ESSAYS ON INTERNATIONAL CAPITAL FLOWS TO DEVELOPING COUNTRIES

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Contents

List of Figures

List of Tables

Muhterem babam, Salih Keskinsoy ve sevgili annem, Hava Keskinsoy'a

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To my venerable father, Salih Keskinsoy and my beloved mother, Hava Keskinsoy

Acronyms and Abbreviations

ADC	All Developing Countries
ADF	Augmented Dickey-Fuller
ANOVA	Analysis of Variance
AREAER	Annual Report on Exchange Arrangements and Exchange Restrictions
ARIMA	Autoregressive Integrated Moving Average
BGR	Bulgaria
BOPS	Balance of Payments Statistics
BRA	Brazil
CAB	Current Account Balance
CF	Capital Flows
CHL	Chile
CRAM	Country Risk Assessment Model
CRS	Constant Returns to Scale
CV	Coefficient of Variation
DA	Developing Asia
DF	Debt Flows
DGP	Data Generating Process
DMRC	Decreasing Marginal Returns to Capital
EAP	East Asia and Pacific
ECA	Europe and Central Asia
EF	Equity Flows
FDI	Foreign Direct Investment
FEM	Fixed Effects Model
FPEI	Foreign Portfolio Equity Investment
GCF	Gross Capital Formation
GDF	Global Development Finance
GDI	Gross Domestic Investment
GDP	Gross Domestic Product
GLS	Generalized Least Squares
GMM	Generalized Method of Moments
HIPC	Heavily Indebted Poor Countries
HP	Hodrick-Prescott
ICRG	International Country Risk Guide
IFS	International Financial Statistics
IMF	International Monetary Fund
IND	India
IV	Instrumental Variable
KAB	Financial and Capital Account Balance
KPSS	Kwiatkowski-Phillips-Schmidt-Shin
LAC	Latin America and Caribbean
LIC	Low Income Countries
LMIC	Lower Middle Income Countries
LTDEBT	Long-term Debt Flows (sometimes LTD)
MAPE	Mean Absolute Percentage Error

MAR	Morocco
MEB	Millî Eğitim Bakanlığı (Ministry of National Education of Turkey)
MENA	Middle East and North Africa
MEX	Mexico
ML	Maximum Likelihood
MUS	Mauritius
N/A	Not Available
NFA	Net Foreign Assets
NFL	Net Foreign Liabilities
NLS	Nonlinear Least Squares
OECD	Organisation for Economic Co-operation and Development
OIR	Over-Identifying Restrictions
OLS	Ordinary Least Squares
PAK	Pakistan
PNG	Private Non-Guaranteed
POLS	Pooled Ordinary Least Squares
PP	Phillips-Perron
PPG	Public and Publicly Guaranteed
PPP	Purchasing Power Parity
PRS	Political Risk Services Group
PWT	Penn World Tables
RE	Regressor Endogeneity
REM	Random Effects Model
RES	International Reserves
RHS	Right Hand Side
SA	South Asia
SEN	Senegal
SIC	Schwarz Information Criterion
SLS	Stage Least Squares
SNA	System of National Accounts
SSA	Sub-Saharan Africa
STDEBT	Short-term Debt Flows (sometimes STD)
SVAR	Structural Vector Autoregression
TC	Türkiye Cumhuriyeti (Government of the Republic of Turkey)
TED	Total External Debt
TFP	Total Factor Productivity
THA	Thailand
TIC	Theil Inequality Coefficient
TUN	Tunisia
TUR	Turkey
UMIC	Upper Middle Income Countries
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
USD	United States Dollars
VAR	Vector Autoregression
WDI	World Development Indicators
WEO	World Economic Outlook

Abstract

This thesis investigates international capital flows to developing countries for the period 1970-2006. The first chapter introduces the theoretical and empirical framework of the thesis, motivates it, overviews its building blocks (i.e. the following chapters) and clarifies its approach to the balance of payments. The second chapter reviews the data and shows the overall trends and developments in capital flows to the developing world by focusing on the geographical regions and income groups.

The core of the thesis explores the empirical puzzle that although one would expect international capital to flow to capital scarce countries where returns are higher, observation shows that capital flows to richer rather than to poorer countries (the Lucas paradox). To explore this total capital is measured as the sum of foreign direct investment and portfolio equity flows. The third chapter addresses the argument, based on cross-section evidence (Alfaro et al, *Rev. Econ. Stats*), that including the quality of institutions accounts for the paradox (because richer countries have better institutions they attract more capital) and finds that this only holds if developed countries are included; *within* developing countries, institutions do not account for the paradox. The fourth chapter extends this by including institutional quality indicators among determinants of capital inflows and employs a variety of panel data estimators; the quality of institutions does not resolve the Lucas paradox, although certain types of institutions are important. The persistence in the paradox and implied non-convergence could be ascribed to the detrimental impacts of negative shocks and volatility in global financial markets or to a Linder-type home bias in international finance.

The fifth chapter analyzes volatility, comovement (or contagion risk) and sudden stop (reversibility) of capital flows (foreign direct investment (FDI), foreign portfolio equity investment, long-term and short-term debt flows) using time series econometric techniques for twelve emerging market economies over 1970-2006. This is informative on the pattern and relationship between capital inflows, with implications for accommodating macroeconomic policies in countries receiving inflows. The chapter also addresses the predictions of conventional theory, that differences are associated with the *maturity* of the capital (long-term vs. short-term), with the information-based trade-off model of Goldstein and Razin (2006), that differences are associated with the *structure* of the capital (equity vs. debt). In line with the latter, equity flows (FDI and portfolio) are less volatile, more

persistent, more predictable and less susceptible to sudden stops than debt flows. Contrary to conventional theory, short-term flows are not more volatile, but there is evidence that correlations and risks of contagion are stronger within the pairs of long-term and equity capital flows than within the short-term capital flows.

CHAPTER 1

INTRODUCTION

1.1 PREFACE

In a world of perfect capital mobility and under the assumption of complete arbitrage, global savings are expected to flow to the economies with the highest rates of return. However, Feldstein and Horioka (1980) detect very high correlations between long-term averages of domestic savings and investment in OECD countries over 1960-1974. Based on this finding, they conclude that additions to the domestic supply of capital do not appear to move abroad in chase of the maximum return. For a sample of developing countries and with a different empirical strategy, Aizenman *et al*. (2007) document that 90 percent of domestic capital stock is self-financed and this ratio was stable during the 1990s. These findings imply that capital is not perfectly mobile internationally as incremental savings tend to stay in the country making the savings. This is the puzzle of imperfect capital mobility, or the so-called Feldstein-Horioka puzzle, that Obstfeld and Rogoff (2000) include as one of the six major puzzles in international macroeconomics.

The limited capital market integration or incompleteness is not the only puzzle in cross-border capital mobility. There is another related to the *direction* of the mobility: the Lucas paradox. It simply refers to the empirical observation that capital does not flow from richer to poorer countries as one would expect it to. Assuming homogeneous (constant returns to scale) technology, identical goods and competitively free international trade; neoclassical theory predicts that international capital will flow from richer to poorer economies. This is because, by the law of diminishing marginal returns, marginal product of capital is higher and hence returns to financial investments are larger in the latter. Nevertheless, as Lucas (1990) observes, capital flows disproportionately to richer economies rather than the poorer. The macroeconomic implication of this diversion in the direction of capital flows is that it aggravates sustained cross-country variations in factor prices, returns and real incomes.

Lucas (1990) proposes four hypotheses as potential explanations for the paradox: capital market frictions (institutions, political risk etc.); barriers to capital mobility (capital controls,

taxation and similar policies) and monopoly power; differences in relative human capital stocks; and differences in external benefits of human capital. Lucas (1990) favours the combination of the last two explanations, arguing that correcting for human capital differentials reduces the predicted return ratios between very rich and very poor countries.

Several papers provide alternative theoretical explanations that can be divided into two broad strands. In the first strand, papers attribute the paradox to differences in economic fundamentals. They propose that financiers will invest more in countries with more human capital, ample natural resources, better institutions (high quality regulatory and supervisory environment that confers safety and security for the property) and less distortive government interventions. Contributions in this strand include Stockman and Hernández (1988), Parente and Prescott (2000), Acemoglu and Zilibotti (2001), Castro *et al*. (2004), Romer (2006), Hsieh and Klenow (2009), Acemoglu and Dell (2010). The second strand emphasises capital market frictions associated with asymmetric information and sovereign risk (Gertler and Rogoff, 1990, Gordon and Bovenberg, 1996, Wright, 2006). We will consider all of these propositions to some extent in our empirical assessments.

Few empirical studies offer direct evidence on the Lucas paradox. Using annual panel data for 34 countries, Clemens and Williamson (2004) analyse the wealth bias in the geographical distribution of British capital exports during 1870-1913. They discover that, although local fundamentals (schooling, natural resources and demography) and capital market failures mattered, there was a stronger and persistent wealth bias (or the Lucas paradox) during the first global capital market boom. On the other hand, using data for a cross-section of 81 countries and over a more recent period 1970-2000, Alfaro *et al.* (2008) find that including a composite measure for institutional quality resolves the paradox. This means that foreign funds favour economies not because they have higher wealth but because the risks are lower due to better institutions and social infrastructure (Hall and Jones, 1999).

There are more empirical treatments on the general determinants, composition and behaviours of capital flows. The number of country studies increased significantly following the resumption and surges in financial flows to developing countries in the late 1980s and early 1990s. Capital flows in the forms of bonds, commercial bank lending and portfolio equity investments escalated as a result of financial and economic liberalization and integration policies. Also, resolution of the debt problems of these countries (e.g. Brady Initiative, 1989) contributed to the restoration of investor confidence and country credibility. This, in turn, led to the unprecedented build up of external funding. Motivated by these

developments early empirical studies focus on the determinants of capital flows. They investigate whether the flows are attracted by the favourable economic and financial conditions in the recipients (the pull view) or protracted by the unfavourable conditions in the capital exporting advanced countries (the push view).

Calvo *et al*. (1993) pioneered the literature on the 'push vs. pull' controversy by analysing monthly data for ten Latin American countries over 1988:1 through 1991:12 in a structural vector autoregression (SVAR) representation. They show that capital inflows (official reserves as the proxy) are explained by push factors. Recessionary trends in the US economic activity and low international interest rates were the main reasons for the recent surges. The dilemma is modelled by Fernández-Arias (1996) on the basis of the country risk or creditworthiness that comprises 'push' and 'pull' components. He also calibrates his model to empirical specifications (pooled and individual country OLS regressions). Similar to Calvo *et al*. (1993), Fernández-Arias (1996) finds that creditworthiness and ensuing portfolio inflows are pushed up by the external forces (i.e. falls in developed country returns). Results of Chuhan *et al*. (1998) and Taylor and Sarno (1997) give credit to both pull and push views.

In recent years, financial movements are increasingly related to the quality of institutions. The conceptual content of institutions—which could roughly be defined as incentive and safeguard structures that shape, control and lead economic activity—is vast. Institutional quality is intended to capture the degree of political risk, country risk, credit risk, domestic investment climate, capital market imperfections, civil liberties, transparency, contract enforcement and protection of property rights. Because of this wide scope, the way in which institutions are measured varies across studies. Some papers try to gauge a specific institution (such as investment security, corruption, expropriation etc.) or regulation (e.g. accounting standards), given that it is theoretically relevant to a particular type of capital flow. Although such an approach is taken in Daude and Fratzscher (2008), the majority of authors use a composite index. For instance, Edison and Warnock (2008) use the first differenced composite index of International Country Risk Guide (ICRG) political risk. Development of a country's institutional framework is captured by an index of civil liberties in De Santis and Lührmann (2009), while the institutional quality index in Faria and Mauro (2009) is composed of six world governance indicators.

The nature of linkages between institutional quality and capital flows also varies. Using 5-year panel data for 130 countries over 1970-2003, De Santis and Lührmann (2009) show that deteriorating civil liberties have negative impact on net foreign portfolio flows. Faria and

Mauro (2009) find, for a cross-section of 94 high and low income countries for the period 1996-2004, that institutional quality is the core determinant of external capital structure. The composition of external liabilities exhibits remarkable tendency towards equity, particularly FDI, rather than debt as institutional quality improves. To see if there is a pecking order of cross-border investment, Daude and Fratzscher (2008) employ bilateral capital stock data for 77 countries for the 1999-2003 period. Their seemingly unrelated regressions demonstrate that there is indeed such a pecking order and that the quality of host country institutions is one of its key determinants. More specifically, FDI and loans are detected to be less sensitive to institutional indicators than portfolio debt and equity. Using monthly panel data for 9 emerging markets over the period 1989:1-1999:12, Edison and Warnock (2008) could not find any significant relationship between institutional quality and US net purchases of emerging Asian and Latin American equity securities. This implies that when it comes to developing or emerging countries the quality of institutions seems to lose its explanatory power.

Some papers examine specific components and patterns of international capital flows. Using monthly data for 20 emerging economies over 1990s, Bekaert *et al*. (2002) analyse endogenous (structural) break points in portfolio equity investment time series. They discover that foreign participation in domestic stock markets rises promptly after the liberalization (because of portfolio rebalancing toward newly available emerging market assets) but level out three years later on. Transition dynamics analysis shows that equity capital leaves an emerging market much faster than when it enters. SVAR analysis in the same paper reveals that unexpected (positive) shocks to equity flows are linked to strong short-lived increases in average returns. The same shocks, however, lead to permanent declines in dividend yields and the cost of capital. Kalman filter applications of Sarno and Taylor (1999a and b) indicate that there are low permanent components in portfolio and official flows and high permanent components in cross-border commercial bank lending. FDI flows are indicated to be almost entirely permanent. Claessens *et al*. (1995), using quarterly time series data for five industrial and five developing countries, find that long-term flows are at least as volatile, transient and unpredictable as short-term flows. Hence, the data or accounting labels ‘short-term’ and ‘long-term’ do not signal any information about the time series properties of the funding component in question.

Instead of using individual time series, Levchenko and Mauro (2007) evaluate group medians and means of capital flow component data for the countries of all income levels.

They explore limited differences across types of flow with respect to volatility, persistence, cross-country comovement and correlation with growth. Striking differences, however, are discovered around the sudden stop episodes: bank loans and trade credits tumble severely and stay depressed for some time, portfolio flows experience quickly recovering reversals and FDI remains the most resilient.

1.2 OUTLINE OF THE THESIS

The principal objective of this thesis is to explore explanations for the Lucas paradox. A specific motivation is that the Alfaro *et al.* (2008) results may be driven by a 'capital flow bias' for high-income developed countries that have higher institutional qualities compared to developing countries. We will remove developed countries from the sample and investigate the role of the quality of institutions in explaining the Lucas paradox *within* developing countries. More broadly, the focus of the thesis is to try and identify factors that determine the patterns of capital flows across developing countries, and to provide an assessment of how these patterns and trends vary for different types of capital flow (long-term or short-term, debt or equity).

1.2.1 Chapter 2 Preview

Chapter 2 surveys the data employed in the thesis, providing the definitions and measures of different types of international financial flows to developing regions since 1970 through 2006. It is a detailed overview of the patterns, volumes, composition and trends.

We derive an expression for the definition of total net capital inflows used in Chapter 2. From the generic equations between the balance of payments and national income accounts

$$KAB = -CAB + \Delta RES = GAP + \Delta RES \quad (1)$$

where KAB denotes financial and capital account balance, CAB stands for current account balance, ΔRES means change in international reserves and GAP is the difference between domestic investment and savings ($GAP = I - S$). The financial and capital account balance could also be expressed as

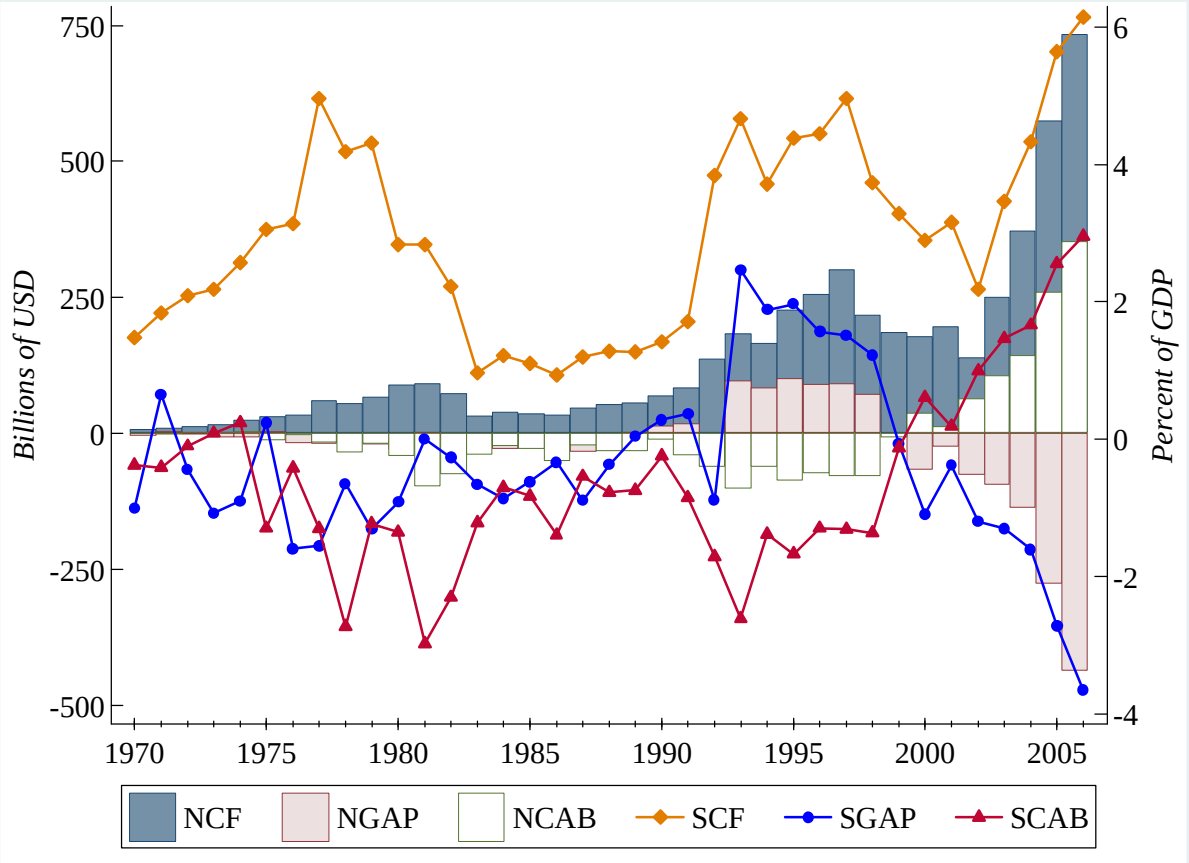
$$KAB = NFL - NFA \quad (2)$$

where, NFL refers to net foreign liabilities and NFA denotes net foreign assets. Rearranging the terms across Equation (1) and (2) we obtain

$$NFL = -CAB + \Delta RES + NFA \equiv GAP + \Delta RES + NFA = CF \quad (3)$$

where CF represents total net capital inflows that include net liabilities on foreign direct and portfolio equity investment plus external public and private debt net off foreign aid (i.e. concessional loans and grants), IMF credits, non-residents' deposits and interest arrears.

Figure 1.1: Foreign Capital Flows and Adjustments in Developing Countries, 1970-2006



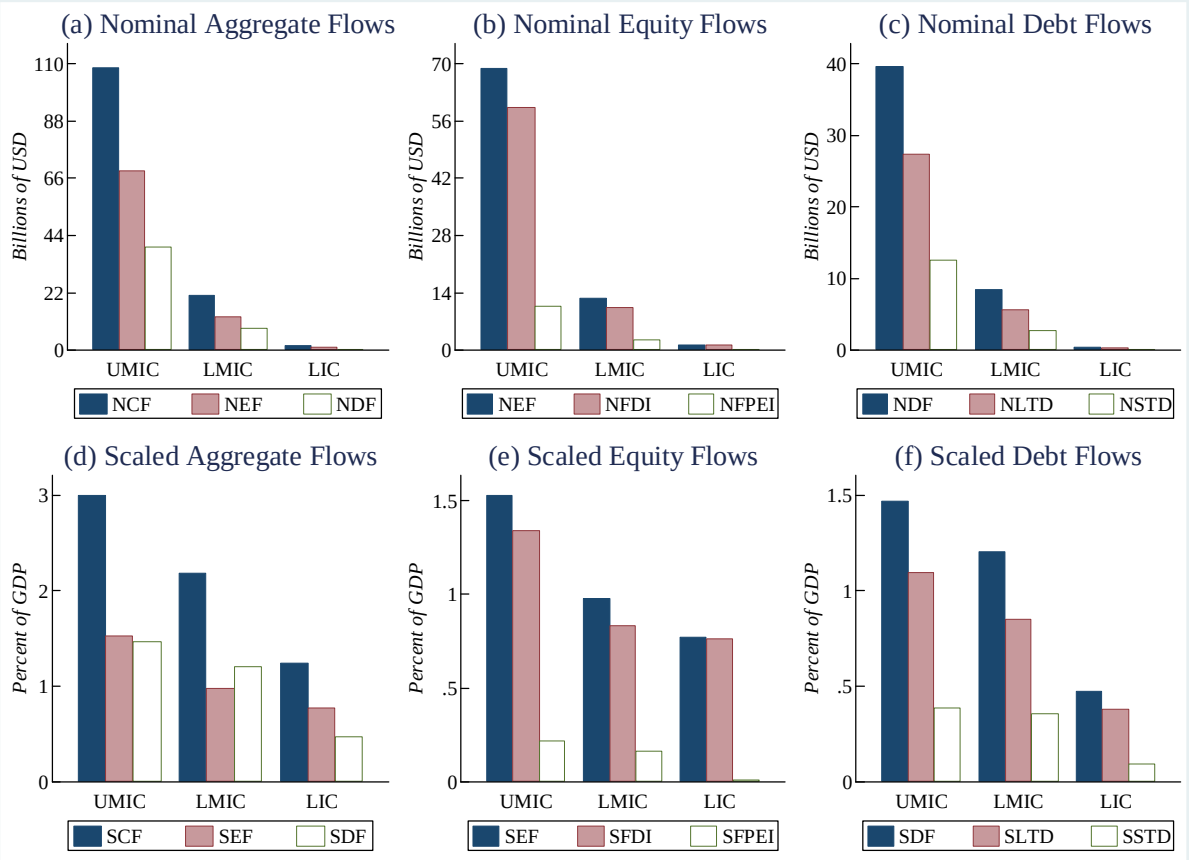
Sources: World Bank, *World Development Indicators (WDI), Global Development Finance (GDF).*

Notes: Bars show the *nominal* levels of aggregate net capital flows to all developing countries (NCF), investment-savings gap (NGAP) and current account balance (NCAB) which are in current U.S. dollars (left axis), whilst lines indicate the percentage amounts for the same variables that are *scaled* by current GDP (right axis). The common letters, *N* and *S*, at the beginning of the legend labels denote 'nominal' and 'scaled' respectively. Total capital inflows (CF) are composed of private equity (FDI and portfolio) inflows and public and private debt (portfolio, short-term and long-term loans) inflows net off foreign aid (i.e. concessional loans and grants), IMF credits, non-residents' deposits and interest arrears on foreign debt. The investment-saving gap (GAP) is the difference between gross domestic investment and gross domestic savings; the former minus the latter. Gross domestic investment, or gross capital formation as in WDI, consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. Gross domestic savings are calculated as GDP less final consumption expenditure (total consumption). Current account balance (CAB) is the sum of net exports of goods, services, net income, and net current transfers. Only hollow bars (with forest-green outline) exactly match their legends (both keys and labels), whereas light (maroon) and dim (navy-blue) bars represent their labels partly. The true NCF for a year is the vertical sum of all the above-zero bars within that year. Light maroon bars exhibit merely the amount of NGAP in excess of NCAB when both have the same signs and they show the whole NGAP when the signs are opposite. These could also be made clear from all-exact line plots.

Figure 1.1 shows the evolution of aggregate net capital flows, external and internal adjustments in developing countries. Total net capital inflows undergo three episodes of

surge and two phases of depression. The first surge was during the initial decade 1970s, the second was seen in the early 1990s and the third came in the last years. The inflows deteriorated for almost a decade in 1980s due to Latin American debt crisis and for about five years (1997-2002) as a result of financial crashes in East Asia and in many individual countries. Albeit incurring deficits all the way through until the late 1990s, current account balance does not seem to be a cause for concern as its GDP share varies within the band ±3%. Evaluating the GAP, it is either the case that developing countries underinvest or that they have excess savings because only in 10 years out of 37 investment exceeded savings. This suggests a potential problem with the economic efficiency in less developed countries.

Figure 1.2: Distribution of Capital Inflows by Income Groups, 1970-2006



Sources: World Bank, *World Development Indicators, Global Development Finance*.

Notes: Income groups refer to the World Bank's classification of countries according to the level of 2009 GNI per capita, calculated using the World Bank Atlas method. From those mutually exclusive groups; included are upper middle income countries (UMIC) which are also known as emerging market economies, lower middle income countries (LMIC) and low income countries (LIC). Component bars indicate the simple arithmetic averages for the corresponding region or income group. EF denotes equity flows, DF stands for debt flows, FDI refers to foreign direct investment, FPEI represents foreign portfolio equity investment, LTD denotes long-term debt and STD stands for short-term debt. See also notes to Figure 1.1.

As Equation (3) and Figure 1.1 reflect the thesis' approach to the balance of payments, Figure 1.2 illustrates the distribution of capital inflows among developing country income

groups. All the panels in the figure say in chorus that lower income countries receive less foreign capital in all types. The theme of Chapters 3 and 4 is centred on this paradoxical pattern.

1.2.2 Chapter 3 Preview

Chapter 3, the first empirical essay, uses cross-section data for a sample of 47 developing countries over the period 1970-2006 to examine if the Lucas paradox is resolved by including a measure for institutional quality. Institutional quality is measured by a composite index of ICRG political risk that consists of twelve components: government stability, socioeconomic conditions, investment profile, internal conflict, external conflict, corruption, military in politics, religion in politics, law and order, ethnic tensions, democratic accountability and bureaucratic quality (see Chapter 3 for details). This is a very broad measure and where appropriate it is useful to focus on components of this index that may be particularly important. Cross-section OLS regressions are employed to estimate the *long-run* responses of real capital inflows (the sum of foreign direct investment and portfolio equity inflows) per capita to the proxies of theoretically implied variables. As the cross-section estimates are based on the data averaged over the decades the results can be interpreted as capturing 'long-run' relationships (Houthakker, 1965; Baltagi and Griffin, 1984; Pesaran and Smith, 1995). One should be wary of drawing causal inferences as essentially one is identifying covariates of capital inflows across countries.

1.2.3 Chapter 4 Preview

Cross-section OLS estimators based on long-term averages of the data are criticized as being predominantly long-run steady state equilibrium models that generally do not illuminate *intertemporal* dependence (Cameron and Trivedi, 2005, Sinn, 1992). As these estimators are unable to control for country-specific heterogeneity (potentially giving rise to omitted variables bias), they may not satisfy the unbiasedness and consistency conditions. They are also unable to explain the true state dependence and the sources of persistence in the data. Chapter 4 tackles these issues by extending the analysis in Chapter 3. It applies a range of static (primarily within-group fixed-effects) and dynamic (system GMM) panel data models on 5-year-averaged panel data for the same group of developing countries and 1980-2006 period. Chapter 4 additionally considers the testable predictions of Acemoglu and Zilibotti (1997)—who propose that under the augmented assumptions of micro-level

indivisibilities and uncertainty there will be deviation from steady-state growth (i.e. global income divergence), with more capital flowing to richer countries—in the *short-run*.

1.2.4 Chapter 5 Preview

As Chapters 3 and 4 show uniformly that the Lucas paradox (or the wealth bias) is a persistent syndrome in the direction of developing-country capital flows, Chapter 5 considers if this is related to the composition and behaviour of the flows. Financial liberalization, capital market integration, capital controls and capital market imperfections may have distinct effects on different types of capital flow. Ultimately one wants to know if capital flows function as economic theory implies—that they sponsor productive investment opportunities and bring convergence in real factor returns, prices and incomes across nations. As the relevant literature proves inconclusive for virtues and vices of capital flows (Kose *et al*., 2009), the best strategy would be to concentrate on specific components and distinguish them according to their characteristics so as to better guide economic research and policy making.

Chapter 5, therefore, focuses on elucidating the behavioural patterns of foreign direct investment, foreign portfolio equity investment, long-term debt flows and short-term debt flows. To address this, the chapter uses time series data on these flow components for 12 emerging market economies from five regions over 1970-2006. It tests the hypotheses derived from the conventional theory, asserting that *maturity* (long-term vs. short-term) is the distinguishing factor in component attributes, and the information-based trade-off model of Goldstein and Razin (2006), suggesting that *structure* (debt vs. equity) is the distinguishing factor. The chapter employs appropriate time series techniques to shed light on volatility, persistence, predictability, correlation, contagion risk (comovement) and sudden stop (reversibility) profiles of the financing components.

In brief, the thesis is organized as follows. Chapter 2 reviews the aggregate and component-based capital flow data for different country groups of developing countries. The third and fourth chapters study the Lucas paradox in the long-run and in the short-run, respectively. Chapter 5 examines the behavioural patterns of basic capital flow components. Overall conclusions, limitations and future research possibilities are discussed in Chapter 6.

CHAPTER 2

A DATA SURVEY ON INTERNATIONAL CAPITAL FLOWS TO DEVELOPING COUNTRIES

2.1 INTRODUCTION

This chapter introduces the data on international capital flows to developing economies. The overall structure and defining features of the data are discussed with reference to the main data sources, span of time and cross-section units and the core variables of interest.

The Global Development Finance (GDF) database of the World Bank is the key source for our data series on capital movements.[1] Although there is the word 'global' in its name, GDF covers only developing regions and countries including emerging and less developed. Being another and yet more extensive World Bank database, World Development Indicators (WDI) is used to get the indicators—mostly macroeconomic and financial sector—that are not available from the GDF. Databases such as International Financial Statistics (IFS), Balance of Payments Statistics (BOPS), World Economic Outlook (WEO) of the International Monetary Fund (IMF), United Nations Conference on Trade and Development (UNCTAD) and statistics portal of the Organisation for Economic Co-operation and Development (OECD) are also consulted for comparison and cross checks.

The years of observations range from 1970 to 2006, covering a maximum of 37 annual data points. This is the general case for the regions and income groups for which the data are available. The time length, particularly because of the changing initial years, varies considerably across countries and by different types of capital flow. As we look at the overall trends and developments in financial movements to developing markets in this chapter, that should not be a concern for the moment. We assure sample consistency in the analytical chapters of the thesis. Country groups that are composed of developing countries from different income classes and geographical regions constitute the spatial domain of the

[1] The data is made available through the library and information service facilities of the University of Nottingham by providing access to Economic and Social Data Service (ESDS) which is an integrated online data archiving and dissemination service throughout the United Kingdom.

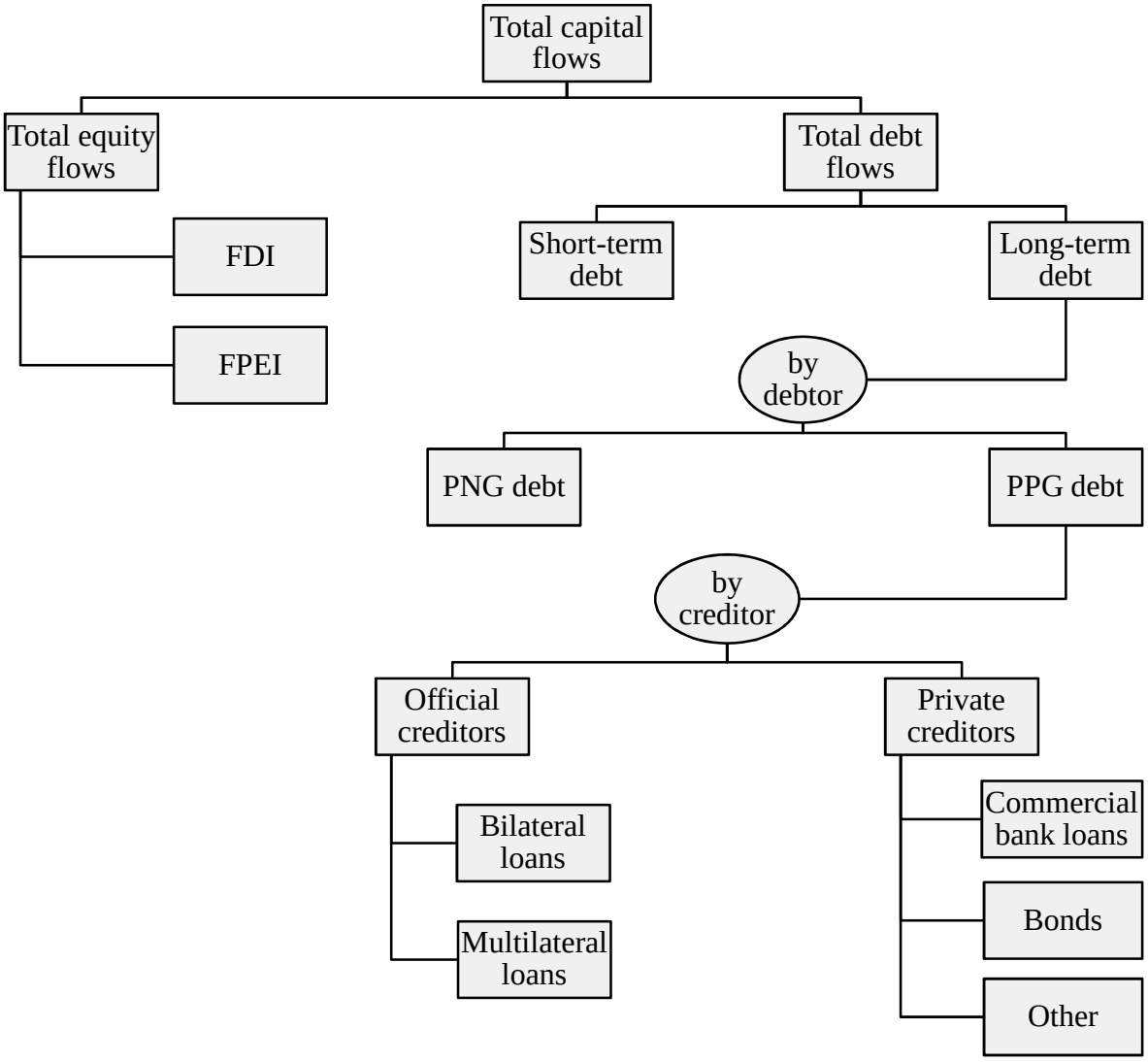
chapter. Although some data illustrations are based on the income groups for comparison purposes, the cross-section emphasis is on regions. The two Asian regions, East Asia and Pacific and South Asia, that are separately identified by the World Bank are combined under the name of Developing Asia (DA) as in WEO. Europe and Central Asia (ECA) comprises so-called transitional economies located in Eastern Europe and Central Asia as well as Turkey.[2] The remaining regions, Latin America and Caribbean (LAC), Middle East and North Africa (MENA) and Sub-Saharan Africa (SSA) are the same as in Word Bank classifications. The chief grouping is All Developing Countries (ADC) for which the aggregate data consist of individual sums of regional data. Income groups are based on the World Bank's classification of countries according to the level of 2009 GNI per capita, calculated using the Atlas method: upper middle income countries (UMIC), which are also known as emerging market economies, lower middle income countries (LMIC) and low income countries (LIC).

Despite the fact that all capital flow types serve similar economic goals through financing productive real investment opportunities, smoothing business and consumption cycles and offering diversification and risk sharing, there are differences in terms of functionality, type of the security, original contractual maturity, direction of the investment, and other contractual arrangements. For this study, cross-border capital flow data are collected and organized under the standard sub-aggregates of equity and debt flows. Figure 2.1 provides a taxonomic portrayal of the major and minor global funding components covered. Due to space considerations, seven different data series for which the compositional structures are shown in the figure are identified for focus: total capital flows, total equity flows, total debt flows, foreign direct investment (FDI), foreign portfolio equity investment (FPEI), short-term debt flows and long-term debt flows. The items and information beyond the third level (i.e. after the node 'by debtor') are given for illustrative purposes only.

Aggregate total net capital flows for a country group is the sum of total net equity and debt flows to that group. International aid allocations (concessional loans and grants), IMF credits, non-residents' deposits and interest arrears on external debt are excluded. Total equity inflows comprise net flows of FDI and FPEI.

[2] As a poor transition economy, Mongolia is classed with Central Asia.

Figure 2.1: Taxonomy of Global Capital Flows Considered throughout the Thesis



Sources: World Bank, *Global Development Finance* and author's depictions.

Notes: FDI denotes foreign direct investment and FPEI refers to foreign portfolio equity investment. Private nonguaranteed (PNG) debt comprises the external obligations of private debtors that are not guaranteed for repayment by a public entity of their country. Public and publicly guaranteed (PPG) debt covers the external obligations of public and private borrowers that are insured by a public entity. Bilateral creditors are governments and their agencies, including central banks, official export credit agencies and autonomous agencies. Multilateral creditors are international financial institutions such as the World Bank, regional development banks, and other multilateral and intergovernmental agencies whose lending is administered on a multilateral basis. Commercial bank loans comprise loans from private banks and other private financial institutions. Bonds include publicly issued or privately placed bonds. Credits from 'other' private creditors contain credits by manufacturers, exporters and other suppliers of goods plus bank credits covered by a guarantee of an export credit agency. Foreign aid (i.e. concessional loans and grants), credits from the International Monetary Fund (IMF), non-residents' deposits and interest arrears on all sorts of debt are excluded.

Foreign direct investment refers to the net financial investments that involve acquisition of a lasting management interest (10 percent or more of voting stock) in an enterprise operating

in an economy other than that of the investor.[3] It is the sum of equity capital, reinvested earnings and other long-term and short-term capital of similar character. FPEI includes net inflows from equity securities other than those recorded as direct investment, inflows from traded shares, stocks, depository receipts (American or global) and direct purchases of shares in local stock markets by foreign investors. Long-term and short-term debt inflows add up to the total net debt flows. Long-term debt inflows are disbursements minus principal repayments on private nonguaranteed (PNG) and public and publicly guaranteed (PPG) debt securities (e.g. publicly issued and privately placed bonds) and international loans (official and private non-concessional) with an original or extended maturity of more than one year and that are repayable in foreign currency, goods or services. Net short-term debt flows consist of disbursements less principal repayments on loans, trade credits and negotiable money market debt instruments (such as repos, treasury bills, commercial and financial papers, bankers' acceptances, certificates of deposit and other short-term notes issued under the note issuance facilities that render the bearer the unconditional right to receive a contractually stipulated, reserved and fixed sum of money on a specified date) with an original maturity of one year or less.

Following the convention in World Bank (2008), we construct the 'net' aggregate capital flow indicators by summing up net annual credit (if the balance of the flow is positive) or debit (if it is negative) of the relevant liability accounts in the balance of payments. A positive numeric figure for a given year, therefore, implies that the financial liability items end up with a net inflow in that year, while any negative amount would reflect a net outflow for the year. By this practice, we concentrate on the foreigners' financial claims on the country group receiving the funding and ignore those of the domestic residents on foreign entities.

The data are usually expressed either in nominal billions of US dollars (USD) or as percent of the group's gross domestic product (GDP), unless otherwise stated. Nominal values are reported to show the actual realizations (i.e. the data) as they are. It is crucial to consider these values, as they are the essential or base data of interest throughout the thesis. The primary focus is on nominal values because these figures have actual meaning in that international financial transactions originally bear these monetary values. In contrast to some

[3] Both the initial transactions that set up the relationship between the investor and the enterprise and all the subsequent transactions that take place between them and among affiliated enterprises such as subsidiaries (a non-resident investor owns more than 50%), associates (an investor owns 50 percent or less) and branches (entirely or jointly owned unincorporated enterprises) are recorded as FDI.

economic and financial indicators or accounts (e.g. GDP), these values are not attached or assigned by statisticians but perpetually reported through the relevant money and capital market security accounts. The pertinent recordings in the balance of payments follow crude realizations and market activities which are mostly denominated in US dollars. Furthermore, it is the standard treatment in the periodic reports of multilateral organizations and in some academic articles when they review this kind of data (World Bank, 2012, Bosworth and Collins, 1999).

Wealth or income scaling is performed to take relative economic sizes or masses, exchange-rate movements and domestic price changes into account, along with real GDP growth.[4] It also improves the accuracy and reliability of the comparisons across country groups, as the changing number of countries and observations for each group could bias the comparisons based on nominal values. Hence, GDP-scaled data are preferred in comparing geographical regions and income groups. Currency conversion, aggregation and gap-filling procedures of the World Bank are adopted and applied for some years in some cases.

The chapter proceeds as follows. Section 2.2 focuses on trends and developments in capital flow aggregates, whilst Section 2.3 reviews the level and direction of foreign direct and portfolio equity investments. The evolution and financial implication of international lending are covered in Section 2.4 and the key observations are summarized in Section 2.5.

2.2 TRENDS AND DEVELOPMENTS IN AGGREGATE CAPITAL FLOWS

We describe the level, composition and direction of global financial flows to developing countries for the period 1970-2006. The moving averages of total net capital flows and aggregate components are provided in Table 2.1. For all developing countries, total capital inflows jumped from about $13 billion a year to the nominal level of $350 billion within three decades. Modest during the initial years, total net equity flows have experienced the most outstanding rise by ending up with average annual inflows of almost $262 billion. Debt flows rose very little and fell below 1% of GDP in the most recent sub-period. Although capital flows as a share of GDP are variable throughout, in these terms total net capital flows doubled and total equity inflows rose by more than six times eventually.

[4] For more on this, see World Bank (2008). It should be noted, however, that the emphasis in this chapter is on trends and developments in capital flows that are characterised by the changes in capital flows themselves. For the GDP-scaled data, changes in percentages over time would also be affected by the changes in GDP.

Table 2.1: Total Capital Inflows to Developing World by Sub-periods, Billions of USD

Region and Component	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-06
All Developing Countries							
Total Capital Inflows	13.42	48.59	64.69	45.11	127.27	236.86	349.02
	(2.0)	(3.9)	(2.0)	(1.2)	(3.1)	(4.2)	(4.0)
Total Equity Inflows	3.22	6.03	11.24	15.72	66.82	161.92	261.91
	(0.5)	(0.5)	(0.3)	(0.4)	(1.6)	(2.8)	(3.1)
Total Debt Inflows	10.20	42.56	53.45	29.39	60.45	74.94	87.11
	(1.5)	(3.4)	(1.7)	(0.8)	(1.5)	(1.3)	(0.9)
Developing Asia							
Total Capital Inflows	1.62	6.07	15.98	18.34	56.20	79.89	143.53
	(0.6)	(1.4)	(2.4)	(2.0)	(4.5)	(4.0)	(4.0)
Total Equity Inflows	0.35	0.72	2.44	6.00	29.99	63.92	116.33
	(0.1)	(0.2)	(0.4)	(0.7)	(2.3)	(3.2)	(3.3)
Total Debt Inflows	1.27	5.35	13.54	12.34	26.20	15.96	27.20
	(0.5)	(1.2)	(2.0)	(1.4)	(2.2)	(0.8)	(0.7)
Europe and Central Asia							
Total Capital Inflows	1.01	4.88	6.47	7.19	12.29	37.99	108.50
	(n/a)	(n/a)	(0.5)	(0.4)	(1.7)	(3.6)	(5.6)
Total Equity Inflows	0.14	0.25	0.52	1.02	5.40	17.56	49.43
	(n/a)	(n/a)	(0.04)	(0.1)	(0.7)	(1.7)	(2.6)
Total Debt Inflows	0.87	4.63	5.94	6.17	6.90	20.43	59.07
	(n/a)	(n/a)	(0.5)	(0.4)	(1.1)	(1.9)	(3.0)
Latin America and Caribbean							
Total Capital Inflows	8.21	27.04	31.60	9.75	51.15	105.27	69.41
	(3.3)	(5.6)	(4.0)	(1.2)	(3.8)	(5.4)	(3.2)
Total Equity Inflows	1.50	3.34	6.13	6.07	27.44	65.35	68.90
	(0.7)	(0.7)	(0.8)	(0.8)	(2.0)	(3.4)	(3.2)
Total Debt Inflows	6.71	23.70	25.47	3.68	23.70	39.92	0.51
	(2.7)	(4.9)	(3.2)	(0.5)	(1.8)	(2.1)	(-0.03)
Middle East and North Africa							
Total Capital Inflows	0.93	6.10	4.22	4.87	4.97	1.48	10.78
	(1.9)	(4.5)	(1.8)	(1.8)	(1.9)	(0.4)	(2.0)
Total Equity Inflows	0.37	0.95	1.07	1.34	1.91	2.75	10.35
	(0.7)	(0.7)	(0.5)	(0.5)	(0.7)	(0.7)	(1.8)
Total Debt Inflows	0.56	5.15	3.16	3.53	3.06	-1.27	0.43
	(1.2)	(3.8)	(1.4)	(1.3)	(1.2)	(-0.3)	(0.2)
Sub-Saharan Africa							
Total Capital Inflows	1.66	4.51	6.43	4.95	2.66	12.24	16.81
	(1.9)	(2.6)	(2.5)	(1.8)	(0.9)	(3.7)	(3.1)
Total Equity Inflows	0.85	0.78	1.09	1.28	2.07	12.34	16.91
	(1.0)	(0.5)	(0.4)	(0.5)	(0.7)	(3.7)	(3.4)
Total Debt Inflows	0.80	3.73	5.34	3.67	0.58	-0.10	-0.10
	(0.9)	(2.1)	(2.1)	(1.4)	(0.2)	(-0.03)	(-0.3)

Sources: World Bank, *World Development Indicators, Global Development Finance*.

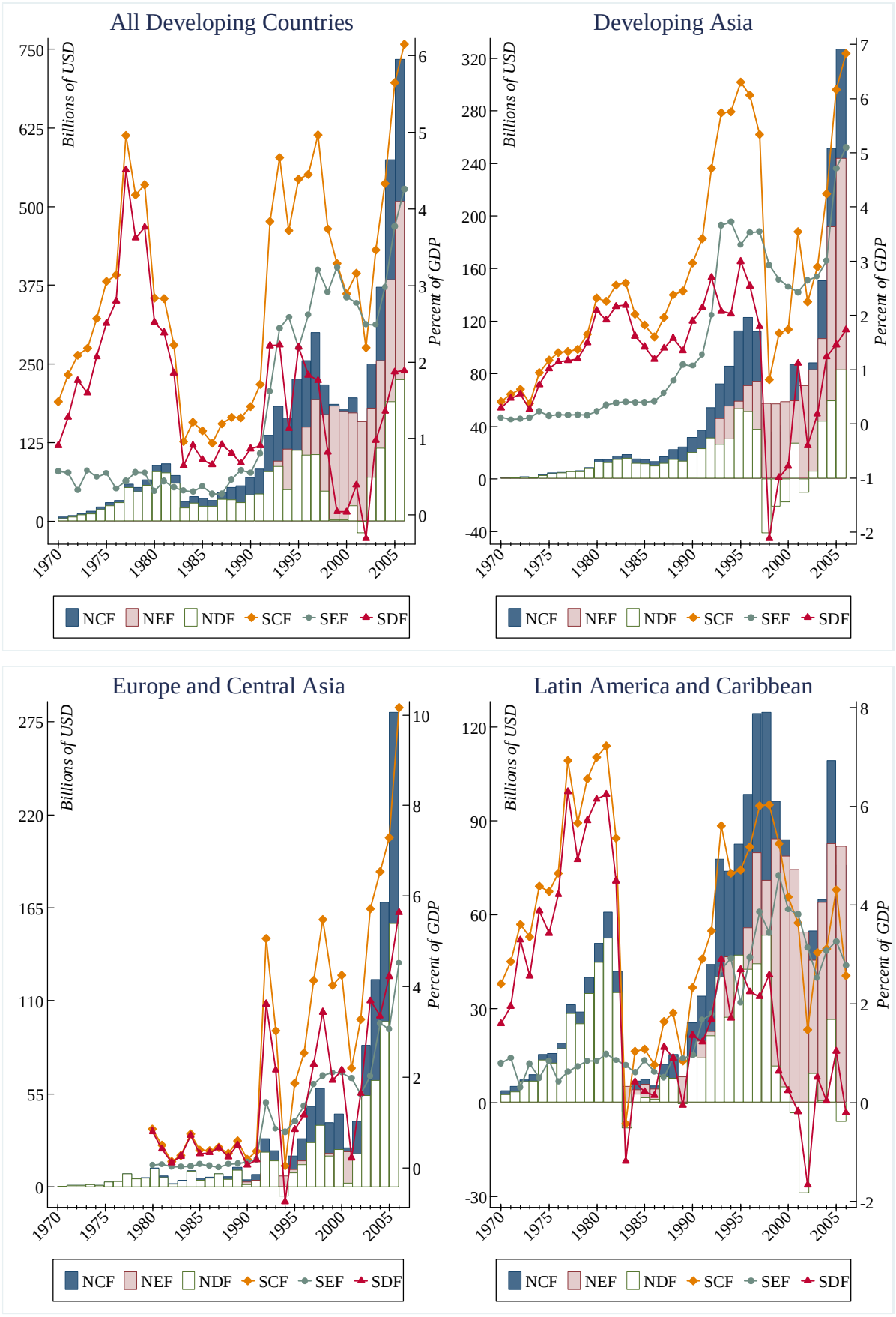
Notes: Including the numbers in parentheses which are the inflows expressed as percent of regional gross domestic product (GDP), all nominal figures in the table are averages for the corresponding period and country group or region. Data for all developing countries consist of the individual sums of regional data. South, East and Pacific Asian developing countries are combined within Developing Asia, while Europe and Central Asia covers so-called transition economies in Central Asia and Eastern Europe as well as Mongolia. The remaining regions are the same as in World Bank classifications. N/A means not available. See also notes to Figure 2.1.

