)	(-0.45)	(0.05)
Border	-0.004	0.17	0.27	1.61	1.39	0.92			
	(-0.01)	(0.67)	(1.85)*	(2.92)***	(2.98)***	(4.16)***			
Language	1.95	0.76	0.79	1.45	1.59	0.55	2.32	2.12	1.18
	(5.16)***	(4.16)***	(4.61)***	(2.39)**	(4.24)***	(3.46)***	(2.68)***	(2.98)***	(3.00)***
Adj R^2	0.54	0.85	0.84	0.45	0.69	0.82	0.23	0.64	0.83
S.E. of regression	1.48	0.89	0.59	1.73	1.33	0.63	2.34	1.33	0.61
N	193	193	193	170	170	170	37	37	37

* White heteroskedasticity-consistent standard errors and covariances calculated.
t-statistics in parentheses. * significant at 10%, ** significant at 5%, *** significant at 1%. Source country dummies used.

APPENDIX 4.1

List Of Countries

NORTH	SOUTH
Australia	Korea
Austria	Mexico
Belgium-Luxembourg	Turkey
Canada	Algeria
Denmark	Egypt
Finland	Libya
France	Morocco
Germany	South Africa
Iceland	Argentina
Italy	Brazil
Japan	Chile
Netherlands	Colombia
New Zealand	Costa Rica
Norway	Netherlands Antilles
Portugal	Panama
Spain	Venezuela
Sweden	Kuwait
Switzerland	Saudi Arabia
United Kingdom	United Arab Emirates
United States	Iran
	Israel
	China
	Chinese Taipei
	Hong Kong
	India
	Indonesia
	Malaysia
	Philippines
	Singapore
	Thailand

APPENDIX 4.2

List of Variables

Variable	Definition	Source
The Dependent Variable: Log(FDI)	FDI Inflows (US$ millions)	FDI Inflows – OECD Direct Investment Statistics, 1999.
GDP	GDP in constant 1987 US$ millions	WDI database (World Bank)
GDP per capita	GDP / population (1987 US$)	WDI
Distance	Greater circle distance in km	Andrew Rose (2000)
Border	Common land border	Andrew Rose (2000)
Language	Common language	Andrew Rose (2000)
Latitude	Latitude of capital city	World Bank
Trade	Bilateral Trade Flows (imports) in constant 1987 US$ millions	IMF Direction of Trade Statistics
RTA	Regional Trade Agreement dummy (EC, EFTA, NAFTA, Australia-New Zealand Closer Economic Relation Trade Agreement and some unilateral trade agreements included*)	World Trade Organization website (http://www.wto.org/english/tratop_e/region_e

* The unilateral trade agreements included in sample: EC/Algeria (1976), EC/Egypt (1977), EC/Iceland (1973), EC/Israel (1975), EC/Morocco (1976), EC/Norway (1973), EC/Turkey (1995), EFTA/Israel (1993), EFTA/Turkey (1992), US/Israel (1985).

Currency Union		Andrew Rose (2000)
Portfolio Investment Stocks	Equity and long-term bond stocks as year end-1997 in US$ millions	IMF (2000), Results of the 1997 Comprehensive Portfolio Investment Survey

APPENDIX 4.3

Table 4.3A.1 Trade – FDI (Panel Fixed Effects Estimation)