The period-averages of total capital and equity inflows are always, while those of debt inflows are almost always, positive (except for MENA during 1995-99 and for SSA during the last two sub-periods). This shows that external funding is a persistent and prevalent reality for developing economies and a manifestation of continual investor and creditor interest in them. The individual sub-periods of 1975-79 and 1990-94 witness remarkably higher surges that are driven by debt inflows in the former and by equity inflows in the latter. Economic slowdown in advanced countries could have contributed to both surges, while surges during the second episode may additionally be linked to concomitant liberalizations in developing countries. Total capital inflows were dwarfed by paralyzed debt inflows during 1985-89 due most probably to the Latin American debt crisis that had broken out one sub-period earlier. The effects of 1997 East Asian financial crises are not that visible from this table. Initially strong in receiving foreign capital, Latin America and Caribbean loses its position to other regional destinations like Developing Asia and particularly Europe and Central Asia where debt flows most in the latest sub-periods. Middle East and North Africa and Sub-Saharan Africa have weak capital flows that remain under $20 billion per year.

Figure 2.2 shows the distribution and evolution of aggregate capital inflows over time. Foreign borrowing and financial investments in developing countries have risen from relatively low levels to unprecedented amounts within nearly 40 years, approaching to $750 billion in nominal terms. However, this escalation was not monotonic. Lending driven cross-border financing, displaying largely similar profile across geographical regions, has increased rather gradually until 1980s. It is depressed throughout this decade because of debt problems and international credit dry-up in some LAC countries (i.e. Latin American debt crisis that started in 1982). Financial integration, capital account liberalization and privatization of the late 1980s have facilitated and accelerated the international investment process that has led net capital flows to escalate. Exceeding aggregate net debt flows from early 1990s onwards, aggregate net equity flows have acted as a lean-against-the-wind in keeping total capital inflows uninhibited from devastating impacts (visible in this figure) of the contagious East Asian financial crises that started in 1997 and resulted in lingering debt overhangs in most of the regions.[5] Relative to GDP however, the rise is less impressive and regular, given growth of GDP and depreciation of the US dollar against some developing country currencies.

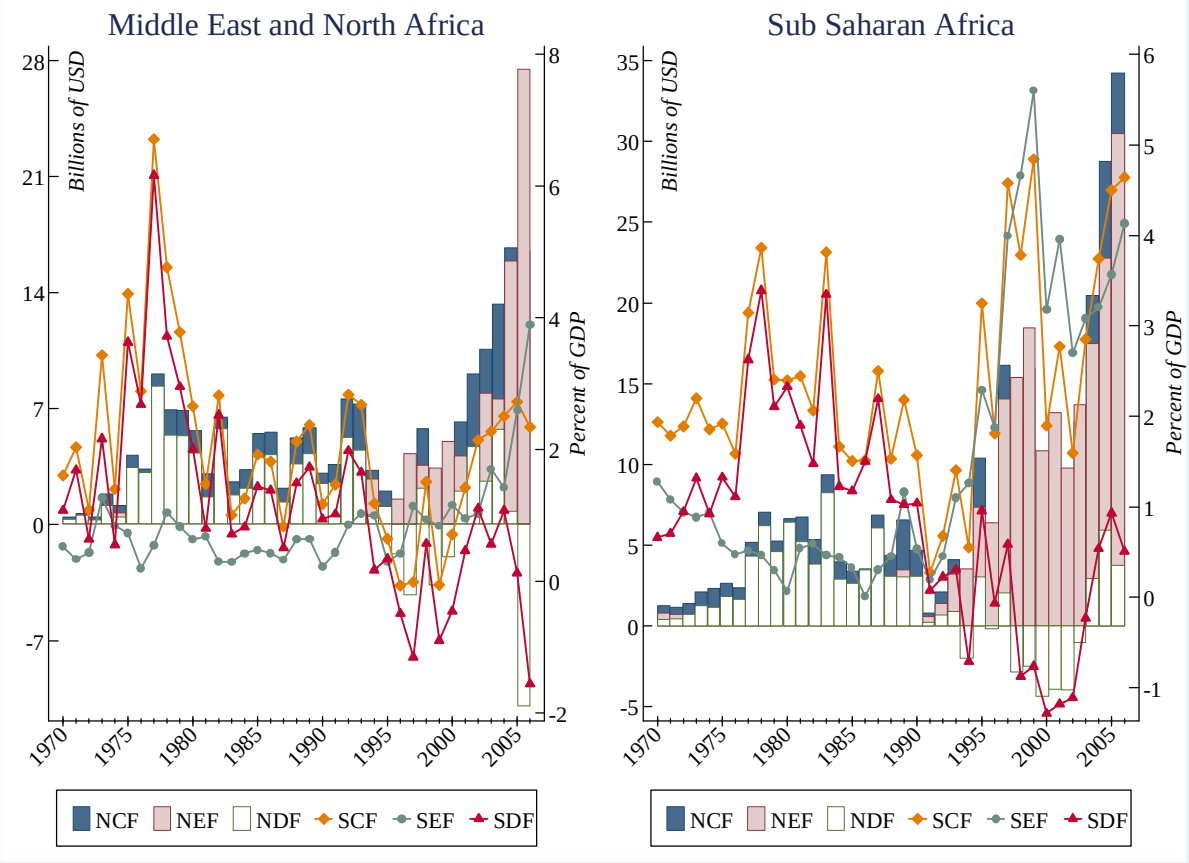
[5] Contagion in 1990s with special emphasis on East Asian financial crisis is documented in Fratzscher (2003) and Caramazza *et al*. (2004).

Figure 2.2: Aggregate Net Capital Flows to Developing World by Regions, 1970-2006



(continued on next page)

Figure 2.2 *(continued)*



Sources: World Bank, *World Development Indicators, Global Development Finance*.

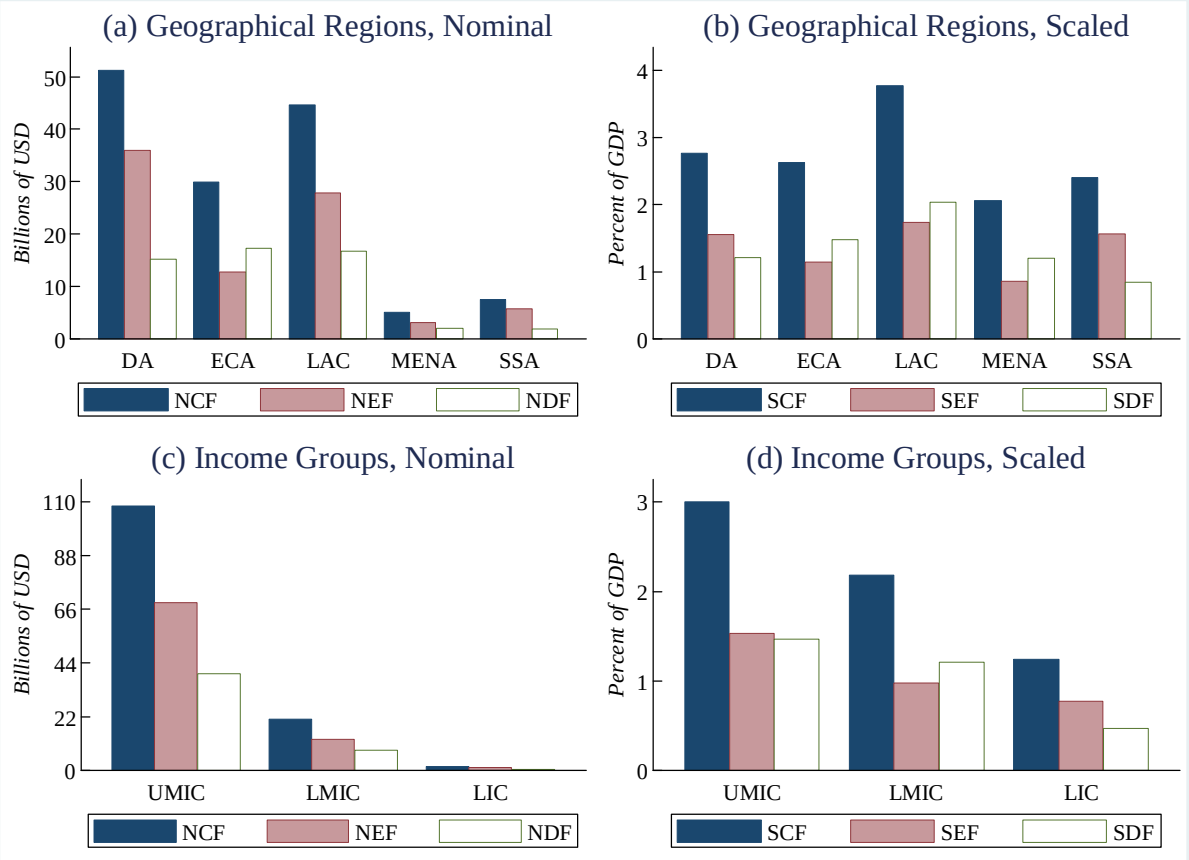
Notes: Bars show the *nominal* levels of aggregate net capital flows which are in current U.S. dollars (left axis), whilst lines indicate the percentage amounts for the same flows that are *scaled* by current GDP (right axis). The common letters, *N* and *S*, at the beginning of the legend labels denote 'nominal' and 'scaled' respectively. CF refers to (aggregate) capital flows, EF is equity flows and DF stands for debt flows. Only hollow bars (with forest-green outline) exactly match their legends (both keys and labels), whereas light (maroon) and dark (navy-blue) bars represent their labels partly. The true NCF for a year is the vertical sum of all the bars within that year and the true NEF is what remains from the hollow bar (NDF) in a certain year. Light maroon bars exhibit merely the amount of NEF in excess of NDF when both have the same signs and they show the whole NEF when the signs are opposite. These could also be made obvious from all-exact line plots. See notes to Table 2.1 as well.

Aggregate debt flows are more volatile than aggregate equity flows, making the former responsible for much of the fluctuations in total capital flows.[6] Regarding the individual regions, note that total debt inflows to DA have never been more than 3% of GDP. This low level of dynamic external leverage of the region coincides with the conventional view that economic and financial fundamentals of the Developing Asian countries had not, in fact, deteriorated to the extent of giving rise to a crash, which happened nonetheless. Second and third generation models of financial crises have, therefore, been devised to address this sort of anomaly by incorporating the investor behaviour, capital market imperfections and systemic inefficiencies (balance sheet distortions, deposit insurance schemes etc.) into their

[6] Including the volatility, Chapter 5 analyzes the behavioural patterns of the main capital flow components.

formulations.[7] Europe and Central Asia is the region where debt flows shape the total capital flows—that ultimately achieve a high GDP share, being over 10% as of 2006—for the majority of years. As most of the heavily indebted poor countries (HIPC) are in Sub-Saharan Africa, the apparent downward course of the region's SDF over time mirrors the effects of debt reduction and restructuring policies in these countries. International equity flows to SSA, albeit quite unstable, increasingly compensate for any possible shortfall in foreign financing due to borrowing constraints in the region. Following the new millennium, Middle East and North African capital flows in the last year and Latin American and Caribbean capital flows for a couple of years has diminished.

Figure 2.3: Distribution of Capital Inflows by Geographic Regions and Income Groups



Sources: World Bank, *World Development Indicators, Global Development Finance*.

Notes: Geographical regions are Developing Asia (DA), Europe and Central Asia (ECA), Latin America and Caribbean (LAC), Middle East and North Africa (MENA), and Sub-Saharan Africa (SSA). Income groups refer to the World Bank's classification of countries according to the level of 2009 GNI per capita, calculated using the World Bank Atlas method. From those mutually exclusive groups; included are upper middle income countries (UMIC) which are also known as emerging market economies, lower middle income countries (LMIC) and low income countries (LIC). Component bars indicate the simple arithmetic averages for the corresponding region or income group. See also notes to Figure 2.2.

[7] See Frankel and Wei (2005), Burnside *et al*. (2008).

To enable more explicit comparisons among different country groups, four panels of bar graphs of the aggregate capital flow component averages are presented in Figure 2.3. According to nominal evaluations, Developing Asia, followed by LAC and ECA, ranks the first among five geographical regions in getting total capital and equity flows. Most of the aggregate debt inflows go to Europe and Central Asia. However, Latin America and Caribbean has the highest GDP shares in all categories. The other difference is that equity flows stand out to be the dominant aggregate component in Panel (a), whereas they are slightly superseded by debt flows in (b). These differences are most probably due to the valuation effects (exchange rate and price level changes) that are uncontrolled in Panel (a). As the exchange rate movements and price level changes may cause the later or recent period data to dominate the averages in nominal panels, GDP-scaled panels are believed to provide more accurate and consistent comparisons. Nonetheless, there is a common aspect of both panels in that the positions of MENA and SSA as being the least popular foreign capital destinations remain unaltered. The plain truth discernible from the lower half of the figure is that the global funds are lower in lower income countries. Cross-border capital moving to developing world, which is already meagre as most of the average GDP shares are well below 3%, seems to be channelled mainly to the upper middle income county (emerging or richer developing) markets.[8]

Growth rates and cyclicality measures of capital flows to developing countries are reported in Table 2.2. For the purpose of assessing relative growth performances, Panel (a) gives average and median annual percentage changes in aggregate real capital flows, real GDP, international reserves (RES) and total external debt (TED) stocks (all in fixed 2005 US dollars). As capital flows are year-on-year changing net foreign liabilities, they are more dynamic and have higher growth rates than memorandum items (i.e. the stock variables of GDP, RES and TED that are inherently static). Setting total capital flows to LIC and total debt flows to LAC, MENA and LIC aside, all of the real capital flow aggregates grow. Real debt inflows to low income countries and to Middle East and North Africa are shrinking. Reading negative medians and positive means respectively, we notice that total capital inflows to low income countries and total debt inflows to Latin America and Caribbean are characterized by weak but frequent ebbs and intermittent but torrential flows, so that whether they are actually growing or contracting is difficult to tell.

8 The wealth bias in international capital flows, their role in global macroeconomic (non)convergence and interactions with institutional quality levels are exclusively studied in third and fourth chapters of the thesis.

Table 2.2: Growth and Cyclicality of Total Capital Flows in Comparative Perspective

	ADC	Geographical Regions					Income Groups		
		DA	ECA	LAC	MENA	SSA	UMIC	LMIC	LIC
(a) Average and Median Annual Growths (Percent)									
Means									
RCF	12.58	21.68	174.14	24.51	945.40	30.11	17.12	69.22	220.01
REF	14.34	19.30	55.74	15.58	28.56	90.44	21.47	18.87	86.17
RDF	40.88	35.97	67.95	170.00	-8.23	42.35	178.85	37.91	-64.20
GDP	5.42	4.34	2.39	3.89	4.83	2.57	4.12	3.42	0.84
RES	13.28	11.99	8594.84	8.41	12.72	9.07	9.36	9.96	4.80
TED	6.07	6.13	10.84	4.45	5.74	5.00	6.62	4.54	5.38
Medians									
RCF	15.03	18.75	30.02	14.78	9.20	7.47	12.48	11.88	-6.09
REF	7.63	11.68	18.27	14.36	0.54	7.77	10.50	20.22	6.45
RDF	9.36	14.93	35.12	-0.50	-7.31	7.98	7.65	11.00	-11.37
GDP	3.98	3.38	3.73	5.33	4.57	1.15	3.33	3.56	1.14
RES	9.96	9.92	20.66	12.05	13.18	6.99	9.56	8.52	3.99
TED	6.50	6.57	7.28	3.94	3.06	3.94	6.10	4.11	4.49
(b) Correlations with Real GDP Growth (Coefficient)									
RCF	0.18	0.27	0.15	0.19	-0.06	0.27	0.37	0.22	0.07
	(0.30)	(0.11)	(0.46)	(0.27)	(0.73)	(0.11)	(0.02)	(0.20)	(0.69)
REF	0.06	0.24	-0.01	0.42	0.15	0.16	0.46	-0.04	0.01
	(0.74)	(0.16)	(0.95)	(0.01)	(0.37)	(0.36)	(0.00)	(0.82)	(0.94)
RDF	0.01	0.34	-0.24	0.35	-0.07	0.25	-0.13	0.35	0.06
	(0.94)	(0.04)	(0.23)	(0.04)	(0.68)	(0.15)	(0.45)	(0.04)	(0.74)

Sources: World Bank, *World Development Indicators, Global Development Finance*.

Notes: Compound growth rates are computed over 1971-2006 for the variables that are expressed in real terms (constant 2005 US dollars). An *R* in front of the acronyms of capital flow aggregates signifies this *reality*. ADC denotes all developing countries, RES stands for total international reserves that comprise holdings of monetary gold, special drawing rights, reserves of IMF members held by the IMF, and holdings of foreign exchange under the control of monetary authorities and TED refers to total external debt outstanding and disbursed. TED is essentially a stock variable (so are GDP and RES) that covers the accumulated sum of public, publicly guaranteed, and private nonguaranteed long-term debt, use of IMF credit and short-term debt. The correlation between annual percentage changes in a flow aggregate and in the real GDP measures the cyclicality of that aggregate. Associated significance levels (*p*-values) are in parentheses. See notes to Figure 2.3 also.

While the growth in equity flows is more regular and steady, in debt flows, by and large, it is bulky and lumpy. All memorandum items, even cumulative external debt stocks, grow everywhere. The positive growth of TED in LIC and MENA—where the mostly private debt inflows were dwindling—is perhaps because of undisbursed credit commitments, concessional loans, interest arrears and IMF credits. Faster accumulation of total external debt than real output is likely to be accommodated by even faster build-up of external

reserves, which are in turn fed by capital inflows. Considering the means and medians, all forms of capital flows to developing economies in Europe and Central Asia appear to have the highest compound growth rates.

The correlations between annual percentage changes in the capital flow aggregates and in the real GDP that are used to measure the cyclicality of these real aggregates are provided in Panel (b) of the table. In general, total capital flows and its aggregate components are acyclical with a few exceptions; total net capital flows to upper middle income countries, aggregate equity inflows to UMIC and Latin America and Caribbean and aggregate net debt flows to lower middle income countries, LAC and Developing Asia are procyclical. Two implications are worth to mention. First, no countercyclicality is observed in capital flows. Second, of the detected procyclicality the most is in the total debt flows.

2.3 TRENDS AND DEVELOPMENTS IN EQUITY FLOWS

A data summary on total net, direct and portfolio equity flows to developing countries is given in Table 2.3. As reasonably expected, a quick scan of the entire table indicates that aggregate equity inflows and FDI are all, and FPEI is mostly, positive. In case of all developing countries, we see a virtually exponential increase in aggregate equity inflows as they are up from 0.5% of GDP per year to 3.1% over the 1970-2006 period. The yearly average inflows of FDI reached nearly to $225 billion, whilst the equity funds that have been created by share purchases of foreign portfolio investors soared from almost nil levels (e.g. $400,000) to $37 billion a year.

Although every type of nominal equity inflows goes up continuously (even more rapidly after 1980s as a result of economic and financial liberalization, integration, capital market establishment and privatization), their GDP proportions do not always follow an increasing pattern—they were smaller than or equal to 0.5% during the pre-1990s and showed consecutive increases only in case of total and direct equity flows thereafter. Average annual GDP share of foreign portfolio equity investments in developing markets has never transcended 0.4%. As a matter of compositional evaluation, total equity flows have been shaped almost completely by FDI throughout the initial two decades and still FDI has wheeled them over the remaining years.

Table 2.3: Equity Inflows to Developing World by Sub-periods, Billions of USD

Region and Component	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-06
All Developing Countries							
Total Equity Inflows	3.22	6.03	11.24	15.72	66.82	161.92	261.91
	(0.5)	(0.5)	(0.3)	(0.4)	(1.6)	(2.8)	(3.1)
Direct Equity	3.22	6.01	11.14	15.26	51.14	144.72	224.72
	(0.5)	(0.5)	(0.3)	(0.4)	(1.2)	(2.5)	(2.7)
Portfolio Equity	0.004	0.02	0.10	0.46	15.68	17.21	37.19
	(0.0)	(0.0)	(0.0)	(0.0)	(0.4)	(0.3)	(0.4)
Developing Asia							
Total Equity Inflows	0.35	0.72	2.44	6.00	29.99	63.92	116.33
	(0.1)	(0.2)	(0.4)	(0.7)	(2.3)	(3.2)	(3.3)
Direct Equity	0.35	0.72	2.41	5.49	26.80	59.63	91.74
	(0.1)	(0.2)	(0.4)	(0.6)	(2.1)	(3.0)	(2.7)
Portfolio Equity	n/a	0.002	0.03	0.51	3.19	4.29	24.59
	(n/a)	(0.0)	(0.0)	(0.1)	(0.2)	(0.2)	(0.7)
Europe and Central Asia							
Total Equity Inflows	0.14	0.25	0.52	1.02	5.40	17.56	49.43
	(n/a)	(n/a)	(0.04)	(0.1)	(0.7)	(1.7)	(2.6)
Direct Equity	0.14	0.25	0.52	1.02	4.95	15.81	46.36
	(n/a)	(n/a)	(0.04)	(0.1)	(0.6)	(1.5)	(2.5)
Portfolio Equity	n/a	n/a	n/a	0.02	0.44	1.75	3.06
	(n/a)	(n/a)	(n/a)	(0.0)	(0.1)	(0.2)	(0.1)
Latin America and Caribbean							
Total Equity Inflows	1.50	3.34	6.13	6.07	27.44	65.35	68.90
	(0.7)	(0.7)	(0.8)	(0.8)	(2.0)	(3.4)	(3.2)
Direct Equity	1.50	3.34	6.13	5.92	15.44	60.19	64.61
	(0.7)	(0.7)	(0.8)	(0.7)	(1.1)	(3.1)	(3.0)
Portfolio Equity	n/a	0.00	0.003	0.15	12.00	5.16	4.28
	(n/a)	(0.0)	(0.0)	(0.02)	(0.9)	(0.3)	(0.2)
Middle East and North Africa							
Total Equity Inflows	0.37	0.95	1.07	1.34	1.91	2.75	10.35
	(0.7)	(0.7)	(0.5)	(0.5)	(0.7)	(0.7)	(1.8)
Direct Equity	0.37	0.94	1.00	1.32	1.84	2.47	9.77
	(0.7)	(0.7)	(0.4)	(0.5)	(0.7)	(0.7)	(1.7)
Portfolio Equity	n/a	0.001	0.07	0.02	0.07	0.28	0.58
	(n/a)	(0.0)	(0.03)	(0.01)	(0.03)	(0.1)	(0.1)
Sub-Saharan Africa							
Total Equity Inflows	0.85	0.78	1.09	1.28	2.07	12.34	16.91
	(1.0)	(0.5)	(0.4)	(0.5)	(0.7)	(3.7)	(3.4)
Direct Equity	0.85	0.76	1.08	1.52	2.11	6.61	12.23
	(1.0)	(0.5)	(0.4)	(0.6)	(0.7)	(2.0)	(2.6)
Portfolio Equity	0.004	0.02	0.003	-0.23	-0.04	5.72	4.68
	(0.0)	(0.01)	(0.0)	(-0.1)	(-0.01)	(1.7)	(0.8)

Sources: World Bank, *World Development Indicators, Global Development Finance*.

Notes: See notes to Table 2.1.

The equity inflows, again in nominal terms, to MENA and SSA that have been getting smaller in volume due to the lower velocity made these regions the ultimate losers against the other two such as DA and ECA whose performances in attracting foreign equity capital have been overwhelming, particularly in the post-1980s. The competitive allocation among regions would then translate into 'who gets more' instead of 'who loses more'. For instance, Latin America and Caribbean (Europe and Central Asia) that was getting largest (smallest) volumes for the first fifteen years has seen its position changed afterwards. It is noteworthy that Sub-Saharan Africa is not only the region which had available FPEI data at the outset but also it is the one that has the highest GDP shares for total and portfolio equity inflows (in the most recent decade). The drastic variations in nominal and scaled FPEI flows—having the only negative figures in the table—might be taken as a clue for the sheer speculative activity in SSA stock markets.

On an annual basis, the net foreign direct and portfolio equity flows to developing countries that were on an upward trajectory after the early 2000s have finally arrived at about $400 billion and $100 billion respectively (Figure 2.4). Nominal inflows follow such a rising trend towards the end of the period in all regions but Latin America and Caribbean, albeit with varying sizes. To rephrase the FDI dominance in total equity flows, FPEI is greater than FDI in just two instances; in LAC, 1993 and in SSA, 1998. The adverse effects of currency and banking crises on global equity flows are also traceable in this figure. Although total and direct equity flows never fall below zero and hence do not pose any outflow, they are reduced by the Latin American debt crisis in early 1980s (distinguishable in ADC and LAC graphs) and by other regional or country level crashes in certain years from the mid-1990s onwards (Mexican, East Asian, Russian, Brazilian, Turkish and Argentine financial mayhems in 1994, 1997, 1998, 1999, 2001 and 2002 respectively).

Net outflows on foreign equity investments, however, can only be seen in FPEI for at least a year in any geographical region (SSA has the most of such cases, for example). Furthermore, it seems that FPEI flows deteriorate concurrently with the beginning of the crisis, whereas deterioration in FDI flows comes with some lag following the crisis.

Figure 2.4: Net Equity Flows to Developing World by Regions, 1970-2006

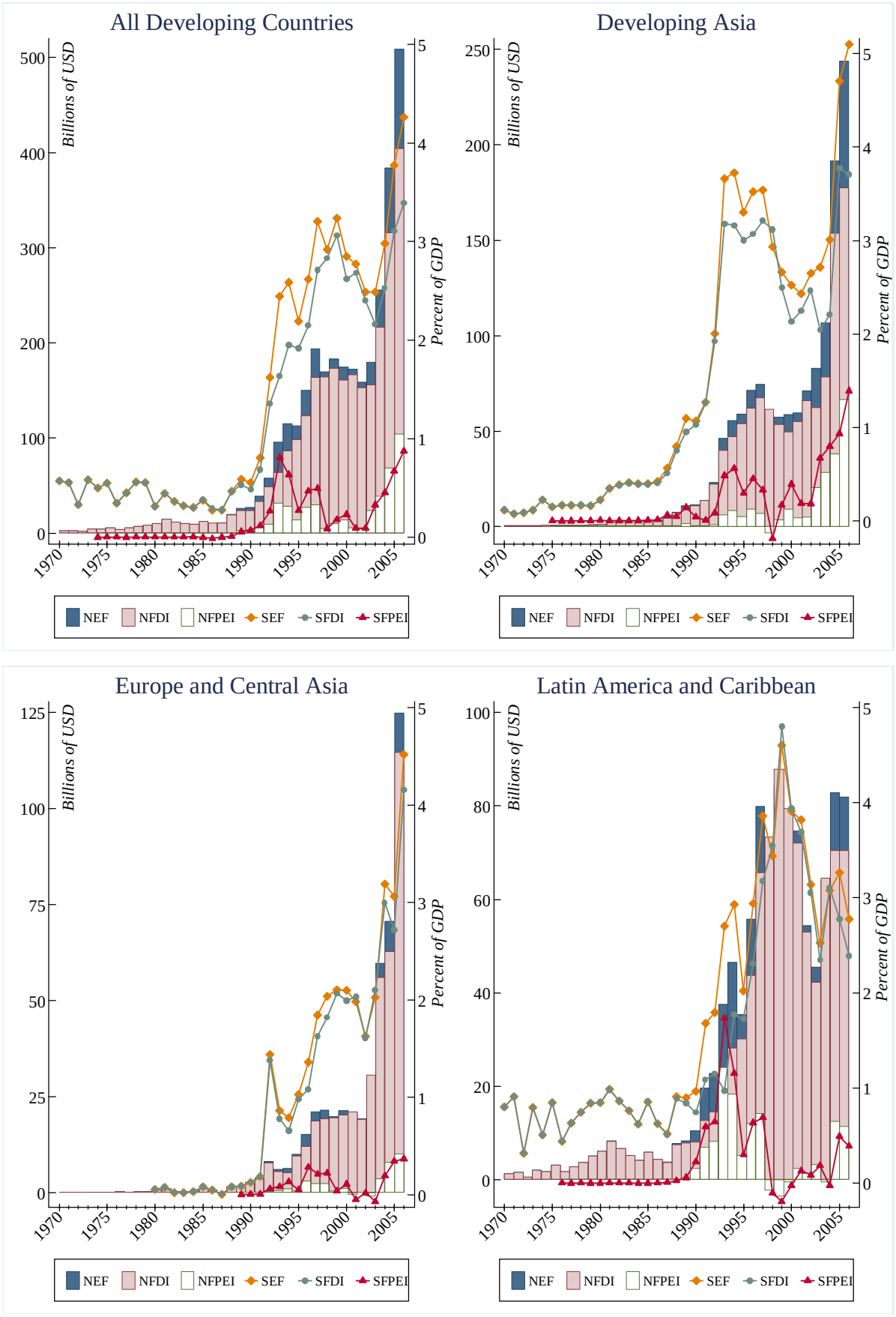


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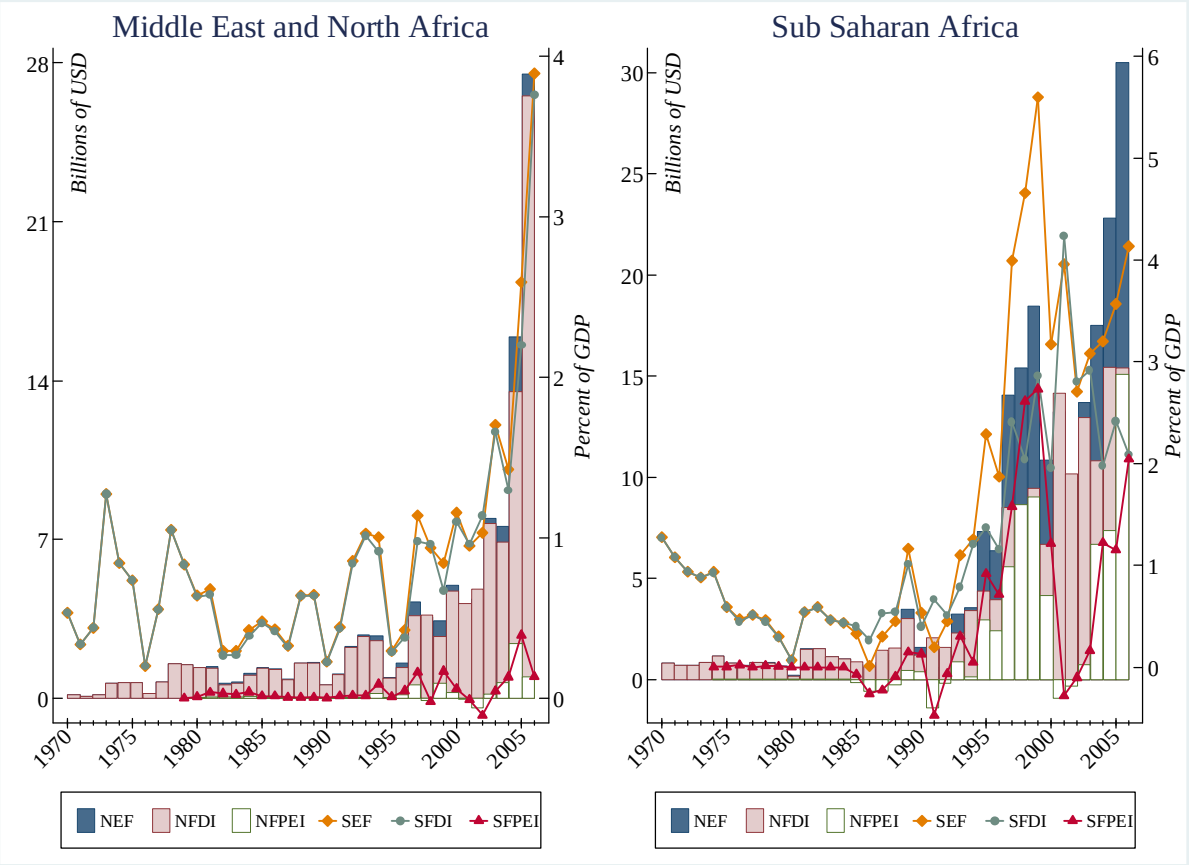
Figure 2.4 *(continued)*



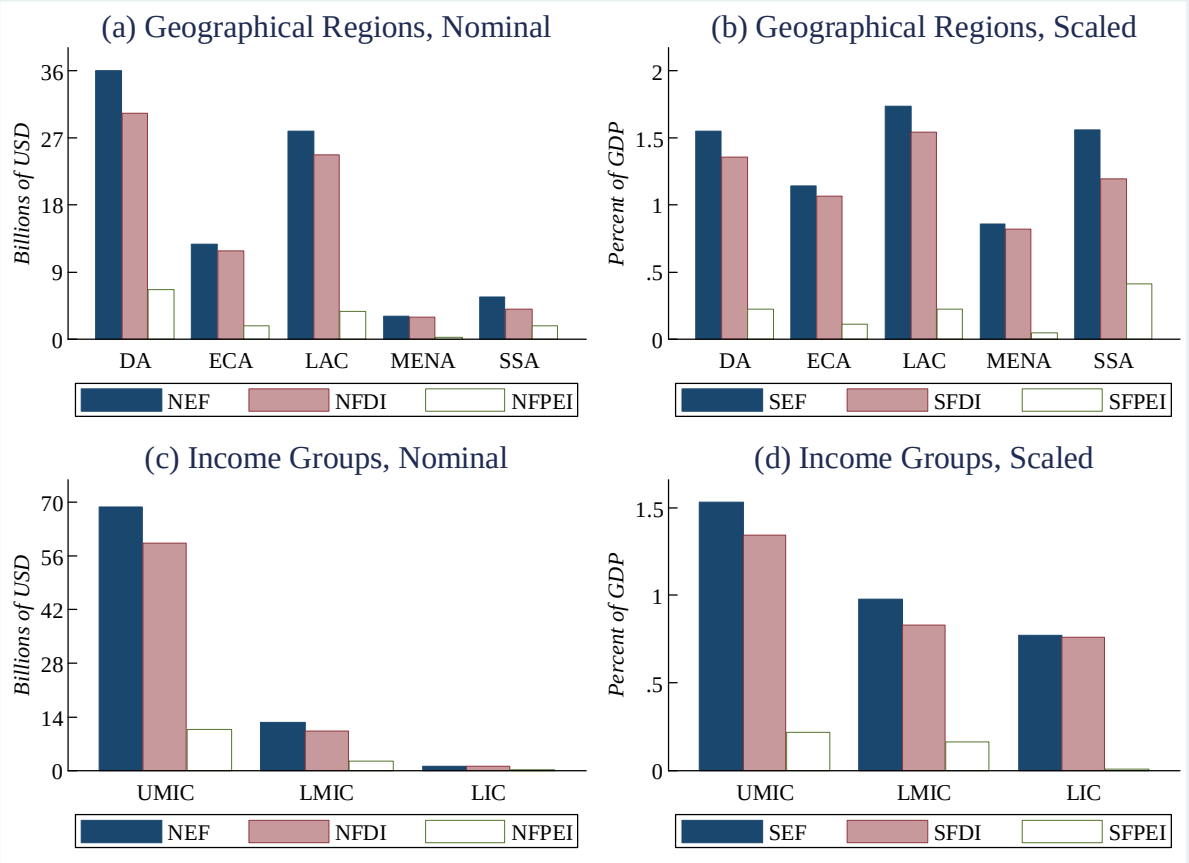
Sources: World Bank, *World Development Indicators, Global Development Finance*.

Notes: FDI refers to foreign direct investment and FPEI stands for foreign portfolio equity investment. The true NEF for a year is the vertical sum of all the bars within that year, while the true NFDI is what remains from the hollow bar (NFPEI) in a certain year. Light maroon bars exhibit merely the amount of NFDI in excess of NFPEI when both have the same signs and they show the whole NFDI when the signs are opposite. Also see notes to Figure 2.2.

Figure 2.5 shows how the aggregates and components of cross-border equity flows are distributed among different country groups. According to Panel (a), Developing Asia has the largest share in nominal FDI and portfolio equity flows as well as in aggregate equity flows. As in Figure 2.3, GDP scaling changes the order of distribution and pulls Latin America and Caribbean up to the highest echelon in SEF and SFDI and to the second highest in SFPEI, after Sub-Saharan Africa. Panel (b) also demonstrates that developing regions have more evenly distributed foreign equity investments relative to their output. The only regularity observed across the top panels of the figure is that Middle East and North Africa has the lowest shares in all three categories. The panels at the bottom, again similar to Figure 2.3, uniformly indicate the existence of income bias in international portfolio and direct equity investments in developing countries. Moreover, we see from the percentage averages (being

as little as around 1.5 or less) in the right panels of the figure that these investments are still well under the economic potential of the countries at the periphery.

Figure 2.5: Distribution of Equity Inflows by Geographical Regions and Income Groups



Sources: World Bank, *World Development Indicators, Global Development Finance*.

Notes: See notes to Figures 2.3 and 2.4.

The compound growth rates of and cyclicality statistics for real equity inflows are reported in Table 2.4. On average, aggregate net equity flows have an annual growth rate of about 10% or more in every country group. Real portfolio equity and FDI flows to all country groups but Sub-Saharan Africa are growing positively, and the former has much faster growth. Since foreign direct and portfolio equity investments tend to fluctuate in SSA, the trends are ambiguous. Europe and Central Asia (among the regions) and lower middle income countries (from the income groups) appear to have the most buoyant equity finance. Correlations between yearly growth rates of real GDP and equity flows reveal that, as for aggregates above, all types of external equity flows are generally acyclical. As there is no significantly countercyclical flow, real equity inflows (all three) to Latin America and Caribbean and direct and total equity inflows to upper middle income countries are the only procyclical flows.

Table 2.4: Growth and Cyclicality of Equity Flows in Comparative Perspective

	ADC	Geographical Regions					Income Groups		
		DA	ECA	LAC	MENA	SSA	UMIC	LMIC	LIC
(a) Average and Median Annual Growths (Percent)									
Means									
REF	14.34	19.30	55.74	15.58	28.56	90.44	21.47	18.87	86.17
RFDI	13.25	18.19	55.59	15.22	28.43	24.80	20.15	17.31	71.66
RFPEI	587.63	377.06	75.53	112.79	140.21	-73.69	146.53	865.43	1256.51
Medians									
REF	7.63	11.68	18.27	14.36	0.54	7.77	10.50	20.22	6.45
RFDI	7.30	10.63	16.38	5.58	3.83	-4.54	10.37	16.96	8.90
RFPEI	58.72	34.31	58.74	15.13	6.65	13.74	61.60	69.31	13.73
(b) Pairwise Correlations with Real GDP Growth									
REF	0.06	0.24	-0.01	0.42	0.15	0.16	0.46	-0.04	0.01
	(0.74)	(0.16)	(0.95)	(0.01)	(0.37)	(0.36)	(0.00)	(0.82)	(0.94)
RFDI	0.06	0.19	-0.02	0.43	0.15	-0.18	0.46	-0.07	0.02
	(0.74)	(0.27)	(0.94)	(0.01)	(0.38)	(0.30)	(0.00)	(0.68)	(0.90)
RFPEI	0.00	-0.24	-0.01	0.38	0.09	0.30	-0.04	-0.14	-0.27
	(0.99)	(0.19)	(0.96)	(0.04)	(0.65)	(0.10)	(0.82)	(0.44)	(0.14)

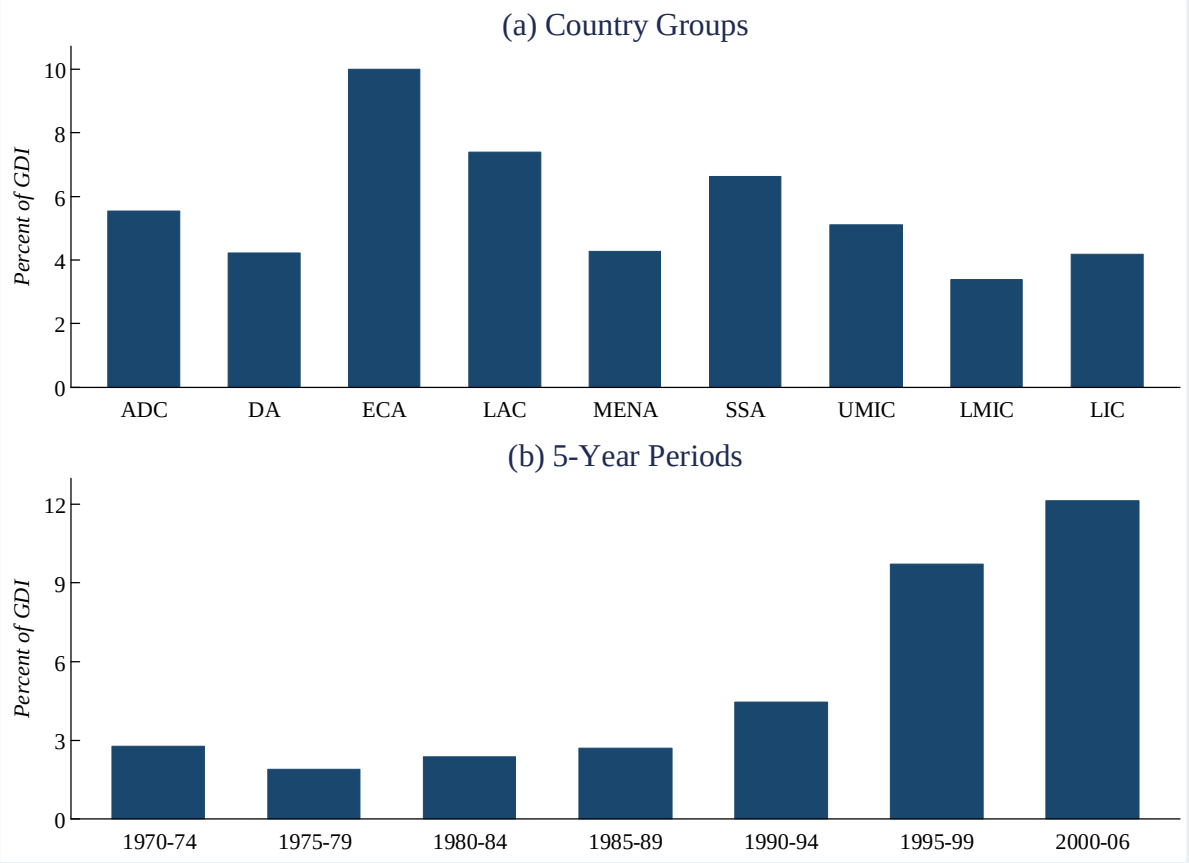
Sources: World Bank, *World Development Indicators, Global Development Finance*.

Notes: See notes to Table 2.2.

Foreign contribution to gross domestic investment (GDI) in developing countries was, on average, around 5.5% a year within the period 1970-2006 (Figure 2.6). This implies that the extent of multinational involvement in domestic capital formation at the periphery has been limited.[9] Among the three regions with above average shares, Europe and Central Asia achieves the highest involvement at nearly 10%, being roughly three percentage points above the next region (Latin America and Caribbean). It is surprising that Developing Asia comes out to be the least popular investment location for foreigners and that even Middle East and North Africa outstrips it in this regard. Notwithstanding the fact that differences among income groups are less pronounced, the FDI portion of GDI is biggest in emerging market economies and, peculiarly, it is bigger in low income countries than the countries of the income group in the middle. Except for the second sub-period, the ratio is increasing over time, with a marked acceleration in the post-1980s.

[9] In a partially similar vein, Aizenman *et al*. (2007) find that just 10% of the domestic capital stock in developing countries has been externally financed throughout the 1990s.

Figure 2.6: FDI Share of Gross Domestic Investment at the Periphery, 1970-2006



Sources: World Bank, *World Development Indicators (WDI)* and author's calculations.

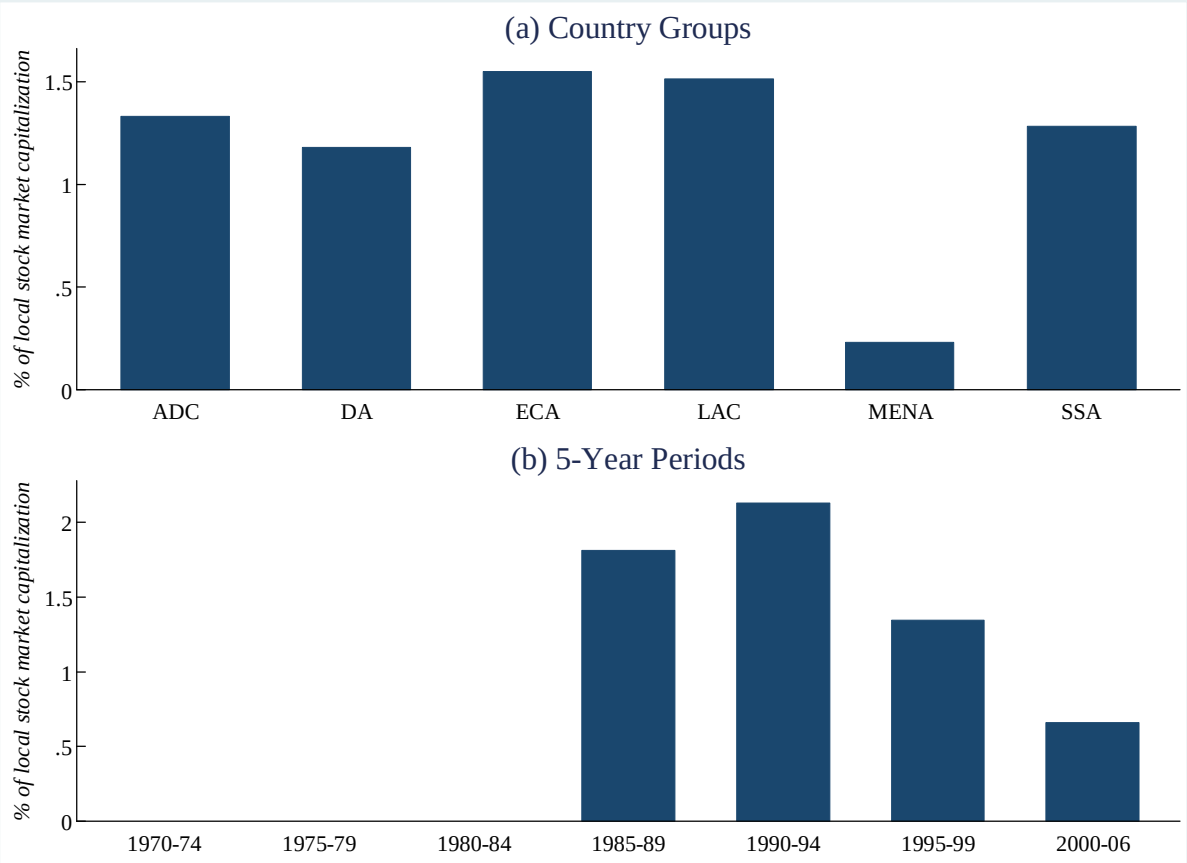
Notes: Gross domestic investment (GDI), or gross capital formation as in WDI, consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. Fixed assets include land improvements (fences, ditches, drains, and so on), plant, machinery, and equipment purchases and the construction of roads, railways and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. Inventories are stocks of goods held by firms to meet temporary or unexpected fluctuations in production or sales and work in progress. According to the United Nations' (UN) System of National Accounts (SNA) in 1993, net acquisitions of valuables are also considered capital formation. Bars show arithmetic averages for the corresponding period or country group. See also notes to Figure 2.3.

Figure 2.7 compares the non-resident participation in developing-country domestic stock markets across the regions and over time. Apart from the Middle East and North Africa which has the lowest share, foreign participation has been relatively balanced throughout the regions. Taking the rate of participation for ADC as an indicator and bearing the definitions of foreign portfolio equity inflows and domestic stock market capitalization in mind (such as that the former additionally includes depository receipts), we estimate that international investors would have weighted developing country assets in their portfolio at an average rate of about 1%. This confirms the common view that developing and emerging market equities are underweighted in global portfolios as a result of home bias and lack of diversification.[10]

[10] See Chan *et al*. (2005), Obstfeld and Rogoff (2000), Tesar (1999), Stulz (1999), Baxter and Jermann (1997).

Because there was no stock exchange in every country until the late 1980s we could not depict the proportions for the first 15 years. Once the bourses are properly established, the non-resident engagement began to materialize and stood above 1.5% per year during the initial episode (which is very close to the estimate of Bekaert *et al*. (2002) who find that, after the liberalization, foreign portfolio equity flows increase by 1.4% of market capitalization); overshooting by 2% in the first half of 1990s has subsequently declined.

Figure 2.7: Foreign Participation in Stock Markets at the Periphery, 1985-2006



Sources: World Bank, *World Development Indicators (WDI)* and author's calculations.

Notes: Market capitalization (also known as market value) of domestically listed companies is the share price times the number of shares outstanding as of the yearend. Listed domestic companies are the domestically incorporated companies listed on the country's stock exchanges. Excluded are investment companies, mutual funds or other collective investment vehicles. The figure does not show the plots for income groups and some earlier sub-periods due to data unavailability. Bars demonstrate country group and period averages of FPEI that is expressed as percent of domestic stock market capitalization. See notes to Figure 2.6 as well.

2.4 TRENDS AND DEVELOPMENTS IN DEBT FLOWS

External debt inflows to developing countries have been more variable than equity inflows over the period 1970-2006. The episodes of upward surges have been interrupted by the next episodes of slumps or decelerations because of either financial crises or voluntary and discretionary debt reduction policies in different countries. Although these structural break-

like episodes were transitory in some countries, they could have been rather prolonged in others. The overall observation is that the volumes of cross-border lending have recorded higher amounts at the end of the period than at the beginning, although this is not the case when expressed relative to income.

A factual synopsis of the total, long-term and short-term debt movements is provided in Table 2.5. Within about four decades, average annual short-term debt inflows soared from $2 billion to $46 billion—a 23-times increase that ultimately put the short-term debt flows ahead of the long-term debt flows in the last sub-period. The enlargement in total and long-term debt inflows has been relatively smaller, even though they had no outflows (i.e. always being positive, on average and for all developing countries) unlike short-term debt inflows. Aggregate nominal foreign borrowing has risen in all sub-periods but 1985-89 when it decreased as a result of Latin American debt crisis. In US dollar denominations, long-term foreign borrowing has behaved similarly but it decreased in the last sub-period, reflecting the adverse effects of financial crises in East Asia and in some other developing countries that had taken place earlier. Voluntary debt restructuring and reduction operations might also have contributed to this diminution. The declines in nominal short-term net foreign borrowing have occurred during the same sub-periods when the crises erupted. To stylize the fact that has become clear so far, we note that the deterioration in short-term debt inflows goes along with the advent of the crisis whilst long-term debt inflows degenerate with some lag after the crisis. This sequential process, which is similar to the one in equity flows described before, largely continues during the recovery phase after the crisis. Following the peak in the second half of the 1970s, all forms of debt flows as a percentage of GDP have fluctuated but never attained their pre-1980 levels, even below 1% in the most recent sub-period.

Net outflows are detected in some regions. As the table shows the rolling averages but not the exact yearly realizations, the negative incidences are quite few. The clustering of outflows in the last decade could be explained by the debt reduction decisions (more repayment and less new borrowing) rather than contagious currency and banking crises. There are two reasons behind this argument; the first is that the most numerous outflows occurred in Sub-Saharan Africa and Middle East and North Africa which are the regions without any notorious financial crashes, and the second is that the number of outflows is the same across the two sub-periods of which the latter does not include as many crises as does the former.

Table 2.5: Debt Inflows to Developing World by Sub-periods, Billions of USD

Region and Component	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-06
All Developing Countries							
Total Debt Inflows	10.20	42.56	53.45	29.39	60.45	74.94	87.11
	(1.5)	(3.4)	(1.7)	(0.8)	(1.5)	(1.3)	(0.9)
Long-term Debt	8.52	31.35	46.71	21.50	38.06	64.41	40.85
	(1.3)	(2.5)	(1.5)	(0.6)	(0.9)	(1.1)	(0.4)
Short-term Debt	2.10	11.21	6.74	7.89	22.39	10.53	46.26
	(0.3)	(0.9)	(0.2)	(0.2)	(0.5)	(0.2)	(0.5)
Developing Asia							
Total Debt Inflows	1.27	5.35	13.54	12.34	26.20	15.96	27.20
	(0.5)	(1.2)	(2.0)	(1.4)	(2.2)	(0.8)	(0.7)
Long-term Debt	1.00	3.57	10.09	9.97	16.77	17.28	-0.62
	(0.4)	(0.8)	(1.5)	(1.1)	(1.4)	(0.9)	(-0.1)
Short-term Debt	0.34	1.78	3.45	2.37	9.43	-1.32	27.82
	(0.1)	(0.4)	(0.5)	(0.3)	(0.8)	(-0.03)	(0.8)
Europe and Central Asia							
Total Debt Inflows	0.87	4.63	5.94	6.17	6.90	20.43	59.07
	(n/a)	(n/a)	(0.5)	(0.4)	(1.1)	(1.9)	(3.0)
Long-term Debt	0.70	3.92	6.31	3.45	8.42	14.01	40.62
	(n/a)	(n/a)	(0.5)	(0.2)	(1.1)	(1.3)	(2.0)
Short-term Debt	0.21	0.71	-0.37	2.72	-1.52	6.42	18.45
	(n/a)	(n/a)	(-0.03)	(0.2)	(-0.04)	(0.6)	(1.0)
Latin America and Caribbean							
Total Debt Inflows	6.71	23.70	25.47	3.68	23.70	39.92	0.51
	(2.7)	(4.9)	(3.2)	(0.5)	(1.8)	(2.1)	(-0.03)
Long-term Debt	5.72	16.77	22.87	3.29	11.94	37.52	2.39
	(2.3)	(3.5)	(3.0)	(0.5)	(0.9)	(1.9)	(0.1)
Short-term Debt	1.24	6.94	2.60	0.39	11.77	2.40	-1.87
	(0.5)	(1.4)	(0.2)	(0.01)	(0.9)	(0.1)	(-0.14)
Middle East and North Africa							
Total Debt Inflows	0.56	5.15	3.16	3.53	3.06	-1.27	0.43
	(1.2)	(3.8)	(1.4)	(1.3)	(1.2)	(-0.3)	(0.2)
Long-term Debt	0.50	4.28	3.15	3.06	0.48	-2.72	-0.49
	(1.1)	(3.2)	(1.3)	(1.1)	(0.2)	(-0.7)	(0.02)
Short-term Debt	0.07	0.87	0.01	0.47	2.58	1.44	0.92
	(0.1)	(0.7)	(0.03)	(0.2)	(1.0)	(0.4)	(0.2)
Sub-Saharan Africa							
Total Debt Inflows	0.80	3.73	5.34	3.67	0.58	-0.10	-0.10
	(0.9)	(2.1)	(2.1)	(1.4)	(0.2)	(-0.03)	(-0.3)
Long-term Debt	0.62	2.81	4.29	1.73	0.46	-1.69	-1.05
	(0.7)	(1.6)	(1.6)	(0.6)	(0.2)	(-0.5)	(-0.3)
Short-term Debt	0.23	0.92	1.05	1.94	0.13	1.59	0.95
	(0.3)	(0.5)	(0.4)	(0.8)	(0.03)	(0.5)	(0.0)

Sources: World Bank, *World Development Indicators, Global Development Finance*.

Notes: See notes to Table 2.1.

Only in Developing Asia are short-term debt outflows during a crisis period (1995-99) succeeded by long-term debt outflows in the next period. Being the most active region that has got ever-increasing external debt funding, Europe and Central Asia saw outflows on its short-term debt twice. First was during the Latin American debt crisis and the second was during the sub-period 1990-94 that includes several prominent transformations and upheavals like the dissolution of the USSR, the Gulf War and the 1994 Turkish currency crisis.[11] The retardation processes in Latin America and Caribbean have been symmetrical in the sense that block declines in all types of debt inflows have been preceded by the initial drops in short-term debt inflows (disrupted by the corresponding crisis) that eventually turned out to be net outflows. Being always positive and driving the flow of external lending after 1980s, short-term debt inflows to Africa and Middle East did not contribute to total debt outflows which are rather produced by consecutive plummets in long-term debt flows to these regions.

Figure 2.8 shows the 37-year progression of foreign borrowing in developing countries. Within this period, total debt inflows have risen to about $225 billion—which is less than even half of the same-year value of total equity inflows in Figure 2.4 and just equal to the seventh sub-period average of FDI in Table 2.3. This implies that the pace of increase in debt flows has been much slower than equity flows. There are many factors that might have badly influenced the influx of international debt capital to a developing economy. Deteriorating macroeconomic fundamentals (like chronically high inflation rates, unsustainable internal and external balances, inadequate foreign reserves etc.), debt overhang, credit rationing and negative investor sentiments that either lead to financial crises or urge the economic agents to reduce their indebtedness could be identified as the main factors.

Besides these structural failures, factors like asymmetric information, moral hazard and costly state verification that are nearly intrinsic to the real functioning of international capital markets may create systemic failures (or risks) that ultimately result in credit crunches.[12] The effects of such factors could be traced explicitly in Figure 2.8. The steady increase in all types of external borrowing of developing countries during 1970s has been depressed by the Latin American debt crisis at the beginning of the next decade. Despite the fact that only short-term debt gave outflows, the depression in every component lingered for almost a decade.

[11] The fact that capital flows to Turkey constitute almost one fifth of the aggregate capital flows to Europe and Central Asia (not explicitly reported) shows the determining role of that country for the whole region.

[12] The second line of factors, for instance, is thought to be the major trigger behind the financial crisis of the late 2000s in advanced economies.

Figure 2.8: Net Debt Flows to Developing World by Regions, 1970-2006

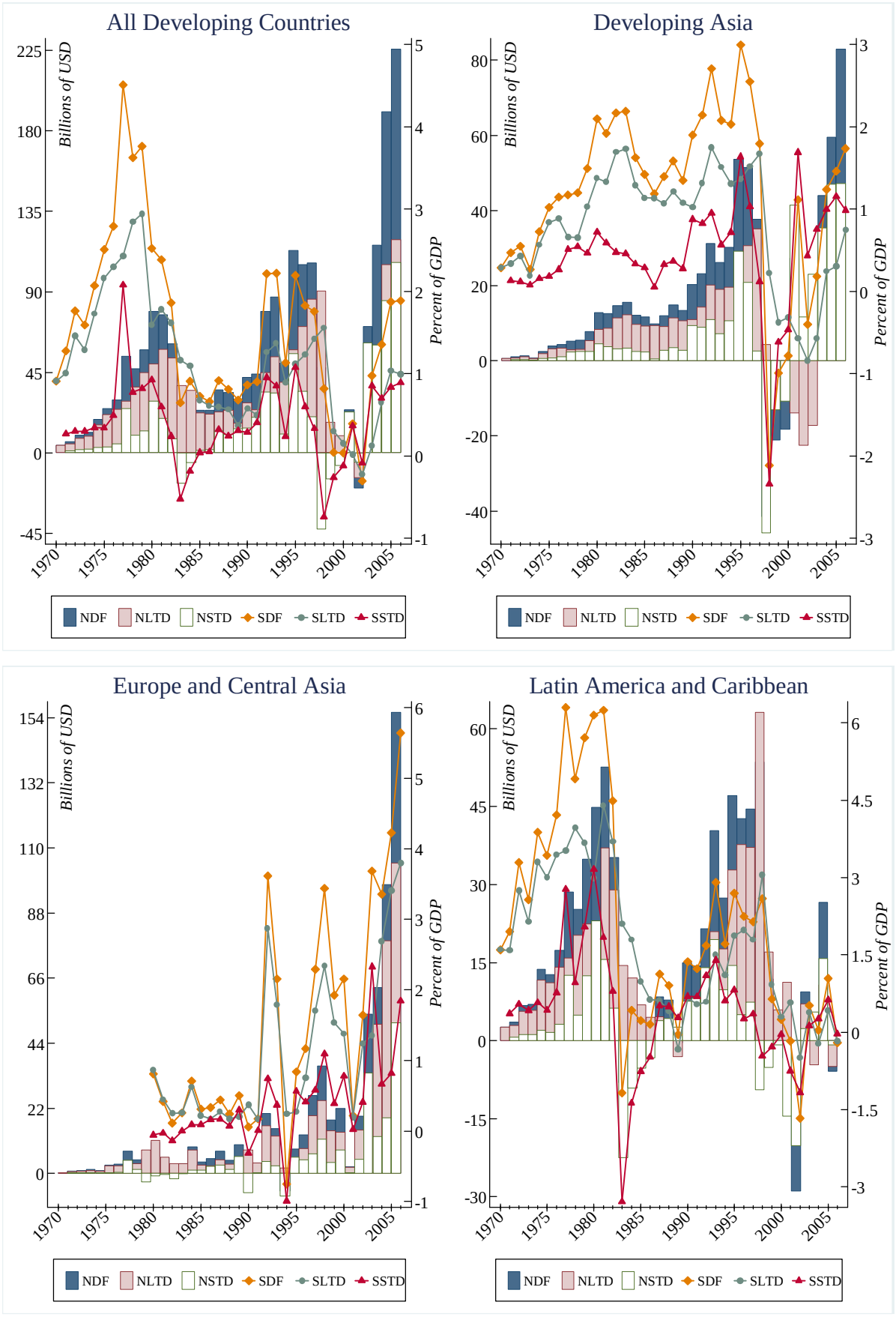


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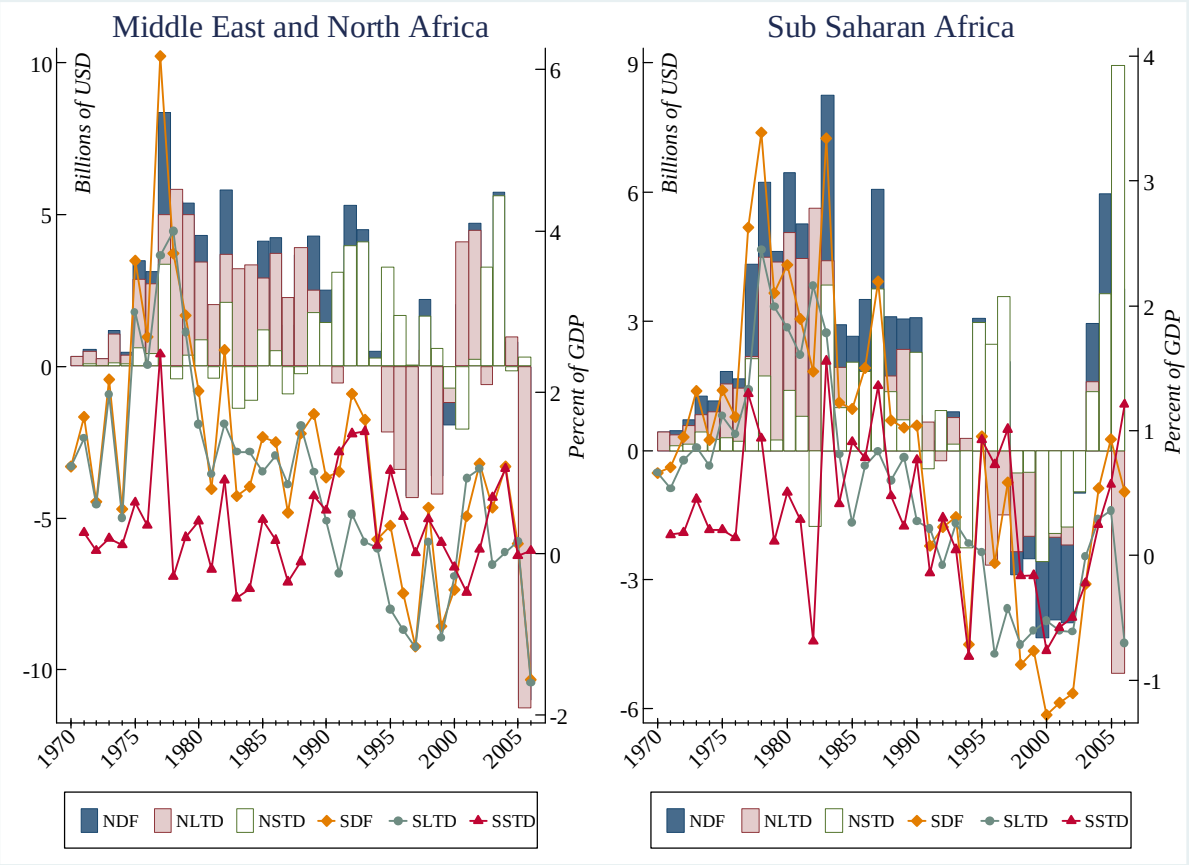
Figure 2.8 *(continued)*

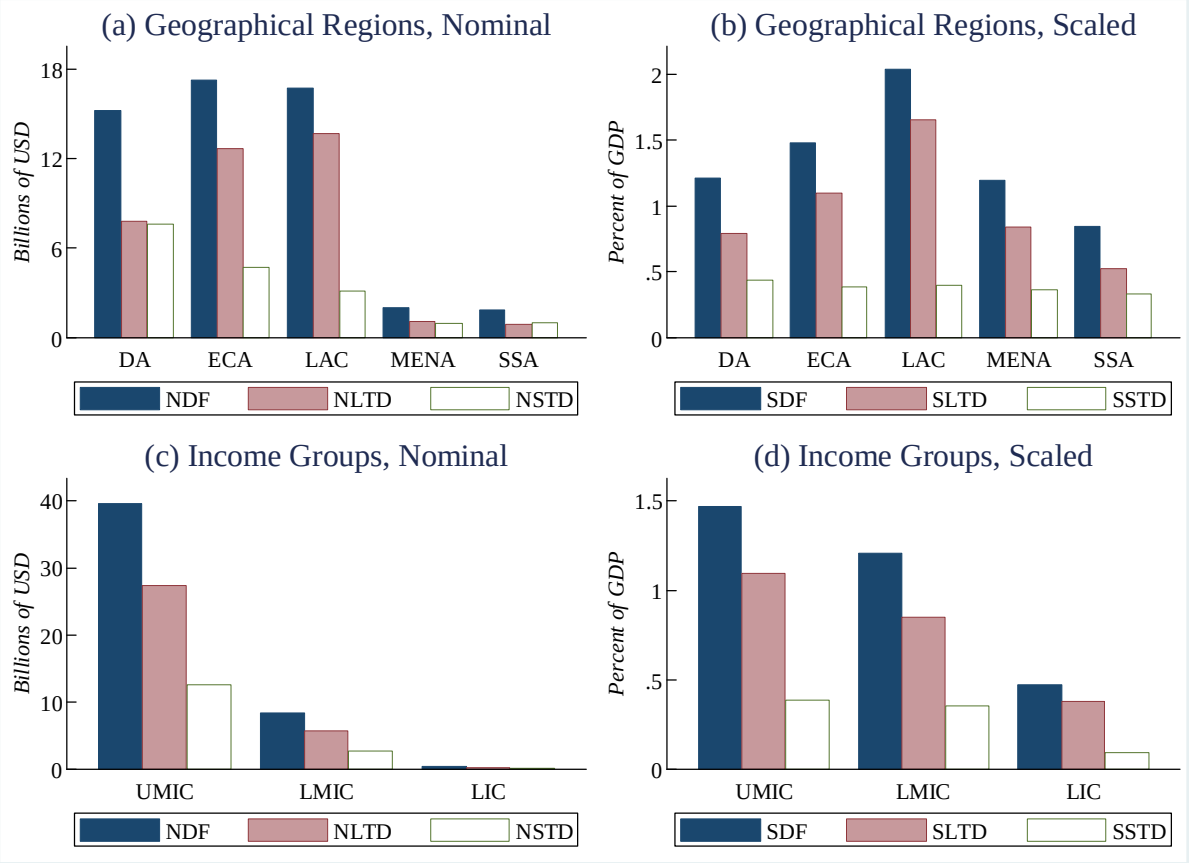


Sources: World Bank, *World Development Indicators, Global Development Finance*.

Notes: LTD refers to long-term debt and STD stands for short-term debt. The true NDF for a year is the vertical sum of all the bars within that year, while the true NLTD is what remains from the hollow bar (NSTD) in a certain year. Light maroon bars exhibit merely the amount of NLTD in excess of NSTD when both have the same signs and they show the whole NLTD when the signs are opposite. Also see notes to Figure 2.2.

Apart from the curtailing in 1994 due to Mexican and Turkish currency crises, the resumption in late 1980s has continued until the 1997 East Asian financial turmoil. The outflows on short-term debt that approximately amounted to $45 billion in the following year showed the first severe sign of the turmoil. As a result of the periodic and spatial contagion, the net foreign borrowings (which have already been hampered) stopped completely and recorded net reimbursements as of 2002. Thereafter, the final rebound came in and pushed them to successively higher levels. Output shares of debt inflows have never repeated their previous gains and levels and stayed below 3% in the majority of years. This is because the valuation effects put a wedge between the nominal and scaled flows. It is clearer from the line plots of the GDP proportioned series that short-term debt inflows go first in worsening-recovery cycle around the crisis periods and long-term debt inflows engage in the cycle later. They also indicate that long-term debt flows are at least as volatile as short-term debt flows.

Figure 2.9: Distribution of Debt Inflows by Geographical Regions and Income Groups



Sources: World Bank, *World Development Indicators, Global Development Finance*.

Notes: See notes to Figures 2.3 and 2.8.

The allocation of international lending among the developing country groups is presented in Figure 2.9. Rankings with respect to the nominal components shift within the top recipients. Once the economic mass is taken into consideration, LAC outperforms the other regions in receiving total and long-term debt. The SSTD bars which are nearly at the same length indicate that developing countries weight short-term foreign borrowing by their wealth at around 0.4. Overall, Sub-Saharan Africa has had the lowest share in global (private and non-concessional) debt allocation. The larger the size of the economy the greater is the external debt capital it raises. As a structural matter, long-term debt flows dominate short-term debt flows and the latter is relatively closer to the former in SSA.

In general, real debt inflows are growing (Table 2.6). Europe and Central Asia has the highest compound growth rates, whereas Middle East and North Africa has the lowest. In income groups, upper middle income countries have the most firmly growing debt inflows. Total debt flows to low income countries, and long-term debt flows to lower middle income countries, shrink.

Table 2.6: Growth and Cyclicality of Debt Flows in Comparative Perspective

	ADC	Geographical Regions					Income Groups		
		DA	ECA	LAC	MENA	SSA	UMIC	LMIC	LIC
(a) Average and Median Annual Growths (Percent)									
Means									
RDF	40.88	35.97	67.95	170.00	-8.23	42.35	178.85	37.91	-64.20
RLTD	-9.22	9.15	52.17	12.49	-33.31	48.65	44.21	-1.23	10.03
RSTD	75.03	-8.36	415.78	-20.29	257.10	6.61	56.43	115.26	2050.81
Medians									
RDF	9.36	14.93	35.12	-0.50	-7.31	7.98	7.65	11.00	-11.37
RLTD	7.17	7.75	22.09	-2.28	-15.79	-5.41	7.38	-6.67	5.77
RSTD	21.02	1.62	46.82	43.43	20.85	3.89	33.84	32.22	19.08
(b) Pairwise Correlations with Real GDP Growth									
RDF	0.01	0.34	-0.24	0.35	-0.07	0.25	-0.13	0.35	0.06
	(0.94)	(0.04)	(0.23)	(0.04)	(0.68)	(0.15)	(0.45)	(0.04)	(0.74)
RLTD	0.10	0.19	-0.19	0.30	-0.04	0.26	0.26	0.37	0.05
	(0.56)	(0.26)	(0.36)	(0.07)	(0.83)	(0.12)	(0.12)	(0.03)	(0.78)
RSTD	0.12	0.32	-0.40	0.34	0.03	0.30	0.15	0.38	0.03
	(0.49)	(0.06)	(0.04)	(0.05)	(0.85)	(0.08)	(0.38)	(0.02)	(0.88)

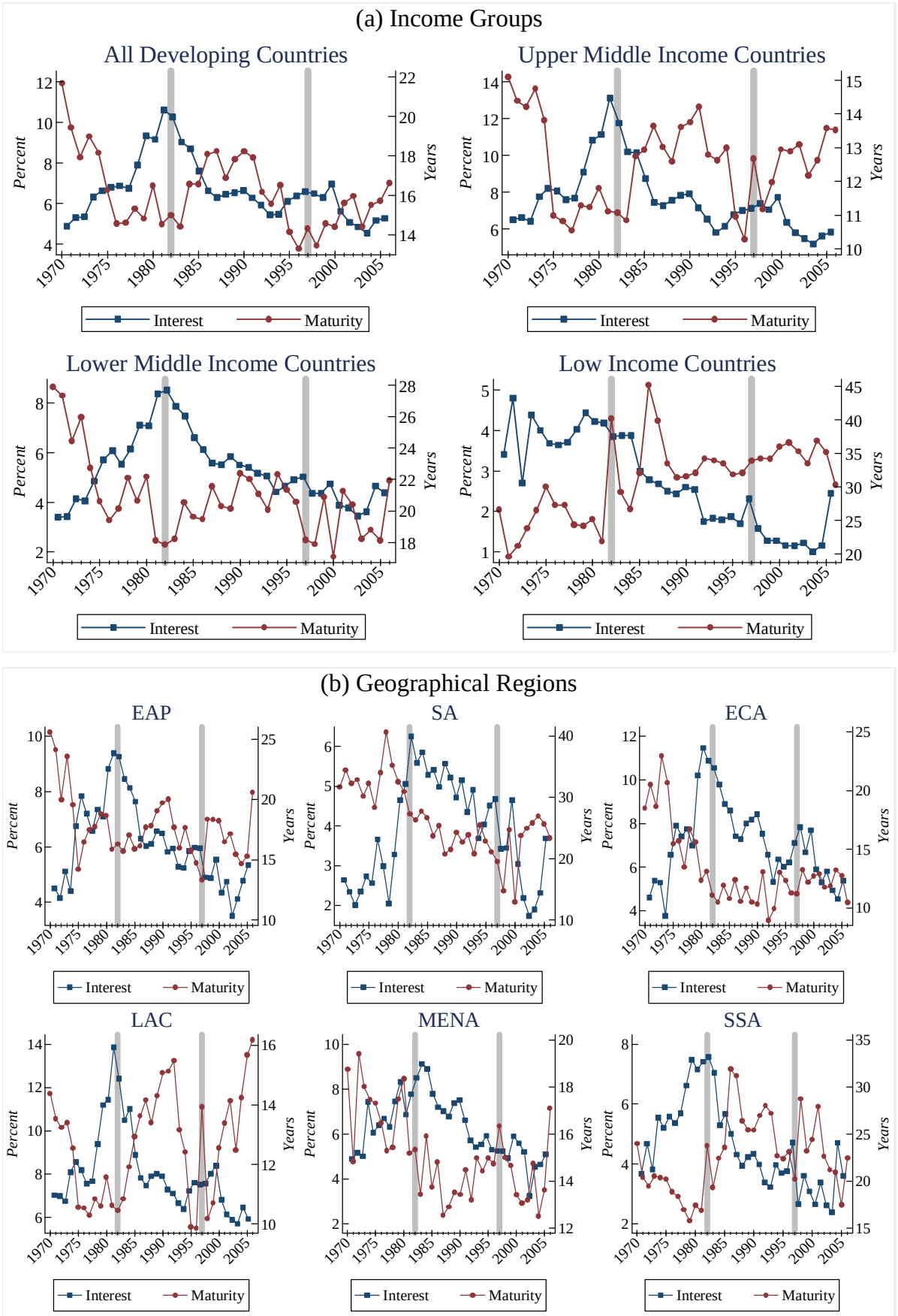
Sources: World Bank, *World Development Indicators, Global Development Finance*.

Notes: See notes to Table 2.2.

As per components, short-term debt grows more rapidly than long-term debt. Comparing Panel (b) in this table and in Table 2.4, acyclicality is less prevalent in debt flows than it was in equity flows. The most striking observation is that Europe and Central Asian debt flows (particularly short-term debt, at 5% significance level) are countercyclical. This may safeguard the economic entities in the region from the harms of excessive leverage that they tend to have. Real debt flows to DA, LAC and LMIC are procyclical. Of the significant cases, short-term debt flows are more (pro)cyclical than long-term debt flows.

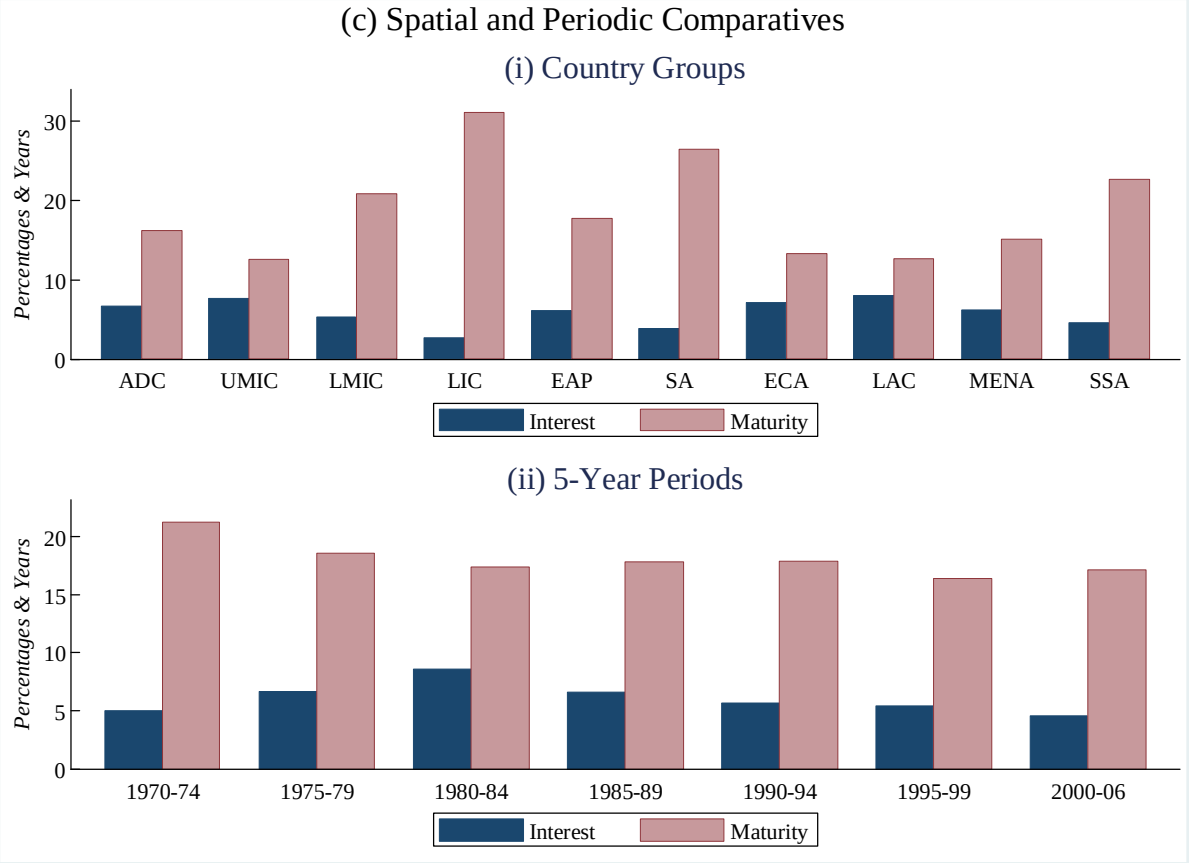
To give an idea about the cost and maturity structure of external borrowing in developing countries, Figure 2.10 demonstrates the time series plots and comparative graphs of weighted average interest rates and years to maturity on new external debt commitments. Over 1970-2006, the global averages of annual interest rate on and maturity of a public or publicly guaranteed loan have been about 6% and 18 years respectively. These figures, being relatively worse than they were at the beginning, clue tightened international lending conditions for developing countries over time.

Figure 2.10: Cost and Maturity Structure of External Borrowing in Developing Markets



(continued on next page)

Figure 2.10 *(continued)*



Sources: World Bank, *Global Development Finance (GDF)* and author's calculations.

Notes: Interest is the GDF's 'average interest on new external debt commitments' that represents the weighted average percentage interest rate on all new public and publicly guaranteed loans contracted during the year. To obtain the average, the interest rates for all public and publicly guaranteed loans are weighted by the amounts of the loans. Maturity refers to the GDF's 'average maturity on new external debt commitments' that is the weighted average number of years (i.e. the sum of grace and repayment periods) to original maturity dates of all new public and publicly guaranteed loans contracted during the year. Grace period for principal is the period from the date of signature of the loan or the issue of the financial instrument to the first repayment of principal. The repayment period is the period from the first to last repayment of principal. To obtain the average, the maturities of all public and publicly guaranteed loans are weighted by the amounts of the loans. Because we do not have access to all the loan data (amount, maturity and interest) that precludes us to follow our own previous conventions, we use the regional data on interest rates and maturities exactly as given by the GDF. Hence, unlike before, all developing countries (ADC) here is the 'low and middle income countries' of the GDF and not composed of the individual sums of regional data. The geographical regions of East Asia and Pacific (EAP) and South Asia (SA) replace their conglomerate region of Developing Asia (DA) in this figure. In Panels (a) and (b), vertical lines mark 1982 Latin American and 1997 East Asian financial crises. See also notes to Figures 2.3.

The main distinction between interest and maturities is that they move in opposite directions for the majority of years. The gap widens particularly around the crises in such a way that as the interest rates hike years to maturity fall, putting the developing economy in further jeopardy. This opposite movement implies an inverted (i.e. quasi-convex) yield curve for the public or publicly guaranteed foreign credits. The higher growth rates of short-term debt flows corroborate this inference because an inverted yield curve exists when the demand for short-term funds (or the incentive to hold short-maturity securities) is greater than the

demand for long-term funds (or the incentive to hold long-maturity securities).[13] The inverted yield curve may also portend the rigidity in international money markets and the economic recession in developing markets, which were all witnessed during or in the aftermath of the Latin American and East Asian financial crises. The reversion of interest rates, but not maturities (except for Latin America and Caribbean), to their pre-1975 levels in the final years constitutes the other distinction. This is also discernible in the lower half of Panel (c) where the interest rate actively rises throughout the first three sub-periods, peaks during the Latin American debt crisis and declines thereafter. Maturity, however, shows limited changes after the initial drop. The variation of maturities and interest rates across country groups mirrors the development objective behind the global lending (the upper part of Panel (c)).

2.5 CONCLUSION

This chapter surveys the data on international capital flows to developing countries for the period 1970-2006. Developing countries are represented by either the most aggregate group of 'all developing countries', five geographical regions (Developing Asia, Europe and Central Asia, Latin America and Caribbean, Middle East and North Africa and Sub-Saharan Africa) or three income groups (upper middle income countries, lower middle income countries and low income countries). Trends and developments in seven fundamental capital flow aggregates (total capital flows, total debt flows, total equity flows, foreign direct investment flows, foreign portfolio equity investment flows, long-term debt flows and short-term debt flows) are discussed under different settings of these country groups. Because it is a review chapter that uses alternative measures to present and discuss the data for several spatial groups and types of capital flow, it has a lengthy exposition.

Total net capital flows denominated in nominal US dollars have surged within about four decades. They were driven by total debt inflows in 1970s and by total equity inflows from 1990s onwards. Rising gradually before 1990s, FDI-shaped total equity inflows have soared thereafter due to financial globalization and liberalization. The overall increase in long-term debt-driven total debt inflows has been less impressive, because not only the financial crises outburst during the period (i.e. 1982 Latin American debt crisis, 1997 East Asian financial crash and many other country crises) severely hit them but they were also decreased as a result of voluntary and discretionary debt reduction policies. These crises dwarfed total

[13] See Turner (2002), Min *et al*. (2003).

capital inflows and depressed total equity inflows as well. Increases in capital inflows as a share of GDP have been more variable and modest. Nevertheless, the similar episodes of ebb and flow as well as the compositional features are observed (though less evidently) in GDP-scaled data.

Among the regions, Latin America and Caribbean got the highest amount of foreign capital relative to its wealth during the last four decades. Africa and the Middle East were the least popular developing market destinations. The other regions, Developing Asia and particularly Europe and Central Asia, have been the growing external fund recipients.

There was a strong wealth bias in foreign capital flows to developing economies as the lower income countries have always received less external debt and equity capital. This persistent observation is the core subject of the next two chapters. In Chapter 3, we test whether the poorer countries receive lower international capital than expected (i.e. the Lucas paradox) in the long-run.

CHAPTER 3

LUCAS PARADOX IN THE LONG-RUN

3.1 INTRODUCTION

Obstfeld and Rogoff (2000) include limited international capital mobility as one of the six major puzzles in international macroeconomics. The stickiness in cross border capital transfers was first documented by Feldstein and Horioka (1980) who found very high correlations between domestic savings and investments in OECD countries for the 1960-1974 period. Since incremental savings tend to stay in the country making the savings it is hard to assert that foreign capital has been perfectly mobile. Using the self-financing ratio of cumulative discounted gross national savings and gross national investment, Aizenman *et al.* (2007) demonstrated that 90 percent of domestic capital stock, on average, in developing countries is self financed and this fraction was stable during the 1990s.

Under homogeneous technology with constant returns to scale, identical goods, and competitively free international trade, conventional neoclassical growth and trade theory predicts that factor price equalizing (Samuelson, 1948) investments will accrue to the capital scarce less developed economies, i.e. capital will tend to flow to poorer countries. Via this mechanism international convergence in economic growth and consumption would be accomplished in a transition period during which cross-country differences in levels of economic development will fade away. This has evidently not happened.

The Lucas paradox refers to the observation of rich-to-poor capital flows falling far short of the flows predicted by the neoclassical growth and trade theory, as systematically observed in Lucas (1990). In fact, capital flows tend to move disproportionately to richer countries, if not from poorer to richer countries. In the same vein and with reference to endogenous growth theory (Romer, 1986; Lucas, 1988), King and Rebelo (1993) conclude that under such conventional assumptions about preferences it is hard to rely on the neoclassical model to explain *sustained* variations in growth rates across countries. Accounting for this paradox would also help explain the more general puzzle of relatively immobile international capital flows.

Lucas (1990) provided four possible hypotheses to account for that puzzling patterns of international capital flows: differences in relative human capital stocks; variations in external benefits of human capital; capital market imperfections (political risk, institutions etc.); and restrictions on capital flows (taxation, capital controls and similar policies) and monopolistic power (Parente and Prescott, 1999) of either the imperial colonizer or of the national sovereign government. Reasoning that adjusting for human capital differentials eliminates the return differentials between poorer and wealthier countries, he favours the combination of the first two explanations.

Theoretical approaches to the Lucas paradox can be categorized into two major groups. Papers in the first group try to explain the puzzle through domestic economic fundamentals such as omitted factors of production, disruptive government policies in forms of taxation, direct controls and restrictions, institutional establishments (incentive and safeguard structures) and total factor productivity differences.[14] International capital market imperfections constitute the conceptual stance on which the second approach favours asymmetric information and sovereign risk explanations.[15] Both approaches are inevitably interlinked and some recent papers (e.g. Goldstein and Razin, 2006; Kraay *et al.*, 2005) take a mixed position between fundamentals and financial market inefficiencies in modelling private foreign equity and portfolio flows.

Although empirical literature focusing directly on the Lucas paradox is limited (e.g. Clemens and Williamson, 2004, Alfaro *et al.*, 2008), there is extensive applied work on the realization of capital flows. Financial and banking crises, capital flight, and rapid capital flow resumptions stimulated economists to analyse the main determinants and properties of flows through empirical research. Some studies have concentrated on the topic of whether external financing is driven by domestic or foreign factors—the push versus pull controversy.[16] Time series properties of cross border fund movements have also been analyzed.[17] Other papers have provided evidence on compositional dynamics and differentiation of various types of financial transfers according to their build-up and determination.[18]

[14] See Martin and Rey (2004), Razin and Yuen (1994), Gomme (1993), Tornell and Velasco (1992).

[15] See Albuquerque (2003), Gordon and Bovenberg (1996), Gertler and Rogoff (1990).

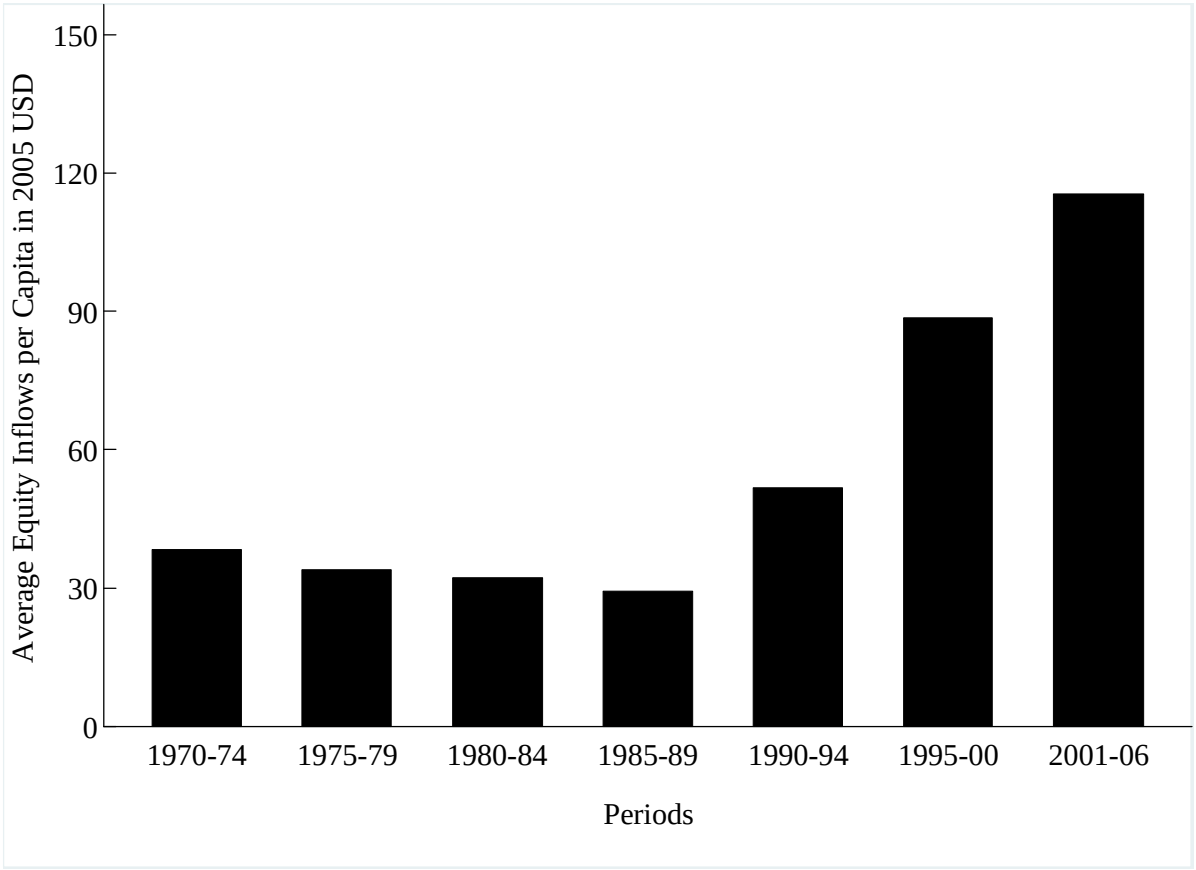
[16] See Calvo *et al.* (1993), Fernández-Arias (1996), Chuhan *et al.* (1998), Taylor and Sarno (1997).

[17] Claessens *et al.* (1995), Sarno and Taylor (1999a, 1999b), Levchenko and Mauro (2007).

[18] See, for instance, Lane (2004).

Specifically for institutions, several studies document that institutional quality is important in explaining capital flows. Employing world governance indicators of the World Bank as proxy for institutions Faria and Mauro (2009) find that institutional quality index is positively significant in explaining the share of direct and portfolio equity stocks in total external liabilities. De Santis and Lührmann (2009) show the negative impact of deteriorating civil liberties on income scaled foreign portfolio equity flows. Daude and Fratzscher (2008) demonstrate that component based institutional quality in terms of corruption, expropriation risk, repudiation costs, and days of enforcement for business contracts has differing influence on capital stock compositions. Institutions, for instance, have not been detected to be effective on FDI unlike the situation for international portfolio equity investments. Edison and Warnock (2008) could not discover any meaningful association between first differenced International Country Risk Guide (ICRG) composite index and US net monthly purchases of emerging Asian and Latin American portfolio equity securities.

Figure 3.1: Equity Capital Inflows to Developing Countries by Sub-periods, 1970-2006



Notes: Data averaged over both sub periods and across countries deliver per capita real foreign portfolio and direct equity inflows to a typical developing country.

In order to give a general idea about the realization of capital flows, Figure 3.1 shows partitioned trends of per capita equity capital flows to a typical developing country.[19] The figure shows a steady small decrease in foreign direct and portfolio equity investments in developing countries for the first two decades of the sample. This corresponds to the oil price shocks in the early and late 1970s and the dramatic (Latin American) debt crisis of the early 1980s which seem to have reduced capital flows over the period. After debt restructuring and relief (e.g. Brady Plan), and widespread liberalization policies in most of the developing countries in the late 1980s and early 1990s, capital inflows have grown and reached unprecedented per capita levels of nearly 120 USD during the initial six years of the new millennium. This amounts to more than doubling of the international financial allocations to developing economies within seventeen years. Nevertheless, capital flows to developing countries do not support the predictions of the neoclassical theory; the volume and magnitude of capital flows to less developed countries are not just well behind the expectations but capital is attracted to the wealthier economies where the capital already is.

Using cross-section data for countries from all income levels (both industrialized and unindustrialized), Alfaro *et al.* (2008) find that the problem of 'lower-than expected capital flows to poorer economies' (the Lucas paradox) is resolved by including a measure for institutional quality. For a sample of 47 developing countries over the 1970-2006 period, this study tests if their findings hold up when advanced countries—that consistently have higher levels of institutional quality—are excluded. Employing simple cross-section OLS estimators and using real capital flows (the sum of foreign direct and portfolio equity investment) per capita as the dependent variable (as in Alfaro *et al.*, 2008), the chapter provides evidence for the Lucas paradox *within* developing countries. Following Houthakker (1965), Baltagi and Griffin (1984), Pesaran and Smith (1995), we interpret the estimation results from cross-section OLS as capturing *long-run* relationships.

The remainder of the chapter is organized as follows. Section 3.2 discusses theoretical background and Section 3.3 specifies econometric methodology. Section 3.4 defines the data and main variables. Section 3.5 describes the data and overviews the evolution of selected data over time. Core regression results are given in Section 3.6 and concluding remarks are in Section 3.7.

[19] This figure is a more accurate version of the figure in Appendix 4.3 (Figure A4.1, among the Chapter 4 appendices) which portrays values on the vertical axis computed exactly similar to Alfaro *et al.* (2008).

3.2 THEORETICAL MOTIVATION

We follow the expositions of Alfaro *et al*. (2008). In the context of economic growth, assume a small open economy operating with explicit production factors capital, K, and labour, L, through a constant returns to scale (CRS) production function of the form:

$$Y_t = A_t \mathrm{F}(K_t, L_t) \quad F_K(\cdot) > 0, F_L(\cdot) > 0; \quad F_{KK}(\cdot) < 0, F_{LL}(\cdot) < 0 \tag{1}$$

where Y represents output, A stands for total factor productivity (TFP), and t subscript denotes time. In such an open economy agents can lend and borrow capital globally. Hence, if all countries are endowed with identical technology with homogeneous capital and labour inputs the instantaneous convergence of the returns to capital would be accomplished via free and competitive international trade so as to get;

$$A_t \mathrm{f}'(k_{it}) = r_t = A_t \mathrm{f}'\left(k_{jt}\right) \tag{2}$$

where $\mathrm{f}(\cdot)$ denotes the net of depreciation production function in per capita terms and k refers to capital input per capita in country i or j. Diminishing returns, identically endowed constant TFP, free and competitive trade, and international arbitrage imply that financial resources will move from capital-abundant countries of low returns to capital-scant countries of high returns. As noted, however, this is not observed; giving rise to the Lucas paradox. Theoretical approaches to account for this paradox can be categorized as cross country variations in economic fundamentals versus international capital market imperfections.

3.2.1 Economic Fundamentals

3.2.1.1 Omitted Factors of Production

One conjecture is that the conventional neoclassical theory disregards other factors potentially influencing production. Natural resources and human capital (Lucas, 1990; Acemoglu and Zilibotti, 2001) may have positive externalities on productivity ultimately leading to increased returns to capital. Incorporating these factors under a new term, Z_t, yields

$$Y_t = A_t \mathrm{F}(K_t,\ Z_t,\ L_t) \tag{3}$$

Thus, we now obtain the true returns equated as

$$A_t \mathrm{f}'(k_{it},\ z_{it}) = r_t = A_t \mathrm{f}'\left(k_{jt},\ z_{jt}\right) \tag{4}$$

The implication being that lower z reduces relative returns in poorer countries.

3.2.1.2 Government Policies

Fiscal policy by means of taxation, monetary policy via inflation targeting, and policies directly imposing capital controls may interrupt capital flows (Stockman and Hernández, 1988). The distortive effects of these government policies can be inserted into the model by supposing that governments levy tax on capital returns at varying rates of τ. The equivalent returns are given in the form of

$$A_t \mathrm{f}'(k_{it})(1-\tau_{it}) = r_t = A_t \mathrm{f}'\left(k_{jt}\right)(1-\tau_{jt}) \tag{5}$$

3.2.1.3 Institutions and TFP

Consisting of both culture shaped informal codes of conduct like social norms, customs, traditions, ethical and moral values; and formal rules such as laws, decrees, statutes, communiqués, and similar regulations institutions are the constraints that structure political, economic, and social interactions. Weak property rights, fear of expropriation, low enforcement of legal contracts, and other weak socio-political and socioeconomic conditions due to poor institutions may leave productive capacities unexploited and may create a wedge between ex ante and ex post financial investment returns in that economy (Parente and Prescott, 1994).[20] Being unable to explicitly distinguish among the reflections of heterogeneous incentive structure, innovation opportunities, and technological efficiency both TFP and institutional quality originated factors are attributed to A_t. The return differentials are expressed as

$$A_{it} \mathrm{f}'(k_{it}) = r_t = A_{jt} \mathrm{f}'\left(k_{jt}\right) \tag{6}$$

3.2.2 International Capital Market Imperfections

3.2.2.1 Asymmetric Information

Both national and international financial markets are subject to either adverse selection, moral hazard, costly state verification, or all of these to a certain extent. In general, laissez-faire market conditions may be paralyzed through the distortions caused by this sort of informational asymmetries among the participants. Furthermore, as Gertler and Rogoff (1990) notes, North-South capital flows are dampened and possibly reversed relative to the perfect-information benchmark. Eventually, the lack of international portfolio diversification

[20] See Acemoglu and Dell (2010), and Castro *et al.* (2004) for institutions; Hsieh and Klenow (2009), and Parente and Prescott (2000) for TFP differences.

and home bias can come into play in the forms of disinvestment, divestment, and under investment particularly in less developed poor countries (Gordon and Bovenberg, 1996).

3.2.2.2 Sovereign Risk

Bearing an overlapping relationship with political risk and institutions, sovereign risk exclusively embraces credit risk, the probability that a sovereign will default on servicing its debt, as well as the risk of expropriation and repudiation. It also refers to the policies by which a government can discourage domestic residents in fulfilling their obligations to foreign contracts. In his recent theoretical paper Wright (2006) argues that due to default risk only smaller levels of capital flows can be supported in equilibrium. By means of the example of colonial India which was exposed to the same rules as imperial Great Britain, Lucas (1990) argued that sovereign risk could not solve his puzzle. Conversely, recalling several rebellions in India, Reinhart and Rogoff (2004) maintained that sovereign risk might well account for the paradox: "As long as the odds of non-repayment are as high as 65 percent for some low-income countries, credit risk seems like a far more compelling reason for the paucity of rich-poor capital flows."

The empirical methodology for testing some premises of the theoretical postulations discussed so far is given as the underlying population model in the following subsection.

3.3 METHODOLOGY

The cross section ordinary least squares (OLS) specification for the long run averages over time can be characterized as:

$$F_i = \mu + \alpha Y_i + \mathbf{x}_i \boldsymbol{\beta} + \varepsilon_i \tag{7}$$

where F_i is average inflows of portfolio equity and direct investment per capita to country i $(i = 1, 2, \dots, N)$, μ is a constant or the intercept, Y_i is the log per capita initial wealth, $\mathbf{x}_i$ is a $1 \times (K-1)$ row vector of any additional covariates or control variables included sequentially either in a way of 'one at a time' or in a multivariate regression framework, and ε_i is the usual disturbance term. The coefficients of interest are α and $(K-1) \times 1$ column vector $\boldsymbol{\beta}$, where K is the number of regressors and $K \geq 1$. The former will be capturing the presence of the Lucas paradox while the latter will be offering quantitative insight about the ability of corresponding regressor in accounting for, i.e. resolving, the paradox.