Dependent Variable: Estimated fixed country-pair effects

	OLS						OLS					
	Trade	FDI	Trade	FDI	Trade	FDI	Trade	FDI	Trade	FDI	Trade	FDI
	N-N	N-N	N-S	N-S	S-N	S-N	N-N	N-N	N-S	N-S	S-N	S-N
Ln(POP) of host	-0.15	0.59	0.96	3.09	0.67	-2.81	-0.16	0.59	0.94	3.14	0.68	-2.82
	(-5.37)***	(10.42)***	(19.54)***	(33.34)***	(18.09)***	(-27.95)***	(-6.54)***	(11.65)***	(17.85)***	(33.97)***	(18.01)***	(-25.02)***
Ln(GDP-PC) of host	-0.29	-0.46	-0.02	-0.25	0.71	0.68	0.03	-0.14	-0.05	-0.27	0.74	0.93
	(-3.21)***	(-2.68)***	(-0.30)	(-1.77)*	(5.82)***	(1.60)	(0.33)	(-0.89)	(-0.73)	(-2.03)**	(6.12)***	(2.18)**
Ln(DIST)	-0.83	-0.85	-0.69	-0.13	-0.81	-0.43	-1.00	-1.16	-0.63	-1.03	-0.78	-0.39
	(-21.80)***	(-10.08)***	(-10.46)***	(-0.73)	(-6.61)***	(-1.78)*	(-25.48)***	(-10.78)***	(-6.69)***	(-4.91)***	(-6.10)***	(-1.67)*
Border							-0.02	-0.68	0.57	0.42	0.71	1.67
							(-0.20)	(-2.78)***	(2.51)***	(0.95)	(1.87)*	(2.14)**
Language							0.52	1.68	0.69	1.84	0.58	1.92
							(5.77)***	(7.80)***	(5.16)***	(6.64)***	(3.97)***	(5.44)***
Latitude							-0.01	-0.02	0.005	-0.03	-0.002	-0.009
							(-9.12)***	(-4.38)***	(2.44)**	(-7.36)***	(-1.08)	(-1.77)*
Landlocked							-0.60	-0.41			0.20	0.29
							(-7.49)***	(-2.34)**			(1.42)	(0.78)
RTA							0.17	0.18	-0.13	-1.07	0.24	-0.19
							(2.44)**	(1.20)	(-0.76)	(-3.26)***	(0.92)	(-0.29)
Currency Union									-0.48	1.49	0.32	2.18
									(-2.21)**	(3.71)***	(1.58)	(3.57)***
Adj R^2	0.86	0.67	0.90	0.93	0.76	0.78	0.91	0.75	0.91	0.95	0.77	0.80
S.E. of regression	0.55	1.25	0.71	1.48	0.63	1.85	0.44	1.10	0.68	1.29	0.61	1.75
N	316	316	339	339	264	264	316	316	339	339	264	264

Notes: (i) White heteroskedasticity-consistent standard errors and covariances calculated.
(ii) t-statistics in parentheses.
(iii) Time dummies are used in column (1) and source country dummies are used in columns (2) and (3).
(iv) * indicates 10% significance level, ** 5% significance, *** 1% significance

Note: Fixed effects models cannot be estimated for time-invariant variables. However, one way of including these time-invariant factors is regressing the estimated fixed country-pair effects on the time-invariant explanatory variables (Hsiao, 1986). The regression results in the above table are from cross-country OLS in which the dependent variable is the estimated fixed country-pair effects.

CONCLUSION

This thesis was motivated by a curiosity to improve our understanding of international capital flows. The four chapters provide empirical results on four separate but related issues on international capital flows that have not been explored to the best of our knowledge in the literature. As such, this thesis contributes to the international finance literature and answers some questions that are important to enhance our understanding of international capital flows.

Chapter 1 has examined the relationship between net private capital inflows and the current account in a set of industrial and developing countries. The results indicate that inflows do not cause current account imbalances in the industrial countries, nor does the inflow volatility affect current account volatility (except when the outliers are excluded from the sample). However, in the panel of developing countries, the results indicate that cyclical volatility in net inflows positively affects volatility in the current account. There is also evidence in some developing countries that net inflows cause current account imbalances. Our results suggest that there are differences between developing and industrial countries in this regard.

In developing countries large capital inflows have been financing current account deficits and increasing reserve assets. Capital outflows from these countries have been restricted by controls. In contrast, large private capital inflows in industrial countries are matched by large capital outflows. The evidence in a small sample of developing countries that capital flows cause current account imbalances, may suggest that consumption-smoothing motives do not explain current account balances in these countries, if capital flows were motivated by overly optimistic growth prospects (e.g. motivated by implicit or explicit government guarantees as explained in Chapter 2). Although the current account itself is not a policy variable, large and protracted current account deficits raise concern for policy makers. We find in our sample that capital flows and the current account have a long-run equilibrium relationship, and that in some countries capital flows cause current account imbalances. This implies that when there is a sudden reversal of capital flows

(net capital outflows), developing countries may be more vulnerable to balance-of-payments crises. In order to provide stability of the current account, developing countries may develop policies to attract FDI, rather than short-term bank loans or portfolio capital, which are more volatile.