3.4 THE DATA AND VARIABLES

3.4.1 The Dependent Variable

The idea of using alternative capital flows data motivated Alfaro *et al*. (2008) to employ three different samples including both developing and developed countries. In the first IMF-IFS sample, spanning over 1970-2000 for 81 counties, capital flows data defined as inflows of portfolio equity and direct foreign investment (i.e. total equity flows) per capita expressed in constant 1996 $US. Adjusted foreign capital stock data taken from Kraay *et al*. (2005) (KLSV) and from Lane and Milesi-Ferretti (2001) (LM) were used to account for potential valuation effects (capital gains and losses, defaults, and price and exchange rate fluctuations) on the cross border capital transactions that are not incorporated in the IFS. The second and third samples have been composed using the first-differenced per capita constant forms of those equity *stock* estimates so as to get *flow* data. Instead of the valuation of stocks using stock market prices which may not fully represent the stock of capital in especially a developing country, unlike LM, KLSV use the price of investment goods in local currency (the investment deflator) for their valuation of the stocks of capital. The KLSV data set covers 1970-1997 period and 58 countries whilst the latter comprises 1970-1998 time interval for 56 countries. In our replication study capital flows also refer to total equity inflows that are similarly constructed from the sum of FDI and foreign portfolio equity investments (FPEI) in 47 developing (emerging and lower (middle) income) countries between 1970 and 2006. The data as net liability balances of both series compiled via WDI of the World Bank which essentially transmits the IFS data on that sort of accounts. Hence, the notion of our net liability balances is parallel to 78bed (FDI in recipient economy, not included elsewhere (n.i.e.)) and 78bmd (portfolio investment equity securities, liabilities) lines used by Alfaro *et al*. (2008). The only difference is that we take 2005 as the base year to obtain constant values of per capita equity flows (scaled through dividing by 100).[21]

3.4.2 Key Independent Variables

To substantiate whether there is indeed a paradox as claimed by Lucas (1990), Alfaro *et al*. (2008) uses the logarithm of 1996-PPP adjusted per capita GDP in 1970 as one of the main regressors. A positive significance of that right hand side variable would indicate the

[21] We conjecture that the same scaling has actually been done in the paper despite the absence of such an explicit statement therein. Because the parameters would not appear as they are unless the dependent variable is scaled by 100. For more detailed definitions of FDI and portfolio equity flows see the relevant sections of Chapter 2.

presence of the paradox. Because we need to conduct econometric analyses to serve replication purposes we employ similarly constructed initial income variable adjusted by Penn World Tables (PWT), mark 6.3 with PPP in USD (Heston *et al*., 2009).

Explanatory variables other than the initial GDP are included sequentially to see which, if any, accounts for the Lucas paradox by rendering the log initial output insignificant. The institutional quality variable to capture possible repercussions of the domestic capital market inefficiencies, creditworthiness, and political risk factors is one of those fundamental covariates. It is a yearly composite index, over 1984-2006 in our study and 1984-2000 in theirs, constructed by adding up annual scores of twelve sub indices (11 in the paper) from International Country Risk Guide (ICRG) of Political Risk Services Group (PRS, 2007). These indices are government stability, socioeconomic conditions, investment profile, internal conflict, external conflict, corruption, military in politics, religion in politics, law and order, ethnic tensions, democratic accountability, and bureaucratic quality. Unlike other ratings of institutional attributes, opinion surveys are not the basis for ICRG data which depend rather on risk assessments of experts who subjectively manipulate gathered political and institutional information by converting them into risk points for each individual risk component.[22] Each component is allotted a maximum numerical value as risk points where the highest score means the lowest potential risk for that component, and vice versa. Following Alfaro *et al*. (2008) we have rescaled the composite political risk or institutional quality index by dividing the row totals by 10 so that the variable range is 0-10 not 0-100. The proposition is that institutional structure and functioning in a country may influence economic growth, marginal productivity of capital and investment conditions; a positive association between per capita equity inflows and the level of institutional quality is expected.

Average years of schooling, the human capital proxy, is from the Barro and Lee (2001) international data on educational attainment for five-year intervals between 1970 and 2000. Average years of schooling is defined as educational attainment of total population aged 25 and over in some levels (primary, secondary, or tertiary) for some years. Although Alfaro *et al*. (2008) have retrieved their data from the same source, they have not clearly mentioned whether it is the educational attainment of population aged 15 years and over or 25 years and over. Human capital in general and schooling in particular is expected to have significant

[22] Extensive descriptions of these twelve sub indices can be found in Chapter 4 appendix (Appendix 4.2).

impact on economic growth, investment, and development conditions and prospects in a country.[23] Therefore, we anticipate a nonnegative relationship between foreign equity investment and average years of schooling.

Inspired by gravity models of trade, distance is the third independent variable to test whether transaction costs, international capital market imperfections and information frictions impinge on foreign direct and portfolio equity inflows. The unilateral distance variable has been constructed as a GDP weighted average of the distances between capital city of a country and capital cities of all the other countries in the world. Namely, denoting the kilometres distance from country i's capital city to country j's capital city by d_{ij}; weighted average distance of country i at year t is formulated as

$$d_{it} = \frac{\left[\sum_{j=1}^{N-1} d_{ij} GDP_{jt}\right]}{GDP_{wt}} \tag{8}$$

where the denominator, GDP_{wt}, is the year t world GDP. A negative coefficient is expected on the distance. [24]

'Capital mobility restrictions' is the last explanatory variable that enters the main specifications, as a measure of a government's official constraints on free capital movements. Taking values between 0 and 1, it is the mean of four dummy variables (multiple exchange rate practices, restrictions on current account transactions, barriers on capital account dealings, and surrender and repatriation requirements for export proceeds) created by exploiting the information and notices in the various issues of the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions* (AREAER). A '1' indicates the existence of controls, restrictions, or policies while a '0' refers to the absence thereof. Periodic coverage corresponds to 1970-2000 in Alfaro *et al*. (2008), and to 1970-2005 in this investigation. Since those restrictions are regarded as premeditated measures against cross-border free fund transfers, we expect the parameter on capital mobility restrictions to be negative.

[23] See Barro (1991), Benhabib and Spiegel (1994), Banerjee and Duflo (2005), Bils and Klenow (2000), Acemoglu and Angrist (2000), and Chapter 5 in Barro and Sala-i-Martin (2003).

[24] Distance data in kilometres are from Centre d'Etudes Prospectives et d'Informations Internationales (CEPII); a leading French research centre in international economics. Geodesic distances are calculated following the great circle formula which uses the geographic coordinates (latitudes and longitudes) of the capital cities. Data for nominal GDP in current $US are taken from the WDI and we impute zeros for any missing GDP data. $j = 1,2,\ldots,N$; where $N\ (=197)$ is the number of countries for which both GDP and geographic distance data are simultaneously available.

3.4.3 Additional Regressors for Sensitivity Analyses

For distortive government policies, corporate tax from the *KPMG*'s Corporate and Indirect Tax Rate Survey for various years (1999-2006) is used. Taxation may deter foreign investors from allocating increased amount of funds so that it is predicted this variable to have reducing effect on equity capital inflows. It is not uncommon that trade openness (exports plus imports expressed as a percentage of GDP, data for all three variables are from the World Bank's WDI) is used as a proxy for the extent of economic liberalization and integration of a country. The predicted impact of those attributes on cross border capital investments is positive. To represent another aspect of domestic economic climate GDP scaled deposit money bank assets as one of the several measures of the level of credit market development is employed. Theoretically, improvements in financial sector lead to enhanced productivity of capital which, in turn, results in higher returns on capital attracting more investments.

In the conceptual issues section, Alfaro *et al*. (2008) have specified the production function that incorporates institutional structure and technological efficiency within the term A_t, standing for total factor productivity (TFP). Thereby institutional quality variable has been imagined to affect production and investment opportunities under the TFP process. While using it previously as a proxy for cross country TFP differences also, in robustness checking section they have attempted to distinguish incentive (institutional) structure and technological efficiency effects by additionally employing TFP variable per se. Taken from Kraay *et al*. (2005) for 1970-1997, the level of TFP growth is an estimated Solow residual from the neoclassical production function, $y = Ak^{\alpha}$, as $y \;\; k^{\alpha}$, where y is GDP per capita, k is domestic capital stock per capita, and $\alpha = 0.3$. Hence, it does not take into account labour input. In our case, on the other hand, TFP growth is from Total Economy Database of the Conference Board (2010) where it is defined as the effect of technological change, efficiency improvements, and immeasurable contribution of all inputs other than capital and labour. It is estimated as the residual by subtracting the sum of two-period average compensation share of capital and labour inputs weighted by their respective growth rates from the output growth rate. Usage of log level differences delivers the logarithmic annual TFP growth rates as Tornqvist indexes throughout 1982-2006. The expected sign of the link between capital inflows and TFP growth is positive.

Initial per capita domestic capital stock in 1970 substitutes for per capita initial GDP as the new wealth control. Acquired from version 5.6 of PWT, domestic capital stock is capital

reserves per capita including gold in 1970 expressed at 1990 PPP equivalents. Because this data is no longer available in PWT we use gross capital formation (GCF) from WDI which refers to outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. Fixed assets include land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like; including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. Inventories are stocks of goods held by firms to meet temporary or unforeseen fluctuations in production or sales, and work-in-progress. Data are in constant 2005 US dollars.

To represent socioeconomic conditions, infrastructure, environmental sustainability, and the level of economic development from a different angle we employ malaria in 1994 from Sachs (2003) who describes it as the proportion of a country's population at risk of falciparum malaria infection. Per capita foreign equity investments are expected to be negatively influenced by the malaria incidence.

The potential effects of asymmetric information on the behaviours of international financial investors are controlled for through three different measures: country creditworthiness, foreign bank penetration, and global awareness about local conditions. To capture credibility OECD's (2010) country risk classifications are used. In accordance with the OECD Knaepen Package, which came into effect in 1999, country credit risks are assessed and countries are classified into eight numerical categories between 0 and 7 on the basis of valid country risk elements by a consensus decision of the sub-group of country risk experts. It involves both quantitative evaluation through the Country Risk Assessment Model (CRAM) and qualitative country-by-country expert appraisal of the model results to integrate political risk and other risk factors not considered by the model. Since a lower category number means lower country credit risk, an increase in this variable is conjectured to decrease capital inflows. Taken from WDI, international per person voice traffic (the sum of international incoming and outgoing telephone calls in minutes divided by the total population) is another proxy for cross country information spillovers. More informed investors via increased telephone communications are likely to invest more in familiar markets. Standing for the share of assets of foreign-owned banks in total domestic bank assets, foreign bank asset share emerges as the final proxy for the degree of global

information asymmetries.[25] Enhanced international awareness due to foreign bank participation in the domestic financial system of a country may stimulate foreign direct and portfolio equity investments.

3.4.4 Instrumental Variables

The threats of probable endogeneity and attenuation bias due to measurement error in the indexation of the institutional quality or political risk give rise to utilization of instrumental variable methods such as two-stage least squares (2SLS). Log European settler mortality is one variable that instruments institutional quality. Acemoglu *et al*. (2001) define it as historical European colonizers' mortality rates measured in terms of annual death per 1,000. British legal origin dummy, whether the origin of the current formal legal code of a country is British common law (La Porta *et al*., 1997), and English language, fraction of the population speaking English as mother tongue (Hall and Jones, 1999), are the other variables that implicitly instrument institutional quality.

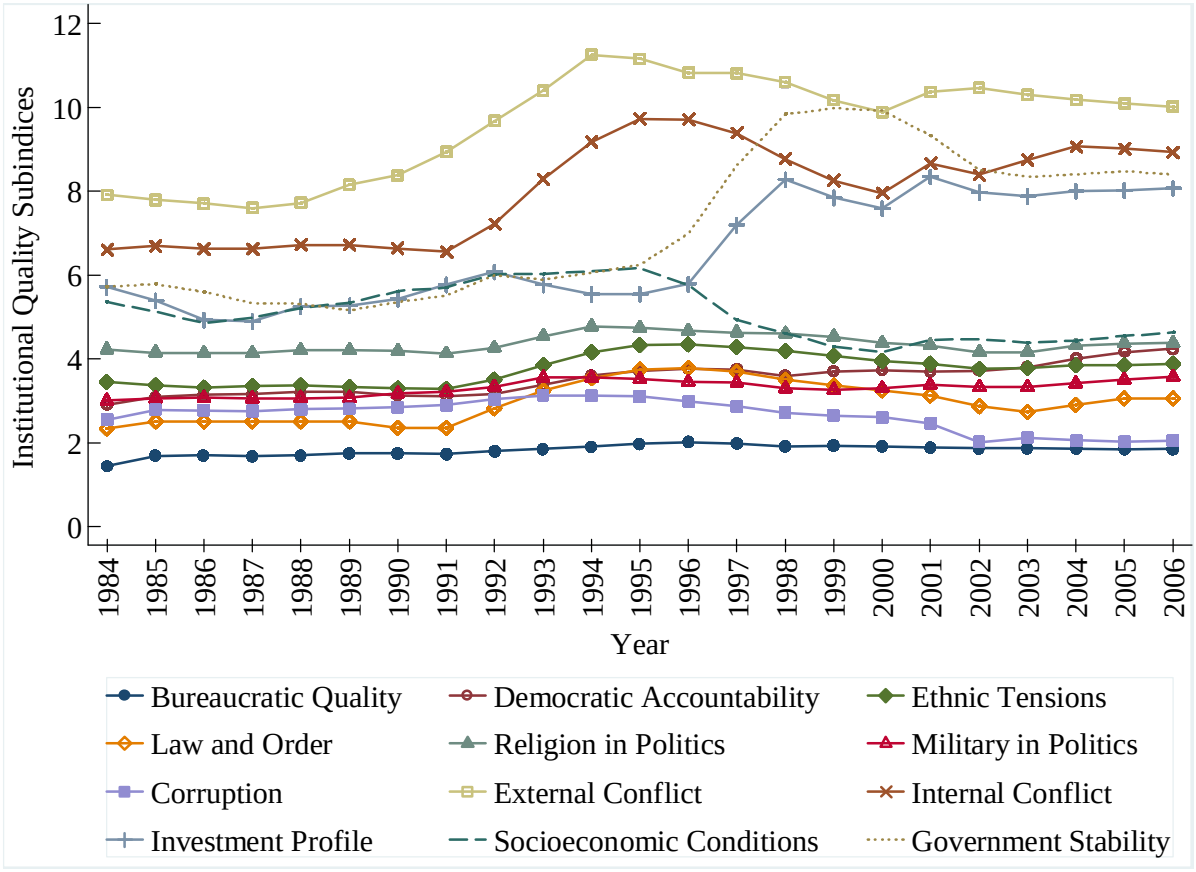
3.5 DESCRIPTIVE STATISTICS AND TRENDS

Alfaro *et al*. (2008) argued that it is more appropriate to use time averaged variables for elucidating the long run relationships. Figure 3.2 shows the trends of twelve components of the composite index for the quality of institutions. The scores of each component are the annual mean values across all sample countries for which the data are available. Because institutional quality is one of the core variables it has been conjectured that a breakdown of its components would demonstrate the profile of their time variation, thus giving an idea about the composite index too. Indeed, as can be seen from the figure all the components but four display a relatively stationary pattern and those four are mostly stable throughout the 1980s and since 2001. The coefficient of variation statistics of both per capita equity inflows and institutional quality averaged across counties are less than of those averaged across years.[26]

[25] Deposit money bank assets as percentages of GDP and foreign bank asset shares are from Beck *et al.* (2005).

[26] The *within* coefficient of variation is 0.65 for per capita equity flows, and 0.10 for institutional quality whereas the *between* coefficient of variation reads 1.40 for the former, and 0.11 for the latter.

Figure 3.2: Evolution of the Institutional Quality Index Components, 1984–2006



Notes: A higher score which is the average across 53 countries for each year implies lower risk for every component. Detailed definitions of all sub-indices relegated to the Chapter 4 appendix (Appendix 4.4).

Table 3.1 provides descriptive statistics for time averaged cross section data on the main variables in our analysis. On average, a typical developing country attracts per capita foreign portfolio equity plus direct investment around $48. Ranging between $1 and $202 average capital flows per capita also has high variation across countries. Less variation in initial income reflects the fact that the sample is composed of countries from similar income levels. With a mean value of 5.9 out of 10 the index of quality of institutions has the lowest cross country variation; a parallel and more pronounced less spatial (country) heterogeneity indication. In a slight contrast, average years of education attainment shows a wide array from about five months to 8 years which demonstrates the disparity in human capital formation across unlucky developing countries. The negative mean growth rate of the most volatile variable of average total factor productivity might be a sign for declining efficiency in production processes and technologies of those countries. Finally, it is important to note that the mean value of the composite variable of restrictions on capital mobility (taking values between 0 and 1) reads as 0.60 which is well above 0.50. This reveals how strongly

countries themselves de-jure constrain and control the flow of funds albeit all financial liberalizations they pass through and economic globalizations they become a part.

Table 3.1: Descriptive Statistics

Variables	Sample	Mean	Std. Dev.	Min	Max
Average per capita equity flows, 1970-06	47	47.964	48.692	1.189	202.261
Per capita GDP (PPP $US) in 1970	47	0.881	0.588	0.175	2.838
Average institutional quality, 1984-06	47	5.901	0.688	4.539	7.238
Average years of schooling, 1970-00	47	3.932	1.693	0.477	8.209
Average distance, 1970-06	47	8.842	1.657	5.903	12.312
Average capital mobility barriers, 1970-05	47	0.600	0.202	0.000	0.910
Average corporate tax rate, 1999-06	36	29.872	5.422	15.000	38.240
Average trade openness, 1970-06	47	63.162	31.823	16.924	155.182
Average bank assets, 1970-06	46	0.344	0.198	0.118	0.990
Average TFP growth, 1982-06	39	-0.277	1.448	-3.934	1.909
Per capita GCF (2005 $US) in 1970	44	0.401	0.411	0.057	2.005
Malaria contagion risk as of 1994	47	0.418	0.400	0.000	1.000
Average risk level, OECD, 1999-06	47	5.145	1.582	2.000	7.000
Average Int'l voice traffic, 1970-06	46	30.523	39.074	0.785	165.678
Average foreign bank asset share, 1990-97	41	0.229	0.208	0.006	0.852

Notes: Though it may change as a result of data availability, the overall sample period is 1970-2006 in our case whereas it is either 1970-2000 or 1970-1997 in Alfaro *et al*. (2008). All selected variables expressed as monetary values are either in current PPP $US or in 2005 constant $US. Distance, gross capital formation (GCF), and GDP are in thousands of $US. Due to data unavailability, unlikely Alfaro *et al*. (2008), we used GCF rather than domestic capital stock and OECD risk classification level in lieu of Moody's sovereign risk and international per person voice traffic instead of *Reuters*. Moreover, in their TFP growth calculation only capital input has been subtracted from the total output whereas in ours both capital and labor inputs deducted so as to yield more accurate TFP estimation.

Pairwise correlations between the core independent variables and alternative robustness covariates are presented in Table 3.2. Most Pearson correlation coefficients are either around 0.5 or lower in absolute terms. The foremost difference between this table and Tables 3 and 4 in Alfaro *et al.* (2005) is that main explanatory variables are more highly correlated in their case. In particular, the correlation of 0.84 between initial income and institutional quality might drive their regression results (so that developed countries steer the higher correlation of institutions with capital flows). Correlations of log distance and TFP with the remaining variables also show dramatic difference between samples. In Alfaro *et al.* (2005), for example, distance is negatively and significantly correlated with most of the other explanatory variables whereas as seen from the above table correlation coefficients of that variable are insignificantly positive for the matching pairs. Structural difference between our TFP growth variable and their estimated log TFP level propagates itself in pairwise correlations as well as in descriptive statistics. Unlike Alfaro *et al.* (2005) TFP growth has

negative, though insignificant, correlations with institutional quality and log average years of schooling, and significantly negative with initial income per capita according to Table 3.2. This implies that less wealthy countries have faster total factor productivity growth despite having lower levels. The profound problem, however, is that the correlation coefficient should be much more negative than -0.329 to satisfy the predictions of neoclassical growth and trade theories.

Table 3.2: Correlations between Main Explanatory and Other Control Variables

	L. pc IGDP	***Institutions***	***L. Schooling***	***L. Distance***	***Restrictions***
Institutions	0.398 *(0.00)*				
Log schooling	0.626 *(0.00)*	0.496 *(0.00)*			
Log distance	0.064 *(0.62)*	0.107 *(0.44)*	0.275 *(0.04)*		
Restrictions	-0.202 *(0.12)*	-0.175 *(0.21)*	-0.244 *(0.08)*	-0.224 *(0.08)*	
Corporate tax	0.071 *(0.67)*	-0.221 *(0.19)*	-0.142 *(0.40)*	0.122 *(0.46)*	0.068 *(0.68)*
Log openness	0.133 *(0.30)*	0.242 *(0.08)*	0.193 *(0.16)*	-0.020 *(0.88)*	-0.406 *(0.00)*
L. Bank assets	0.366 *(0.00)*	0.323 *(0.02)*	0.483 *(0.00)*	-0.041 *(0.75)*	-0.211 *(0.10)*
L. TFP growth	-0.329 *(0.03)*	-0.140 *(0.36)*	-0.115 *(0.49)*	0.118 *(0.45)*	0.005 *(0.98)*
Log pc IGCF	0.802 *(0.00)*	0.530 *(0.00)*	0.598 *(0.00)*	0.095 *(0.50)*	-0.084 *(0.55)*
Malaria	-0.584 *(0.00)*	-0.502 *(0.00)*	-0.554 *(0.00)*	0.028 *(0.83)*	0.050 *(0.71)*
Country risk	-0.216 *(0.10)*	-0.588 *(0.00)*	-0.390 *(0.01)*	-0.085 *(0.53)*	-0.003 *(0.98)*
L. Voice traffic	0.555 *(0.00)*	0.398 *(0.00)*	0.520 *(0.00)*	-0.161 *(0.21)*	-0.248 *(0.05)*
Foreign banks	-0.354 *(0.02)*	-0.169 *(0.27)*	-0.250 *(0.11)*	0.132 *(0.38)*	-0.021 *(0.89)*

Notes: All the variables are those as in Table 3.1 except the logarithmic forms of some of them. The abbreviations *L*, *I*, and *pc* refer to 'logs', 'initial' and 'per capita' respectively. Country observations change from pair to pair adjusting to data availability. *P*-values are in italics and in parentheses.

3.6 THE UNDERLYING REGRESSION RESULTS

This section concentrates on the actual models fitted to the data by replicating key aspects of the analysis in Alfaro *et al*. (2008) first, laying down the estimation outputs in the subsequent tables for the sample of developing countries second, carrying out sensitivity checks third and finally dealing with potential endogeneity issues through instrumental variable regressions.

3.6.1 Replication of Alfaro *et al*. (2008)

Using data for the same sample of 98 developed and developing countries, we first replicate the main estimates of Alfaro *et al*. (2008). Panel A in Table 3.3 provides the cross-section OLS regression results following the approach of the original paper.

Table 3.3: Replication of Core Specifications in Alfaro *et al*. (2008)

A. 1970-2000 Period

	Base Year 1996					Base Year 2005		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Log per capita initial GDP (1996 PPP$)	1.20*** (0.18)	-0.02 (0.30)	1.36*** (0.19)	-0.08 (0.43)	0.07 (0.26)			
Log per capita initial GDP (2005 PPP$)						1.39*** (0.20)	0.18 (0.27)	0.46** (0.23)
Average institutional quality, 1984-2000		1.22*** (0.35)		1.31*** (0.43)	1.18*** (0.41)		1.43*** (0.41)	1.37*** (0.41)
Log average years of schooling, 1970-2000					-0.38 (0.35)			-0.78 (0.58)
Log average distance, 1970-2000					1.02 (1.26)			1.60 (1.71)
Average restrictions to capital mobility					-2.27** (0.90)			-2.60** (1.04)
Countries	98	98	81	81	81	81	81	81
R^2	0.27	0.43	0.29	0.44	0.50	0.30	0.44	0.50

B. 1970-2006 Period

	Base Year 2005					Base Year 1996		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Log per capita initial GDP (2005 PPP$)	1.65*** (0.22)	0.09 (0.33)	1.79*** (0.24)	0.08 (0.40)	0.31 (0.29)			
Log per capita initial GDP (1996 PPP$)						1.74*** (0.22)	-0.27 (0.57)	-0.12 (0.35)
Average institutional quality, 1984-2006		1.82*** (0.48)		1.92*** (0.55)	1.80*** (0.55)		1.75*** (0.54)	1.56*** (0.53)
Log average years of schooling, 1970-2005					-0.81 (0.72)			-0.39 (0.44)
Log average distance, 1970-2006					1.07 (2.14)			0.61 (1.59)
Average restrictions to capital mobility					-2.80** (1.31)			-2.40** (1.09)
Countries	98	98	81	81	81	81	81	81
R^2	0.32	0.49	0.33	0.49	0.53	0.31	0.50	0.53

Notes: Dependent variable is average capital flows (the sum of FDI and foreign portfolio equity inflows, wherever the data are available for at least one of them) per capita expressed either in 1996 or in 2005 US dollars. Initial GDP is the first-observed GDP of a country within the corresponding sample period. The dependent variable and log per capita initial GDP consistently accord with the relevant base year. As the most part of Panel A (especially the first five models) is an exact replication of Alfaro *et al*. (2008), institutional quality considered in this panel is composed of eleven components out of twelve ICRG political risk indicators. The remaining 'socioeconomic conditions' component is also incorporated in Panel B as in the thesis. The 'years of schooling' variable refers to average years of school attainment (at all levels) of the total population aged 25 and over and not 15 and over. The results are robust to either measure of institutional quality and years of schooling. The base sample of 81 countries excludes any country that does not have data for all variables of interest. Heteroscedasticity robust (White-corrected) standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$ denote significance at 10%, 5%, and 1% respectively. Unreported constant included in all estimations.

Models (1), (3) and (6) show that the Lucas paradox exists for both samples of countries from all income levels as the log per capita initial GDP (a proxy for the level of initial capital stock in an economy) is positively significant in explaining the inflow of new foreign capital. The inclusion of institutional quality 'resolves' the paradox in all models except (8) which, in contrast, demonstrates that the results for the original period 1970-2000 are sensitive to base year adjustment. Nevertheless, our data reaffirm the findings of Alfaro *et al*. (2008) with the same base year. Panel B reports estimation results from the replications that consider slight modifications (e.g., extending the sample period to 2006, taking 2005 as the base year and additionally incorporating the 'socioeconomic conditions' component in the composite institutional quality variable). The estimates in this lower panel corroborate those of Alfaro *et al*. (2008) more strongly than the upper panel.

Throughout the remainder of this chapter, we focus on the subset of developing countries and investigate the empirical implications of the Lucas paradox and related theories within that particular country group. More specifically, we explore if the above findings hold when industrialised (developed) countries are removed from the sample.

3.6.2 Central Cross-Section OLS Results

Table 3.4 reports the main estimation results for the sample of developing countries. The preliminary cross section OLS regressions of per capita foreign portfolio equity and direct investment inflows on initial GDP and composite institutional quality index are given in the first three models. Model (1) in the table corroborates that the Lucas paradox indeed exists; i.e. capital moves to wealthier markets in contrast to the expectations of neoclassical growth and trade theory. Looking at Model (2), log initial GDP per capita remains significant. With an alternative income measure, Model (3) supports the previous model that quality of institutions is not able to resolve the paradox for a sample of only developing countries. The last three models in the same table portray additional and augmented multivariate estimation results. This part encompasses regressions testing all four hypotheses proposed by Lucas (1990). From these explanations Lucas (1990) had preferred the stock differences in and positive externalities of human capital interpretations over the remaining. Model (4) challenges this as the inclusion of average years of schooling as human capital proxy does not remove the paradox for developing countries. Similarly, Model (5) shows that initial GDP still preserves its statistical significance (at 10%) despite controlling for distance, restrictions on capital market transactions and years of schooling. With a slightly different initial wealth

measure, Model (6) also corroborates the persistence of the paradox within developing economies.

Table 3.4: Cross-Section OLS Regressions of Capital Inflows per Capita, 1970-2006

	(1)	(2)	(3)	(4)	(5)	(6)
Log per capita GDP (PPP$) in 1970	0.372*** (0.077)	0.187*** (0.060)		0.225** (0.089)	0.137* (0.073)	
Average institutional quality, 1984-2006		0.446*** (0.062)	0.348*** (0.060)		0.410*** (0.065)	0.366*** (0.060)
Log average per capita GDP (PPP$), 1970-2006			0.276*** (0.071)			
Log average years of schooling, 1970-2000				0.288** (0.134)	0.060 (0.079)	0.007 (0.056)
Log average distance, 1970-2006					-0.050 (0.265)	0.078 (0.250)
Average capital mobility restrictions, 1970-2005					-0.665 (0.429)	-0.625 (0.395)
Log per capita GDP (2005 US$) in 1970						0.220*** (0.072)
Countries	47	47	47	47	47	47
R^2	0.259	0.592	0.620	0.335	0.669	0.707

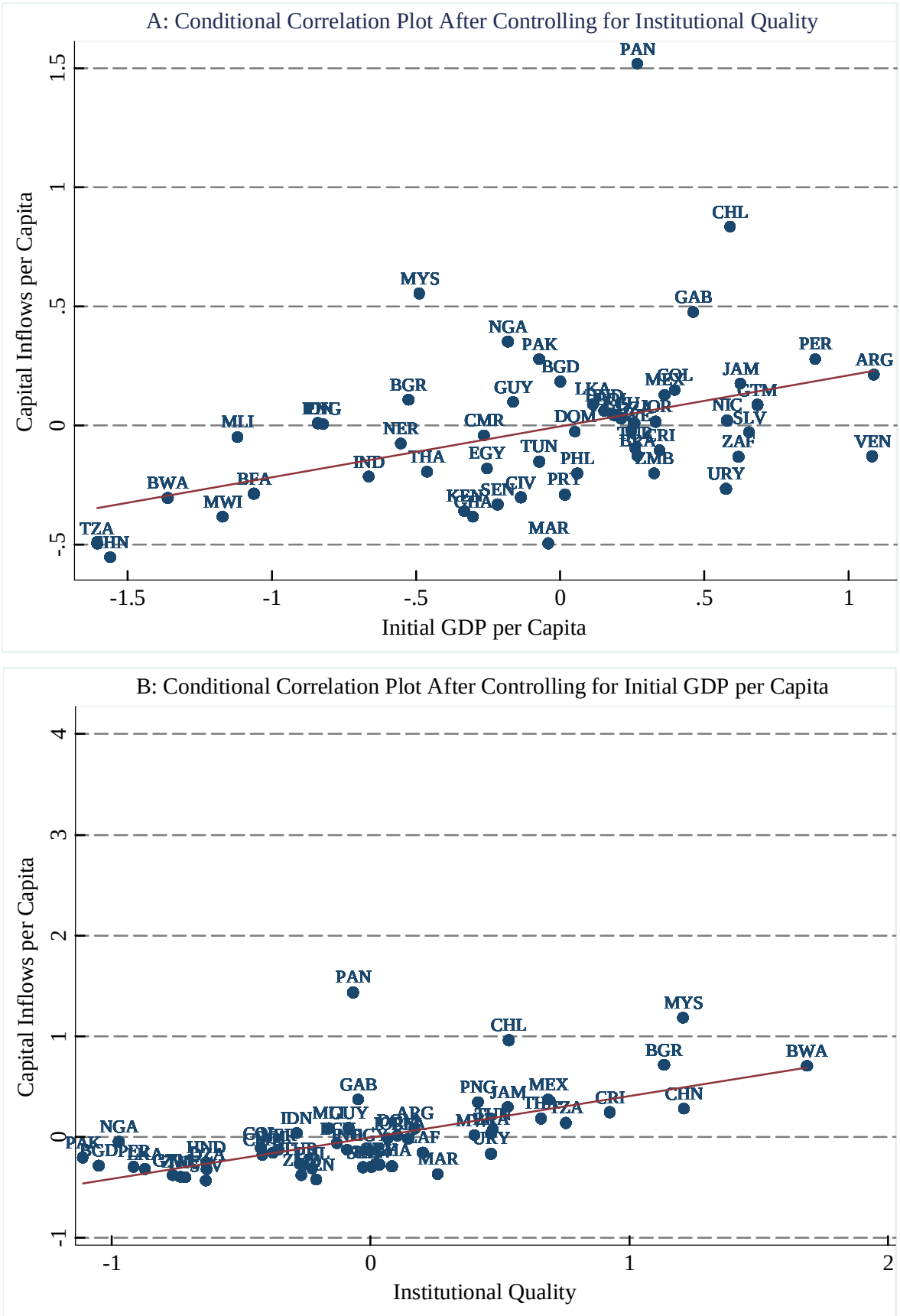
Notes: Dependent variable is average capital (foreign direct and portfolio equity) flows per capita. Heteroscedasticity robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$ denote significance at 10%, 5%, and 1% respectively. Unreported constant included in all estimations.

To address potential endogeneity, cross feedback, and collinearity issues Figure 3.3 illustrates the conditional correlation plots between the residuals from core specifications.

Panel A plots the data pointed residuals from the regression of average capital inflows on average institutional quality index against the residuals from the regression of log initial GDP again on institutional quality variable.

Panel B, likewise, sketches the data pointed residuals from the regression of average equity investment on log initial GDP against the residuals from the regression of institutional quality on log GDP in 1970. It is clear that institutional quality abstracted initial GDP and initial GDP-free institutional quality are both positively related to capital flows, visualizing the persistence of the Lucas paradox within developing countries.

Figure 3.3: Conditional Correlation Plots of the Residuals



Note: Panel A abstracts from the effects of institutional quality while Panel B does from those of log initial GDP in shaping the mutual associations in question.

3.6.3 Robustness Checks

A variety of alternative specifications and variable measures show our main results to be robust. [27] Table 3.5 provides six different models fitted. With the same periodic focus as in Table 3.4 and by controlling for additional proxies of economic fundamentals, each of the first mid three regressions substantiate that the quality of institutions does not fully answer the question; why does capital *not* flow to poorer countries? Meanwhile, all the parameters on those covariates carry expected signs despite some being insignificant. Model (5) switches initial wealth measure, the paradox proxy, from GDP to gross capital formation per capita (domestic capital stock) and verifies the settled outcomes of the second and third models in the previous table. The two remaining estimations, one on the far left and the other on the far right of the table, fit the data averaged over two different sub-periods without breaking the robustness of our key findings.

Table 3.5: Robustness Cross-Section OLS Regressions of Capital Inflows per Capita

	(1) **1990–06**	**(2)** **1970–06**	**(3)** **1970–06**	**(4)** **1970–06**	**(5)** **1970–06**	**(6)** **1994–06**
Log per capita initial GDP (PPP$)	0.593*** (0.100)	0.204*** (0.059)	0.139** (0.057)	0.177** (0.072)		0.643*** (0.122)
Average institutional quality	0.508*** (0.126)	0.404*** (0.064)	0.423*** (0.050)	0.448*** (0.084)	0.410*** (0.073)	0.563*** (0.133)
Average corporate tax rate, 1999-06	-0.010 (0.022)					
Log average trade openness, 1970-06		0.204 (0.136)				
Log average bank assets, 1970-06			0.220** (0.103)			
Log average TFP growth, 1982-06				0.001 (0.025)		
Log per capita GCF (2005 $US) in 1970					0.143*** (0.051)	
Malaria contagion risk in 1994						0.112 (0.232)
Countries	36	47	46	39	44	47
R^2	0.611	0.634	0.650	0.739	0.721	0.657

Notes: Dependent variable is average capital (foreign direct and portfolio equity) flows per capita. Heteroscedasticity robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$ denote significance at 10%, 5%, and 1% respectively. Unreported constant included in all estimations. Although the same restrictions imposed throughout all the estimations to ensure sample consistency, sample size may still vary due to data availability for some control variables.

[27] Outliers detecting added variable plots (available upon request) indicate that Chile and Panama may have influential observations. Our key results are left unaltered, however, when we drop either of them in turn or suppress both at once.

Asymmetric information and sovereign risk explanations are considered in Table 3.6. Models from (1) to (3) testify that none of the additional covariates is significant and our basic results are insensitive to allowing for them. Specification (4) regresses average capital inflows over 1985-2006 on initial levels of institutional quality (in 1984). The positively significant impact of pre-sample institutions on the subsequent capital inflows wanes when per capita GDP in 1984 enters in the last model. This is just the opposite of the corresponding estimates in Alfaro *et al.* (2008).[28]

Table 3.6: Robustness Cross-Section OLS Regressions of Capital Inflows per Capita

	(1) 1990–06	**(2) 1970–06**	**(3) 1990–06**	**(4) 1984–06**	**(5) 1984–06**
Log per capita initial GDP (PPP$)	0.437*** (0.092)	0.148** (0.066)	0.429*** (0.114)		
Average institutional quality	0.562*** (0.106)	0.425*** (0.067)	0.603*** (0.154)		
Average risk level, OECD, 1999-06	-0.014 (0.057)				
Log average Int'l voice traffic		0.047 (0.032)			
Average foreign bank asset share, 1990-97			-0.124 (0.511)		
Average institutional quality in 1984				0.226*** (0.058)	0.098* (0.058)
Log per capita GDP (PPP$) in 1984					0.550*** (0.114)
Countries	47	46	41	45	45
R^2	0.640	0.603	0.613	0.177	0.449

Notes: See notes to Table 3.5.

[28] For robustness purposes, taking the fifth model in Table 3.4 as benchmark, we also run the regressions involving real capital flows per capita as the dependent variable including debt and aid flows besides direct and portfolio equity flows under a more composite capital flow measure; and regressions containing real per capita capital flows as another dependent variable excluding only aid allocations. Alternatively we have incorporated population, savings and income growth under the same specification as Mankiw *et al*. (1992) suggests that those factors affect marginal product of capital according to their augmented Solow growth model. In addition to savings and growth, Gourinchas and Jeanne (2011) argue that the allocation puzzle in capital flows to developing countries is also related to the pattern of accumulation of international reserves. All of the reassurance checks with these alternative dependent and independent variables deliver results (available upon request) very similar to Model (5) of Table 3.4. Using the first two and the fifth specifications from the same table, we conduct cross-section OLS estimations for the main capital flow components (FDI, portfolio equity, long-term debt and short-term debt) and provide the results in the chapter appendix. Decomposition leads to radically different results. Institutional quality resolves the Lucas paradox in FDI only when more controls (e.g. capital mobility restrictions) are included. For FPEI, institutions explain the paradox. Although the quality of institutions has positive impact on debt inflows in the long-run, the paradox remains.

3.6.4 Instrumental Variable Estimations

Taking into account possible endogeneity of institutional quality variable because of different factors like measurement error and attenuation bias, we conduct instrumental variable (IV) estimations as the final stage of analysis. The index of institutional quality is sequentially instrumented by European settler mortality variable (in logs), British legal origin dummy, and the variable of English language.

Table 3.7: Instrumental Variable Regressions of Capital Inflows Per Capita

	(1)	**(2)**	**(3)**
Panel A: Two-Stage Least Squares (2SLS)			
Average institutional quality, 1984-2006	0.849***	2.377	0.935**
	(0.285)	(21.261)	(0.453)
Log per capita GDP (PPP$) in 1970		-0.854	
		(11.525)	
Log European settler mortality			0.016
			(0.117)
Hausman RE Test (p-value)	0.397	0.996	0.649
Hansen J-Test (p-value)			0.898
Panel B: First Stage for Average Institutional Quality in 1984-2006			
Log European settler mortality	-0.189**	-0.010	-0.202*
	(0.089)	(0.122)	(0.102)
Log per capita GDP (PPP$) in 1970		0.529***	
		(0.193)	
British legal origin			-0.275
			(0.289)
English language			0.720
			(0.633)
R^2	0.061	0.284	0.111
Panel C: Ordinary Least Squares			
Average institutional quality, 1984-2006	0.528***	0.428***	0.507***
	(0.072)	(0.086)	(0.069)
Log per capita GDP (PPP$) in 1970		0.188**	
		(0.076)	
Log European settler mortality			-0.065
			(0.050)
Countries	39	39	39

Notes: In Panels A and C the response variable is average capital (foreign direct and portfolio equity) flows per capita whereas in B it is the composite index of institutional quality. Hausman regressor endogeneity (RE) test compares each model between Panels A and C whilst Hansen *J*-test of over-identifying restrictions –feasible only under (3)– assesses the validity of model instruments. For both tests given are *p*-values. Robust standard errors are in parentheses. Unreported constant included in all estimations. * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$ denote significance at 10%, 5%, and 1% respectively.

Under Model (1) in Table 3.7, negative significance of the settler mortality variable at the first stage regression (in Panel B) corroborates the assertion of Acemoglu *et al.* (2001) that if the European settlement was discouraged by diseases or when they could not settle the colonizers created worse institutions. In Panel A under the same model, second stage regression of the two stage least squares (2SLS) indicates that the portion of the average institutional quality index that is explained by the log European settler mortality has a significantly positive impact on capital flows. Under (2B), however, log European settler mortality is no longer significant once initial income enters into the specification. And under (2A), neither log initial GDP nor instrumented institutional quality is statistically different from zero. Therefore, settler mortality appears to be an imperfect or weak instrument. Very large standard errors of the 2SLS estimates in 2A (see below) and specification-sensitive results support this surmise. Hence, we cannot assert that European settler mortality resolves our question (the Lucas paradox) despite its common use as an effective instrument for institutions in the literature.

The last IV estimation is given under Model (3) where institutional quality is now instrumented by the British legal origin dummy and the English language variable. Extremely weak coefficient on log colonizer mortality verifies the excludability (strict exogeneity) of that variable. Moreover, the *p*-value of the Hansen *J*-test of over-identifying restrictions ascertains that all instruments are valid. Contrary to our results, highly significant English language seems to be crucial in accounting for institutional differences across countries in Alfaro *et al.* (2008). This might be due to the fact that their sample contains currently advanced large countries like the United States of America, Canada, New Zealand and Australia which were the former British colonies.

The IV (2SLS) estimator is less efficient (has larger standard errors) than OLS when the explanatory variables are exogenous (Wooldridge, 2009, p. 527). Therefore it would be useful to test whether the institutional quality variable is in fact endogenous. One way to do this is to conduct a Hausman test to compare the IV and the OLS estimates. According to Hausman specification tests on the non-robust versions we are unable to reject the null hypothesis that the difference between IV and OLS are not systematic. Hence, endogeneity does not appear to be a critical problem.

3.7 CONCLUSION

This essay empirically examines whether the results of Alfaro *et al.* (2008) are robust to a sample that excludes developed countries. Using cross-section data averaged over the period 1970-2006 for up to 47 developing countries, it tests the sensitivity of the Lucas paradox to a measure for institutional quality, given control variables.

We discover that, within developing economies, the puzzle of rich-to-poor capital flows persists, despite allowing for the quality of institutions, in the long-run. In most of the cross-section OLS estimations, the real per capita initial GDP (the paradox proxy) and the composite index of institutional quality have positive impacts on real capital inflows (the sum of foreign direct and portfolio equity inflows) per capita.

Our analysis suggests that the approach of Alfaro *et al.* (2008) only appears to explain the Lucas paradox because of the driving effects of developed countries. Relative to developing countries, advanced countries attract higher volumes of capital inflows and have significantly higher institutional quality. These are supported by the larger variable variances across countries and very high correlations between main explanatory variables in their sample (Tables 1-4 in Alfaro *et al.*, 2005). Another explanation for the persistence of the wealth bias (the Lucas paradox) within developing countries could be that either underdeveloped economies do not actually have higher returns or international investors and creditors are not satisfactorily convinced that they are higher.

Chapter 4 extends the analysis in this essay by allowing for time series variation through static and dynamic linear panel data methods.

APPENDIX 3.1: REPLICATION SAMPLES

Table A3.1: Replication Samples

Whole World Sample of 98 Countries			Base Sample of 81 Countries		
Albania	Gabon	Nicaragua	Argentina	India	Slovenia
Algeria	Gambia	Niger	Australia	Indonesia	South Africa
Angola	Germany	Nigeria	Austria	Iran	Spain
Argentina	Ghana	Norway	Bangladesh	Israel	Sweden
Armenia	Greece	Oman	Bolivia	Italy	T. Tobago
Australia	Guatemala	Pakistan	Brazil	Jamaica	Tunisia
Austria	Guinea	Panama	Bulgaria	Japan	Turkey
Azerbaijan	Guyana	P. N. Guinea	Cameroon	Jordan	Uganda
Bangladesh	Haiti	Paraguay	Canada	Kenya	Ukraine
Belarus	Honduras	Peru	Chile	Korea Rep.	UK
Bolivia	Hungary	Philippines	Colombia	Latvia	US
Brazil	India	Portugal	Congo Rep.	Lithuania	Uruguay
Bulgaria	Indonesia	Russian Fed.	Costa Rica	Malaysia	Vietnam
Burkina Faso	Iran	Saudi Arabia	Croatia	Mali	Zambia
Cameroon	Israel	Senegal	Cyprus	Mexico	Zimbabwe
Canada	Italy	Sierra Leone	Czech Rep.	Morocco	
Chile	Jamaica	Singapore	Denmark	Mozambique	
Colombia	Japan	Slovenia	Dominican Rep.	Netherlands	
Congo Rep.	Jordan	South Africa	Ecuador	New Zealand	
Costa Rica	Kazakhstan	Spain	Egypt	Nicaragua	
Côte d'Ivoire	Kenya	Sweden	El Salvador	Niger	
Croatia	Korea Rep.	T. Tobago	Estonia	Norway	
Cyprus	Latvia	Tunisia	Finland	Pakistan	
Czech Rep.	Lithuania	Turkey	France	Panama	
Denmark	Madagascar	Uganda	Gambia	P. N. Guinea	
Dominican Rep.	Malaysia	Ukraine	Germany	Paraguay	
Ecuador	Mali	UK	Ghana	Peru	
Egypt	Mexico	US	Greece	Philippines	
El Salvador	Morocco	Uruguay	Guatemala	Portugal	
Estonia	Mozambique	Vietnam	Guyana	Russian Fed.	
Ethiopia	Namibia	Zambia	Haiti	Senegal	
Finland	Netherlands	Zimbabwe	Honduras	Sierra Leone	
France	New Zealand		Hungary	Singapore	

Note: Unlike what Alfaro *et al*. (2008) report in their Appendix B, Belarus drops from the base sample due to schooling data unavailability but Vietnam remains instead.

APPENDIX 3.2: CROSS-SECTION OLS ESTIMATIONS FOR THE MAIN CAPITAL FLOW COMPONENTS

Table A3.2: Cross-Section OLS Regressions of Capital Flow Components, 1970-2006

	A. Equity Components					
	FDI			***FPEI***		
	(1)	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**
Log per capita GDP (PPP$) in 1970	0.345*** (0.076)	0.173*** (0.062)	0.121 (0.074)	0.034** (0.017)	0.020 (0.015)	0.026 (0.018)
Average institutional quality, 1984-2006		0.415*** (0.060)	0.379*** (0.064)		0.033*** (0.010)	0.034*** (0.012)
Log average years of schooling, 1970-2000			0.059 (0.078)			-0.006 (0.011)
Log average distance, 1970-2006			-0.136 (0.262)			0.086 (0.057)
Average capital mobility restrictions, 1970-2005			-0.736* (0.429)			0.075 (0.057)
Countries	47	47	47	47	47	47
R^2	0.238	0.545	0.643	0.108	0.199	0.284
	B. Debt Components					
	LTDEBT			***STDEBT***		
	(1)	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**
Log per capita GDP (PPP$) in 1970	0.406*** (0.059)	0.324*** (0.058)	0.288*** (0.070)	0.144*** (0.034)	0.115*** (0.038)	0.084* (0.044)
Average institutional quality, 1984-2006		0.197*** (0.053)	0.176*** (0.059)		0.068*** (0.023)	0.051** (0.021)
Log average years of schooling, 1970-2000			0.034 (0.074)			0.057 (0.038)
Log average distance, 1970-2006			-0.193 (0.265)			-0.122 (0.079)
Average capital mobility restrictions, 1970-2005			-0.568 (0.340)			-0.189*** (0.057)
Countries	47	47	47	47	47	47
R^2	0.448	0.543	0.622	0.374	0.449	0.540

Notes: Dependent variable is average FDI (foreign direct investment), FPEI (foreign portfolio equity investment), LTDEBT (long-term debt) and STDEBT (short-term debt) flows in per capita 2005 USD for each respective model-triplet. Heteroscedasticity robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$ denote significance at 10%, 5%, and 1% respectively. Unreported constant included in all estimations.

CHAPTER 4

LUCAS PARADOX IN THE SHORT-RUN

4.1 INTRODUCTION

Ordinary least squares (OLS) estimators using time-aggregated (long-term averaged) data for cross-sections are charged not to take the *intertemporal* dependence into account but fit mainly long-run steady-state equilibrium models (Cameron and Trivedi, 2005, Sinn, 1992). In such cross-section models, the unobservable country-specific fixed effects that are correlated with the observed characteristics (i.e. explicitly controlled variables) included in the model can cause statistical difficulties in estimation: potential aggregation bias, loss of information (due to absorbed time variation), inconsistency and inefficiency. Neither can they account for the causes of behavioural persistence since they are unable to control for true state dependence (autoregressivity, especially in the dependent variable).[29]

Drawing largely on the theoretical considerations of the previous chapter, this chapter addresses the methodological and measurement issues discussed above. It is concerned with the question: Is it (the persistence of the Lucas paradox within developing countries, as documented in Chapter 3) because of the unobservable county-specific effects or is it actually due to the persistence of the capital in flowing to a certain market but appears as if its initial abundance in that market spurs further inflows? In other words, perhaps capital has been flowing to where it has already flowed and not necessarily where it had already been. Using five-year (rolling-averaged) panel data for up to 47 developing countries over the period 1980-2006, it examines if including the institutional quality index removes the Lucas paradox intertemporally (i.e. in the short-run). The 'short-run' relationships are captured by employing linear static (principally within-group fixed effects) and dynamic (system GMM) panel data methods (Pesaran and Smith, 1995, Houthakker, 1965, Baltagi and Griffin, 1984).[30]

[29] In a time series context, state dependence means that state at a given moment depends on the previous state(s) of the system.

[30] Baltagi (2005) states that the Between estimator (pooled OLS or equivalently cross-section OLS, which are based on the cross-section component of the data) tends to give long-run estimates while the Within estimator (which is based on the time-series component of the data) tends to give short-run estimates.

In this chapter, we additionally investigate the short-run prognoses of Acemoglu and Zilibotti (1997) who, in contrast to Lucas (1988, 1990), argue that economic growth, development and capital flow patterns are predicted by a neoclassical growth model augmented with assumptions of micro-level indivisibilities and uncertainty. According to their overlapping generations model of optimal portfolio choice, it is not a paradox at all (as it is already expected) that more foreign capital will flow to richer economies in the short-run. The data and methodology of the chapter enable such an empirical verification. Capital inflows per capita (the dependent variable as the sum of foreign direct and portfolio equity investment) represent the cross-border risky financial investments in Acemoglu and Zilibotti (1997). The initial endowments were captured by the initial GDP per capita while the risk-return trade-off (insurance, investment security or risk conditions) is embodied in the institutional quality variable. Static and dynamic panel estimators that fit to 'time *t*' notion let us analyse the short-run or dynamic implications of their model. Comprehensive review of the derivation of Acemoglu and Zilibotti (1997) results that are particularly considered here is in the chapter appendix (Appendix 4.1).

Table 4.1: Standard Deviation Decompositions and Coefficients of Variation of the Data

Variables	Proportional Deviations				CV	
	Annual Sample		5-Year Sample		Annual Sample	
	Between	Within	Between	Within	Between	Within
Per capita equity flows	46.81	53.19	51.92	48.08	1.40	0.65
Per capita initial GDP	100	0	49.41	50.59	0.67	—
Institutional quality	43.84	56.16	46.42	53.58	0.11	0.10
Average years of schooling	64.55	35.45	64.55	35.45	0.45	0.23
Weighted-average remoteness	86.43	13.57	87.89	12.11	0.19	0.01
Capital mobility barriers	44.49	55.51	48.35	51.65	0.31	0.16
Corporate tax rate	70.39	29.61	79.90	20.10	0.18	0.02
Trade openness	66.29	33.71	69.66	30.34	0.49	0.12
Deposit money bank assets	58.32	41.68	59.12	40.88	0.56	0.21
TFP growth	26.26	73.74	38.26	61.74	-6.81	-4.38
Per capita initial GCF	100	0	55.84	44.16	1.04	—
Malaria contagion risk	100	0	100	0	0.87	—
Risk level, OECD	78.93	21.07	81.81	18.19	0.30	0.02
International voice traffic	73.46	26.54	75.37	24.63	1.85	1.11
Foreign bank asset share	77.77	22.23	84.62	15.38	0.93	0.12

Notes: Percentage proportions for standard deviations of each variable across countries, *between*, versus over time, *within*, under annually observed and five-year averaged samples. Cross country (time averaged data) and over time (country averaged data) coefficient of variations (CV) are calculated for annual sample only.

To compare space (between) and time (within) variations in our data, coefficients of variation and percentage proportions for standard deviations of over-time and cross-country averaged data are given in Table 4.1. Notwithstanding the fact that *between* coefficients of variation are larger for all variables, standard deviation proportions are either relatively close to each other or even higher in *within* cases for, at least, the first three most important variables. All in all, the figures in the table imply that time variation should not be ignored as incorporating time dimension through appropriate model specifications would not only alleviate aggregation bias but would also yield significant information and efficiency gains. Furthermore, we want to examine how this information enhancement impinges on the Lucas paradox and whether it makes any difference to the irresolution in Chapter 3.

The rest of the chapter proceeds as follows. Econometric methodology is devised in section 4.2. Section 4.3 reviews the descriptive statistics and pairwise correlations. Results from static panel estimators are examined in section 4.4, while dynamic panel regressions discussed in section 4.5. Section 4.6 concludes.

4.2 METHODOLOGY

Given small T, relative to N, we avail of cross-section asymptotics in building up the following sections.[31]

4.2.1 Specification for Static Panel Estimators

The static two-way error components population regression function for our sample estimations can be written as:

$$F_{it} = \mu + \alpha Y_{it} + \mathbf{x}_{it}\boldsymbol{\beta} + \vartheta_{it} \qquad i = 1, \dots, N; \quad t = 1, \dots, T \qquad (1)$$

where F_{it} is the dependent variable (five-year averaged inflows of portfolio equity and foreign direct investment expressed as capital inflows per capita) for country i and time period t, μ is a constant, Y_{it} is the main regressor (the natural log of GDP per capita at first years of each panels), $\mathbf{x}_{it}$ is a $1 \times (K-1)$ row vector of any additional explanatory variables. The estimators of interest are the scalar α and $(K-1) \times 1$ column vector $\boldsymbol{\beta}$; $K \geq 1$ being the number of covariates. Similar to cross section OLS case, $\hat{\alpha}$ will be capturing the Lucas paradox and $\widehat{\boldsymbol{\beta}}$ the influence of the other regressors on capital inflows (and whether

[31] $N \to \infty$ asymptotics are more appropriate than $T \to \infty$ asymptotics, even though N is practically fixed while T can grow (Wooldridge, 2002). This is in fact the case in our country panel study. Nonetheless, if N is sufficiently large relative to T and we can assume rough independence in the cross section or make sure it to be so by introducing cluster robust estimators then the suitable approximations warranted (Ibid.).

they account for, that is remove, the paradox). Assuming ϑ_{it}, the composite disturbances, follow a generalized two-way error components structure

$$\vartheta_{it} = u_i + \delta_t + \varepsilon_{it} \qquad i = 1, \dots, N; \quad t = 1, \dots, T \tag{2}$$

where u_i refers to country specific unobservable fixed effects, δ_t denotes period-specific effects which are assumed to have fixed parameters to be estimated as coefficients of time dummies, and ε_{it} denotes idiosyncratic errors.

Each of the three static panel data models (pooled OLS, fixed effects, and random effects) we apply specifies different orthogonality, rank, and efficiency assumptions about the elements of ϑ_{it} and $\mathbf{x}_{it}$ in terms of conditional expectations, invertibility, and variances. Pooled OLS (POLS) assumes that u_i is fixed over time and has a constant partial impact on the mean response in each time period. If u_i is correlated with any element of $\mathbf{x}_{it}$, then POLS estimator is biased and inconsistent. Because POLS does not offer any solution for potential cross section heterogeneity we consider two other estimators. Fixed effects model (FEM) allows for arbitrary correlation between u_i and $\mathbf{x}_{it}$ by relaxing the orthogonality assumption and deals with this through within transformation; time demeaning of Equation (1) removes observed and unobserved fixed effects. More intuitively, FEM accounts for unobserved country effects that are correlated with $\mathbf{x}_{it}$ but 'sweeps up' time-invariant variables. On the other hand, random effects model (REM) involves generalized least squares (GLS) transformation under stricter orthogonality assumptions. REM estimator is obtained by quasi time demeaning which implies the removal of only a pre-estimated fraction of the time averages. Having the advantage of explicitly allowing for time-invariant variables REM favoured over FEM if country effects are uncorrelated with $\mathbf{x}_{it}$ but is inconsistent if FEM is the 'true' model. It is standard to choose between FEM and REM using a cross section-time series adapted version of the Hausman specification test. To avoid heteroscedasticity and serial correlation in ε_{it} we employ the Huber/White/sandwich cluster robust estimator.

4.2.2 Representation of Dynamic Panel Estimators

As many economic relationships are inherently dynamic (Nerlove, 2002), the dynamics of adjustment can be represented by a dynamic two-way error components population regression:

$$F_{it} = \mu + \mathbf{f}_{it-s}\boldsymbol{\gamma} + \alpha Y_{it} + \mathbf{x}_{it}\boldsymbol{\beta} + \vartheta_{it} \qquad i = 1, \dots, N; \quad t = 1, \dots, T; \quad s = 1, 2 \tag{3}$$

where $\mathbf{f}_{it-s}$ is the vector containing the lags of the dependent variable (capital inflows per capita) as regressors rendering (3) to include an autoregressive process. The parameter vector $\boldsymbol{\gamma}$ involves the scalars measuring the extent of state dependence (inertia), and the composite disturbance term is similarly specified as a two-way error components mechanism

$$\vartheta_{it} = u_i + \delta_t + \varepsilon_{it} \qquad i = 1, \dots, N; \quad t = 1, \dots, T \tag{4}$$

where u_i represents, as before, state-specific effects, and δ_t denotes period-specific effects which are assumed to have fixed parameters to be estimated as coefficients of time dummies.

In a dynamic specification of the kind in (3) POLS, within-group FEM, and REM do not take the endogeneity of the lagged dependent variable into consideration and produce biased and inconsistent estimates. Therefore, a generalized method of moments (GMM) approach is required. Because our short time panel data are highly persistent we use the Blundell and Bond (1998) *system* GMM estimator which entails contemporaneous first differences to instrument the levels of the endogenous variables and past (two-period or earlier) lagged levels to instrument the first differences of the same variables *simultaneously*.[32] Because we conjecture that only the lags of the dependent variable are structurally endogenous in our framework and the Hausman regressor endogeneity tests corroborate this we assume all the remaining explanatory variables to be strictly exogenous throughout the entire dynamic model estimations.[33] As a result, the composite instrument matrix with varying dimensions according to the relevant specification is composed of two blocks: GMM-style instruments for the lagged dependent variables and conventional IV-style instruments (essentially the rest of the covariates instrument themselves). We prefer the GMM instruments to be *collapsed* to create one instrument for each variable and lag distance rather than one for each time period, variable, and lag distance since GMM estimators, including 2SLS and 3SLS, using too many over-identifying restrictions are known to have poor finite sample properties and to decrease

[32] Blundell and Bond (1998) show that as the concentration parameter approaches to zero, i.e. the data series becomes more persistent, the conventional instrumental variable estimator (Arellano and Bond (1991) difference GMM) performs poorly. They attribute the bias and the poor precision of the first-difference GMM estimator to the problem of weak instruments. Under the extra moment conditions of Ahn and Schmidt (1995) and Arellano and Bover (1995), with short *T* and persistent series Blundell and Bond (1998) also show that an additional mild stationarity restriction on the initial conditions process allows the use of an extended system GMM estimator that has dramatic efficiency gains over the basic first-difference GMM. These results are reviewed and empirically verified by Blundell and Bond (2000). In our study the time length is quite short as $T = 5$ most of the cases. In each of the simple autoregressive POLS with no exogenous regressors (results from which are available upon request) the positively significant (all at 1%) coefficients on the first lags of capital inflows per capita, real per capita initial output and institutional quality are respectively around 0.765, 0.912 and 0.698.

[33] Endogeneity issues are exclusively examined in the static panel instrumental variable regressions section.

the test powers.[34] Small-sample adjustment, two-step estimator optimization, and Windmeijer (2005)'s finite-sample corrected cluster-robust standard errors used in all GMM applications.

4.3 DESCRIPTIVE STATISTICS AND PAIRWISE CORRELATIONS

All data are the same as in Chapter 3 except that they are now organized as five-year sub-period moving averages (1980-84, 1985-89, 1990-94, 1995-99 and 2000-2006; the last interval comprises seven years to encompass the whole of the available time domain) over 1980-2006 for up to 47 developing countries. Data availability may limit the number of countries or periods for some variables. Given the panel structure, data in the first year of each sub-period are used as initial values for per capita GDP and GCF, so some time variation is incorporated in addition to the variation across countries.

Table 4.2 shows summary statistics for the fie-year panel sample. The increased sample size compared to Chapter 3 should enable potential degrees of freedom and efficiency gains in estimation provided that there is sufficient variation over time.

Table 4.2: Summary Statistics, Five-Year Panel Data

Variables	Sample	Mean	Std. Dev.	Min	Max
Per capita equity flows	231	51.047	78.533	-147.875	482.952
Per capita initial GDP ($PPP)	231	3.439	2.303	0.406	11.647
Institutional quality	231	5.733	1.103	3.168	7.804
Average years of schooling	231	4.352	1.887	0.370	9.740
GDP- weighted average remoteness	231	8.913	1.617	5.840	12.501
Average capital mobility barriers	231	0.585	0.303	0.000	1.000
Corporate tax rate	68	30.118	5.542	15.000	42.220
Trade openness	231	64.961	35.735	12.146	207.290
Deposit money bank assets	212	0.355	0.251	0.040	1.526
TFP growth	180	-0.422	2.675	-8.390	5.166
Per capita initial GCF (2005 $US)	230	0.524	0.482	0.019	2.783
Malaria contagion risk as of 1994	141	0.418	0.398	0.000	1.000
Risk level, OECD	94	5.106	1.542	2.000	7.000
International voice traffic	160	27.011	42.203	0.066	289.080
Foreign bank asset share	77	0.224	0.202	0.006	0.900

Notes: All the variables are those as defined in Chapter 3.

Although the data are identical to Chapter 3 in terms of definition and measurement, inserting time series information via sub-period averaging has clearly increased sample sizes, mean realizations, overall variations and ranges of almost all variables. Estimation efficiency

[34] See Tauchen (1986), Altonji and Segal (1996), Ziliak (1997), Sargan (1958), Bowsher (2002), and Roodman (2009).

and precision in short-run regressions are expected to improve due to degrees-of-freedom gains as a result of that disaggregation.

Table 4.3: Pearson Product-Moment Correlation Coefficients, Five-Year Panel Data

	Equity Flows pc	*Log pc IGDP*	*Quality of Institutions*	*Log Schooling*	*Log Distance*	*Barriers to Cap. Mob.*
L. pc IGDP	0.444					
p-value	0.000					
Institutions	0.508	0.496				
p-value	0.000	0.000				
Log schooling	0.367	0.707	0.424			
p-value	0.000	0.000	0.000			
Log distance	0.103	0.101	0.090	0.273		
p-value	0.033	0.036	0.146	0.000		
Restrictions	-0.307	-0.258	-0.385	-0.208	-0.172	
p-value	0.000	0.000	0.000	0.000	0.000	
Corporate tax	-0.236	-0.082	-0.197	-0.069	0.033	0.099
p-value	0.043	0.487	0.102	0.565	0.782	0.400
Log openness	0.359	0.287	0.261	0.180	-0.020	-0.329
p-value	0.000	0.000	0.000	0.001	0.675	0.000
L. Bank assets	0.373	0.527	0.339	0.378	-0.020	-0.265
p-value	0.000	0.000	0.000	0.000	0.706	0.000
TFP growth	0.107	-0.062	0.106	-0.003	0.057	-0.175
p-value	0.125	0.373	0.129	0.968	0.410	0.012
Log pc IGCF	0.454	0.687	0.368	0.514	0.046	-0.187
p-value	0.000	0.000	0.000	0.000	0.359	0.000
Malaria	-0.250	-0.539	-0.295	-0.461	0.029	0.018
p-value	0.000	0.000	0.000	0.000	0.563	0.728
Country risk	-0.237	-0.578	-0.553	-0.449	-0.113	0.090
p-value	0.010	0.000	0.000	0.000	0.229	0.336
Voice traffic	0.626	0.374	0.379	0.286	-0.120	-0.187
p-value	0.000	0.000	0.000	0.000	0.081	0.006
Foreign bank	-0.218	-0.348	-0.067	-0.195	0.215	-0.121
p-value	0.043	0.001	0.544	0.083	0.045	0.266

Notes: Equity flows are the sum of international portfolio equity and direct investment inflows expressed in constant 2005 US dollars divided by the total population. *Barriers-to-Capital* and *Restrictions* are interchangeably used terms for the same variable of average restrictions to and controls on capital mobility imposed by a country. The abbreviations *L*, *I*, and *pc* refer to 'logs', 'initial' and 'per capita' respectively. Country observations change from pair to pair adjusting to data availability. See notes to Table 4.2 as well.

Table 4.3 reports pairwise correlations for the variables using the Pearson product-moment correlation coefficients for the equity flows per capita. This dependent variable is highly correlated with all the other variables (in the expected direction) except for total factor productivity growth. Initial per capita purchasing power parity (PPP) adjusted GDP has the highest positive correlation, with average years of schooling (0.707), the highest negative

correlation, with country risk. This is unsurprising to the extent that relatively wealthier countries at the outset have better schooling and creditworthiness in subsequent years. In contrast to Table 3.2, log initial GDP, log remoteness and average restrictions on capital mobility exhibit higher correlations, suggesting that some of their time variation is greater than their cross-section variation.

4.4 STATIC PANEL ESTIMATIONS

Three static panel data estimators are employed (using the same specifications and following the order of variable inclusion as in Chapter 3): pooled ordinary least squares (POLS), within-group fixed effects model (FEM) and random effects model (REM). In order to save space results of all these models are reported for only one specification in each table. For the other specifications, either FEM or REM results are given. To choose between FEM and REM, we first estimate the model with cluster-robust random effects. Then, we apply a panel data-adjusted version of the Sargan-Hansen over-identifying restrictions (OIR) test using the Stata® command 'xtoverid' (Schaffer and Stillman, 2010).[35] Based on the test results, we finally choose fixed effects if the p-value is smaller than 0.10; and random effects otherwise. As economic theory suggests (that unobserved country-specific effects are likely to be correlated with the observable characteristics in **x**, see above) and econometric tests mostly confirm, FEM is the preferred estimator.

4.4.1 Baseline Results

Table 4.4 reports the basic static panel data regression results. Since the Sargan-Hansen OIR test implies that REM is inconsistent only FEM estimates are given under the first specification. Controlling for time invariant country-specific heterogeneity, fixed effects estimation shows once again that capital moves to relatively wealthier economies; allowing for within-group variation the Lucas paradox exists. Under (2) and (3), fixed effects (likewise POLS and REM) estimates for initial income and institutions are positive and highly significant (at 1% and 5% respectively). Hence, the quality of institutions still cannot explain the paradox for developing countries even in the short-run when time series variations are also taken into account.

[35] Arellano (1993) and Wooldridge (2002, pp. 290-91) propose more technical approaches for this test.

Table 4.4: Static Panel Regressions of Capital Inflows per Capita, 5-Year Panel Data

	(1)	(2)			(3)
	FEM	**POLS**	**FEM**	**REM**	**FEM**
Log per capita initial GDP (PPP$)	0.658*** (0.168)	0.415*** (0.063)	0.443*** (0.128)	0.426*** (0.064)	
Average institutional quality		0.226*** (0.043)	0.173** (0.065)	0.207*** (0.047)	0.142** (0.063)
Log average per capita GDP (PPP$)					0.592*** (0.147)
Observations	231	231	231	231	231
Countries	47	47	47	47	47
R^2	0.236	0.424	0.276		0.300
R^2***_Overall***	0.358		0.421	0.423	0.428
ρ	0.313		0.279	0.157	0.295
Sargan-Hansen OIR Test (p-value)	0.000			0.028	0.015

Notes: Cluster-robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$ denote significance at 10%, 5%, and 1% respectively. Unreported constant and time dummies included in all estimations. POLS, FEM, REM, and OIR are standing for pooled ordinary least squares, fixed effects model, random effects model, and over-identifying restrictions respectively. ρ is known either as the fraction of the variance due to unobserved country-specific effects or as interclass correlation of the country-specific error.

Table 4.5 includes additional covariates. The fraction of the composite error variance due to unobservable country-specific fixed effects (ρ) is very high leading the Sargan-Hansen OIR test to always reject the asymptotic appropriateness of the REM. Following the practices in some empirical papers testing the postulations of gravity models of trade we include both fixed distance and time varying remoteness variables simultaneously under the remaining regressions.[36] In line with the models under (2) and (3) in the previous table, all of the Table 4.5 estimations demonstrate that within developing countries the paradox prevails, not only across countries but also over time no matter how significant are the additional explanatory variables.

[36] See Brun *et al.* (2005), Guttmann and Richards (2006), and Coe *et al.* (2007) for empirical; and Deardorff (1998), and Anderson and van Wincoop (2003) for theoretical treatments.

Table 4.5: Static Panel Regressions of Capital Inflows per Capita, 5-Year Panel Data

	(1)	(2)			(3)
	FEM	**POLS**	**FEM**	**REM**	**FEM**
Log per capita initial GDP (PPP$)	0.592** (0.240)	0.375*** (0.089)	0.531*** (0.194)	0.400*** (0.096)	
Log average years of schooling	0.161 (0.310)	0.0478 (0.107)	-0.199 (0.309)	0.0357 (0.111)	0.573** (0.225)
Average institutional quality		0.180*** (0.044)	0.0785 (0.082)	0.147*** (0.050)	0.124 (0.091)
Log average distance		-3.332 (2.399)	–	-3.736* (2.040)	–
Log average remoteness		3.571 (2.489)	5.278*** (1.734)	3.975* (2.112)	5.977*** (2.032)
Average restrictions to capital mobility		-0.313 (0.233)	-0.398 (0.269)	-0.323 (0.205)	-0.368 (0.277)
Log per capita initial GDP (2005 US$)					0.379** (0.178)
Observations	231	231	231	231	231
Countries	47	47	47	47	47
R^2	0.237	0.451	0.318		0.309
R^2***_Overall***	0.361		0.147	0.450	0.174
ρ	0.313		0.774	0.167	0.839
Sargan-Hansen OIR Test (p-value)	0.000			0.000	0.000

Notes: Cluster-robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ denotes significance at 10%, 5%, and 1% respectively. Unreported constant and time dummies included in all estimations. POLS, FEM, REM, and OIR are standing for pooled ordinary least squares, fixed effects model, random effects model, and over-identifying restrictions respectively. ρ is known either as the fraction of the variance due to unobserved country-specific effects or as interclass correlation of the country specific error. The dash "–" signifies automatic drop of corresponding regressor because of collinearity or model algorithm.

4.4.2 Sensitivity Analyses

Through a number of alternative specifications with different proxy variables and sub-periods we document that all of the static panel within-group fixed effects, pooled OLS and random effects GLS techniques consistently deliver similar estimates that are implicationally robust. [37] Regressions reported in Table 4.6 include some aspects of the host country economic fundamentals alongside initial GDP per capita and institutional quality. Validated by the pertinent OIR tests, REM under (1) and (3) and FEM under (2) show that the paradox is still left unexplained despite controlling for corporate tax, trade openness and deposit money bank assets as well as institutions.

[37] Outliers detecting added variable plots (available upon request) indicate that Chile and Panama may have influential observations. Our key results are left unaltered, however, when we drop either of them in turn or suppress both at once.

Table 4.6: Robustness Static Panel Regressions of Capital Inflows, 5-Year Panel Data

	(1)	(2)			(3)
	REM	**POLS**	**FEM**	**REM**	**REM**
Log per capita initial GDP (PPP$)	0.712*** (0.126)	0.410*** (0.063)	0.475*** (0.155)	0.417*** (0.065)	0.457*** (0.073)
Average institutional quality	0.550*** (0.111)	0.212*** (0.042)	0.176** (0.067)	0.199*** (0.048)	0.229*** (0.050)
Average corporate tax rate	-0.0190 (0.030)				
Log average trade openness		0.131 (0.102)	-0.104 (0.184)	0.111 (0.101)	
Log average deposit money bank assets					0.0222 (0.081)
Observations	68	231	231	231	212
Countries	36	47	47	47	46
R^2		0.431	0.277		
R^2***_Overall***	0.552		0.401	0.431	0.448
ρ	0.603		0.298	0.149	0.123
Sargan-Hansen OIR Test (p-value)	0.169			0.004	0.179

Notes: Cluster-robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ denotes significance at 10%, 5%, and 1% respectively. Unreported constant and time dummies (none in (1)) included in all estimations. POLS, FEM, REM, and OIR are standing for pooled ordinary least squares, fixed effects model, random effects model, and over-identifying restrictions respectively. ρ is known either as the fraction of the variance due to unobserved country-specific effects or as interclass correlation of the country specific error. The number of observations may change due to data availability.

From Table 4.7 it seems as if institutional quality accounts for the capital flows and the Lucas paradox under FEM (2) but when we replace initial income with initial GCF in FEM (2) of Table 4.5 the quality of institutions variable is not significant whilst initial capital stock is. Albeit not equivalently consistent, POLS and REM yield the results (unreported) that they both are significant under (2). All the other regressions maintain the finding that the paradox unresolved for developing countries.

Table 4.7: Robustness Static Panel Regressions of Capital Inflows, 5-Year Panel Data

	(1)			(2)	(3)
	POLS	**FEM**	**REM**	**FEM**	**REM**
Log per capita initial GDP (PPP$)	0.496*** (0.072)	0.495*** (0.139)	0.516*** (0.068)		0.617*** (0.117)
Average institutional quality	0.229*** (0.059)	0.0916 (0.094)	0.187*** (0.066)	0.251*** (0.075)	0.326*** (0.062)
Log average TFP growth	0.0305* (0.018)	0.0377 (0.024)	0.0313* (0.019)		
Log per capita initial GCF (2005 $US)				0.0291 (0.108)	
Malaria contagion risk					0.134 (0.166)
Observations	180	180	180	230	141
Countries	39	39	39	47	47
R^2	0.501	0.293		0.237	
R^2***_Overall***		0.485	0.499	0.330	0.480
ρ		0.348	0.153	0.356	0.297
Sargan-Hansen OIR Test (p-value)			0.006	0.000	0.174

Notes: Cluster-robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ denotes significance at 10%, 5%, and 1% respectively. Unreported constant and time dummies (none in (3)) included in all estimations. POLS, FEM, REM, and OIR are standing for pooled ordinary least squares, fixed effects model, random effects model, and over-identifying restrictions respectively. ρ is known either as the fraction of the variance due to unobserved country-specific effects or as interclass correlation of the country specific error. The number of observations may change due to data availability.

Table 4.8 reports the results considering proxy variables for asymmetric information, sovereign risk, and international knowledge spillovers. The relevant estimations throughout the table reassure that including country risk, global phone traffic and foreign bank penetration have no influence at all on the prevalence of the paradox.

Table 4.8: Robustness Static Panel Regressions of Capital Inflows, 5-Year Panel Data

	(1)			(2)	(3)
	POLS	**FEM**	**REM**	**FEM**	**REM**
Log per capita initial GDP (PPP$)	0.660*** (0.090)	0.421 (0.485)	0.648*** (0.089)	0.288* (0.166)	0.598*** (0.169)
Average institutional quality	0.503*** (0.078)	0.159 (0.193)	0.447*** (0.074)	0.186 (0.132)	0.306*** (0.086)
Average risk level, OECD taxonomy	0.0108 (0.062)	-0.290 (0.244)	-0.0201 (0.066)		
Average Int'l voice traffic				0.0030 (0.002)	
Average foreign bank asset share					-0.434 (0.476)
Observations	94	94	94	160	77
Countries	47	47	47	46	41
R^2	0.555	0.125		0.273	
R^2***_Overall***		0.427	0.553	0.431	0.409
ρ		0.627	0.406	0.372	0.431
Sargan-Hansen OIR Test (p-value)			0.440	0.011	0.116

Notes: Cluster-robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$ denotes significance at 10%, 5%, and 1% respectively. Unreported constant included in all estimations. Time dummies considered only under (2) but not reported. POLS, FEM, REM, and OIR are standing for pooled ordinary least squares, fixed effects model, random effects model, and over-identifying restrictions respectively. ρ is known either as the fraction of the variance due to unobserved country-specific effects or as interclass correlation of the country specific error. The number of observations may change due to data availability.

4.4.3 Static Panel Instrumental Variable Regressions

It might be the case that there is a feedback from capital inflows per capita (the dependent variable) to the quality of institutions (one of the key regressors). More generally, there may be an omitted variable that influences both of these. Thus, we cannot discount the possibility of endogeneity of the institutional quality variable. To address this we adopt a panel instrumental variables approach.

Table 4.9 below gives the linear cross section-time series instrumental variable (IV) regressions in addition to the first stage and primary panel data estimations throughout Panels A, B and C.

Table 4.9: Static Panel IV Regressions of Capital Inflows per Capita, 5-Year Panel Data

	(1)		(2)		(3)	
	POLS	**REM**	**POLS**	**REM**	**POLS**	**REM**
Panel A: Instrumental Variable Estimations						
Average institutional quality	1.009***	1.007	0.318	0.286	1.212*	1.212
	(0.352)	(0.620)	(0.342)	(0.361)	(0.734)	(1.556)
Log per capita initial GDP (PPP$)			0.355	0.370		
			(0.284)	(0.324)		
Log European settler mortality					0.0427	0.0434
					(0.177)	(0.376)
Hausman RE (p)	0.374	0.756	0.999	0.999	0.859	0.988
Sargan OIR (p)					0.812	
Panel B: First Stage for Average Institutional Quality						
Log European settler mortality	-0.210**	-0.212*	0.166**	0.212*	-0.221**	-0.222*
	(0.084)	(0.128)	(0.082)	(0.114)	(0.085)	(0.133)
Log per capita initial GDP (PPP$)			0.918***	1.023***		
			(0.102)	(0.123)		
British legal origin					-0.200	-0.199
					(0.175)	(0.274)
English language					0.473	0.473
					(0.408)	(0.639)
R^2	0.137	0.137	0.397	0.396	0.146	0.146
Panel C: Primary POLS and REM Regressions						
Average institutional quality	0.392***	0.333***	0.230***	0.210***	0.371***	0.323***
	(0.045)	(0.046)	(0.050)	(0.050)	(0.045)	(0.046)
Log per capita initial GDP (PPP$)			0.426***	0.434***		
			(0.072)	(0.086)		
Log European settler mortality					-0.134**	-0.145*
					(0.052)	(0.074)
Observations	194	194	194	194	194	194
Countries	39	39	39	39	39	39

Notes: In Panels A and C the response variable is average capital (foreign direct and portfolio equity) flows per capita whereas in B it is the composite index of institutional quality. Hausman regressor endogeneity (RE) test compares each model between Panels A and C whilst Sargan over-identifying restrictions (OIR) test assesses the validity of model instruments. For both tests given are *p*-values. Standard errors are in parentheses. Consult also notes to Table 4.2.

Under (1) and (2) institutional quality is instrumented solely by the time invariant variable of log European settler mortality. Since this implicit instrument does not change over time FEM estimators do not work properly so that we are unable to report any within-group estimate. Considering all the other two-stage least squares (2SLS) for POLS and generalized two-stage least squares (G2SLS) for REM results, Hausman RE tests suggest that the corresponding models in Panels A and C are asymptotically equivalent. Excessively larger

standard errors in Panel A reinforces this also that institutional quality is actually exogenous to the conventional static panel specifications. As a last remark, the second part of Panel C shows that the Lucas paradox persists even within the adjusted sample.

To see whether the colonizer mortality (main instrument) is excludable in the second stage and to test the validity of all the instruments we run further two-way error components IV regressions and provide the results under specification (3) in Table 4.9. Here we additionally employ again fixed but observable variables of British legal origin and English language as implicit instruments besides explicitly controlling for European settler mortality as another instrument for the quality of institutions. Albeit Sargan test for over-identifying restrictions validates those instruments, the Hausman regressor endogeneity test and very high standard errors (Panel A) imply that institutional quality is independent from the idiosyncratic errors (i.e. exogenous).

4.5 DYNAMIC PANEL ESTIMATIONS

As noted above, to capture dynamic relationships consistently we employ two-way error components models of generalized method of moments (GMM). We report results from the Blundell and Bond (1998) system GMM estimator as the main variables of interest are quite persistent over time.[38]

4.5.1 Fundamental Results

Through six dynamic model settings Table 4.10 provides the system GMM results testing the presence of the Lucas paradox and looking whether it disappears when allowing for institutional quality and other control variables. Specification fitted under (1) once again shows that the paradox indeed exists within this autoregressive dynamic panel framework. Inclusion of the quality of institutions leaves the paradox unresolved as in the pure cross section and static panel cases. In parallel with these, estimations controlling for human capital, unilateral distance, capital controls and remoteness in addition to initial income and institutions demonstrate that the Lucas paradox persists when the autoregressivity in the dependent variable is allowed for. Also there is positively significant (one period) state dependence under all specifications in the table.

[38] Arellano-Bond difference GMM results are demoted to the chapter appendix.

Table 4.10: System GMM Regressions of Capital Inflows per Capita, 5-Year Panel Data

	(1)	(2)	(3)	(4)	(5)	(6)
Average per capita equity flows, $t-1$	0.606*** (0.123)	0.564*** (0.133)	0.536*** (0.138)	0.598*** (0.125)	0.531*** (0.150)	0.541*** (0.135)
Average per capita equity flows, $t-2$	-0.257 (0.196)	-0.215 (0.178)	-0.218 (0.177)	-0.252 (0.196)	-0.189 (0.160)	-0.227 (0.168)
Log per capita initial GDP (PPP$)	0.348*** (0.059)	0.190*** (0.048)		0.310*** (0.072)	0.161** (0.073)	
Average institutional quality		0.185*** (0.035)	0.171*** (0.033)		0.157*** (0.033)	0.171*** (0.033)
Log average per capita GDP (PPP$)			0.247*** (0.054)			
Log average years of schooling				0.0779 (0.111)	0.0645 (0.096)	0.0926 (0.077)
Log average distance					-1.328 (1.457)	-2.175 (1.437)
Log average remoteness					1.292 (1.486)	2.161 (1.493)
Average restrictions to capital mobility					-0.184 (0.249)	-0.175 (0.235)
Log per capita initial GDP (2005 US$)						0.153*** (0.050)
Observations	229	229	229	229	229	229
Countries	47	47	47	47	47	47
m_1 ***(p-value)***	0.021	0.026	0.026	0.021	0.026	0.025
m_2 ***(p-value)***	0.624	0.527	0.516	0.610	0.474	0.636
$Hansen\ J$ ***(p-value)***	0.803	0.740	0.739	0.800	0.735	0.736

Notes: All specifications comprise finite-sample adjustment, two-step estimator optimization, and collapsed GMM-style instruments. Unreported constant and time dummies included in all estimations. m_1 and m_2 are the Arellano-Bond tests for first order and second order autocorrelations in the residuals whilst $Hansen\ J$ is the test of over-identifying restrictions for all the model instruments. Because sample size is not an entirely well-defined concept in system GMM which effectively runs on two samples (in levels and in first-differences) simultaneously, we report the size of the untransformed (level) sample. Windmeijer's finite-sample corrected cluster-robust standard errors in parentheses. $^{*}\ p < 0.10$, $^{**}\ p < 0.05$, and $^{***}\ p < 0.01$ denote significance at 10%, 5%, and 1% respectively.

4.5.2 Robustness Checks

Controlling for trade openness, level of financial sector development, total factor productivity growth, initial capital stock per capita, malaria incidence and international communication traffic in Table 4.11 do not alter the mainstay of the *dynamics* characterized above. Coefficients on the lags of the dependent variable give a monotonic adjustment to a shock that is over after two 5-year periods. The positive significance of the first lag effectively narrows this decay to a 5-year period. This is consistent with our interpretation of the estimates from the five-year panel data as the short-run parameters in that it takes five

years for an impact on the contemporaneous capital flows (i.e. F_{it}) to die out, after which F_{it} reverts to its long-run level.[39]

Table 4.11: System GMM Regressions of Capital Inflows per Capita, 5-Year Panel Data

	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Average per capita equity flows, $t-1$	0.566*** (0.128)	0.548*** (0.134)	0.552*** (0.144)	0.599*** (0.121)	0.511*** (0.110)	0.539*** (0.124)
Average per capita equity flows, $t-2$	-0.205 (0.180)	-0.192 (0.178)	-0.0391 (0.252)	-0.249 (0.178)	-0.259 (0.295)	-0.355 (0.280)
Log per capita initial GDP (PPP$)	0.191*** (0.050)	0.247*** (0.050)	0.225** (0.086)		0.306** (0.115)	0.279*** (0.089)
Average institutional quality	0.182*** (0.035)	0.211*** (0.037)	0.156*** (0.044)	0.209*** (0.037)	0.260*** (0.055)	0.250*** (0.064)
Log average trade openness	0.0149 (0.070)					
Log average deposit money bank assets		-0.0441 (0.050)				
Log average TFP growth			0.0175 (0.015)			
Log per capita initial GCF (2005 $US)				0.0878** (0.036)		
Malaria contagion risk					-0.0686 (0.153)	
Log average Int'l voice traffic						0.0029 (0.034)
Observations	229	212	178	228	141	160
Countries	47	46	39	47	47	46
m_1 ***(p-value)***	0.026	0.034	0.057	0.026	0.043	0.047
m_2 ***(p-value)***	0.504	0.372	0.482	0.674	0.257	0.442
Hansen J (p-value)	0.744	0.750	0.626	0.778	0.584	0.743

Notes: See notes to Table 4.10.

[39] Because $T \leq 2$ for corporate tax, country risk and foreign bank penetration the dynamic models including them are unspecified. Hence, we are unable to report robustness checks for those extra explanatory variables. We also fit the first two models from Table 4.4, the second model from Table 4.5 and the fifth model from Table 4.10 to the data for main capital flow components (FDI, portfolio equity, long-term debt and short-term debt) and report the results in the chapter appendix. Changing the data and methodology also changes the estimates. FEM and system GMM estimations for FDI show that the Lucas paradox (or the positive wealth effect as Acemoglu and Zilibotti (1997) predict) prevails in the short-run. The case for FPEI is less robust, as neither initial income nor institutional quality is significant when the dynamics are considered. There is some (little for short-term debt) evidence in favour of the presence and persistence of the paradox in debt flows. Finally, capital controls and similar restrictive policies deter short-term external borrowing and induce portfolio equity financing in the short-run.

4.6 CONCLUSION

This chapter augments the analysis in Chapter 3 by implementing static (including within-group fixed effects) and dynamic (system GMM) panel estimators. These estimators are used to capture short-run dynamic relationships and to deal with any possible omitted variables problem. For a panel of five-year moving averages over 1980-2006 and for 47 developing countries, the chapter probes whether the wealth bias in international financial flows (the Lucas paradox) is resolved in the short-run. It also tests if the short-run predictions of Acemoglu and Zilibotti (1997) hold. Insofar as our dynamic and static panel estimations are accurate and reliable, we reach conclusions broadly similar to the previous chapter. We demonstrate that the persistence in the Lucas paradox within developing countries is so entrenched that allowing for unobserved country-specific effects, within-group (time series) variation and autoregressive dynamics do not make any radical difference.

The results are identical within and across static panel data methods. Within-group fixed effects regressions imply (as equivalently consistent random effects GLS regressions do in some cases) that the paradox remains in the short-run for developing economies. Although institutional quality has positive impact on capital flows to these economies, it is unable to resolve the wealth bias. Capturing the dynamics and controlling for endogeneity, Blundell-Bond style system GMM estimations indicate that the existence and persistence of the Lucas paradox is an intertemporal phenomenon within developing countries. They also show that real capital flows per capita have positive, one five-year period state dependence or inertia. This additionally justifies the short-run interpretation throughout the chapter.

The persistence in the Lucas paradox and associated non-convergence in real incomes, factor prices and returns could be attributed to a Linder-type home bias in international finance. It may also be the case that excessive volatility in financial markets and related behavioural anomalies in certain types of external funding breed the negative shocks that cancel out the effects of positive shocks. This may eventually give rise to a permanent diversion in the direction of funding. Hence, it is crucial to disentangle total capital flows into appropriate components in undertaking a rather conclusive study on financial globalization, capital controls and capital market integration, as well as the Lucas paradox. To that end, Chapter 5 concentrates on the major flow components and analyzes their behavioural characteristics by distinguishing them with respect to maturity and structure.

APPENDIX 4.1: CAPITAL FLOWS IN ACEMOGLU AND ZILIBOTTI (1997)

International capital flows are modelled through a problem of optimal portfolio choice in a two-country world. The model assumptions are: *(i)* free international trade in final goods and financial instruments, *(ii)* intermediate goods cannot be traded internationally, *(iii)* both countries face identical constant returns to scale (CRS) technologies, micro-level indivisibilities (nonconvexities or inefficiencies implying that a certain minimum size investment or start-up cost is required to be productive) and uncertainty, *(iv)* there are two countries such that Country 1 is richer (has higher initial endowments) while Country 2 is poorer. Under these assumptions, there are two forces to be taken into account when comparing the profitability of investments in two different countries: *risk diversification* (larger stock of savings → more open or operating sectors → larger amount of intermediate goods ≡ more diversification opportunities in Country 1) and *differential prices for intermediate goods* (higher in Country 2, hence marginal product of capital is higher there). The risk-return trade-off that an agent faces is determined by these two forces.

Because all agents can run any of the intermediate sector firms, can buy any security issued in either country and are equally distributed between the two countries; an agent $h \in \Omega_1 \cup \Omega_2$ is allowed to invest her funds in any combination of the two safe assets and $2 \times [0,1]$ risky assets, where Ω_i is the set of young agents in Country $i = 1,2$ and $[0,1]$ is the unit interval. Uncertainty is considered by a continuum of equally likely states of nature such that an intermediate sector $j \in [0, n_i, 1]$ pays a positive return only in state j and nothing otherwise. In each country, larger sectors will open after smaller ones and, presumably, the number of open projects in Country 1 is at least the same as in Country 2 (i.e. $n_1 \geq n_2$). Since investing in a sector is equivalent to buying a basic Arrow security that pays in only one state of nature, dropping t (the time subscript) and h (the agent indicator) for notational convenience, the optimal portfolio problem of the agent h is written as

$$\begin{aligned} \max_{F_1,F_2,G,\phi_1,\phi_2} \; & n_2 \log\left[\rho_1^{(q_1)}(RF_1 + r\phi_1) + \rho_2^{(q_1)}(RF_2 + r\phi_2)\right] \\ & + (n_1 - n_2)\log\left[\rho_1^{(q_2)}(RG + r\phi_1) + \rho_2^{(q_2)}(r\phi_2)\right] \\ & + (1 - n_1)\log\left[\rho_1^{(q_3)}(r\phi_1) + \rho_2^{(q_3)}(r\phi_2)\right] \end{aligned} \tag{A4.1}$$

subject to

$$n_2(F_1 + F_2) + (n_1 - n_2)G + \phi_1 + \phi_2 = s^* \tag{A4.2}$$

F is the amount of savings invested in risky asset and $F^j \geq M_j = \max\left\{0, \frac{D}{1-\gamma}(j-\gamma)\right\}$, where M_j is the minimum investment to ensure productivity or positive return and the expression on the right hand side (RHS) is its distribution function. There is no minimum investment requirement for the sectors to be open if they satisfy $j \leq \gamma$. For the rest of the sectors, the minimum investment requirement increases linearly in D (> 0), which captures the presence of nonconvexities or indivisibilities that in turn shape the trade-off between insurance and productivity or risk and return. ϕ is the amount of savings invested in safe asset that has a nonstochastic gross rate of return r $(< R)$, where R is the rate of return on or payoff from the investment in risky security. ρ refers interchangeably to the price of intermediate goods, the aggregate rate of return on safe and risky financial investments and the marginal product of capital. As intermediate goods are nontradable (Asmp. ii), $\rho_1^j \neq \rho_2^j$. Given that $n_1 \geq n_2$; if the realized state of nature is $j \in q_1 \equiv [0, n_2]$, a risky investment in both countries will have a positive payoff. If $j \in q_2 \equiv [n_2, n_1]$, however, only risky investments in Country 1 will have a positive payoff. Finally, if $j \in q_3 \equiv [n_1, 1]$, no risky projects will be successful. G is the amount of investment in risky assets of Country 1 such that $\forall h$ and $\forall j$, $j' \in [n_2, n_1]$, there exists $F_1^j = F_1^{j'} \equiv G$. From the constraint, s^* is the optimal savings of the agent.

The equilibrium solutions can be characterized from the first order conditions of the form

$$\frac{n_2 \rho_1^{(q_1)} R}{\rho_1^{(q_1)}(RF_1 + r\phi_1) + \rho_2^{(q_1)}(RF_2 + r\phi_2)} = \lambda n_2 \tag{A4.3}$$

$$\frac{n_2 \rho_2^{(q_1)} R}{\rho_1^{(q_1)}(RF_1 + r\phi_1) + \rho_2^{(q_1)}(RF_2 + r\phi_2)} = \lambda n_2 \tag{A4.4}$$

$$\frac{(n_1 - n_2)\rho_1^{(q_2)} R}{\rho_1^{(q_2)}(RG + r\phi_1) + \rho_2^{(q_2)}(r\phi_2)} = \lambda(n_1 - n_2) \tag{A4.5}$$

$$\frac{n_2 \rho_1^{(q_1)} r}{\rho_1^{(q_1)}(RF_1 + r\phi_1) + \rho_2^{(q_1)}(RF_2 + r\phi_2)} + \frac{(n_1 - n_2)\rho_1^{(q_2)} r}{\rho_1^{(q_2)}(RG + r\phi_1) + \rho_2^{(q_2)}(r\phi_2)} + \frac{(1 - n_1)\rho_1^{(q_3)} r}{\rho_1^{(q_3)}(r\phi_1) + \rho_2^{(q_3)}(r\phi_2)} = \lambda \tag{A4.6}$$

$$\frac{n_2 \rho_2^{(q_1)} r}{\rho_1^{(q_1)}(RF_1 + r\phi_1) + \rho_2^{(q_1)}(RF_2 + r\phi_2)} + \frac{(n_1 - n_2)\rho_2^{(q_2)} r}{\rho_1^{(q_2)}(RG + r\phi_1) + \rho_2^{(q_2)}(r\phi_2)} + \frac{(1 - n_1)\rho_2^{(q_3)} r}{\rho_1^{(q_3)}(r\phi_1) + \rho_2^{(q_3)}(r\phi_2)} = \lambda \tag{A4.7}$$

Given that $n_2^* < 1$, from (A4.3) and (A4.4) it follows that $\rho_1^{(q_1)} = \rho_2^{(q_1)}$, hence

$$RF_1 + r\phi_1 = RF_2 + r\phi_2 \tag{A4.8}$$

Using (A4.3)—(A4.5) to obtain the ratio

$$\frac{\rho_1^{(q_1)}}{\rho_1^{(q_2)}} = \frac{\rho_1^{(q_1)}(RF_1 + r\phi_1) + \rho_2^{(q_1)}(RF_2 + r\phi_2)}{\rho_1^{(q_2)}(RG + r\phi_1) + \rho_2^{(q_2)}(r\phi_2)} \tag{A4.9}$$

Given the production function $Y = AK^{\alpha}L^{1-\alpha}$, factor prices $w = (1-\alpha)AK^{\alpha}$ as the wage earning or returns to labour and $\rho = \alpha AK^{\alpha-1}$ as the marginal product of capital and optimal savings $s^* = \frac{\beta}{1+\beta}(1-\alpha)AK^{\alpha}$ in addition to $n_2^* < 1$, it follows from the law of decreasing marginal returns to capital (DMRC) that there exists such a nontrivial relation (otherwise contradiction arises); $\rho_1^{(q_2)} < \rho_1^{(q_1)} = \rho_2^{(q_1)} \equiv \rho^{(q_1)}$, hence $G^* > F_1^*$, which is also the case due to higher minimum size requirement (Asmp. iii). Observing now that $r\phi_2 < RF_2 + r\phi_2 = RF_1 + r\phi_1$, decreasing marginal productivity once again implies that $\rho_2^{(q_2)} > \rho_1^{(q_1)} = \rho_2^{(q_1)} \equiv \rho^{(q_1)} > \rho_1^{(q_2)}$. Finally, subtracting (A4.7) from (A4.6)

$$\frac{(n_1 - n_2)}{\rho_1^{(q_2)}(RG + r\phi_1) + \rho_2^{(q_2)}(r\phi_2)}\left(\rho_1^{(q_2)} - \rho_2^{(q_2)}\right) = \frac{(1-n_1)}{\rho_1^{(q_3)}(r\phi_1) + \rho_2^{(q_3)}(r\phi_2)}\left(\rho_2^{(q_3)} - \rho_1^{(q_3)}\right) \tag{A4.10}$$

From $\rho_1^{(q_2)} < \rho_2^{(q_2)}$ it follows that $\rho_2^{(q_3)} < \rho_1^{(q_3)}$ which, in turn, implies by DMRC that

$$\phi_2^* > \phi_1^* \tag{A4.11}$$

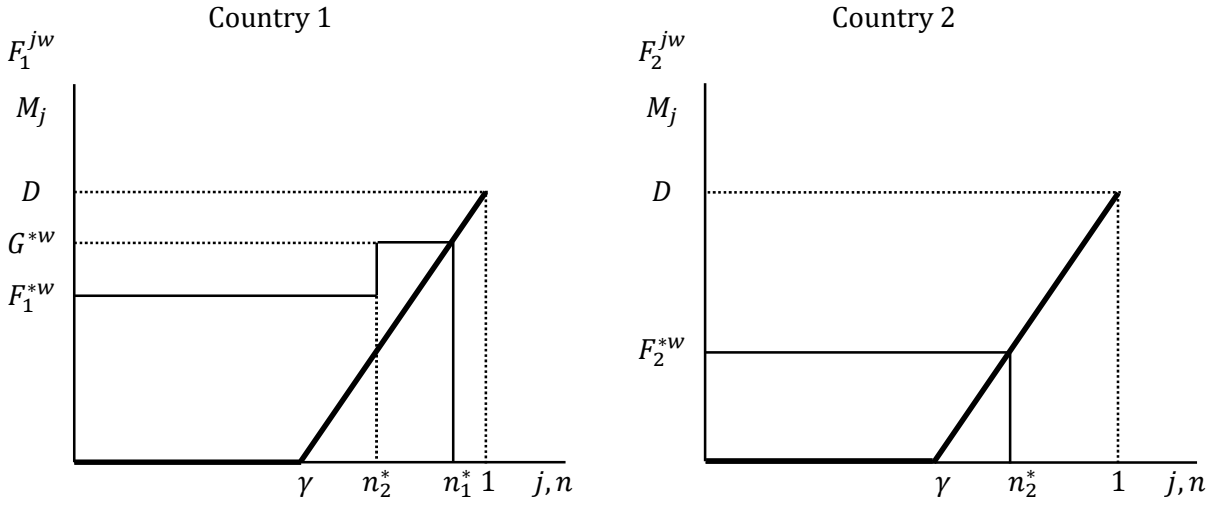
Since the optimal condition was $RF_1 + r\phi_1 = RF_2 + r\phi_2$, it finally proves

$$G^* > F_1^* > F_2^* \tag{A4.12}$$

Equation (A4.8) shows that the marginal product of capital or return on financial investments is equal across countries (no matter whether they are rich or poor) for the equilibrium subset of states $q_1^* \equiv [0, n_2^*]$, where the size of open sectors and the level of associated investments are lower. The eleventh equation implies that the insurance role of the safe asset is more important in Country 2 than in Country 1, so the risk free investments are higher in the poorer country. Ultimately, the inequality in Equation (A4.12) means that larger scale and risky financial investments ($G^*$and F_1^*) are higher in the richer country. Because the return on risky assets is greater than the return on safe assets (i.e. $R > r$) and risky asset purchases increase with the size and number of open sectors within the countries, risky financial investments are more significant than safe ones. In other words, what is meant by international capital flows are essentially those risky financial investments that are promoted by return and diversification motives and take place across countries. Figure A4.1 sketches the resulting aggregate equilibrium capital flows in this two-country world. Both equilibrium solutions at time t (recall that the time subscripts were dropped) and their aggregate images

in the figure (areas within the solid lines) demonstrate that more capital flows to the richer country in the short-run.