For some of the industrial countries, there is evidence that the current account imbalance causes capital flows. This may indicate that consumption-smoothing exists in industrial countries. The difference between industrial and developing countries may be explained by the fact that most industrial countries have liberalized capital accounts, which implies that in industrial countries, there are fewer barriers to borrowing and lending internationally, compared to developing countries. The ability to borrow in international markets is restricted for developing countries, and mostly determined by foreign investors' willingness to lend.

Chapter 2 has examined the relationship between explicit deposit insurance and gross private capital flows for a set of developing countries. This chapter was motivated by the theory that private capital flows to developing countries were attracted by a powerful deposit insurance guarantee rather than any other external or domestic factor. The cross-section OLS regression results found no evidence in our data that the existence of formal deposit insurance has an effect on private capital flows.

Lack of more prevalent evidence may be explained by the ambiguity relating to the design of explicit deposit insurance. Two points are crucial for deposit insurance to work effectively. First, explicit deposit insurance has to be clearly outlined in law, specifying the types of deposits that are insured and the coverage limits. Second, even if explicit deposit insurance is designed according to best practice, the guarantee has to be credible. The insurance should credibly guarantee the deposits under coverage, and also under no circumstances should it rescue any uninsured deposits of a bank. Finally, in an ideal situation, there should be no interrelationship between financial institutions and the corporate world. As long as banks are owned by corporations, it is more likely that there will be self-lending policies. If these three conditions are violated, the explicit insurance

becomes not only more prone to moral hazard but is indistinguishable from having no coverage. It is important to remember that implicit deposit protection systems are more prevalent in developing countries where most banks are government-owned and the governments are expected to resolve bank failures.

Chapter 3 has investigated the determinants of FDI flows with an emphasis on the role of geography to highlight the factors that affect the spatial allocation of FDI. Initial analysis concentrated on the characteristics of North-North, North-South and South-North bilateral inflows. We further examined the differential impact of gravity variables on two-way FDI flows between North-North and North-South.

The results from both pooled least squares and panel fixed-effects regression analyses indicate that standard gravity and other control variables have the same impact on each bilateral inflow. However, significant differences arise in the magnitude of the effect of these variables. Results indicated that geographical factors are more important and robust for North-South inflows compared with North-North, indicating greater information costs. In summary, there is evidence in our data that distance may act as a proxy for information costs and that information costs do have a significant negative effect on asset trade. We also find support for the market access theory for North-North two-way FDI flows. However, the North-South two-way FDI flows can be better explained by tariff jumping motivations. Also, industrial countries may prefer direct investment in developing countries to other types of capital flows in order to obtain control and curtail informational asymmetries.

Chapter 4 has investigated the determinants of FDI, trade and portfolio investment flows with an emphasis on the role of geography to highlight the factors that affect the spatial allocation of trade and portfolio investment *vis à vis* FDI. The results from pooled least squares regression analyses indicate that standard gravity variables have the same impact on each bilateral trade and FDI inflow. Significant differences arise in the magnitude of the effects of these variables. There is evidence in our data that there are greater

information costs for North-North and North-South direct investment than for trade. However, for South-North, information costs for trade are larger than for FDI.

The results also indicate that portfolio investment follows a similar pattern to FDI. Portfolio investment is more sensitive to the macroeconomic fundamentals. In our sample, there is evidence that geography is more important for FDI than it is for portfolio investment both for North-North and North-South flows. These results imply that there may be "cost" motivations for FDI. We conclude that geographical factors can explain the spatial allocation of FDI, trade and portfolio investment flows, as well as the macroeconomic fundamentals.

The results from chapters 3 and 4 are complementary. In Chapter 3, we find evidence that trade has a statistically significant positive effect on all groups of bilateral FDI inflows. As bilateral trade increases between two countries, bilateral FDI inflows to the host country also increase. This suggests that for North-North, North-South and for South-North trade and FDI are complements. The question that follows then is: what attracts FDI and trade? This question is answered in Chapter 4. Both trade and FDI are attracted to host countries that are nearby with large markets and high income. Portfolio investment is also attracted to host countries with large markets and higher income. Although pessimists may argue that location determines the economic integration of a country unalterably, the right policy mix can still encourage growth. Also to the extent that information costs are important, governments may facilitate information for direct investors. Increased FDI inflows may contribute to domestic growth, which in turn attracts more FDI.