Figure A4.1: International Capital Flows in Acemoglu and Zilibotti (1997)



This open economy model of optimal portfolio choice provides an alternative approach to the direction and allocation of international capital, which is different than the approaches previously considered. The model offers a time-dependent explanation and implies that the neoclassical view, that the new financial investments will accrue to poorer economies, can only be achieved in the long-run. In the short-run and under the governing assumptions of micro-level nonconvexities (or indivisibilities) and uncertainty, it expects the foreign capital to be destined to richer economies. Hence, there would be no paradox in such circumstances.

In this chapter, where we extend the analysis of the preceding chapter with a different data and methodology, we find it relevant and appropriate to additionally consider the model of Acemoglu and Zilibotti (1997). Using five-year panel data for 47 developing countries (including the richer emerging market economies) over 1980-2006, we test if including a measure for institutional quality resolves the Lucas paradox or is it their prediction that holds in the short-run.

APPENDIX 4.2: DIFFERENCE GMM ESTIMATIONS

Table A4.1: Difference GMM Regressions of Capital Inflows per Capita, 5-Year Panel Data

	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Average per capita equity flows, $t-1$	0.638** (0.268)	0.537** (0.259)	0.492** (0.244)	0.624** (0.248)	0.501** (0.227)	0.493** (0.206)
Average per capita equity flows, $t-2$	-0.312 (0.202)	-0.260 (0.192)	-0.219 (0.182)	-0.272 (0.196)	-0.226 (0.171)	-0.205 (0.171)
Log per capita initial GDP (PPP$)	0.151 (0.251)	-0.0050 (0.256)		-0.0331 (0.347)	-0.149 (0.341)	
Average institutional quality		0.214*** (0.056)	0.172*** (0.062)		0.179*** (0.057)	0.159*** (0.055)
Log average per capita GDP (PPP$)			0.261 (0.275)			
Log average years of schooling				0.426 (0.439)	0.262 (0.409)	0.226 (0.295)
Log average distance					–	–
Log average remoteness					0.0397 (1.591)	1.374 (1.905)
Average restrictions to capital mobility					-0.298 (0.296)	-0.262 (0.315)
Log per capita initial GDP (2005 US$)						0.172 (0.145)
Observations	184	182	182	184	182	182
Countries	47	47	47	47	47	47
m_1 ***(p-value)***	0.028	0.040	0.042	0.027	0.036	0.036
m_2 ***(p-value)***	0.810	0.689	0.515	0.678	0.632	0.569
Hansen J (p-value)	0.624	0.542	0.587	0.654	0.591	0.587

Notes: See notes to 4.10 and 4.11.

Table A4.2: Difference GMM Regressions of Capital Inflows per Capita, 5-Year Panel Data

	(1)	(2)	(3)	(4)	(5)	(6)
Average per capita equity flows, $t-1$	0.523*	0.570**	0.236	0.483***	0.476	0.327
	(0.262)	(0.256)	(0.639)	(0.170)	(0.341)	(0.347)
Average per capita equity flows, $t-2$	-0.261	-0.224	-0.0827	-0.279	-0.348	-0.397
	(0.193)	(0.193)	(0.273)	(0.168)	(0.309)	(0.293)
Log per capita initial GDP (PPP$)	0.0615	0.110	0.314		0.0654	-0.0448
	(0.249)	(0.260)	(0.562)		(0.544)	(0.680)
Average institutional quality	0.224***	0.240***	0.166**	0.214***	0.237***	0.226***
	(0.059)	(0.064)	(0.070)	(0.055)	(0.073)	(0.077)
Log average trade openness	-0.270					
	(0.231)					
Log average deposit money bank assets		-0.164				
		(0.135)				
Log average TFP growth			0.0182			
			(0.020)			
Log per capita initial GCF (2005 $US)				-0.0054		
				(0.096)		
Malaria contagion risk					–	
Log average Int'l voice traffic						0.165
						(0.103)
Observations	182	166	139	181	139	112
Countries	47	46	39	47	47	45
m_1 ***(p-value)***	0.042	0.040	0.325	0.017	0.120	0.146
m_2 ***(p-value)***	0.757	0.441	0.668	0.703	0.561	0.904
Hansen J (p-value)	0.512	0.604	0.561	0.613	0.516	0.549

Notes: See notes to 4.10 and 4.11.

APPENDIX 4.3: STATIC AND DYNAMIC PANEL ESTIMATIONS FOR THE MAIN CAPITAL FLOW COMPONENTS

Table A4.3: Static Panel Regressions of Capital Flow Components, 5-Year Panel Data

A. Equity Components

	FDI			***FPEI***		
	(1)	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**
Log per capita initial GDP (PPP$)	0.622*** (0.165)	0.423*** (0.130)	0.558*** (0.181)	0.0556*** (0.018)	0.0469*** (0.014)	0.0486*** (0.012)
Average institutional quality		0.160** (0.060)	0.0663 (0.077)		0.0142 (0.009)	0.0190* (0.010)
Log average years of schooling			-0.364 (0.262)			0.00111 (0.021)
Log average distance			—			-0.237 (0.429)
Log average remoteness			4.803*** (1.569)			0.365 (0.422)
Average restrictions to capital mobility			-0.494* (0.268)			0.114** (0.049)
Observations	231	231	231	231	231	231
Countries	47	47	47	47	47	47
R^2_Overall	0.336	0.395	0.129	0.0838	0.0903	0.134
Sargan-Hansen OIR Test (p-value) & Model	0.000 FEM	0.005 FEM	0.000 FEM	0.260 REM	0.125 REM	0.434 REM

B. Debt Components

	LTDEBT			***STDEBT***		
	(1)	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**
Log per capita initial GDP (PPP$)	0.515** (0.222)	0.524** (0.220)	0.376 (0.281)	0.128 (0.093)	0.128 (0.091)	0.181* (0.100)
Average institutional quality		0.0562 (0.070)	0.0461 (0.073)		-0.00511 (0.033)	-0.0236 (0.034)
Log average years of schooling			-0.758* (0.391)			0.0537 (0.181)
Log average distance			—			—
Log average remoteness			-3.776 (2.858)			0.122 (1.085)
Average restrictions to capital mobility			-0.163 (0.206)			-0.239* (0.135)
Observations	229	229	229	229	229	229
Countries	47	47	47	47	47	47
R^2_Overall	0.328	0.332	0.00143	0.0827	0.0813	0.0993
Sargan-Hansen OIR	0.235	0.000	0.000	—	—	—
Test (p-value) & Model	FEM	FEM	FEM	FEM	FEM	FEM

Notes: Unlike Table A3.1, dependent variables are averaged over 5-year windows here. Unreported constant and time dummies included in all estimations. The dash "—" signifies unavailability of either the relevant regressor due to perfect collinearity or the Sargan-Hansen over-identifying restrictions (OIR) test.

Table A4.4: System GMM Regressions of Equity Flow Components, 5-Year Panel Data

	FDI			FPEI		
	(1)	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**
Average per capita FDI | FPEI, $t-1$	0.563*** (0.144)	0.519*** (0.163)	0.486** (0.182)	0.424*** (0.098)	0.422*** (0.093)	0.402*** (0.096)
Average per capita FDI | FPEI, $t-2$	-0.247 (0.182)	-0.236 (0.167)	-0.209 (0.150)	0.391 (0.414)	0.346 (0.366)	0.374 (0.323)
Log per capita initial GDP (PPP$)	0.326*** (0.070)	0.188*** (0.059)	0.173** (0.081)	0.00313 (0.026)	0.00257 (0.018)	-0.00737 (0.026)
Average institutional quality		0.161*** (0.030)	0.120*** (0.027)		0.00381 (0.010)	0.0124 (0.009)
Log average years of schooling			0.0189 (0.087)			0.0189 (0.022)
Log average distance			-1.252 (1.603)			-0.708* (0.416)
Log average remoteness			1.136 (1.648)			0.775* (0.422)
Average restrictions to capital mobility			-0.321 (0.266)			0.122* (0.061)
Observations	229	229	229	229	229	229
Countries	47	47	47	47	47	47
m_1 ***(p-value)***	0.0253	0.0320	0.0334	0.144	0.135	0.123
m_2 ***(p-value)***	0.782	0.774	0.739	0.406	0.443	0.381
$Hansen\ J$ ***(p-value)***	0.765	0.569	0.579	0.598	0.707	0.663

Notes: All specifications comprise finite-sample adjustment, two-step estimator optimization, and collapsed GMM-style instruments. Unreported constant and time dummies included in all estimations. m_1 and m_2 are the Arellano-Bond tests for first order and second order autocorrelations in the residuals while $Hansen\ J$ is the test of over-identifying restrictions for all the model instruments. Because sample size is not an entirely well-defined concept in system GMM which effectively runs on two samples (in levels and in first-differences) simultaneously, we report the size of the untransformed (level) sample. Windmeijer's finite-sample corrected cluster-robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$ denote significance at 10%, 5%, and 1% respectively. The first two explanatory variables are first and second lags of the corresponding dependent variable. See also notes to Table A4.3.

Table A4.5: System GMM Regressions of Debt Flow Components, 5-Year Panel Data

	LTDEBT			STDEBT		
	(1)	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**
Average per capita LTDEBT | STDEBT, $t-1$	0.0582	0.0610	0.0650	-0.0990	-0.0885	-0.125
	(0.080)	(0.091)	(0.096)	(0.066)	(0.065)	(0.080)
Average per capita LTDEBT | STDEBT, $t-2$	-0.108	-0.117	-0.132	-0.0693*	-0.0670	-0.0714
	(0.078)	(0.086)	(0.084)	(0.039)	(0.044)	(0.044)
Log per capita initial GDP (PPP$)	0.371***	0.335***	0.372***	0.142***	0.118***	0.0909***
	(0.083)	(0.082)	(0.099)	(0.026)	(0.027)	(0.031)
Average institutional quality		0.0562	0.0505		0.0388	0.0285
		(0.066)	(0.063)		(0.024)	(0.022)
Log average years of schooling			-0.103			0.0490
			(0.102)			(0.054)
Log average distance			0.935			-0.142
			(1.647)			(0.794)
Log average remoteness			-0.995			0.0995
			(1.632)			(0.829)
Average restrictions to capital mobility			-0.160			-0.210***
			(0.269)			(0.069)
Observations	225	225	225	225	225	225
Countries	47	47	47	47	47	47
m_1 ***(p-value)***	0.0442	0.0386	0.0324	0.0148	0.0140	0.0167
m_2 ***(p-value)***	0.0548	0.0579	0.0746	0.855	0.851	0.864
Hansen J (p-value)	0.0593	0.0505	0.0556	0.408	0.498	0.557

Notes: See notes to Table A4.4.

Table A4.6: Difference GMM Regressions of Equity Components, 5-Year Panel Data

	FDI			FPEI		
	(1)	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**
Average per capita FDI | FPEI, $t-1$	0.567**	0.469*	0.424*	-0.309*	-0.289	-0.178
	(0.255)	(0.251)	(0.238)	(0.171)	(0.265)	(0.424)
Average per capita FDI | FPEI, $t-2$	-0.259	-0.222	-0.239	-0.430	-0.391	-0.299
	(0.203)	(0.193)	(0.172)	(0.322)	(0.463)	(0.524)
Log per capita initial GDP (PPP$)	0.232	0.104	0.167	-0.0355	-0.0556	-0.0422
	(0.211)	(0.205)	(0.276)	(0.108)	(0.117)	(0.114)
Average institutional quality		0.180***	0.149***		0.0200	0.0101
		(0.042)	(0.048)		(0.026)	(0.017)
Log average years of schooling			-0.321			0.149
			(0.292)			(0.452)
Log average distance			—			—
Log average remoteness			-0.667			1.023*
			(1.642)			(0.534)
Average restrictions to capital mobility			-0.492			0.0178
			(0.317)			(0.094)
Observations	184	182	182	184	182	182
Countries	47	47	47	47	47	47
m_1 ***(p-value)***	0.0485	0.0660	0.0567	0.223	0.341	0.397
m_2 ***(p-value)***	0.796	0.704	0.830	0.673	0.775	0.801
Hansen J (p-value)	0.604	0.508	0.488	0.587	0.399	0.518

Notes: See notes to Table A4.4.

Table A4.7: Difference GMM Regressions of Debt Components, 5-Year Panel Data

	LTDEBT			STDEBT		
	(1)	**(2)**	**(3)**	**(1)**	**(2)**	**(3)**
Average per capita LTDEBT | STDEBT, $t-1$	0.198** (0.083)	0.204** (0.094)	0.179* (0.091)	-0.134*** (0.046)	-0.112** (0.048)	-0.145** (0.063)
Average per capita LTDEBT | STDEBT, $t-2$	-0.141* (0.074)	-0.139* (0.081)	-0.162* (0.081)	-0.0344 (0.042)	-0.0308 (0.050)	-0.0593 (0.063)
Log per capita initial GDP (PPP$)	0.708** (0.328)	0.713** (0.331)	0.723* (0.416)	0.252 (0.168)	0.247 (0.168)	0.296* (0.170)
Average institutional quality		0.0753 (0.095)	0.0728 (0.104)		0.0520 (0.035)	0.0428 (0.034)
Log average years of schooling			-0.405 (0.602)			0.277 (0.273)
Log average distance			—			—
Log average remoteness			-1.411 (3.074)			0.605 (1.281)
Average restrictions to capital mobility			-0.0882 (0.450)			-0.337*** (0.120)
Observations	180	178	178	180	178	178
Countries	46	46	46	46	46	46
m_1 ***(p-value)***	0.0167	0.0164	0.0118	0.0105	0.0113	0.00837
m_2 ***(p-value)***	0.106	0.105	0.120	0.696	0.713	0.860
Hansen J (p-value)	0.218	0.158	0.134	0.537	0.621	0.464

Notes: See notes to Table A4.4.

APPENDIX 4.4: THE INSTITUTIONAL QUALITY (POLITICAL RISK) INDEX AND ITS COMPONENTS

The ICRG political risk rating which enters under the guise of institutional quality variable into both investigations has been generated through summing up the individual weights of the components below.

(1) Government Stability: The sum of ratings assigned to three subcomponents of government unity, legislative strength, and popular support; each with a maximum score of 4 points and a minimum score of 0 points. It is an overall evaluation of a government's ability to stay in the office, and its ability to execute its declared programs.

(2) Socioeconomic Conditions: The sum of ratings assigned to three subcomponents of unemployment, consumer confidence, and poverty; each with a maximum score of 4 points and a minimum score of 0 points. It is an overall evaluation of the socioeconomic pressures at work in a society that could restrain government action or ferment social dissatisfaction.

(3) Investment Profile: The sum of ratings assigned to three subcomponents of contract viability/expropriation, profits repatriation, and payment delays; each with a maximum score of 4 points and a minimum score of 0 points. It is an overall evaluation of the factors putting investment in a country at risk that are not contained by other political, economic, and financial risk components.

(4) Internal Conflict: The sum of ratings assigned to three subcomponents of civil war/coup threat, terrorism/political violence, and civil disorder; each with a maximum score of 4 points and a minimum score of 0 points. It is an overall evaluation of the actual or potential impact of political violence on governance in a country.

(5) External Conflict: The sum of ratings assigned to three subcomponents of war, cross-border conflict, and foreign pressures; each with a maximum score of 4 points and a minimum score of 0 points. It is an overall evaluation both of the risk to incumbent government from foreign action, ranging from non-violent external pressure (diplomatic pressures, aid withholdings, trade restrictions, territorial disputes, sanctions, embargos etc.) to violent external force (cross-border conflicts to all out war).

(6) Corruption: Evaluation of actual or potential corruption in the form of excessive patronage, nepotism, job reservations, favour-for-favours, secret party funding, and suspiciously close ties between politics and business such as demands for special payments

and bribes connected with import and export licences, exchange controls, tax assessments, police protection, or loans. The assigned rating array is 0-6.

(7) Military in Politics: Evaluation of actual or potential military involvement in the politics and governance of a country from de facto influence to full-fledged regime. The assigned rating array is 0-6.

(8) Religious Tensions: Evaluation of the risk of dominating society and governance by a single religious group that aims to replace civil law by religious law and to keep out other religions from the political and social affairs. The assigned rating array is 0-6.

(9) Law and Order: The sum of ratings assigned separately to law, and order; each with a maximum score of 3 points and a minimum score of 0 points. The Order subcomponent is an evaluation of popular observance of the law whereas the Law subcomponent is an assessment of the strength and impartiality of the legal system.

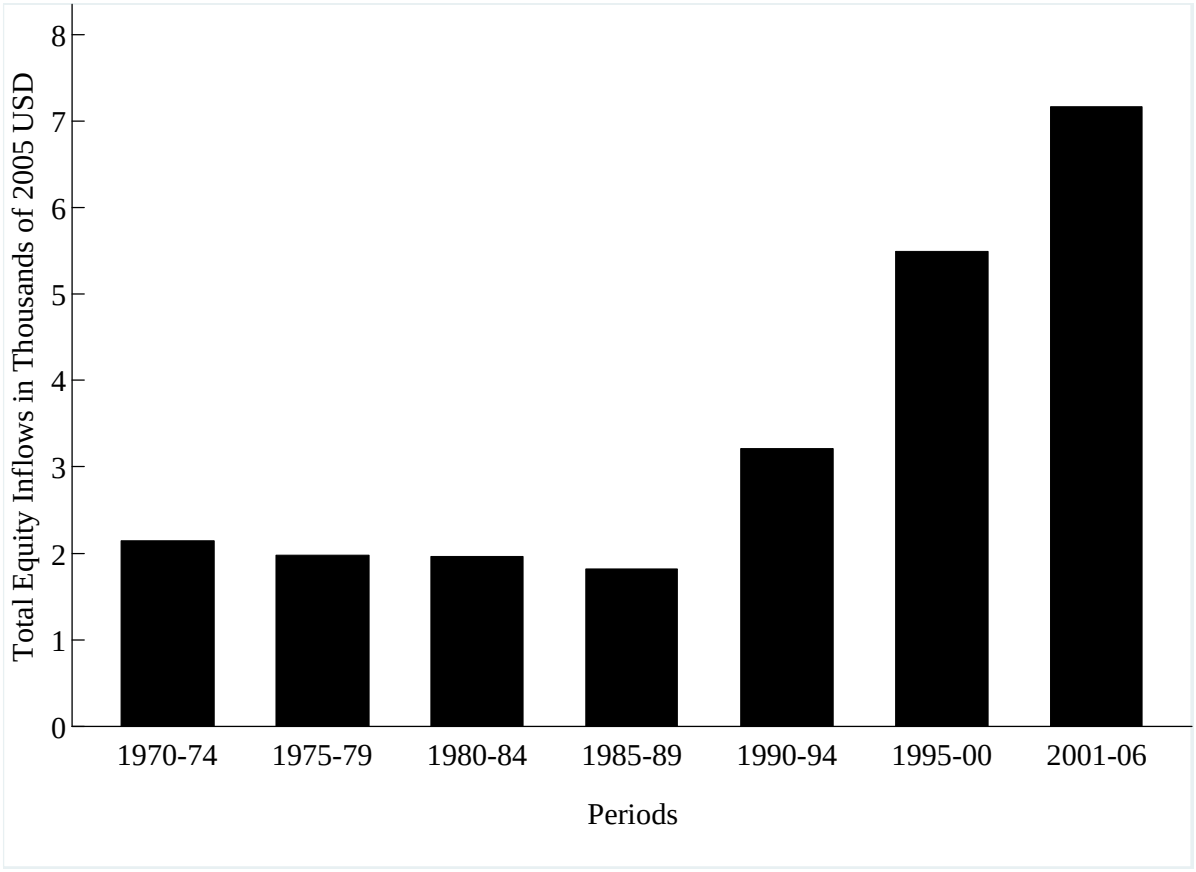
(10) Ethnic Tensions: Evaluation of the extent of racial, national, or linguistic tensions within a country . The assigned rating array is 0-6.

(11) Democratic Accountability: Evaluation of the degree of governmental responsiveness to public citizens through either alternating democracy, dominating democracy, de facto one-party state, de jure one-party state, or autarchy. The assigned rating array is 0-6.

(12) Bureaucratic Quality: Evaluation of the risk level of policy revisions in daily administrative functions when governments change. The assigned rating array is 0-4.

APPENDIX 4.5: COMMON DATA AND SAMPLES IN CHAPTERS 3 AND 4

Figure A4.2: Total Equity Inflows by Sub-periods, 1970-2006



Notes: Partial equivalent of Figure 1 in Alfaro *et al.* (2008) to illustrate that the data for developing countries therein are very similar to ours, albeit some source and manipulation differences like using different base years etc. Data are for 47 developing countries and cross country summed per capita totals averaged over the corresponding time periods only. Total equity inflows are the sum of net annual liability balances for foreign portfolio equity and direct investments across all sample countries.

Table A4.8: Country Samples

Baseline Sample		**IV Regressions Sample**	
Algeria	Kenya	Algeria	Mexico
Argentina	Malawi	Argentina	Nicaragua
Bangladesh	Malaysia	Bangladesh	Niger
Bolivia	Mali	Bolivia	Pakistan
Botswana	Mexico	Brazil	Panama
Brazil	Nicaragua	Cameroon	Papua New Guinea
Bulgaria	Niger	Chile	Paraguay
Cameroon	Pakistan	China	Peru
Chile	Panama	Colombia	Senegal
China	Papua New Guinea	Costa Rica	South Africa
Colombia	Paraguay	Dominican Republic	Sri Lanka
Costa Rica	Peru	Ecuador	Thailand
Dominican Republic	Philippines	Egypt	Tunisia
Ecuador	Senegal	El Salvador	Uruguay
Egypt	South Africa	Ghana	Venezuela
El Salvador	Sri Lanka	Guatemala	
Ghana	Thailand	Guyana	
Guatemala	Tunisia	Honduras	
Guyana	Turkey	India	
Honduras	Uruguay	Indonesia	
India	Venezuela	Jamaica	
Indonesia	Zambia	Kenya	
Jamaica	Zimbabwe	Malaysia	
Jordan		Mali	

CHAPTER 5

TAXI, TAKEOFF AND LANDING: BEHAVIOURAL PATTERNS OF CAPITAL FLOWS TO EMERGING MARKET ECONOMIES

5.1 INTRODUCTION

> "The loans from creditor countries . . . begin with modest amounts, then increase and proceed crescendo. They are likely to be made in exceptionally larger amounts toward the culminating stage of a period of activity and speculative upswing, and during that stage become larger from month to month so long as the upswing continues. With the advent of crises, they are at once cut down sharply, even cease entirely."—Taussig (1927, quoted in Dornbusch, 2002, p. 745).

International capital mobility is a crucial theme in open economy macroeconomics. It has been treated within different theoretical and empirical frameworks under monetary, fiscal, financial, trade, growth and development economics with a global outlook. Foreign capital flows to emerging market economies, despite being underweighted (a lower share than expected) in international portfolios (Tesar, 1999, Sarno and Taylor, 1999a), constitute an integral part of that broad topic of economic research.

Starting from the late 1950s and increasing in subsequent decades, convertibility-led monetary interdependence and the emergence of international banking consortia through formation of multinational syndicates facilitated the vast expansion of international financial transactions predominantly across the developed country markets. These developments in the core (i.e. the advanced world) have enabled the cross-border financial investments to materialize in the periphery (i.e. the developing and emerging world). After the dissolution of the Bretton Woods system onwards, according to the observed realizations, external funding to emerging markets have followed three recurring phases: crawling initially (the taxi phase) then having surges (the takeoff phase) and finally ending up with either soft or hard declines (the landing phase).

In conjunction with the controversies on financial liberalization, deregulation, opening-up, globalization and integration, it is argued that there are pros and cons of capital flows to emerging economies. Besides their direct function in financing current account imbalances, potential benefits include investment inducement, growth acceleration, consumption smoothing, competitiveness gain, macroeconomic discipline reinforcement, financial system efficiency and stability enhancement, risk sharing and diversification (see Agénor, 2003, Stulz, 1999, Tesar, 1999). In contrast, rather than financing and reconciling current account imbalances, capital inflows are blamed for enlarging the deficits even further and making them unsustainable by aggravating economic overheating (WEO, 2007). Among others, Obstfeld (1985, 2009) views capital inflows as a 'problem' claiming that stabilization programmes based on fixed or pegged exchange rate regimes give rise to excess capital inflows which magnify real exchange rate appreciations as well as macroeconomic instability and add to deterioration of economic fundamentals through inflationary pressures.[40]

These problems are closely related to the first generation financial crisis models (Krugman, 1979, Flood and Garber, 1984). They propose that macro-structural rudiments that are weakened by external and internal over-expansions, due to risen foreign financing, trigger a deterministic process of speculative attacks against international reserves. This process ultimately leads to reserve depletions and currency collapses. Building on an explanation of this type, Sachs *et al*. (1996) show that excessive capital inflows make a financial crisis more likely. Other negative side-effects attributed to capital flows are asset price bubbles (Sarno and Taylor, 1999b), contagion and spillovers (Obstfeld, 1996, Calvo and Mendoza, 2000), transmission of foreign shocks and monetary instability under the compromised policy mix of the central bank (Hermalin and Rose, 1999). Some argue that the size and liquidity of international capital markets create the potential for self-fulfilling speculative attacks and that financial movements across those markets are subject to animal spirits and investor sentiments which characterize surges of panics and manias or euphoria and despair.[41]

Frankel and Wei (2005) and Kose *et al*. (2009) conclude that the evidence on advantages and disadvantages of international financial liberalization, capital market integration and

[40] Not just in case of emerging and developing countries but also for advanced nations capital flows are, at times, regarded as troublesome. The following excerpt (from a speech of the former US president, Bill Clinton) in Karolyi (2004) exemplifies this: "...it is now time for the world to take the next steps of implementing a new financial architecture and long-term reform of the global financial system. This should include steps to reduce the entire financial system's vulnerability to rapid capital flows..."

[41] See McKinnon and Pill (1998), Kindleberger and Aliber (2005).

capital flows is mixed and inconclusive. This inconclusiveness arises from a kind of 'one size fits all' conduct, which entails the use of total (gross or net) capital flows in studying these issues (as well as the issue of Lucas paradox). Hence, total capital flows should be disentangled into appropriate components to ensure an accurate, convincing and conclusive analysis. Furthermore, behavioural patterns of those components should be illuminated for better understanding and effective management.

In the literature, there are theoretical and applied treatments that consider compositional and behavioural aspects of international financial movements. Modelling financial development and instability in open economies, Aghion *et al*. (2004) suggest that unrestricted and infinitely elastic foreign direct investment (FDI, as a substitute for domestic investment), acts countercyclically and stabilizes the economy. Foreign credit, on the contrary, is a highly procyclical funding source that—by having knock-on effects on the domestic credit expansion—destabilizes the economy. Envisaged as a part of or an addition to the equity of domestic firms, restricted and finitely elastic FDI (which may well be interpreted as portfolio equity-like FDI or directly as foreign portfolio equity investment that complements the domestic investment) may also cause aggregate instability. Agénor and Aizenman (1998) and Aizenman and Powell (2003) conjecture that amplified volatility in cross-border lending (i.e. random shifts in external factors acting as aggregate contagious 'shocks' to productivity) increases financial spreads and the producer cost of capital, resulting in higher incidence of default, lower employment and welfare losses. Empirically, transitory and volatile portfolio inflows are detected to have negative impacts on future returns (Froot *et al*., 2001) and new investment spending of private firms (Demir, 2009). The volatility of FDI is predicted to decrease economic growth (Lensink and Morrissey, 2006).[42]

On the other hand, Caballero and Krishnamurthy (2006) take a holistic approach while focusing on the behavioural side of capital flows. They show that excessive capital flow volatility leads to real and financial asset price bubbles which expose the emerging country to bubble-bursts and funding reversals. Financial crises are preceded by volatile capital flows resulting from information frictions and default problems in Chari and Kehoe (2003).

[42] There are also policy prescriptions to contain and control volatility and speculative activity in international financial markets and capital flows. In his presidential address at the conference of the Eastern Economic Association in 1978, Washington DC; James Tobin proposed a tax (credited to him as 'Tobin tax') on capital market transactions to mitigate excess fluctuations and stampedes across the markets and thus to serve as 'sand in the wheels' of international finance. Tobin (1978) and Eichengreen *et al*. (1995) formalize the idea, while Uppal (2011) reviews its costs and benefits. Recently, José Manuel Barroso, European Commission president, has called for a tax for similar purposes on financial transactions throughout the European Union or at least for the Euro Zone (Financial Times, September 28, 2011).

Besides, the notion of 'capital flow volatility' is interchangeably used with the term 'sudden stops in capital flows' by Jeanne and Ranciére (2011), and likewise, with the concept 'financial crises'—both of which are linked to investor herding—by Chari and Kehoe (2004). From this perspective, any comment on sudden stops, reversals and financial (banking and currency) crises could be ascribed to capital flow volatility and contagion.

Mendoza (2010) hypothesizes that hampered access to working capital financing, due to sudden stops in capital inflows, induces contractions in factor allocations (e.g. heightens unemployment) and production. Popularizing the term 'sudden stop', Calvo (1998) argues that sudden stops cause insolvency, lower the productivity of physical and human capital and engender across-the-board bankruptcies after sharp and unexpected changes in relative prices. Forbes and Warnock (2011) demonstrate that the depressed capital flow episodes (i.e. sudden stops and retrenchments) are more prone to contagion than the normal episodes of surges and flights. Employment and output costs of sudden stops and financial crises are documented in Hutchison and Noy (2005, 2006) and Bordo (2008).

Some applied works have adopted direct approaches to compositional and behavioural dynamics of international capital flows. Employing univariate time series data on five industrial and five developing countries, Claessens *et al*. (1995) discover that long-term funding components are at least as volatile and unpredictable as short-term components. Hence, the data labels 'short-term' and 'long-term' do not signal any information about the time series properties of the component in question. Sarno and Taylor (1999a) find relatively low permanent components in portfolio and official flows and high permanent components in commercial bank lending, while FDI flows are detected to be almost entirely permanent. For nine emerging East Asian economies plus Japan and Australia, Sarno and Taylor (1999b) report similar findings. Using group medians and means instead of individual time series for the countries from all income levels, Levchenko and Mauro (2007) show that there are limited differences across types of flow with respect to volatility, persistence, cross-country comovement and correlation with growth. Nevertheless, striking differences are explored around the sudden stop episodes: FDI is the most stable, portfolio flows undergo quickly recovering reversals whereas bank loans and trade credits tumble severely and stay depressed for some time. Albeit providing useful insights about the characteristics of various forms of capital movements, these studies have some shortcomings. There are inconsistencies and lack of clarity in sampling (often whether the data are monthly, quarterly or annual is unclear),

definition (distinguishing the series as net or gross is arbitrary), measurement and scaling of the data used.

Our goal in this investigation is to draw on the literature to elucidate the behavioural features of the main capital flow components by testing directly the conventional wisdom and the predictions from information-based trade-off model. Summarized in Claessens *et al*. (1995), conventional wisdom implies that short-term, as labelled on some balance of payments accounts, capital flows (short-term debt and portfolio equity) that are influenced by market sentiment are inherently speculative 'hot' money sources. Conversely, long-term flows (FDI and long-term debt) that are determined by structural factors are considered stable 'cold' money sources. According to the information-based trade-off model of Goldstein and Razin (2006), equity flows are expected to see lower reversals (FDI least and portfolio equity less) and hence they are more persistent and predictable. Liquid debt flows, however, are predicted to go through higher incidence of sudden stops. In order to analyze these maturity (short-term—long-term) and structure (debt—equity) distinctions and thus to provide cogent evidence from the case studies we identify four capital flow types: foreign direct investment, foreign portfolio equity investment, long-term debt and short-term debt. Since this is projected as an event study, each annual time series of those components for twelve emerging market countries from five regions over 1970-2006 constitutes a different sample.

Extending earlier papers and systematically testing the hypotheses that distinguish external funding components according to maturity vs. structure, we will also be answering the following questions: *(i)* Is the increase in identified forms of capital flows part of a long-run trend toward greater international diversification and risk sharing or is it simply a short-run phenomenon that could reverse suddenly? *(ii)* Do foreign investors take a long horizon in making their investments or are they in pursuit of short-run capital gains? *(iii)* Are there systematic differences across the funding components, countries and regions within the answers to *(i)* and *(ii)*?

The rest of the chapter is organized as follows. Section 5.2 sets out the hypotheses to be tested and Section 5.3 devises the methodology. Data and measurement issues are discussed in Section 5.4, while Section 5.5 delves into realized fluctuations of the basic external financing components. Section 5.6 deals with the process modelling and forecasting, as correlations and comovements are considered in Section 5.7. Volume, volatility and sudden stop linkages are probed in Section 5.8 and Section 5.9 assembles final remarks.

5.2 THEORETICAL CONSIDERATIONS

Claessens *et al*. (1995) argue that there is a conventional wisdom shaped by common beliefs about the behavioural patterns of different forms of international capital flows. Some accounting labels in the balance of payments and some time series tags in other databases (e.g. WDI and GDF of the World Bank) also reflect this understanding. The approach is that there is a distinction between foreign financing components as short-term and long-term. Short-term capital flows which include debt bearing money market securities and loans with a maturity of one year or less and foreign portfolio equity investment (FPEI) are regarded as inherently volatile and speculative hot money (i.e. funding sources that react to changes in expected risk and return, investor psychology and exchange rate differentials) that are also highly reversible and susceptible to sudden stops.[43] On the contrary, long-term capital flows including bonds and loans with a maturity of more than one year and foreign direct investment (FDI) are construed as intrinsically stable and predictable cold money (i.e. funding sources that respond to slow-moving structural factors and economic fundamentals) which are rather irreversible and immune to sudden stops. Therefore, the hypotheses pertinent to the so called conventional wisdom can be stipulated as:

$H1 :=$ Short-term debt flows (STDEBT) and FPEI are more volatile than long-term debt flows (LTDEBT) and FDI.

$H2 :=$ FDI and LTDEBT are more persistent and predictable than FPEI and STDEBT.

$H3 :=$ FPEI and STDEBT are less strongly correlated and comoving than FDI and LTDEBT.

$H4 :=$ FDI and LTDEBT are less prone to sudden stops than FPEI and STDEBT.

In their comprehensive model of information-based trade-off among foreign financing components Goldstein and Razin (2006) show that if FDI and FPEI coexist in the equilibrium then, on average, the expected liquidity needs of FPEI investors are higher than the expected liquidity needs of FDI investors.[44] This implies that the withdrawal rate of FPEI is higher

[43] The view that FPEI is reckoned as a kind of short term capital flow could be traced in Stulz (1999) who states that in a positive feedback trading prevalent stock market environment highly liquid short-term financial instruments are open to volatility spawning speculative trading. Also see Sachs *et al*. (1996) as well as 'hot money' on Wikipedia.

[44] Information asymmetries in the model are envisaged to take place at two stages. At first stage there is a principal-agent kind of information asymmetry that exists between entrepreneurs and managers where the level of ownership reduces the costs and improves efficiency by mitigating the effects of information failures. The second stage information asymmetry arises between the current owner and the potential buyer when the former happens to sell prior to the maturity. The investor liquidity needs and preferences, instead of market conditions, determine the 'liquidity shocks' definition of the paper.

than that of FDI, resulting in greater volatility of the former relative to the latter. It is also proposed that as the investor heterogeneity in terms of the degree of being sensitive to liquidity shocks increases, a separating equilibrium—with a large difference between the withdrawal rates and volatilities of FDI and FPEI—becomes more likely. They finally suggest that, albeit not explicitly formulated but deduced from the model, debt instruments are anticipated to attract investors with even higher liquidity needs so such capital movements face the highest withdrawal frequencies and severest fluctuations. This is because the return on debt is expected to be less sensitive to liquidity shocks as asymmetric information problems do not depress the secondary market price of debt. Thus, a pecking order among the capital flow components is established in the sense that there is an equity-debt distinction following the subordinate differentiation within equity flows.[45] Then, the information-based trade-off hypotheses are:

$H5 :=$ STDEBT and LTDEBT are more volatile than FPEI and FDI.

$H6 :=$ FDI and FPEI are more persistent and predictable than LTDEBT and STDEBT.

$H7 :=$ LTDEBT and STDEBT are less strongly correlated and comoving than FDI and FPEI.

$H8 :=$ FDI and FPEI are less prone to sudden stops than LTDEBT an STDEBT.

It is straightforward to notice that in both explanations ($H1 - H4$ vs. $H5 - H8$) short-term debt flows and FDI always lie at the opposite sides, whilst FPEI and long-term debt flows shift their positions. The hypotheses above will be tested with respect to volatility, persistence, predictability, correlation, comovement (or contagion risk) and incidence of sudden stop in turn.

Under the Bacchetta and van Wincoop (2000) model of overshooting effects of deterministic liberalization, it is also expected that all funding types indicate some degree of permanence as the market reforms and liberalizations giving rise to these flows are themselves predominantly permanent events.

5.3 METHODOLOGY

It is widely accepted that a consistent measure for the true volatility of a time series is not readily available yet. This might partly be due to varying definitions and use of the concept of

[45] Under the assumptions of financial frictions and partial inalienability, Albuquerque (2003) offers an FDI–non-FDI dichotomy for capital flow volatility profiles.

volatility and partly because of the contingent or context-dependent nature of the current measures of volatility.[46] Hence, we consider feasible alternatives to identify consistent regularities in the realized volatility patterns of univariate time series of capital flow components and to assess $H1$ and $H5$. For the original series we calculate standard deviations and coefficients of variation as a preliminary exercise. The latter is used only as a complementary measure to the former because we are interested in absolute volatility more than the relative one.[47] The other reason for considering standard deviation as the favourite volatility measure is that comparing flow components pairwise within each country is prioritised to comparing them across countries and regions which are not collectively exhaustive.

Following the practice in World Bank (2005) we further decompose the series into trend and cyclical components by the Hodrick-Prescott (HP) filter, taking the penalty parameter as $\lambda = 6.25$ in accordance with the frequency power rule of Ravn and Uhlig (2002). Realized fluctuations are measured through standard deviations of the cyclical components of these filtered series. The last method is preferred as it is sort of a Bayesian approach, similar to the one that Aizenman and Pinto (2005) mention, whereby the relatively more predictable and persistent trend component of the underlying variable is abstracted from the unanticipated cyclical (stochastic or random) component whose *volatility* is deemed to capture pure *risk* or *uncertainty* and to constitute a *shock* as conceived in Agénor and Aizenman (1998).[48] This is tantamount to a quasi detrended fluctuation analysis (Peng *et al*., 1994) by which we seek to eliminate the effects of potential nonstationarities and long-range dependence in the data—due to high volume, magnitude or scaling—so as to gauge true volatility without necessarily modelling it.

We formally test the difference between realized volatilities (i.e. standard deviations) of the actual and detrended capital flow series using Brown-Forsythe variance equality test (Brown and Forsythe, 1974) where the sample sizes are taken into account too. This test is chosen among the alternatives since it is found to be superior in terms of robustness and power even when the population means are unknown (Conover *et al*., 1981). Various line

[46] For instance, Liu *et al*. (1999) quantify volatility by logarithmic growth rates of the series.

[47] Cox and Sadiraj (2010) argue that the coefficient of variation has poor normative and descriptive performance in risk appraisal and Polly (1998) shows that there is size-related bias in the coefficient of variation. See also Sørensen (2002).

[48] Volatility of the cyclical component obtained from the partitioning through HP filter could also be seen analogous to the *random component* in Chari and Kehoe (2003) and *stochastic component* in Acemoglu and Zilibotti (1997).

plots and bar charts are also depicted to show the evolution of volatilities through time, over sub-periods and across countries and regions.

We carry forward the behavioural analysis by undertaking process modelling to explore stationarity and persistence properties of capital flow series in question. ADF (Dickey and Fuller, 1979), PP (Phillips and Perron, 1988) and KPSS (Kwiatkowski *et al*., 1992) unit root tests are performed to determine the order of integration and hence to decide whether a series is stationary. The limitation is that possible outliers or breaks in the series (especially if early or late in the sample period) could engender low power in these tests. Following this, an autoregressive integrated moving average (ARIMA) model is fitted to the data along with a general-to-specific specification search strategy. Impulse response function diagnostics from these data generating processes (DGPs) are derived to provide secondary line of evidence on the degree of permanence of the time series. Furthermore, a standard ARIMA(1,0,0) model is regressed over 1970-2003 and 3-year ahead (2004-2006) dynamic out-of-sample forecasts are obtained from this estimation. Predictability conditions of capital flow components are, then, assessed with an explicit recourse to mean absolute percentage error (MAPE) and Theil inequality coefficient (TIC); the favoured statistics as they are scale-independent absolute measures. These statistical practices are to test the second and the sixth hypothesis.

By employing pooled data and individual country samples we compute simple pairwise correlations and percentage proportions of the total variances explained by the first principal components to evaluate Hypotheses 3 and 7. Following Levchenko and Mauro (2007), we use first principal components to measure comovement among funding types *within* a specific country and risk of contagion *across* countries for an individual or a group of funding type. The principal component method is used for factor analysis because, as Rigobon (2002) argues, estimates are consistent even if the data would have simultaneous equations or omitted variable biases.[49]

The last hypotheses of conventional theory and information-based trade-off model ($H4$ and $H8$, respectively) are assessed through identifying and comparing sudden stops or reversibility incidences. A reduction of at least 25% from the previous year is defined as a sudden stop in the inflow of a capital flow component.

[49] Boyson *et al*. (2010), Pukthuanthong and Roll (2009), Bekaert *et al*. (2009), Bordo and Murshid (2006), Mauro *et al*. (2002) also employ principal component analysis to gauge comovement and contagion.

Finally, as a robustness exercise we carry out pooled ordinary probability unit (probit; à la Bliss, 1934) estimations for the potential links between sudden stop, volume and volatility of capital flows. The population regression function takes the form of conditional probit representation of an index model of binary response

$$\Pr(S_{it} = 1|\mathbf{x}_{it}) = \mathbf{\Phi}(\mathbf{x}_{it}\boldsymbol{\beta}) \qquad i = 1, \dots, N; \quad t = 1, \dots, T \tag{1}$$

where, S_{it} denotes the dependent variable of sudden stop which is essentially a categorical factor variable taking on the dichotomous values of either 0 (failure, no sudden stop) or 1 (success, or sudden stop). $\mathbf{x}_{it}$ is a $1 \times K$ ($K \geq 2$ being the number of covariates) row vector of observed explanatory variables containing volumes, volatilities and time dummies. $\boldsymbol{\beta}$ is a $K \times 1$ column vector of parameters to be estimated, and $\mathbf{\Phi}$ is the standard cumulative normal distribution function.[50] As the pooled ordinary probit specification with Huber/White/sandwich robust standard errors performed better from an efficiency point of view and equally satisfied asymptotic conditions, it is the model of choice rather than the logit or random-effects probit.

5.4 DATA AND MEASUREMENT

To analyze volatility, persistence and univariate time series properties of international capital flow composition in twelve emerging countries we identify four basic categories as foreign direct investment (FDI), foreign portfolio equity investment (FPEI), long term debt (LTDEBT) and short term debt (STDEBT). For a fair representation of emerging world, at least two countries are picked from each of the five emerging market regions. Data availability (particularly portfolio equity) is another determining factor in choosing individual countries since this study involves univariate time series analysis which requires sample sizes to be as lengthy as possible. Developing Asian (DA) countries are India (IND), Pakistan (PAK) and Thailand (THA) whilst countries from Europe and Central Asia (ECA) are Bulgaria (BGR) and Turkey (TUR). Latin America and Caribbean (LAC) is represented by Brazil (BRA), Chile (CHL) and Mexico (MEX). Middle East and North Africa (MENA) comprises Morocco (MAR) and Tunisia (TUN) whereas Mauritius (MUS) and Senegal (SEN) represent Sub Saharan Africa (SSA). Each country-component pair constitutes a different sample so that, in total, there are 48 ($= 12 \times 4$) yearly observed samples under

[50] As stated in Wooldridge (2002), achieving a $\sqrt{N}$-consistent estimator of $\boldsymbol{\beta}$ is possible by maximizing the *partial* (sometimes *quasi*, *pseudo* or only *probit*) log-likelihood function

$\sum_{i=1}^{N}\sum_{t=1}^{T}\{S_{it}\log\mathbf{\Phi}(\mathbf{x}_{it}\boldsymbol{\beta}) + (1 - S_{it})\log[1 - \mathbf{\Phi}(\mathbf{x}_{it}\boldsymbol{\beta})]\}$.

consideration. Time dimension of these annual samples may vary due to data availability; e.g. in case of FDI, Bulgarian data span is 1990-2006; for FPEI, the data start between 1974 and 1996; for LTDEBT, again Bulgarian data covers limited period of 1981-2006; for STDEBT, data run from 1971 for most countries except Bulgaria (1986), and Mauritius and Senegal (1978). Table 5.1 summarizes the sample periods.

FDI refers to net inflows of investment to acquire a lasting management interest (10% or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvested earnings, and other such long-term and short-term capital as shown in the balance of payments of the reporting economy.

FPEI represents non-debt-creating portfolio equity flows which are the sum of country funds, depository receipts, and direct purchases of shares by foreign investors.

LTDEBT is composed of publicly guaranteed and nonguaranteed debt from bonds that are either publicly issued or privately placed, publicly guaranteed and nonguaranteed long-term commercial bank loans and non-concessional credits (with an original or extended maturity of more than one year and owed to non-residents and repayable in foreign currency, goods, or services) from private banks, other private financial institutions, official creditors (international organizations like the World Bank, regional development banks, other multilateral and intergovernmental agencies, and other sovereign governments), manufacturers, exporters, and export credit agencies.

STDEBT consists of publicly guaranteed and nonguaranteed debt arising from underwriting such as notes, repos and other money market instruments like treasury bills, commercial papers, bankers' acceptances and certificates of deposit and all the other loans with an original maturity of one year or less.

To construct FDI and FPEI series annual liability balances of the relevant balance of payments accounts reported by the World Development Indicators (WDI) are considered only whereas LTDEBT and STDEBT are generated from the sub-accounts calculated as disbursements minus principal repayments in the Global Development Finance (GDF).[51] All four variables of fundamental capital flow components (FDI, FPEI, LTDEBT and STDEBT) are expressed in real (constant 2005 US dollars) per capita terms that are believed to be more

[51] We opt to use the net liability balances as they constitute the data of interest. The idea is that, as Dornbusch (2002) argues, when foreign financing to a particular sector is withdrawn (i.e. a sudden stop or reversal occurs) that means a capital outflow and not a substitution into other assets currently held by that sector.

compatible with the theoretical formulations such as in Gourinchas and Jeanne (2011), Kraay *et al*. (2005), Boyd and Smith (1997). By normalizing with population we also take the destination country size into account keeping the original currency representation of the data that we would lose should we use GDP as numéraire.[52] Besides, conversion of the nominal values into real terms (using the US consumer price index as deflator) eliminates potential inflationary and exchange rate valuation effects.

Table 5.1 provides summary statistics. The size of pooled FPEI sample is below 400 as most developing countries liberalized their capital accounts and set up domestic exchange markets for stock and share trading much later (late 1980s) than the beginning of the overall sampling time (1970). For a typical emerging country the yearly average of each capital flow type might seem quite low but the mean per capita total capital flows (not reported) are about $141 per year. Although the long-term debt seems to have the highest share, FDI flows are catching up. As structured markets were established relatively late, portfolio equity financing has the lowest share (less than a quarter of direct equity financing). High standard deviations reinforce the widely accepted conviction that capital flows to emerging market economies are extremely volatile.[53] According to scale dependent standard deviations, FDI is the most volatile whereas FPEI is the most resilient. Once relative variations are considered, however, STDEBT has the largest coefficient of variation; followed by FPEI. Therefore, scale invariant relative figures confirm the conventional view that short-term borrowing and portfolio equity flows are more volatile sources subject to speculation, sudden stops and reversals whilst FDI and long-term borrowing are rather persistent sources that are not driven by quickly changing investor and market sentiments but more related to sluggish economic fundamentals. We will treat the volatility issue exclusively in section five focusing on 'realized fluctuations' to see what is actually happening.

[52] Binici *et al*. (2010), Aykut *et al*. (2010), Neumann *et al*. (2009), Alfaro *et al*. (2008), Schularick (2006), UNCTAD (2000) adopt similar practice.

[53] See Martin and Rey (2006), Caballero and Krishnamurthy (2006), Aizenman and Pinto (2005), Aghion *et al*. (2004), Chari and Kehoe (2003), Sarno and Taylor (1999a), McKinnon and Pill (1998).

Table 5.1: Summary Statistics (1970-2006, per capita 2005 $US)

County	Component	Sample	Mean	Std. Dev.	Min	Max
Pooled	***FDI***	424	49.85	96.88	-25.44	964.76
	FPEI	251	11.79	24.76	-31.44	164.71
	LTDEBT	433	50.76	89.78	-259.76	649.08
	STDEBT	403	19.53	82.44	-266.74	789.86
Brazil	*FDI*	37 (1970)	60.08	57.33	4.42	226.02
	FPEI	28 (1979)	14.29	18.90	-12.52	60.22
	LTDEBT	37 (1970)	69.79	81.36	-74.64	247.26
	STDEBT	36 (1971)	12.75	28.55	-48.84	95.33
Bulgaria	*FDI*	17 (1990)	172.49	255.88	0.69	964.76
	FPEI	11 (1996)	5.99	14.30	-3.16	46.91
	LTDEBT	26 (1981)	86.06	98.02	-39.61	309.46
	STDEBT	21 (1986)	51.31	111.68	-119.44	452.68
Chile	*FDI*	37 (1970)	162.86	177.15	-9.39	674.74
	FPEI	18 (1989)	34.20	50.62	-31.44	141.16
	LTDEBT	37 (1970)	151.79	139.59	-28.13	649.08
	STDEBT	36 (1971)	35.05	87.26	-126.42	307.84
India	*FDI*	37 (1970)	1.91	3.02	-0.18	15.23
	FPEI	16 (1991)	4.13	3.62	-0.73	11.09
	LTDEBT	37 (1970)	3.11	4.39	-3.37	17.97
	STDEBT	36 (1971)	0.94	2.86	-4.08	15.35
Mauritius	*FDI*	37 (1970)	27.85	43.51	-25.44	253.83
	FPEI	13 (1994)	11.91	17.20	-15.26	40.41
	LTDEBT	37 (1970)	25.10	97.70	-259.76	293.72
	STDEBT	29 (1978)	63.93	194.51	-266.74	789.86
Mexico	*FDI*	37 (1970)	95.90	76.22	15.45	327.90
	FPEI	18 (1989)	34.21	46.17	-25.55	164.71
	LTDEBT	37 (1970)	92.34	109.21	-116.64	387.24
	STDEBT	36 (1971)	21.39	97.61	-250.38	285.48
Morocco	*FDI*	37 (1970)	12.54	20.47	-4.86	85.73
	FPEI	14 (1993)	2.66	6.93	-9.82	20.68
	LTDEBT	37 (1970)	36.77	61.98	-33.60	223.97
	STDEBT	36 (1971)	5.49	19.91	-37.21	59.69
Pakistan	*FDI*	37 (1970)	3.92	4.73	-0.26	26.03
	FPEI	23 (1984)	1.63	3.19	-1.01	13.84
	LTDEBT	37 (1970)	3.85	6.41	-9.55	16.70
	STDEBT	36 (1971)	1.31	6.81	-28.42	13.58
Senegal	*FDI*	37 (1970)	6.91	7.48	-11.07	24.44
	FPEI	33 (1974)	0.59	1.65	-2.61	7.70
	LTDEBT	37 (1970)	10.84	22.95	-24.04	69.88
	STDEBT	29 (1978)	1.80	13.61	-20.79	33.20
Thailand	*FDI*	37 (1970)	41.75	40.70	3.22	142.73
	FPEI	32 (1975)	17.87	25.34	-8.60	85.91
	LTDEBT	37 (1970)	19.77	66.73	-136.04	198.63
	STDEBT	36 (1971)	16.94	90.85	-196.97	317.86
Tunisia	*FDI*	37 (1970)	55.57	51.39	12.74	312.80
	FPEI	27 (1980)	6.35	7.77	-2.08	27.49
	LTDEBT	37 (1970)	54.14	59.00	-29.50	268.70
	STDEBT	36 (1971)	14.23	34.44	-69.60	120.06

(continued on next page)

Table 5.1 *(continued)*

County	Component	Sample	Mean	Std. Dev.	Min	Max
Turkey	*FDI*	37 (1970)	22.75	47.86	0.81	269.71
	FPEI	18 (1989)	11.28	19.33	-9.64	79.66
	LTDEBT	37 (1970)	66.02	90.71	-29.35	460.16
	STDEBT	36 (1971)	27.65	94.19	-213.87	326.68

Notes: FDI denotes foreign direct investment, FPEI stands for foreign portfolio equity investment, LTDEBT refers to long term debt, and STDEBT represents short term debt. Each univariate time series per country constitutes a different sample. All samples end in 2006; varying initial years are in parentheses.

It may not be so meaningful to discuss the individual country inflows by merely taking the face values as these figures are in per capita real terms and reflect the normalization with respect to population.[54] Nonetheless, focusing on relative variations over time we notice that, on average, Senegal has the highest variability (particularly STDEBT and FPEI) whereas Tunisia has the lowest. The most unstable FDI inflows per capita are those to Turkey and the highest stability can be observed in FDI to Mexico. Regionally, capital flows (portfolio equity, short-term and long-term debt) to Sub Saharan Africa are the least stable.

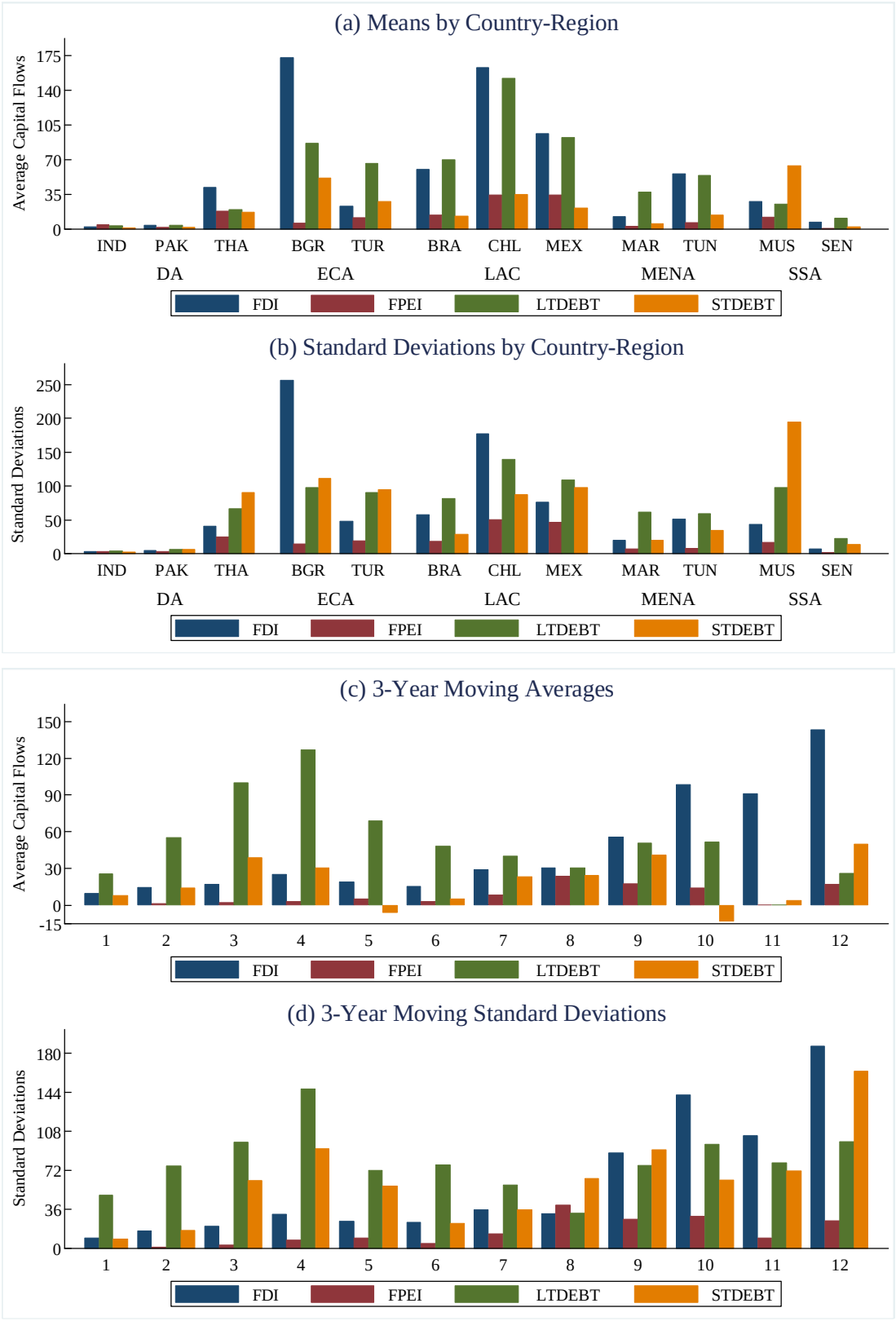
Figure 5.1 encompasses four panels of bar charts illustrating the average realizations and fluctuation patterns of the capital flow components by country, region and sub-periods. In all panels of the figure, the order of the component bars within each category is the same as the order of the components in the legends. In terms of capital flow types, the précis given by Table 5.1 can broadly be traced throughout this figure as well.

Panel (a) shows that the profile of allocations varies not only across countries and regions but also within each of them. The lumpy nature of FDI, the primary significance of long term borrowing, and the roles of FPEI and short term borrowing as low in volume (averages) but high in volatility (standard deviations) are visible. Looking at the remaining panels, (c) and (d), periodic distributions of capital flows indicate the changing structure of external financing in emerging markets.

The dominance of debt financing (long-term especially) has been curbed due most probably to dramatic and contagious Latin American debt crisis in early 1980s when short term debt net flows turned out to be net outflows. Although capital inflows have weakly recovered following that distress, considerable resumptions have taken place rather later.

[54] As an alternative presentation of the raw data two-way line plots of the time series are illustrated county by country in the appendix.

Figure 5.1: Data Panorama by Country-Region and 3-Year Sub-periods, 1970-2006



Notes: In panels (a) and (b) averages and standard deviations are calculated over the full sample periods for each country-region. In (c) and (d), the same statistics are calculated over the years within each sub-period. 3-year moving windows corresponding to the numbers on the horizontal axes are 1970-72, 1973-75, 1976-78, 1979-81, 1982-84, 1985-87, 1988-90, 1991-93, 1994-96, 1997-99, 2000-02, 2003-06 respectively. In all panels, the order of the component bars within each category is the same as the order of the components in the legends.

Following extensive current and capital account liberalizations (removal of trade restrictions and capital controls, liberalization of the domestic financial systems, macroeconomic stabilization and privatization) of the late 1980s and early 1990s (periods correspond also to economic and financial slowdown in the industrialized world) portfolio equity inflows materialized and FDI has taken the lead all the way through. Sub-periods including the renowned financial and currency deterioration episodes of 1994-95 Mexican crisis, 1997 East Asian crisis, 1998 Russian crisis, 1999 Brazilian crisis, 1994 and 2001 Turkish crises, and 2002 Argentine crisis show the critical role of short term debt and its volatility in aggravating (if not triggering) the aggregate volatility associated with crises.[55]

5.5 REALIZED FLUCTUATIONS

Using alternative procedures we measure how basic capital flow components fluctuate over time (and across countries) to evaluate the first and fifth hypotheses. The results are sensitive to the choice of measurement, scaling and magnitude of the series, cross section units (i.e. countries), and the length of time. There may be variations across countries or over time even under the same technique. Regarding the pairs of capital flow components, however, we can still observe important regularities throughout so as to reach conclusions on the volatility hypotheses (i.e. $H1$ and $H5$). The conventional approach specified in $H1$, that the pair of short-term capital flows (STDEBT and FPEI) fluctuates more than the long-term capital flows pair (LTDEBT and FDI), does not come out unambiguously from the data. However, again on the basis of pairwise evaluations, the information-based trade-off model prediction in $H5$ is confirmed in that equity flows (FDI and FPEI) are observed almost always to be more stable than debt flows (LTDEBT and STDEBT). This finding implicationally supports the premise that debt flows (including long-term maturity structured public and publicly guaranteed private external borrowings) pose the main policy challenges for and require more effective management by emerging economies.[56]

In relation to the individual series, for which the results may not always be insensitive, FPEI is the least volatile and short term debt is the most volatile component. We could also rank the individual series of capital flow components from the most volatile to the least as short-term debt flows, long-term debt flows, foreign direct investment (occasionally the most

[55] On the vulnerability generating impact of short-term external borrowing see Kose *et al*. (2009), Dornbusch (2002), Chang and Velasco (2001), Cole and Kehoe (2000), Calvo (1998).

[56] The surmise has been developed and discussed around the concept of 'debt intolerance' in Reinhart *et al*. (2003), Reinhart and Rogoff (2004), Eichengreen *et al*. (2007).

stable) and foreign portfolio equity investment. By and large, erratic oscillations in all forms of financing increase over time.

5.5.1 Fluctuations of Unfiltered Series

Realized volatilities of country capital flow series calculated via standard deviations and coefficients of variation, as well as the associated results from the nonparametric Brown-Forsythe variance equality test, are presented in Table 5.2.

Standard deviations of these unfiltered series show that long-term debt is the most volatile whilst portfolio equity is the least. According to the coefficients of variation, however, short-term debt has the highest relative volatility. A pairwise evaluation of the results from both measures along with the tests for equality of volatilities between the pertinent pairs indicates that equity flows are more stable than debt flows, supporting the fifth hypothesis. Some individual country cases differ: Bulgarian figures are ambiguous while Chilean and Indian results provide little evidence in favour of that hypothesis. The results for the first hypothesis are not clear. Although coefficients of variation support $H1$, standard deviations do not. This also emerges when we compare specific countries like Mauritius and Turkey; $H1$ is rejected for the former but supported for the latter. The Middle East and North Africa is the only region in which sample countries (Morocco and Tunisia) share the same volatility pattern, in terms of standard deviations, which is exactly opposite to the conventional view in $H1$.

Table 5.2: Overall Volatility of Unfiltered Capital Flow Components, 1970-2006

Counties	Unfiltered Capital Flow Series	Std. Dev.	Coef. of Var.	Brown-Forsythe Variance Equality Tests					
				FDI		*FPEI*		*LTDEBT*	
				Stat.	*p*-Val.	Stat.	*p*-Val.	Stat.	*p*-Val.
Pooled	***FDI***	96.88	1.94						
	FPEI	24.76	2.10	29.24	0.00				
	LTDEBT	89.78	1.77	5.13	0.02	85.15	0.00		
	STDEBT	82.44	4.22	0.54	0.46	34.47	0.00	11.31	0.00
Brazil	*FDI*	57.33	0.95						
	FPEI	18.90	1.32	6.92	0.01				
	LTDEBT	81.36	1.17	7.68	0.01	36.11	0.00		
	STDEBT	28.55	2.24	3.93	0.05	3.14	0.08	31.79	0.00
Bulgaria	*FDI*	255.88	1.48						
	FPEI	14.30	2.39	4.42	0.05				
	LTDEBT	98.02	1.14	2.30	0.14	12.81	0.00		
	STDEBT	111.68	2.18	2.39	0.13	5.22	0.03	0.27	0.61
Chile	*FDI*	177.15	1.09						
	FPEI	50.62	1.48	8.17	0.01				
	LTDEBT	139.59	0.92	1.52	0.22	5.73	0.02		
	STDEBT	87.26	2.49	8.31	0.01	2.08	0.16	3.54	0.06
India	*FDI*	3.02	1.58						
	FPEI	3.62	0.88	1.73	0.19				
	LTDEBT	4.39	1.41	4.97	0.03	0.25	0.62		
	STDEBT	2.86	3.04	0.20	0.65	3.45	0.07	7.99	0.01
Mauritius	*FDI*	43.51	1.56						
	FPEI	17.20	1.44	0.37	0.55				
	LTDEBT	97.70	3.89	11.89	0.00	7.02	0.01		
	STDEBT	194.51	3.04	7.66	0.01	3.32	0.08	1.17	0.28
Mexico	*FDI*	76.22	0.79						
	FPEI	46.17	1.35	2.69	0.11				
	LTDEBT	109.21	1.18	3.54	0.06	9.46	0.00		
	STDEBT	97.61	4.56	0.16	0.69	2.99	0.09	1.77	0.19
Morocco	*FDI*	20.47	1.63						
	FPEI	6.93	2.61	1.76	0.19				
	LTDEBT	61.98	1.69	16.90	0.00	10.55	0.00		
	STDEBT	19.91	3.63	0.42	0.52	5.19	0.03	14.83	0.00
Pakistan	*FDI*	4.73	1.21						
	FPEI	3.19	1.95	0.92	0.34				
	LTDEBT	6.41	1.67	6.48	0.01	11.99	0.00		
	STDEBT	6.81	5.18	1.80	0.18	3.95	0.05	0.64	0.43
Senegal	*FDI*	7.48	1.08						
	FPEI	1.65	2.78	26.25	0.00				
	LTDEBT	22.95	2.12	12.90	0.00	25.28	0.00		
	STDEBT	13.61	7.57	9.56	0.00	43.43	0.00	2.53	0.12
Thailand	*FDI*	40.70	0.97						
	FPEI	25.34	1.42	6.95	0.01				
	LTDEBT	66.73	3.38	2.39	0.13	10.41	0.00		
	STDEBT	90.85	5.36	3.28	0.07	8.44	0.01	0.40	0.53

(continued on next page)

Table 5.2 *(continued)*

Counties	Unfiltered Capital Flow Series	Std. Dev.	Coef. of Var.	Brown-Forsythe Variance Equality Tests					
				FDI		*FPEI*		*LTDEBT*	
				Stat.	p-Val.	Stat.	p-Val.	Stat.	p-Val.
Tunisia	*FDI*	51.39	0.92						
	FPEI	7.77	1.22	8.82	0.00				
	LTDEBT	59.00	1.09	0.95	0.33	15.85	0.00		
	STDEBT	34.44	2.42	0.67	0.41	12.05	0.00	3.79	0.06
Turkey	*FDI*	47.86	2.10						
	FPEI	19.33	1.71	0.42	0.52				
	LTDEBT	90.71	1.37	6.19	0.02	5.72	0.02		
	STDEBT	94.19	3.41	9.49	0.00	8.70	0.00	0.15	0.70

Notes: Coefficient of variation (Coef. of Var.) is the ratio of the standard deviation (Std. Dev.) of a variable to its mean and it is used as an alternative and scale-free measure for the degree of variability in the data. Brown-Forsythe variance equality test evaluates the null hypothesis that the variances of paired capital flow components are equal against the alternative of different variances. It is based on an analysis of variance (ANOVA) of the absolute difference from the median. The test statistic (Stat.) has an approximate F^{G}_{N-2} −distribution with $G = 1$ numerator degrees of freedom and $N - 2$ denominator degrees of freedom (N being the total number of observations in the pair). Degrees of freedom and pair sizes can be identified from the sample information in Table 5.1. See notes to Figure 5.1 and Table 5.1 as well.

5.5.2 Fluctuations of Filtered Series

Table 5.3 provides the Brown-Forsythe variance homogeneity tests and results related to the volatilities that are measured as standard deviations of the cyclical components of HP-filtered series. As the table documents, the previous characterization that debt flows are less stable than equity flows (i.e. $H5$) is corroborated. Indian and Tunisian statistics lend weak support to this hypothesis while Bulgarian data are inconclusive. This could be attributed to the short time series as well as to the European Union effects in case of Bulgaria and to the late liberalization (1991) in the case of India. It is also demonstrated that the long-term financial flows (FDI and LTDEBT) are at least as volatile as the short-term financial flows (FPEI and LTDEBT), providing mixed support for the conventional volatility hypothesis.

Table 5.3: Cyclical Component Volatility of HP-Filtered Capital Flow Series, 1970-2006

Counties	Filtered Capital Flow Series	Std. Dev.	Brown-Forsythe Variance Equality Tests					
			FDI		*FPEI*		*LTDEBT*	
			Stat.	*p*-Val.	Stat.	*p*-Val.	Stat.	*p*-Val.
Pooled	***FDI***	26.60						
	FPEI	15.35	7.68	0.01				
	LTDEBT	42.71	52.48	0.00	73.13	0.00		
	STDEBT	64.32	33.48	0.00	35.87	0.00	0.90	0.34
Brazil	*FDI*	17.84						
	FPEI	10.39	2.69	0.11				
	LTDEBT	39.01	12.24	0.00	17.70	0.00		
	STDEBT	19.11	1.18	0.28	9.22	0.00	8.21	0.01
Bulgaria	*FDI*	54.40						
	FPEI	10.71	3.92	0.06				
	LTDEBT	38.15	0.10	0.75	9.56	0.00		
	STDEBT	54.15	0.60	0.44	11.81	0.00	2.34	0.13
Chile	*FDI*	58.80						
	FPEI	40.98	0.27	0.61				
	LTDEBT	78.52	2.86	0.10	3.56	0.06		
	STDEBT	78.52	2.27	0.14	2.95	0.09	0.02	0.89
India	*FDI*	0.95						
	FPEI	2.00	13.15	0.00				
	LTDEBT	2.20	7.57	0.01	0.12	0.73		
	STDEBT	1.62	3.73	0.06	2.05	0.16	1.13	0.29
Mauritius	*FDI*	35.72						
	FPEI	10.44	0.70	0.41				
	LTDEBT	65.28	10.28	0.00	8.22	0.01		
	STDEBT	173.26	8.95	0.00	3.98	0.05	3.01	0.09
Mexico	*FDI*	24.37						
	FPEI	28.39	0.66	0.42				
	LTDEBT	60.30	21.60	0.00	8.50	0.01		
	STDEBT	66.61	6.05	0.02	2.00	0.16	0.64	0.43
Morocco	*FDI*	10.11						
	FPEI	5.92	0.47	0.50				
	LTDEBT	28.02	14.99	0.00	8.12	0.01		
	STDEBT	15.72	9.27	0.00	8.68	0.01	3.75	0.06
Pakistan	*FDI*	1.33						
	FPEI	2.29	0.69	0.41				
	LTDEBT	4.05	24.05	0.00	9.41	0.00		
	STDEBT	5.78	6.49	0.01	2.74	0.10	0.03	0.87
Senegal	*FDI*	5.73						
	FPEI	1.09	36.30	0.00				
	LTDEBT	11.44	3.44	0.07	19.09	0.00		
	STDEBT	11.67	13.06	0.00	48.46	0.00	0.94	0.34
Thailand	*FDI*	13.46						
	FPEI	15.70	0.19	0.66				
	LTDEBT	25.92	7.50	0.01	4.75	0.03		
	STDEBT	52.34	8.13	0.01	6.16	0.02	2.06	0.16

(continued on next page)

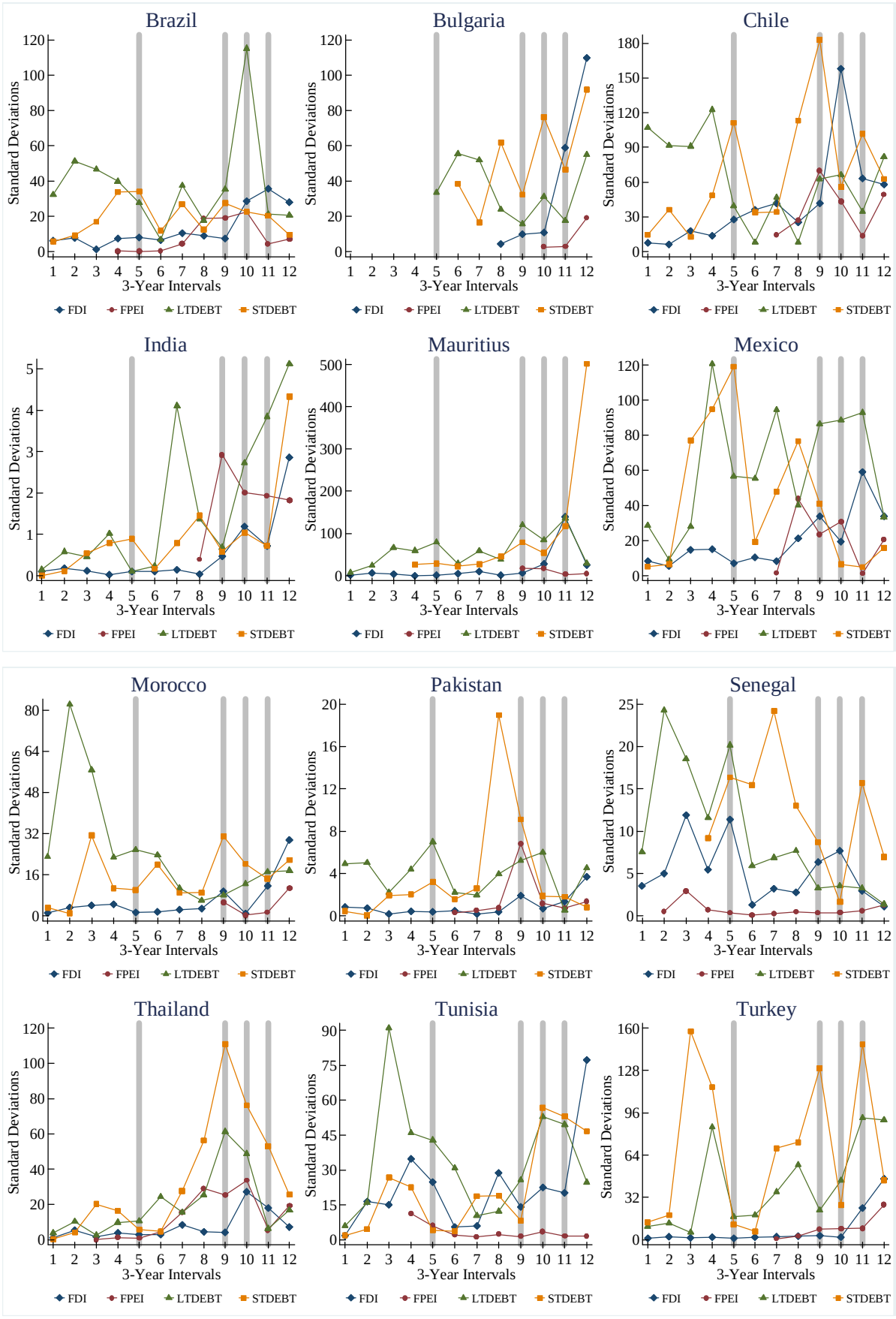
Table 5.3 *(continued)*

Counties	Filtered Capital Flow Series	Std. Dev.	Brown-Forsythe Variance Equality Tests					
			FDI		*FPEI*		*LTDEBT*	
			Stat.	p-Val.	Stat.	p-Val.	Stat.	p-Val.
Tunisia	*FDI*	28.42						
	FPEI	3.76	15.65	0.00				
	LTDEBT	36.62	2.24	0.14	26.81	0.00		
	STDEBT	28.51	0.00	1.00	16.23	0.00	2.24	0.14
Turkey	*FDI*	14.99						
	FPEI	12.42	0.03	0.86				
	LTDEBT	48.38	16.56	0.00	8.33	0.01		
	STDEBT	83.11	19.13	0.00	9.27	0.00	2.94	0.09

Notes: The cyclical component of a capital flow time series refers to its part that has regular or periodic fluctuations around the trend of the series. It is derived through Hodrick-Prescott (HP) filter with $\lambda = 6.25$ as the penalty parameter. Consult also notes to Table 5.2.

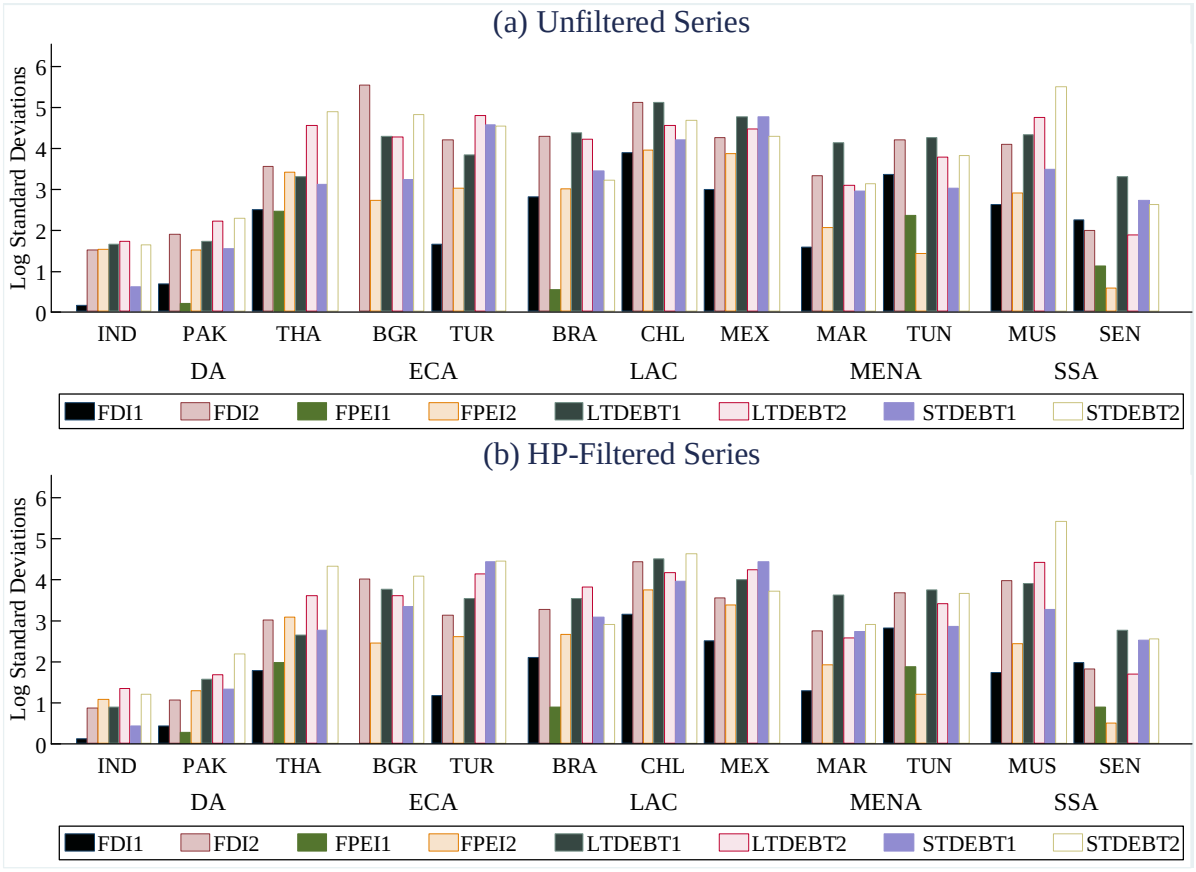
In addition to overall volatilities, Figure 5.2 shows twelve panels of time varying volatility plots measured as 3-year moving standard deviations of the cyclical components of the smoothed capital flow series. Ironically, volatilities themselves are observed to be quite volatile and they increase over time for most country cases. In line with the above finding, debt flows record higher fluctuations than equity flows. Although long-term debt shows slightly dampened oscillations at later times in some countries, short term debt remains highly volatile most of the time. Shaded vertical lines for the periods including 1982 Latin American debt crisis (fifth period), 1994 Mexican peso and Turkish lira crises (ninth period), 1997 East Asian currency crisis (tenth period), 1999 Brazilian real crisis (tenth period), 2001 Turkish and 2002 Argentine financial crises (eleventh period) highlight that debt flows—particularly short-term—fluctuate wildly either right before or during the turmoil. This indicates a country level (partially sovereign) debt overhang problem precipitated by highly leveraged balance of payments positions which might have added to outbreak of the crises (Krugman, 1999, Frankel and Wei, 2005). Broadly resilient equity flows reveal increasing volatilities around the mayhem—portfolio equity in particular as in Thai, Mexican, Chilean and Brazilian cases—and later in the overall sample time as they gain bigger shares in terms of volume and magnitude.

Figure 5.2: 3-Year Rolling Standard Deviation Plots of HP-Filtered Series, 1970-2006



Notes: Vertical lines correspond to the crisis periods mentioned in the text. See notes to Table and Figure 5.1.

Figure 5.3: Volatility Shifts in Capital Flows across Countries and Regions, 1970-2006



Notes: Standard deviations are rescaled as ln $(std.dev.+1)$ so as to give log standard deviations on the vertical axis. Calculations are carried out separately for two successive sub-periods; 1970-1989 and 1990-2006 that are distinguished by the numbers at the end of each component label. Also see notes to Figure 5.1 and Table 5.3.

Figure 5.3 finally illustrates how the profile of fluctuations in capital flow components changes from one sub-period (1970-1989) to the other (1990-2006) across countries and regions. Both panels of filtered and unfiltered series manifest that, in general, almost all forms of the capital flows become more unstable in the aftermath of the massive financial liberalizations that have taken place during the late 1980s and early 1990s. Recommencement of international capital investment in and lending to emerging economies around that time could also have contributed to this instability, as standard deviations reflect inherent scaling, frequency and magnitude of the variables. Long term debt seems to be the most volatile mode of financing in the first decades and it devolves this role to short term debt in the last decades when direct and portfolio equity flows (the most resilient throughout) also become more volatile than before. Due most probably to volume effects, FDI flows had the strongest amplification in their fluctuation patterns. Countries from LAC and SSA show some differences between each other; volatilities of Chilean debt flows shift in the opposite directions with respect to those of Brazilian and Mexican debt flows, and Senegal sees

considerable fluctuation reductions in its capital flows unlike Mauritius. It seems that the restrictive capital market policies and regulations in Chile—where a certain proportion of portfolio inflows were mandated to be deposited with the central bank for a year without interest and a 3% fine was set for the early withdrawals, the policy or regulation called *encaje* which was in effect during 1991-1998—have been counterproductive at least in curbing volatility. This observation is in line with the evidence that the capital controls could not protect Chile from external shocks (Forbes, 2008).

5.6 PROCESS MODELLING AND FORECASTING

In addition to volatility, we provide more direct evidence on the persistence and predictability characteristics of the capital flow components under consideration (re $H2$ and $H6$). To capture the degree of persistence or permanence we identify appropriate data generating processes (DGP) by fitting autoregressive integrated moving average (ARIMA) models to the data series and derive the impulse responses from those models. To evaluate the degree of predictability for the same series, we estimate a standard ARIMA(1,0,0) model for each of them throughout 1970-2003 and perform 3-year ahead (2004-2006) out-of-sample dynamic forecasts using the estimated equation where the time trend is allowed for in each case.

Table 5.4 reports the specified ARIMA models (explicitly indicating the orders of auto-regression, integration and moving average only), *periods* (the number of years during which impulse responses to a one standard deviation shock in the estimated model (i.e. corresponding DGP in the table) innovation remain above 0.50 threshold), and scale independent forecasting measures of mean absolute percentage errors (MAPE; to capture forecast accuracy and precision) and Theil inequality coefficients (TIC; to account for the goodness of fit and forecast quality).[57]

Inspection of the presented ARIMA models show that not all series are the realization of difference stationary or $I(1)$ processes unlike the case in Sarno and Taylor (1999a) where all the series contain unit roots. About a quarter of the series appear non-stationary and some FDI series are integrated of order 2.

[57] Three alternative unit root tests, ADF (Dickey and Fuller, 1979), PP (Phillips and Perron, 1988) and KPSS (Kwiatkowski *et al*., 1992), are employed to determine the order of integration of a series. The decision is made for a particular outcome (i.e. the order of integration) if the results from at least two tests are statistically equivalent. This is consistent with the account of Stock (1994) that interpretation of the unit root tests is a matter of judgement.

Table 5.4: Data Generating Processes (DGP) and Forecasting

County	Component	DGPs and Model Diagnostics			Forecast Evaluation	
		DGP	*Period*	*LM Test*	*MAPE*	*TIC*
Brazil	*FDI*	ARIMA(1,0,2)	14	0.15	24.02	0.16
	FPEI	ARIMA(0,1,2)	3	0.74	50.02	0.18
	LTDEBT	ARIMA(1,0,0)	6	0.27	202.53	0.75
	STDEBT	ARIMA(1,0,0)	3	0.77	82.43	0.46
Bulgaria	*FDI*	ARIMA(1,2,1)	21	0.78	57.14	0.48
	FPEI	ARIMA(1,0,1)	4	0.36	199.20	0.95
	LTDEBT	ARIMA(1,1,0)	4	0.67	107.54	0.96
	STDEBT	ARIMA(1,1,2)	7	0.69	56.37	0.71
Chile	*FDI*	ARIMA(1,0,0)	8	0.59	19.97	0.12
	FPEI	ARIMA(1,0,1)	8	0.45	473.38	0.94
	LTDEBT	ARIMA(1,0,0)	11	0.58	200.26	0.42
	STDEBT	ARIMA(1,0,0)	5	0.73	127.92	0.79
India	*FDI*	ARIMA(1,2,1)	2	0.98	36.94	0.42
	FPEI	ARIMA(1,0,0)	2	0.85	60.53	0.44
	LTDEBT	ARIMA(1,0,2)	5	0.90	77.75	0.89
	STDEBT	ARIMA(1,0,0)	3	0.18	97.20	0.99
Mauritius	*FDI*	ARIMA(1,0,1)	7	0.80	176.60	0.31
	FPEI	ARIMA(1,0,1)	6	0.39	167.08	0.99
	LTDEBT	ARIMA(1,0,2)	16	0.51	94.85	0.92
	STDEBT	ARIMA(0,0,5)	6	0.19	55.59	0.40
Mexico	*FDI*	ARIMA(1,1,2)	6	0.67	12.15	0.08
	FPEI	ARIMA(1,0,0)	3	0.60	150.26	0.89
	LTDEBT	ARIMA(1,0,0)	7	0.22	369.98	0.87
	STDEBT	ARIMA(0,0,1)	2	0.62	892.34	0.61
Morocco	*FDI*	ARIMA(1,0,3)	17	0.42	57.36	0.37
	FPEI	ARIMA(0,0,2)	3	0.24	129.05	0.86
	LTDEBT	ARIMA(0,0,2)	3	0.95	182.09	0.57
	STDEBT	ARIMA(1,0,1)	9	0.92	102.38	0.97
Pakistan	*FDI*	ARIMA(1,2,0)	2	0.51	58.43	0.55
	FPEI	ARIMA(1,0,0)	1	0.77	131.78	0.61
	LTDEBT	ARIMA(1,0,0)	3	0.85	79.85	0.71
	STDEBT	ARIMA(0,0,2)	3	0.93	414.09	0.94
Senegal	*FDI*	ARIMA(1,0,0)	2	0.75	13.92	0.11
	FPEI	ARIMA(0,0,2)	3	0.97	27.18	0.63
	LTDEBT	ARIMA(1,0,0)	6	0.45	3179.83	0.94
	STDEBT	ARIMA(0,0,1)	2	0.66	98.73	0.73
Thailand	*FDI*	ARIMA(1,1,0)	2	0.63	19.16	0.13
	FPEI	ARIMA(1,0,0)	2	0.73	54.81	0.42
	LTDEBT	ARIMA(1,0,2)	10	0.76	520.95	0.90
	STDEBT	ARIMA(1,0,0)	11	0.53	190.35	0.96
Tunisia	*FDI*	ARIMA(1,1,1)	6	0.98	33.32	0.58
	FPEI	ARIMA(1,1,1)	3	0.59	305.63	0.98
	LTDEBT	ARIMA(0,0,3)	4	0.63	1381.75	0.66
	STDEBT	ARIMA(0,0,3)	4	0.53	88.44	0.76
Turkey	*FDI*	ARIMA(1,2,0)	3	0.50	70.82	0.77
	FPEI	ARIMA(1,1,1)	4	0.42	84.13	0.85
	LTDEBT	ARIMA(1,1,0)	5	0.79	72.37	0.69
	STDEBT	ARIMA(0,0,2)	3	0.78	81.32	0.74

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Table 5.4 *(continued)*

County	Component	DGPs and Model Diagnostics			Forecast Evaluation	
		DGP	***Period***	***LM Test***	***MAPE***	***TIC***
Averages	***FDI***		7.50		48.32	0.34
	FPEI		3.50		152.75	0.73
	LTDEBT		6.67		539.15	0.77
	STDEBT		4.83		190.60	0.76

Notes: Each autoregressive integrated moving average (ARIMA) model is estimated via nonlinear least squares (NLS) by applying a Marquardt NLS algorithm to the transformed equation. Note that the NLS estimates are asymptotically equivalent to maximum likelihood (ML) estimates and are asymptotically efficient. Numbers in parentheses respectively show the order of auto-regression (AR), integration (I), and moving average (MA). Period indicates the number of years during which impulse responses to a one-time shock in the innovation (a one standard deviation shock using the standard error of the regression for the estimated equation and taking account of innovation uncertainty) stand above 0.50 in absolute values. Although it is a common measure for residual persistence in the series, the 'period' statistic has a different meaning for stationary and unit root processes. For stationary processes, it shows the number of periods that the *level* remains above 0.50; whereas for unit root processes, it shows the number of periods that the *growth rate* remains above 0.50 following a unit shock. Under LM test given are *p*-values from the Breusch-Godfrey Lagrange multiplier serial correlation test for the model errors with two lags. A *p*-value greater than 0.10 validates the specification fitted in the sense that there is no serial correlation left uncontrolled in the residuals. Mean absolute percentage error (MAPE) and Theil inequality coefficient (TIC) are scale invariant indicators employed to evaluate out-of-sample dynamic forecasts from an ARIMA(1,0,0) model fitted for all the time series of capital flow components, controlling for their trends over time. The estimation period is 1970-2003 and the three-year-ahead forecasting period is 2004-2006.

Considering the DGPs (the actual models and primarily the order of integration counts of each type) in the first place and average *periods* of the capital flow components secondarily, we see that FDI has the longest memory and hence is the most persistent whereas short-term debt is the least permanent. Besides the structural distinction (that debt flows are less persistent than equity flows), there is now also a maturity distinction in that long-term capital flows have higher persistence than short-term ones. These findings corroborate part of the second and sixth hypotheses. International creditors and investors seem to have a rather long-term commitment to Europe and Central Asia (i.e. to Turkey and Bulgaria) for which a potential European Union effect should not be overlooked. Sudden stops in lending and reversals of portfolio and direct equity investments might be regarded as more endemic to Sub Saharan Africa (Senegal and Mauritius). The mean values of MAPE and TIC demonstrate that forecast accuracy, quality and goodness of fit properties of FDI are the best. By and large, individual country scores also confirm that FDI is the most predictable form of cross border flows. Specific to this section of the investigation, rather than short-term, long-term debt flows reveal poorest predictability as they generally record highest MAPE and TIC levels. Again, equity flows better fit to actual data and are predictable more precisely than debt flows. Assessing the pairs as FDI and LTDEBT versus FPEI and STDEBT, forecasting

improves with the maturity and longevity of financial investments. The other part of the second and sixth hypotheses is thus corroborated.

5.7 CORRELATIONS AND COMOVEMENTS

Pairwise correlation and first principal component variance proportion matrices are given in Table 5.5 both on an *overall* basis and for each country separately. Correlations between capital flow components support Hypotheses 3 and 7 that not only long-term flows are more strongly correlated than short-term flows but also are equity flows more so than debt flows. Regarding the nature of correlations as whether the financing components are substitutes (if negatively correlated) or complements (if positively correlated) within emerging markets, they are found to be complements (FDI may be a substitute for a few countries, e.g. Mexico). Generally, our findings contradict those of Claessens *et al*. (1995) and Levchenko and Mauro (2007) who show that for countries from all income levels capital flow types are substitutes. Variance proportions of the fist principal components indicate modest contagion risk across countries for a specific (group of) component(s) and mild comovement among components within a country or region.[58] Nevertheless, maturity and structure dualities also appear here as factors common to all countries account for more of the total variation in FDI-LTDEBT and FDI-FPEI pairs than in FPEI-STDEBT and LTDEBT-STDEBT pairs (as in $H3$ and $H7$). Higher risk of contagion in long-term and equity-like financial investments implies that determining factors behind them might be correlated across emerging countries. Short-run and debt-like financing seem to be influenced by rather destination-specific factors and policy choices which make them to be less prone to contagion. Concerning the regional groupings, capital flows to Europe and Central Asia bear stronger commonality and better synchronization in terms of their composition but, as a downside, they are more susceptible to contagion. For the rest of the emerging regions (Developing Asia, Latina America and Caribbean, Middle East and North Africa, and Sub Saharan Africa), more heterogeneity is observed across capital flow components. As a last point to note on the issue of cross-border interdependence, in contrast to Bae *et al*. (2003), we discover that the risk of contagion is slightly less pronounced in Latin America than in Asia.[59]

[58] What Levchenko and Mauro (2007) come up with as the first principal component (being 0.30) for the advanced economies' financial account is exactly the same as what we uncover for *all* private financial flows to emerging economies. Similar observation qualitatively noted for portfolio equity flows in Stulz (1999).

[59] Percentage variance proportions of the fist principal components of the regionally grouped series are 0.36 for Developing Asia, 0.64 for Europe and Central Asia, 0.33 for Latin America and Caribbean, 0.35 for Middle East and North Africa, and 0.29 for Sub Saharan Africa.

Table 5.5: Pairwise Correlations and Principal Components, 1970-2006

Counties	Series	Pairwise Correlations			First Principal Components			
		FDI	FPEI	LTDEBT	FDI	FPEI	LTDEBT	ALL
Overall	***FDI***				0.48			
	FPEI	0.27*			0.38	0.46		0.30
	LTDEBT	0.24*	0.30*		0.37	0.33	0.27	
	STDEBT	0.17*	0.10	0.19*	0.32	0.31	0.19	*0.21*[a]
Brazil	*FPEI*	0.09			0.55			
	LTDEBT	-0.07	-0.07		0.53	0.53		0.33
	STDEBT	-0.32*	0.17	0.29*	0.66	0.59	0.64	
Bulgaria	*FPEI*	0.47			0.73			
	LTDEBT	0.93*	0.32		0.96	0.66		0.72
	STDEBT	0.86*	0.36	0.35	0.93	0.68	0.67	
Chile	*FPEI*	0.12			0.56			
	LTDEBT	-0.05	0.58*		0.52	0.79		0.45
	STDEBT	-0.02	-0.15	0.16	0.51	0.58	0.58	
India	*FPEI*	0.49*			0.75			
	LTDEBT	0.27	0.22		0.64	0.61		0.68
	STDEBT	0.63*	0.51*	0.57*	0.82	0.75	0.79	
Mauritius	*FPEI*	-0.10			0.55			
	LTDEBT	-0.45*	0.29		0.72	0.64		0.41
	STDEBT	0.13	0.07	-0.13	0.57	0.53	0.56	
Mexico	*FPEI*	-0.56*			0.78			
	LTDEBT	-0.29*	0.01		0.65	0.51		0.57
	STDEBT	-0.25	0.71*	0.47*	0.63	0.86	0.73	
Morocco	*FPEI*	-0.23			0.61			
	LTDEBT	-0.31*	-0.30		0.65	0.65		0.39
	STDEBT	-0.01	-0.41	0.29*	0.50	0.71	0.64	
Pakistan	*FPEI*	0.42*			0.71			
	LTDEBT	0.07	0.23		0.54	0.61		0.41
	STDEBT	-0.09	-0.19	-0.19	0.55	0.59	0.60	
Senegal	*FPEI*	0.39*			0.70			
	LTDEBT	-0.08	0.42*		0.54	0.71		0.41
	STDEBT	0.13	0.31	0.23	0.57	0.65	0.61	
Thailand	*FPEI*	0.57*			0.79			
	LTDEBT	-0.30*	0.13		0.65	0.57		0.45
	STDEBT	-0.26	0.07	0.46*	0.63	0.54	0.73	
Tunisia	*FPEI*	0.08			0.54			
	LTDEBT	-0.19	0.02		0.60	0.51		0.41
	STDEBT	-0.01	-0.31	0.33*	0.51	0.66	0.66	
Turkey	*FPEI*	0.56*			0.78			
	LTDEBT	0.79*	0.51*		0.89	0.76		0.59
	STDEBT	0.07	0.17	0.12	0.54	0.59	0.56	

Notes: *Overall* means over time and across countries (pooled) in case of correlations; and over time (only) in case of principal components. *All* refers to the groups of the entire (country-components for *overall* and components for each country) series. Superscript asterisk (*) indicates statistical difference from zero at 10% level. First principal components are the percentage proportions of total variance explained by the first principal components (i.e. factors common to all variables in a set of time series) which are the unit-length linear combinations of the original variables with maximum variance. *0.21*[a] is the first principal component variance proportion across country STDEBT series. Included observations are automatically adjusted for missing values.

5.8 VOLUME, VOLATILITY AND SUDDEN STOP NEXUS

Broadly defined as swift decline, reversal or crunch in capital flows; *sudden stop* is a crucial phenomenon in several research efforts for understanding the mechanism of financial crises, evaluating the benefits and harms of economic integration and liberalization and assessing pros and cons of capital controls. Sudden stop is also intimately linked to the concept of capital flow volatility. Indeed, Jeanne and Rancière (2011) use these terms interchangeably. By quantifying the subject matter of sudden stop we test the final hypotheses of conventional wisdom and trade-off model ($H4$ and $H8$, respectively). We also investigate if there is a close association between capital flow volatility and sudden stop.

The sudden stop frequencies are provided in Table 5.6. In the context of this investigation, a decrease in a certain type of foreign financing of at least 25% from the previous year is identified as an incidence of sudden stop.[60] Frequency, then, becomes the number of such measured sudden stops in the capital flow component under consideration during the corresponding time period.[61]

In general conformity with the analytical cases of volatility, persistence, predictability and comovement above, it is possible to make an ordinal ranking among the funding series upon the inspection of the relative frequencies in the table. This ranking runs from FDI, FPEI and LTDEBT to STDEBT in terms of being less to more prone to sudden stops. For all the periods, a debt-equity differentiation is distinguishable, as expected by the eighth hypothesis, that sudden stop occurrences of debt flows surpass those of equity investments. These results are largely similar to Levchenko and Mauro (2007) and Sarno and Taylor (1999a, 1999b): FDI is least reversible while some debt flows (bond and official flows) appear quite reversible. Being greater than 0.85 in all cases of *totals*, the ratio of sudden stops in long-term debt to sudden stops in short-term debt shows that the former could hardly be labelled as stable cold money. However, FDI and LTDEBT exhibit fewer sudden stops than STDEBT and FPEI, confirming the last conventional hypothesis (i.e. $H4$).

[60] Similar and alternative definitions could be found in Bordo *et al.* (2010), Cavallo and Frankel (2008), Honig (2008), Hutchinson and Noy (2006).

[61] Of the similar nature, frequency of sign changes in capital flows are given in Table 6.4 in Lipsey (1999) and the number of sudden stops presented in the first tables in Honig (2008), Hutchinson and Noy (2006) and in Figure 1 of Cavallo and Frankel (2008).