When trade, FDI and portfolio investment are compared, trade proves to be more sensitive to proximity of the host market than FDI, and portfolio investment is the least sensitive for North-North flows. This result should be interpreted with caution, since the results are from a single year cross-section OLS. The results from pooled OLS indicate that North-North FDI is more sensitive to the distance than trade. Although the results of

this study and other studies indicate that distance can proxy information costs, some caution is necessary when interpreting distance also as a proxy for transport costs.

It is also important to note the differences between results in Chapters 3 and 4 in terms of FDI. In Chapter 4, the emphasis is on the effect of gravity variables on the level of FDI, whereas in Chapter 3, it is the relative ability of a country to attract FDI, expressed as the share of FDI in GDP. It is now well established that gravity models, with double-log specification are better fit to trade. Our results in Chapter 4 confirm this also for FDI. In Chapter 3, the decision to use FDI/GDP as the dependent variable was to obtain more efficient results. Also, expressing FDI as a ratio to GDP is more appropriate for the purpose of Chapter 3, since this chapter was motivated by the argument that North-North, North-South and South-North FDI are different. One source of difference may be the size of the country. Therefore, it is more informative to look at FDI in terms of its importance in host country GDP. In Chapter 4, standard gravity variables are shown to have the same impact on FDI as bilateral trade. The amount of FDI increases as the size and level of development increases, and decreases as proximity to the host market increases.

These chapters have empirically examined some of the issues on international capital flows. Many questions still remain unexplored. For example, Chapter 1 indicates that further research is required to explore if the volatility in capital inflows is responding to smooth consumption. This chapter suggested that the behaviour of the capital inflows is different in industrial countries compared with developing countries. This implies that comparative research on the consumption smoothing effects of capital inflows in industrial versus developing countries would be worthwhile. This chapter would also have benefited from an examination of the effect of different types of capital flows on the current account. It is well documented that portfolio equity capital is more volatile than foreign direct investment. Sustainability of large current account deficits and sudden reversals of capital flows have often been a concern for economists. Milesi-Ferretti and Razin (1996) list a number of theoretical indicators that may assure the sustainability of the current account deficits, such as the levels of investment and savings, and high economic growth. To the extent that FDI has a positive impact on these indicators, it may

help finance more sustainable current account deficits. The share of FDI in total foreign assets might have a different impact on the current account than the share of portfolio investment or short-term bank loans. We were unable to examine this aspect of the question due to the paucity of data observations. The sample period used in this study captures the time period when capital mobility have been especially high, and capital accounts of both industrial and developing countries have been liberalized compared to earlier periods. It would be interesting to examine the relationship between current account and capital flows in earlier periods of high capital mobility, such as the gold standard era of the late 1800s and early 1900s.

In Chapter 2 the analysis focused on the role of deposit insurance in attracting private capital flows in developing countries. However, explicit deposit insurance is only one aspect of a safety net of a country's financial system, and there remains much scope for further investigation. Other aspects of the safety net that warrant further analysis include lender of last resort facilities, prudential regulations and supervision. Prudential regulations and supervision of the financial markets aim to restrict risk-taking behaviour by banks. In early years of liberalization, banks increase interest rates to raise deposits and fund more risky projects, since prudential regulation and supervision is poor. Dooley suggested in his insurance model that relatively poorly regulated financial markets may see a relatively rapid increase in insured liabilities. Inclusion of some measure of the regulatory environment might have improved our specification. Also the results should be interpreted with a certain level of caution. Even when a country adopts explicit deposit insurance, which would limit its exposure to a bank run risk, the expectations of universal coverage in a too-big-to-fail case remain.

Chapters 3 and 4 indicated that there are information costs to international asset trade, as there is for bilateral trade. The effect of the differential impact of information costs on bilateral FDI inflows, trade and portfolio investment needs to be better understood to overcome geographic determinism. These chapters would have benefited from an analysis at the sectoral level, were such data available.

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