Table 5.6: Frequency of Sudden Stops

Country	Series	1975-2006		1975-1995		1996-2006		1994-2002	
		Obs.	*Freq.*	*Obs.*	*Freq.*	*Obs.*	*Freq.*	*Obs.*	*Freq.*
Totals	***FDI***	247	68	115	34	132	34	106	31
	FPEI	247	108	115	44	132	64	106	57
	LTDEBT	247	135	115	61	132	74	106	58
	STDEBT	247	150	115	70	132	80	106	65
Brazil	*FDI*	28	8	17	5	11	3	9	2
	FPEI	28	9	17	6	11	3	9	3
	LTDEBT	28	17	17	11	11	6	9	5
	STDEBT	28	14	17	7	11	7	9	5
Bulgaria	*FDI*	11	0	n/a	n/a	11	0	7	0
	FPEI	11	5	n/a	n/a	11	5	7	3
	LTDEBT	11	6	n/a	n/a	11	6	7	5
	STDEBT	11	5	n/a	n/a	11	5	7	4
Chile	*FDI*	18	3	7	1	11	2	9	2
	FPEI	18	9	7	2	11	7	9	5
	LTDEBT	18	7	7	3	11	4	9	3
	STDEBT	18	14	7	5	11	9	9	7
India	*FDI*	16	3	5	1	11	2	9	1
	FPEI	16	5	5	1	11	4	9	5
	LTDEBT	16	10	5	3	11	7	9	6
	STDEBT	16	9	5	3	11	6	9	5
Mauritius	*FDI*	13	4	2	0	11	4	9	3
	FPEI	13	5	2	0	11	5	9	4
	LTDEBT	13	6	2	0	11	6	9	6
	STDEBT	13	7	2	1	11	6	9	4
Mexico	*FDI*	18	2	7	0	11	2	9	1
	FPEI	18	9	7	3	11	6	9	7
	LTDEBT	18	12	7	4	11	8	9	5
	STDEBT	18	9	7	5	11	4	9	3
Morocco	*FDI*	14	6	3	1	11	5	9	5
	FPEI	14	8	3	1	11	7	9	5
	LTDEBT	14	9	3	3	11	6	9	5
	STDEBT	14	11	3	2	11	9	9	8
Pakistan	*FDI*	23	4	12	0	11	4	9	3
	FPEI	23	12	12	5	11	7	9	6
	LTDEBT	23	8	12	4	11	4	9	4
	STDEBT	23	13	12	6	11	7	9	6
Senegal	*FDI*	29	20	18	14	11	6	9	6
	FPEI	29	16	18	10	11	6	9	5
	LTDEBT	29	21	18	10	11	11	9	8
	STDEBT	29	20	18	13	11	7	9	6
Thailand	*FDI*	32	7	21	5	11	2	9	3
	FPEI	32	13	21	9	11	4	9	5
	LTDEBT	32	13	21	8	11	5	9	2
	STDEBT	32	17	21	10	11	7	9	4
Tunisia	*FDI*	27	9	16	6	11	3	9	4
	FPEI	27	9	16	6	11	3	9	3
	LTDEBT	27	16	16	10	11	6	9	4
	STDEBT	27	19	16	12	11	7	9	6

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Table 5.6 *(continued)*

Country	Series	1975-2006		1975-1995		1996-2006		1994-2002	
		Obs.	*Freq.*	*Obs.*	*Freq.*	*Obs.*	*Freq.*	*Obs.*	*Freq.*
Turkey	*FDI*	18	2	7	1	11	1	9	1
	FPEI	18	8	7	1	11	7	9	6
	LTDEBT	18	10	7	5	11	5	9	5
	STDEBT	18	12	7	6	11	6	9	7

Notes: Sudden stop is defined as abrupt cessation, drop or reversal of capital flows. Quantitatively, a decrease in a certain type of foreign financing of at least 25% from the previous year is identified as an incidence of sudden stop. *Frequency (Freq.)* is the number of sudden stops in the capital flow component under consideration during the corresponding time period. Individual country observations (obs.) are adjusted to ensure comparability across components and within countries.

The most striking feature of the exclusive sub-period 1994-2002 (which is supposed to be the depression covering period as it includes 1994-95 Mexican crisis, 1997 East Asian crisis, 1998 Russian crisis, 1999 Brazilian crisis, 1994 and 2001 Turkish crises, and 2002 Argentine crisis) is that equity capital investments, particularly portfolio equity, deteriorates during such distressed episodes. Bearing in mind that country level and regional implications should be taken with caution as the sampling coverage is not spatially exhaustive, we notice that as an individual country Senegal suffers most from the sudden stops whereas Bulgaria scores lowest. Regionally speaking, Developing Asia, Latin America and Caribbean and Middle East and North Africa lie in the middle, while Sub Saharan Africa and Europe and Central Asia are the opposite extremes.

As noted, many writers treat capital flow volatility and sudden stop as synonymous, e.g. Jeanne and Rancière (2011), Jeanne and Korinek (2010), Calvo *et al*. (2008), Caballero (2003). Via pooled ordinary probit regressions we analyze the interrelationship between sudden stop probabilities and capital flow volatilities given the volumes of capital flows (i.e. controlling for the per capita real levels). It is hypothesized that the probability of sudden stop in an external funding component is positively (negatively) related to the volatility (volume) of that component.

The results from estimations of the variants of Equation (1) are in Table 5.7.[62] Under each specification, dependent variable is a binary indicator for the corresponding capital flow component designating whether the outcome is a sudden stop in that component during the matching year. Volume refers to per capita real unfiltered forms of the series and volatility stands for 3-year rolling standard deviations of the cyclical components of HP-filtered series.

[62] Related marginal effects and elasticities are relegated to the appendix.

Table 5.7: Pooled Ordinary Probit Estimations of Sudden Stops (Annual Panel Data, 1976-2006)

	FDI (1)	FDI (2)	FPEI (1)	FPEI (2)	LTDEBT (1)	LTDEBT (2)	STDEBT (1)	STDEBT (2)
FDI Volume	-0.00842***	-0.00636**		0.00147		-0.00145		-0.00173
	(0.0029)	(0.0029)		(0.0013)		(0.0019)		(0.0015)
FDI Volatility	0.01369**	0.01599**		-0.00795		0.01353*		0.00572
	(0.0065)	(0.0075)		(0.0056)		(0.0070)		(0.0050)
FPEI Volume		-0.01021	-0.03571***	-0.03701***		0.00216		-0.00508
		(0.0107)	(0.0086)	(0.0092)		(0.0055)		(0.0052)
FPEI Volatility		-0.03093*	0.03512***	0.03221**		0.00325		0.01028
		(0.0185)	(0.0113)	(0.0140)		(0.0131)		(0.0133)
LTDEBT Volume		-0.00087		-0.00024	-0.00825***	-0.01077***		0.00050
		(0.0022)		(0.0015)	(0.0020)	(0.0025)		(0.0014)
LTDEBT Volatility		0.00025		0.00305	0.00987***	0.01224***		-0.00676*
		(0.0051)		(0.0040)	(0.0037)	(0.0047)		(0.0039)
STDEBT Volume		-0.00082		0.00103		-0.00021	-0.00463***	-0.00461***
		(0.0015)		(0.0009)		(0.0013)	(0.0015)	(0.0016)
STDEBT Volatility		-0.00003		-0.00093		-0.00534***	0.00554**	0.00609**
		(0.0020)		(0.0013)		(0.0014)	(0.0024)	(0.0027)
Observations	228	228	228	228	228	228	228	228
Countries	12	12	12	12	12	12	12	12
Pseudo R^2	0.232	0.269	0.180	0.192	0.191	0.242	0.118	0.133

Notes: Under each specification, dependent variable is a binary indicator for the corresponding capital flow component designating whether the outcome is a sudden stop in that component during the matching year. *Volume* refers to original (unfiltered) per capita real capital flow series and *volatility* refers to 3-year rolling standard deviations of the cyclical components of HP-filtered series. Unreported constant and time dummies (period fixed effects) are included in all regressions. Heteroscedasticity robust Huber/White/sandwich type standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$ denote significance at 10%, 5%, and 1% respectively. See notes to Table 5.6 as well.

There are two columns per component reporting the estimates derived from two different model specifications. The first controls for own volume and volatility and the second includes volumes and volatilities of the other components as well to allow for potential cross linkages. The results under all these specifications suggest that, for any type of international financing, volatility exacerbates the likelihood of a sudden stop whereas volume mitigates it. The inverse relationship implies that the more uncertainty muffles the realization and prospect of a flow component the more likely is that the inflow of that component will experience an abrupt cessation. Conversely, sudden stop probability reducing impact of the volume reveals the fact that as the investors and creditors enlarge their exposure by increasing asset purchases and lending they become automatically more committed to a certain market destination which makes them more unlikely to retreat from that market all of a sudden. These robust findings attest to the critical role played by stably increased inflow of foreign funding in avoiding or at least alleviating financial crashes. Some cross linkages manifested by respective significant parameters (FPEI volatility under FDI (2), STDEBT volatility under LTDEBT (2) and vice versa) indicate the prevalence of a sort of checks and balances mechanism across capital flow components.

5.9 CONCLUSION

The conventional wisdom and the predictions of the information-based trade-off model of Goldstein and Razin (2006) are comparatively investigated with reference to behavioural aspects of four major components of capital flows. Using annual time series data for the period 1970-2006 for twelve emerging market economies from five regions, we analyze volatility, persistence, predictability, correlation, comovement (or contagion risk) and sudden stop (reversibility) patterns of foreign direct investment (FDI), foreign portfolio equity investment (FPEI), long-term debt flows (LTDEBT) and short-term debt flows (STDEBT) through appropriate statistical and econometric techniques.

We show that, besides a maturity oriented (i.e. long-term–short-term) polarity, a structural (i.e. equity–debt) dichotomy is noticeable in that equity flows (FDI and FPEI) are less volatile, more persistent, more predictable and less susceptible to sudden stops than debt flows (LTDEBT and STDEBT). Conventional perception that short-term financial flows (STDEBT and FPEI) are more volatile than long-term financial flows (LTDEBT and FDI) is not supported in our data. Nonetheless, there is evidence that correlations and risks of contagion are stronger within the pairs of long-term capital flows (FDI and LTDEBT) and

equity flows (FDI and FPEI) than within the short-term capital flows (FPEI and STDEBT) and debt flows (LTDEBT and STDEBT) pairs.[63] Thus, our findings lend support to all of the hypotheses from the information-based trade-off model. They are also consistent with the majority of the hypotheses from the conventional theory. Finally, we confirm that all funding components reveal some permanence, as conjectured by Bacchetta and van Wincoop (2000).

Considering the results for the individual hypotheses, it is concluded that the conventional claim in the first hypothesis—that the long-term capital flows are less volatile than the short-term capital flows—is empirically vague. The information-based trade-off model version of this hypothesis (i.e. the fifth hypothesis)—arguing that equity flows have lower volatility than debt flows—is plainly verified. Process modelling and forecasting results demonstrate that there is both maturity and structure distinction among the flow components in terms of persistence and predictability, backing the second and the sixth hypothesis. Furthermore, the correlation and comovement hypotheses (that long-term flows are more strongly correlated and comoving than short-term flows, $H3$, and that debt (equity) flows are weakly (strongly) correlated and comoving, $H7$) are broadly confirmed. We provide the last, but not least, evidence on the reversibility profiles of global fund flows. The finding is that not only short-term funds are more susceptible to sudden stops than long-term funds (Hypothesis 4) but also is foreign lending more reversible than foreign equity (Hypothesis 8).

We return to comment on the questions posed in the introduction starting with the last one. It is shown that there are indeed systematic differences across funding components, countries and regions. The increase in equity-type of inflows is characterized to be part of a long-run trend (given that FDI and FPEI are detected to be more stable, persistent, predictable, comoving and less reversible) that offer greater diversification and better risk sharing opportunities not only for foreign financiers but also for domestic borrowers. Being less promising on these terms, debt flows seem to be rather short run phenomena that could reverse suddenly. These findings are in line with the continuous-time stochastic model of Obstfeld (1994) who proposes that an *ever-increasing* (i.e. strongly trended) international portfolio allocation is associated with the greater diversification—pooling portfolios intertemporally with global assets—which in turn leads to substantial risk reduction.

[63] A pecking order among individual components is also established (less strongly though) as FDI, FPEI, LTDEBT and STDEBT; where the order runs from the most persistent, comoving and irreversible to the least. Keeping the same equity-to-debt order: for predictability, components within the last pair, for volatility (ranking from least to most), those within the first pair interchange. The empirical observation that FPEI is less volatile than FDI contradicts the prediction of Goldstein and Razin (2006) for those particular components.

Sørensen *et al*. (2007) provide similar evidence. Our results also suggest that international investors are more likely to chase short-run capital gains and immediate yields on lending, whereas they take long horizon and show commitment in making portfolio equity and direct investments.

As empirically found, it is possible to see a 'debt versus equity' approach in the recent literature where (from an emerging market economy perspective) equity-like financing is viewed as more favourable than debt financing. Aghion *et al*. (2004) posit that debt flows are largely procyclical and, when excessive, they can magnify the adverse impacts of shocks on economic growth. Under the presence of default risk and financial constraints, high external leverage may lead to appreciations and fluctuations in the real exchange rate (i.e. the transfer problem) which in turn propel fluctuations in the price of the country-specific factor. Considerable liquidation and restructuring costs from large-scale bankruptcies that resulted from amplified volatility of firms' cash flows could destabilize the aggregate economy and eventually engender prolonged periods of slumps. They contend, on the other hand, that FDI (and equity capital that has informational advantages) characterized as a substitute for domestic investment (i.e. perfectly free and infinitely elastic) may well be regarded as a countercyclical source that ultimately stabilizes the economy. Moreover, in the absence of restrictions, foreign portfolio and direct equity financing provide a less costly alternative (Neumann, 2003) and offer better risk sharing opportunities (Stulz, 1999) by reducing the cost of capital (Henry, 2003) and the size of distortionary effects of the transfer problem (Lane and Milesi-Ferretti, 2004).

Foreign over-borrowing is more likely to give rise to a debt overhang problem both at firm (Myers, 1977) and country level (Krugman, 1988), either directly or indirectly through facilitating domestic over-lending. Firm level debt overhang that entails risk shifting reduces efficiency and results in underinvestment.[64] At the country level, Aguiar *et al*. (2009) show that, under the limited commitment and impatience of the government, sovereign debt overhang amplifies investment cycles and leads to instability of the aggregate income.[65] On the other hand, over-indebtedness is an integral element of a Fisherian debt-deflation cycle which is held responsible for generating financial and economic crises.[66] Among the three

[64] Shleifer and Vishny (1992), Manso (2008), Moyen (2007), Aivazian *et al*. (2005), Hennessy (2004).

[65] Although investment effect of the country level debt overhang is documented to be ambiguous, the actual service of the debt is found to crowd out investment. See Bulow and Rogoff (1990), Warner (1992), in particular, Cohen (1993).

[66] See Fisher (1933), McKinnon and Pill (1998), Schneider and Tornell (2004), Mendoza (2010).

factors that can make financial collapse possible, as Krugman (1999) highlights, two (high leverage and large foreign currency debt relative to exports) are obviously related to debt funding. Empirically supporting this critique, Frankel and Wei (2005) indicate that while the ratio of short-term debt to international reserves increases the probability of a crash, combined with inflation within their regression tree analysis, a high ratio of external debt to GDP would also place a country in jeopardy.

From the equity funding side, however, again Frankel and Wei (2005) show that the ratio of FDI and portfolio equity to gross foreign liabilities decreases the chance of a crisis. Besides bringing positive externalities of financial globalization such as managerial and technological expertise, foreign equity investments are estimated to induce investment and boost economic growth (Kose *et al*., 2009). Finally, Allen (2001) argues that the buffer role of equity capital might mitigate the detrimental effects of possible future debt overhang and agency problems and attenuate the probability of deadweight costs creating bankruptcies.

In the light of these arguments and mindful of some negative features (identified above) of global equity flows, as being inclined to contagion and speculation, we suggest that emerging market countries—while wisely and vigilantly managing debt financing—should prioritize equity financing.[67]

[67] For identical recommendations please refer to Eichengreen (2000), Cardoso and Dornbusch (1989).

APPENDIX 5.1: UNIT ROOT TEST RESULTS

Table A5.1: Unit Root Tests for Country FDI Series

Test Type	Stat.	Test Type	Stat.	Test Type	Stat.	Test Type	Stat.
Brazil		***Bulgaria***		***Chile***		***India***	
$ADF_L^{\tau}(2)$	-3.23$^{\#}$	$ADF_L^{\tau}(2)$	3.78	$ADF_L^{\tau}(0)$	-3.27$^{\#}$	$ADF_L^{\tau}(8)$	2.84
$ADF_{FD}^{\mu}(2)$	-3.54$^{\blacklozenge}$	$ADF_{SD}^{\tau}(1)$	-4.99*	$ADF_{FD}^{\mu}(0)$	-7.74*	$ADF_{SD}^{\mu}(9)$	-3.51$^{\blacklozenge}$
$PP_L^{\tau}(2)$	-2.11	$PP_L^{\tau}(11)$	10.69	$PP_L^{\tau}(0)$	-3.27$^{\#}$	$PP_L^{\tau}(10)$	4.10
$PP_{FD}^{\mu}(2)$	-4.93*	$PP_{SD}^{\tau}(13)$	-5.12*	$PP_{FD}^{\mu}(5)$	-8.36*	$PP_{SD}^{\mu}(7)$	-4.48*
$KPSS_L^{\tau}(4)$	0.10	$KPSS_L^{\tau}(2)$	0.16$^{\blacklozenge}$	$KPSS_L^{\tau}(3)$	0.12	$KPSS_L^{\tau}(4)$	0.22*
$KPSS_{FD}^{\mu}(0)$	0.09	$KPSS_{SD}^{\mu}(8)$	0.38$^{\#}$	$KPSS_{FD}^{\mu}(6)$	0.14	$KPSS_{SD}^{\mu}(3)$	0.29
Mauritius		***Mexico***		***Morocco***		***Pakistan***	
$ADF_L^{\tau}(9)$	-2.31	$ADF_L^{\tau}(0)$	-3.16	$ADF_L^{\tau}(7)$	-7.39*	$ADF_L^{\tau}(1)$	0.21
$ADF_{FD}^{\mu}(8)$	-6.46*	$ADF_{FD}^{\mu}(1)$	-7.05*	$ADF_{FD}^{\mu}(7)$	-5.89*	$ADF_{SD}^{\mu}(0)$	-6.96*
$PP_L^{\tau}(0)$	-6.88*	$PP_L^{\tau}(3)$	-3.12	$PP_L^{\tau}(4)$	-3.27$^{\#}$	$PP_L^{\tau}(2)$	0.37
$PP_{FD}^{\mu}(2)$	-13.32*	$PP_{FD}^{\mu}(2)$	-7.81*	$PP_{FD}^{\mu}(4)$	-9.36*	$PP_{SD}^{\mu}(1)$	-6.96*
$KPSS_L^{\tau}(0)$	0.03	$KPSS_L^{\tau}(4)$	0.15$^{\blacklozenge}$	$KPSS_L^{\tau}(4)$	0.11	$KPSS_L^{\tau}(1)$	0.13$^{\#}$
$KPSS_{FD}^{\mu}(2)$	0.06	$KPSS_{FD}^{\mu}(1)$	0.05	$KPSS_{FD}^{\mu}(3)$	0.29	$KPSS_{SD}^{\mu}(1)$	0.24
Senegal		***Thailand***		***Tunisia***		***Turkey***	
$ADF_L^{\mu}(0)$	-4.82*	$ADF_L^{\tau}(0)$	-2.92	$ADF_L^{\tau}(0)$	-1.52	$ADF_L^{\tau}(0)$	5.04
$ADF_{FD}^{\mu}(0)$	-9.53*	$ADF_{FD}^{\mu}(0)$	-6.16*	$ADF_{FD}^{\mu}(0)$	-3.80*	$ADF_{SD}^{\mu}(0)$	-6.61*
$PP_L^{\mu}(1)$	-4.81*	$PP_L^{\tau}(3)$	-2.94	$PP_L^{\tau}(3)$	-1.39	$PP_L^{\tau}(9)$	7.19
$PP_{FD}^{\mu}(1)$	-9.83*	$PP_{FD}^{\mu}(6)$	-7.42*	$PP_{FD}^{\mu}(6)$	-3.17$^{\blacklozenge}$	$PP_{SD}^{\mu}(1)$	-6.59*
$KPSS_L^{\mu}(2)$	0.17	$KPSS_L^{\tau}(2)$	0.15$^{\blacklozenge}$	$KPSS_L^{\tau}(1)$	0.15$^{\blacklozenge}$	$KPSS_L^{\tau}(2)$	0.17$^{\blacklozenge}$
$KPSS_{FD}^{\mu}(2)$	0.04	$KPSS_{FD}^{\mu}(6)$	0.30	$KPSS_{FD}^{\mu}(7)$	0.31	$KPSS_{SD}^{\mu}(2)$	0.31

Notes: Augmented Dickey-Fuller (ADF, 1979), Phillips-Perron (PP, 1988), Kwiatkowski, Phillips, Schmidt, and Shin (KPSS, 1992) are the alternative tools for testing a series (or the first or second difference of the series) for the presence of a unit root. Superscripts τ and μ indicate whether a time trend as well as a constant term or just a constant term are included in the test specification. Subscripts L, FD, and SD denote level, first difference, and second difference respectively. Numbers in parentheses are either lags automatically selected according to Schwarz information criterion (SIC) under ADF or default Newey-West bandwidths along with Bartlett kernel as spectral estimation method under PP and KPSS. Symbols on the top right of some test statistics $^{\#}$, $^{\blacklozenge}$, and * signify rejection of the relevant null hypothesis at 10%, 5%, and 1% levels respectively.

Table A5.2: Unit Root Tests for Country FPEI Series

Test Type	Stat.	Test Type	Stat.	Test Type	Stat.	Test Type	Stat.
Brazil		***Bulgaria***		***Chile***		***India***	
$ADF_L^{\tau}(0)$	-3.01	$ADF_L^{\mu}(0)$	-2.35	$ADF_L^{\mu}(0)$	-3.56$^{\blacklozenge}$	$ADF_L^{\tau}(0)$	-2.61
$ADF_{FD}^{\mu}(1)$	-5.56*	$ADF_{FD}^{\mu}(0)$	-4.08$^{\blacklozenge}$	$ADF_{FD}^{\mu}(0)$	-5.69*	$ADF_{FD}^{\mu}(0)$	-5.51*
$PP_L^{\tau}(2)$	-2.97	$PP_L^{\mu}(1)$	-2.36	$PP_L^{\mu}(1)$	-3.57$^{\blacklozenge}$	$PP_L^{\tau}(1)$	-2.60
$PP_{FD}^{\mu}(12)$	-9.95*	$PP_{FD}^{\mu}(1)$	-4.09$^{\blacklozenge}$	$PP_{FD}^{\mu}(1)$	-5.82*	$PP_{FD}^{\mu}(2)$	-5.66*
$KPSS_L^{\tau}(3)$	0.08	$KPSS_L^{\mu}(1)$	0.25	$KPSS_L^{\mu}(1)$	0.14	$KPSS_L^{\tau}(2)$	0.11
$KPSS_{FD}^{\mu}(3)$	0.07	$KPSS_{FD}^{\mu}(1)$	0.09	$KPSS_{FD}^{\mu}(1)$	0.07	$KPSS_{FD}^{\mu}(3)$	0.11
Mauritius		***Mexico***		***Morocco***		***Pakistan***	
$ADF_L^{\mu}(1)$	-2.87$^{\#}$	$ADF_L^{\tau}(0)$	-3.50$^{\#}$	$ADF_L^{\mu}(1)$	-3.27$^{\blacklozenge}$	$ADF_L^{\mu}(0)$	-3.69$^{\blacklozenge}$
$ADF_{FD}^{\mu}(0)$	-2.32	$ADF_{FD}^{\mu}(1)$	-3.80$^{\blacklozenge}$	$ADF_{FD}^{\mu}(1)$	-2.91$^{\#}$	$ADF_{FD}^{\mu}(0)$	-7.76*
$PP_L^{\mu}(1)$	-1.70	$PP_L^{\tau}(1)$	-3.49$^{\#}$	$PP_L^{\mu}(9)$	-3.35$^{\blacklozenge}$	$PP_L^{\mu}(1)$	-3.67$^{\blacklozenge}$
$PP_{FD}^{\mu}(1)$	-2.34	$PP_{FD}^{\mu}(2)$	-5.78*	$PP_{FD}^{\mu}(10)$	-7.08*	$PP_{FD}^{\mu}(3)$	-8.29*
$KPSS_L^{\mu}(1)$	0.13	$KPSS_L^{\tau}(0)$	0.09	$KPSS_L^{\mu}(1)$	0.09	$KPSS_L^{\mu}(2)$	0.12
$KPSS_{FD}^{\mu}(0)$	0.15	$KPSS_{FD}^{\mu}(4)$	0.14	$KPSS_{FD}^{\mu}(1)$	0.13	$KPSS_{FD}^{\mu}(5)$	0.15
Senegal		***Thailand***		***Tunisia***		***Turkey***	
$ADF_L^{\tau}(0)$	-5.17*	$ADF_L^{\tau}(0)$	-5.21*	$ADF_L^{\tau}(1)$	-1.87	$ADF_L^{\tau}(0)$	-2.90
$ADF_{FD}^{\mu}(1)$	-7.41*	$ADF_{FD}^{\mu}(0)$	-10.99*	$ADF_{FD}^{\mu}(0)$	-7.97*	$ADF_{FD}^{\mu}(0)$	-5.60*
$PP_L^{\tau}(2)$	-5.24*	$PP_L^{\tau}(3)$	-5.21*	$PP_L^{\tau}(2)$	-3.46$^{\#}$	$PP_L^{\tau}(0)$	-2.90
$PP_{FD}^{\mu}(5)$	-15.11*	$PP_{FD}^{\mu}(3)$	-11.78*	$PP_{FD}^{\mu}(0)$	-7.97*	$PP_{FD}^{\mu}(0)$	-5.60*
$KPSS_L^{\tau}(3)$	0.12$^{\#}$	$KPSS_L^{\tau}(4)$	0.06	$KPSS_L^{\tau}(2)$	0.13$^{\#}$	$KPSS_L^{\tau}(1)$	0.14$^{\#}$
$KPSS_{FD}^{\mu}(3)$	0.07	$KPSS_{FD}^{\mu}(4)$	0.12	$KPSS_{FD}^{\mu}(3)$	0.08	$KPSS_{FD}^{\mu}(6)$	0.16

Notes: See notes to Table A5.1.

Table A5.3: Unit Root Tests for Country LTDEBT Series

Test Type	Stat.	Test Type	Stat.	Test Type	Stat.	Test Type	Stat.
Brazil		***Bulgaria***		***Chile***		***India***	
$ADF_L^{\tau}(0)$	-3.93$^{\blacklozenge}$	$ADF_L^{\tau}(0)$	-1.17	$ADF_L^{\mu}(0)$	-2.84$^{\#}$	$ADF_L^{\mu}(0)$	-2.14
$ADF_{FD}^{\mu}(0)$	-9.55*	$ADF_{FD}^{\mu}(0)$	-5.57*	$ADF_{FD}^{\mu}(0)$	-6.80*	$ADF_{FD}^{\mu}(0)$	-7.00*
$PP_L^{\tau}(3)$	-3.98$^{\blacklozenge}$	$PP_L^{\tau}(2)$	-1.22	$PP_L^{\mu}(0)$	-2.84$^{\#}$	$PP_L^{\mu}(2)$	-2.00
$PP_{FD}^{\mu}(0)$	-9.55*	$PP_{FD}^{\mu}(2)$	-5.56*	$PP_{FD}^{\mu}(4)$	-6.96*	$PP_{FD}^{\mu}(2)$	-7.02*
$KPSS_L^{\tau}(4)$	0.07	$KPSS_L^{\tau}(3)$	0.14$^{\#}$	$KPSS_L^{\mu}(3)$	0.13	$KPSS_L^{\mu}(4)$	0.19
$KPSS_{FD}^{\mu}(3)$	0.08	$KPSS_{FD}^{\mu}(2)$	0.21	$KPSS_{FD}^{\mu}(7)$	0.09	$KPSS_{FD}^{\mu}(2)$	0.18
Mauritius		***Mexico***		***Morocco***		***Pakistan***	
$ADF_L^{\tau}(0)$	-3.96$^{\blacklozenge}$	$ADF_L^{\tau}(0)$	-3.60$^{\blacklozenge}$	$ADF_L^{\tau}(3)$	-5.45*	$ADF_L^{\mu}(0)$	-3.76*
$ADF_{FD}^{\mu}(0)$	-9.01*	$ADF_{FD}^{\mu}(1)$	-6.13*	$ADF_{FD}^{\mu}(0)$	-10.7*	$ADF_{FD}^{\mu}(0)$	-8.19*
$PP_L^{\tau}(3)$	-3.95$^{\blacklozenge}$	$PP_L^{\tau}(1)$	-3.57$^{\blacklozenge}$	$PP_L^{\tau}(3)$	-3.61$^{\blacklozenge}$	$PP_L^{\mu}(1)$	-3.72*
$PP_{FD}^{\mu}(11)$	-12.39*	$PP_{FD}^{\mu}(9)$	-8.06*	$PP_{FD}^{\mu}(0)$	-10.7*	$PP_{FD}^{\mu}(10)$	-10.1*
$KPSS_L^{\tau}(2)$	0.13$^{\#}$	$KPSS_L^{\tau}(3)$	0.08	$KPSS_L^{\tau}(3)$	0.10	$KPSS_L^{\mu}(3)$	0.16
$KPSS_{FD}^{\mu}(2)$	0.07	$KPSS_{FD}^{\mu}(3)$	0.18	$KPSS_{FD}^{\mu}(6)$	0.14	$KPSS_{FD}^{\mu}(3)$	0.09
Senegal		***Thailand***		***Tunisia***		***Turkey***	
$ADF_L^{\tau}(0)$	-3.39$^{\#}$	$ADF_L^{\mu}(1)$	-3.09$^{\blacklozenge}$	$ADF_L^{\mu}(0)$	-3.20$^{\blacklozenge}$	$ADF_L^{\tau}(0)$	-2.07
$ADF_{FD}^{\mu}(1)$	-5.93*	$ADF_{FD}^{\mu}(0)$	-3.72*	$ADF_{FD}^{\mu}(0)$	-7.42*	$ADF_{FD}^{\mu}(0)$	-6.84*
$PP_L^{\tau}(1)$	-3.40$^{\#}$	$PP_L^{\mu}(0)$	-1.81	$PP_L^{\mu}(4)$	-3.11$^{\blacklozenge}$	$PP_L^{\tau}(2)$	-2.26
$PP_{FD}^{\mu}(1)$	-7.00*	$PP_{FD}^{\mu}(5)$	-3.54$^{\blacklozenge}$	$PP_{FD}^{\mu}(10)$	-8.78*	$PP_{FD}^{\mu}(3)$	-6.84*
$KPSS_L^{\tau}(3)$	0.11	$KPSS_L^{\mu}(4)$	0.15	$KPSS_L^{\mu}(2)$	0.11	$KPSS_L^{\tau}(2)$	0.12$^{\#}$
$KPSS_{FD}^{\mu}(3)$	0.11	$KPSS_{FD}^{\mu}(1)$	0.06	$KPSS_{FD}^{\mu}(2)$	0.08	$KPSS_{FD}^{\mu}(4)$	0.26

Notes: See notes to Table A5.1.

Table A5.4: Unit Root Tests for Country STDEBT Series

Test Type	Stat.	Test Type	Stat.	Test Type	Stat.	Test Type	Stat.
Brazil		***Bulgaria***		***Chile***		***India***	
$ADF_L^{\tau}(0)$	-4.54*	$ADF_L^{\tau}(0)$	-0.71	$ADF_L^{\mu}(0)$	-7.54*	$ADF_L^{\mu}(0)$	-1.61
$ADF_{FD}^{\mu}(0)$	-9.30*	$ADF_{FD}^{\mu}(0)$	-3.13$^{\blacklozenge}$	$ADF_{FD}^{\mu}(2)$	-6.65*	$ADF_{FD}^{\mu}(0)$	-5.71*
$PP_L^{\tau}(1)$	-4.52*	$PP_L^{\tau}(3)$	-0.39	$PP_L^{\mu}(5)$	-8.02*	$PP_L^{\mu}(0)$	-1.61
$PP_{FD}^{\mu}(6)$	-11.96*	$PP_{FD}^{\mu}(3)$	-3.05$^{\blacklozenge}$	$PP_{FD}^{\mu}(5)$	-19.7*	$PP_{FD}^{\mu}(2)$	-5.81*
$KPSS_L^{\tau}(2)$	0.06	$KPSS_L^{\tau}(1)$	0.15$^{\blacklozenge}$	$KPSS_L^{\mu}(13)$	0.21	$KPSS_L^{\mu}(2)$	0.18
$KPSS_{FD}^{\mu}(8)$	0.14	$KPSS_{FD}^{\mu}(3)$	0.31	$KPSS_{FD}^{\mu}(12)$	0.18	$KPSS_{FD}^{\mu}(5)$	0.32
Mauritius		***Mexico***		***Morocco***		***Pakistan***	
$ADF_L^{\tau}(0)$	-14.26*	$ADF_L^{\tau}(1)$	-4.28*	$ADF_L^{\mu}(0)$	-4.95*	$ADF_L^{\mu}(1)$	-5.40*
$ADF_{FD}^{\mu}(1)$	-8.09*	$ADF_{FD}^{\mu}(2)$	-5.11*	$ADF_{FD}^{\mu}(1)$	-5.74*	$ADF_{FD}^{\mu}(3)$	-6.02*
$PP_L^{\tau}(3)$	-12.03*	$PP_L^{\tau}(1)$	-3.52$^{\blacklozenge}$	$PP_L^{\mu}(2)$	-4.93*	$PP_L^{\mu}(6)$	-4.85*
$PP_{FD}^{\mu}(2)$	-33.86*	$PP_{FD}^{\mu}(1)$	-5.43*	$PP_{FD}^{\mu}(2)$	-9.37*	$PP_{FD}^{\mu}(6)$	-10.3*
$KPSS_L^{\tau}(1)$	0.08	$KPSS_L^{\tau}(3)$	0.05	$KPSS_L^{\mu}(1)$	0.12	$KPSS_L^{\mu}(4)$	0.27
$KPSS_{FD}^{\mu}(1)$	0.11	$KPSS_{FD}^{\mu}(3)$	0.05	$KPSS_{FD}^{\mu}(1)$	0.05	$KPSS_{FD}^{\mu}(4)$	0.09
Senegal		***Thailand***		***Tunisia***		***Turkey***	
$ADF_L^{\tau}(1)$	-6.14*	$ADF_L^{\mu}(0)$	-2.81$^{\#}$	$ADF_L^{\mu}(0)$	-5.54*	$ADF_L^{\mu}(0)$	-5.70*
$ADF_{FD}^{\mu}(2)$	-5.24*	$ADF_{FD}^{\mu}(0)$	-5.95*	$ADF_{FD}^{\mu}(5)$	-4.92*	$ADF_{FD}^{\mu}(1)$	-7.23*
$PP_L^{\tau}(4)$	-7.55*	$PP_L^{\mu}(0)$	-2.81$^{\#}$	$PP_L^{\mu}(5)$	-5.56*	$PP_L^{\mu}(1)$	-5.70*
$PP_{FD}^{\mu}(11)$	-17.62*	$PP_{FD}^{\mu}(4)$	-6.05*	$PP_{FD}^{\mu}(5)$	-13.6*	$PP_{FD}^{\mu}(1)$	-8.41*
$KPSS_L^{\tau}(2)$	0.09	$KPSS_L^{\mu}(3)$	0.08	$KPSS_L^{\mu}(5)$	0.24	$KPSS_L^{\mu}(3)$	0.08
$KPSS_{FD}^{\mu}(2)$	0.11	$KPSS_{FD}^{\mu}(5)$	0.07	$KPSS_{FD}^{\mu}(5)$	0.08	$KPSS_{FD}^{\mu}(3)$	0.05

Notes: See notes to Table A5.1.

APPENDIX 5.2: MARGINAL EFFECTS AND ELASTICITIES FOR POOLED ORDINARY PROBIT ESTIMATIONS

Table A5.5: Marginal Effects for Pooled Ordinary Probit Estimations of Sudden Stops (Annual Panel Data, 1976-2006)

	FDI (1)	**FDI (2)**	**FPEI (1)**	**FPEI (2)**	**LTDEBT (1)**	**LTDEBT (2)**	**STDEBT (1)**	**STDEBT (2)**
FDI	-0.00171***	-0.00112**		0.000584		-0.000579		-0.000654
Volume	(0.000489)	(0.000481)		(0.000527)		(0.000771)		(0.000561)
FDI	0.00278**	0.00280**		-0.00315		0.00539*		0.00216
Volatility	(0.00124)	(0.00141)		(0.00221)		(0.00278)		(0.00190)
FPEI		-0.00179	-0.0142***	-0.0147***		0.000860		-0.00192
Volume		(0.00187)	(0.00341)	(0.00364)		(0.00218)		(0.00198)
FPEI		-0.00542*	0.0139***	0.0128**		0.00129		0.00388
Volatility		(0.00320)	(0.00449)	(0.00557)		(0.00523)		(0.00504)
LTDEBT		-0.000153		-0.0000948	-0.00329***	-0.00429***		0.000190
Volume		(0.000375)		(0.000594)	(0.000812)	(0.000993)		(0.000544)
LTDEBT		0.0000437		0.00121	0.00393***	0.00488***		-0.00255*
Volatility		(0.000891)		(0.00159)	(0.00146)	(0.00187)		(0.00147)
STDEBT		-0.000143		0.000409		-0.0000833	-0.00175***	-0.00174***
Volume		(0.000260)		(0.000375)		(0.000516)	(0.000565)	(0.000593)
STDEBT		-0.00000553		-0.000369		-0.00213***	0.00209**	0.00230**
Volatility		(0.000351)		(0.000530)		(0.000577)	(0.000891)	(0.000989)
Observations	228	228	228	228	228	228	228	228
Countries	12	12	12	12	12	12	12	12

Notes: Marginal effect refers to instantaneous average partial response of the dependent variable to a unit change in the continuous explanatory variable in question. Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$ denote significance at 10%, 5%, and 1% respectively. Consult also notes to Tables 5.6 and 5.7.

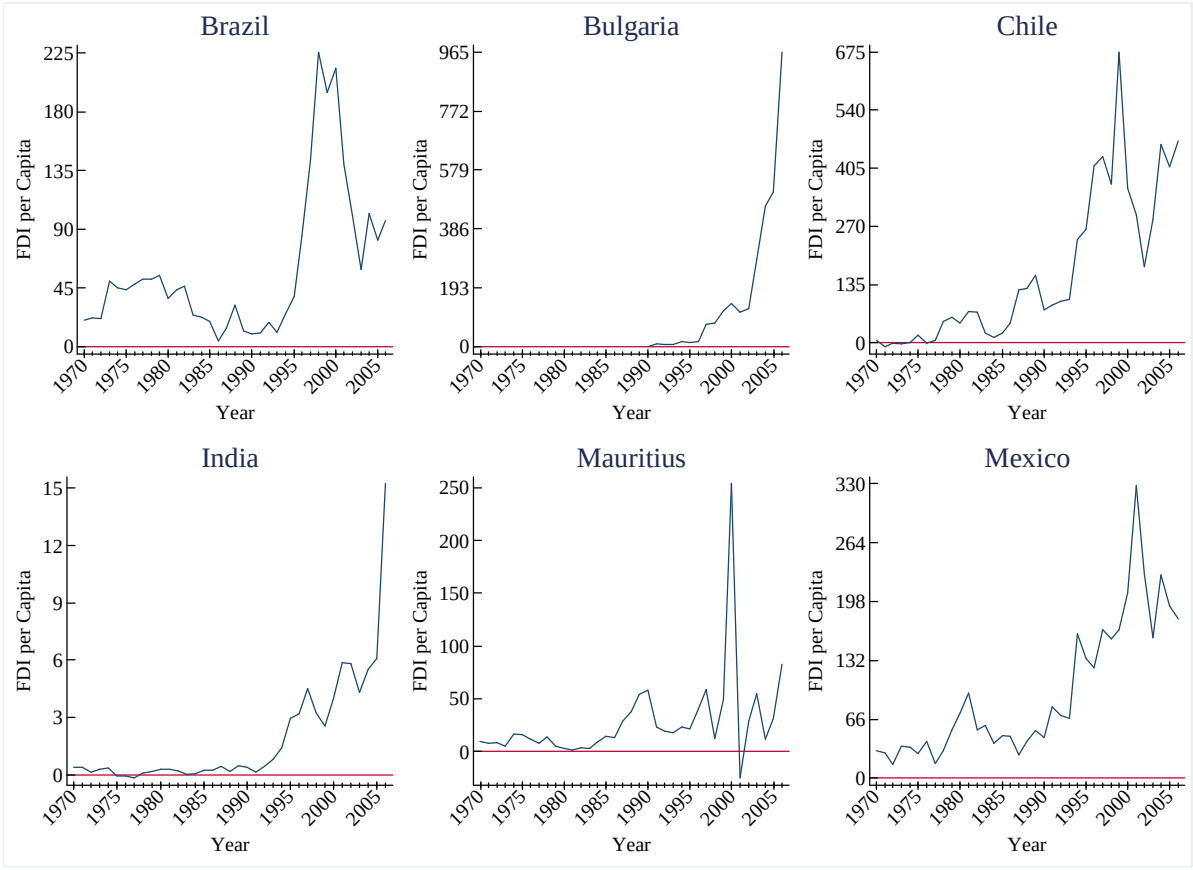
Table A5.6: Elasticities for Pooled Ordinary Probit Estimations of Sudden Stops (Annual Panel Data, 1976-2006)

	FDI (1)	FDI (2)	FPEI (1)	FPEI (2)	LTDEBT (1)	LTDEBT (2)	STDEBT (1)	STDEBT (2)
FDI Volume	-1.064***	-0.851**		0.0973		-0.0845		-0.0791
	(0.410)	(0.403)		(0.0883)		(0.112)		(0.0688)
FDI Volatility	0.481**	0.595**		-0.146		0.218*		0.0726
	(0.239)	(0.282)		(0.103)		(0.112)		(0.0644)
FPEI Volume		-0.229	-0.394***	-0.410***		0.0210		-0.0389
		(0.243)	(0.104)	(0.111)		(0.0530)		(0.0402)
FPEI Volatility		-0.551	0.309***	0.284**		0.0252		0.0626
		(0.337)	(0.0994)	(0.122)		(0.102)		(0.0815)
LTDEBT Volume		-0.0543		-0.00734	-0.225***	-0.291***		0.0107
		(0.135)		(0.0459)	(0.0562)	(0.0659)		(0.0306)
LTDEBT Volatility		0.0139		0.0840	0.242***	0.297***		-0.129*
		(0.284)		(0.111)	(0.0894)	(0.112)		(0.0741)
STDEBT Volume		-0.0301		0.0188		-0.00335	-0.0584***	-0.0582***
		(0.0552)		(0.0174)		(0.0208)	(0.0187)	(0.0197)
STDEBT Volatility		-0.00243		-0.0354		-0.179***	0.146**	0.160**
		(0.154)		(0.0509)		(0.0505)	(0.0614)	(0.0680)
Observations	228	228	228	228	228	228	228	228
Countries	12	12	12	12	12	12	12	12

Notes: Elasticity refers to instantaneous average proportional (percentage) response of the dependent variable to a 1 percent change in the continuous explanatory variable in question. Standard errors are in parentheses. * $p < 0.10$, ** $p < 0.05$, and *** $p < 0.01$ denote significance at 10%, 5%, and 1% respectively. Also see notes to Table A5.5.

APPENDIX 5.3: TIME SERIES PLOTS OF CAPITAL FLOW COMPONENTS

Figure A5.1: Foreign Direct Investment Time Series by Country (2005 $US, 1970-2006)



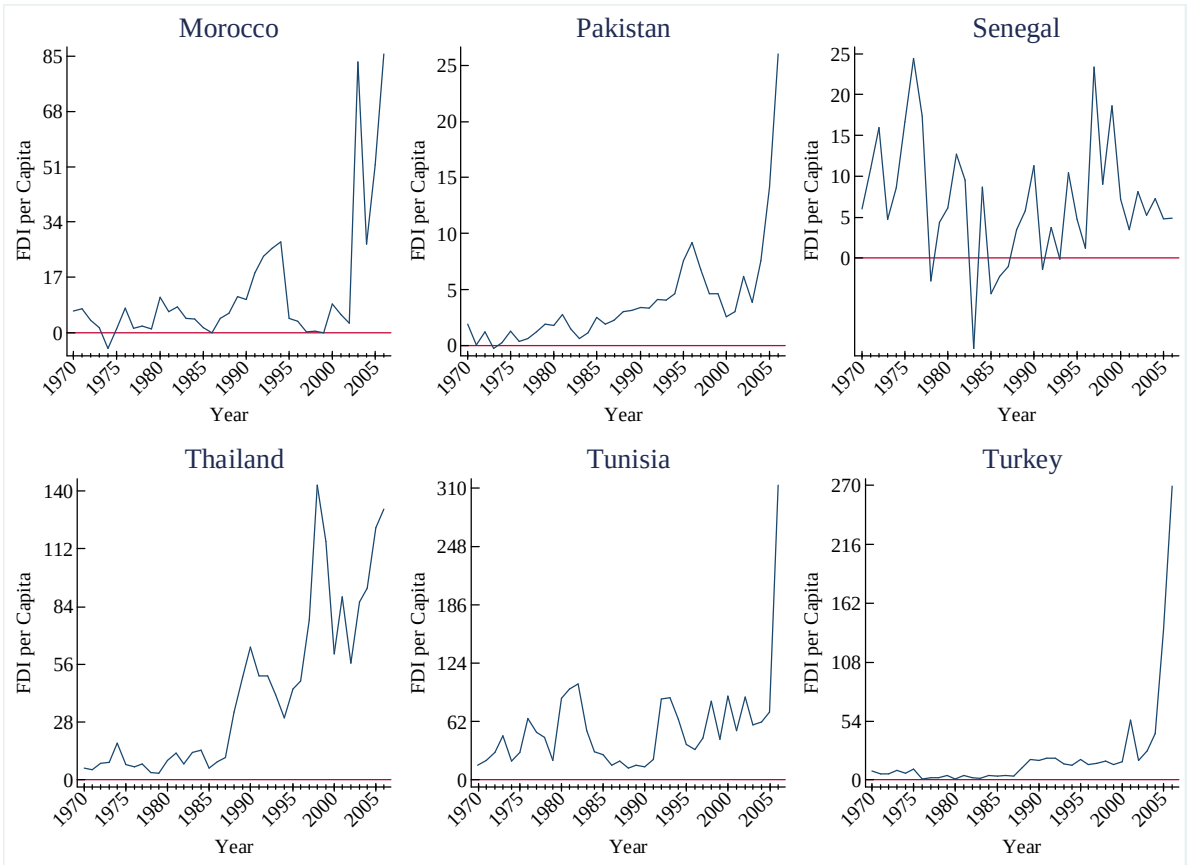


Figure A5.2: Portfolio Equity Flow Time Series by Country (2005 $US, 1970-2006)

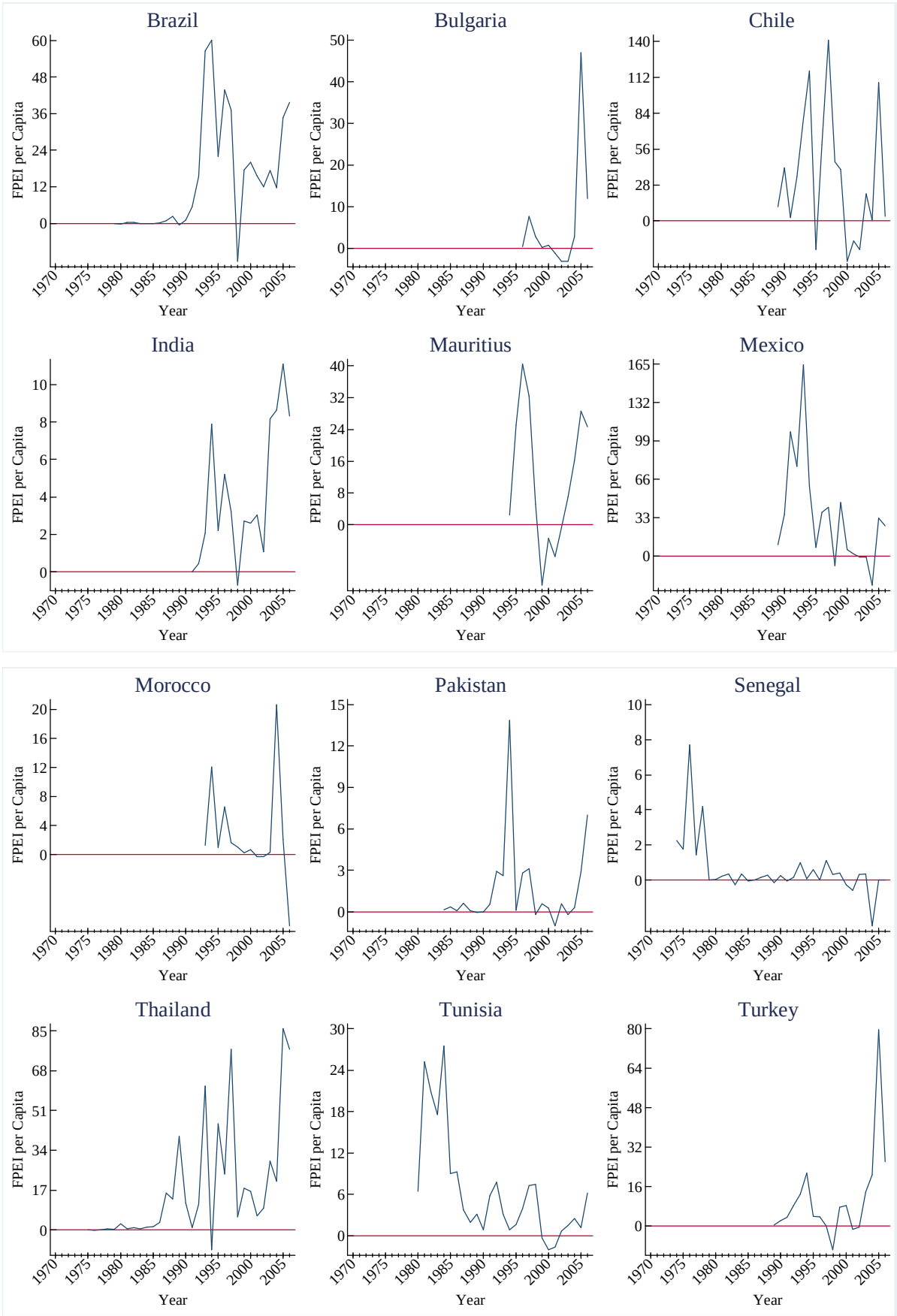


Figure A5.3: Long-term Debt Financing Time Series by Country (2005 $US, 1970-2006)

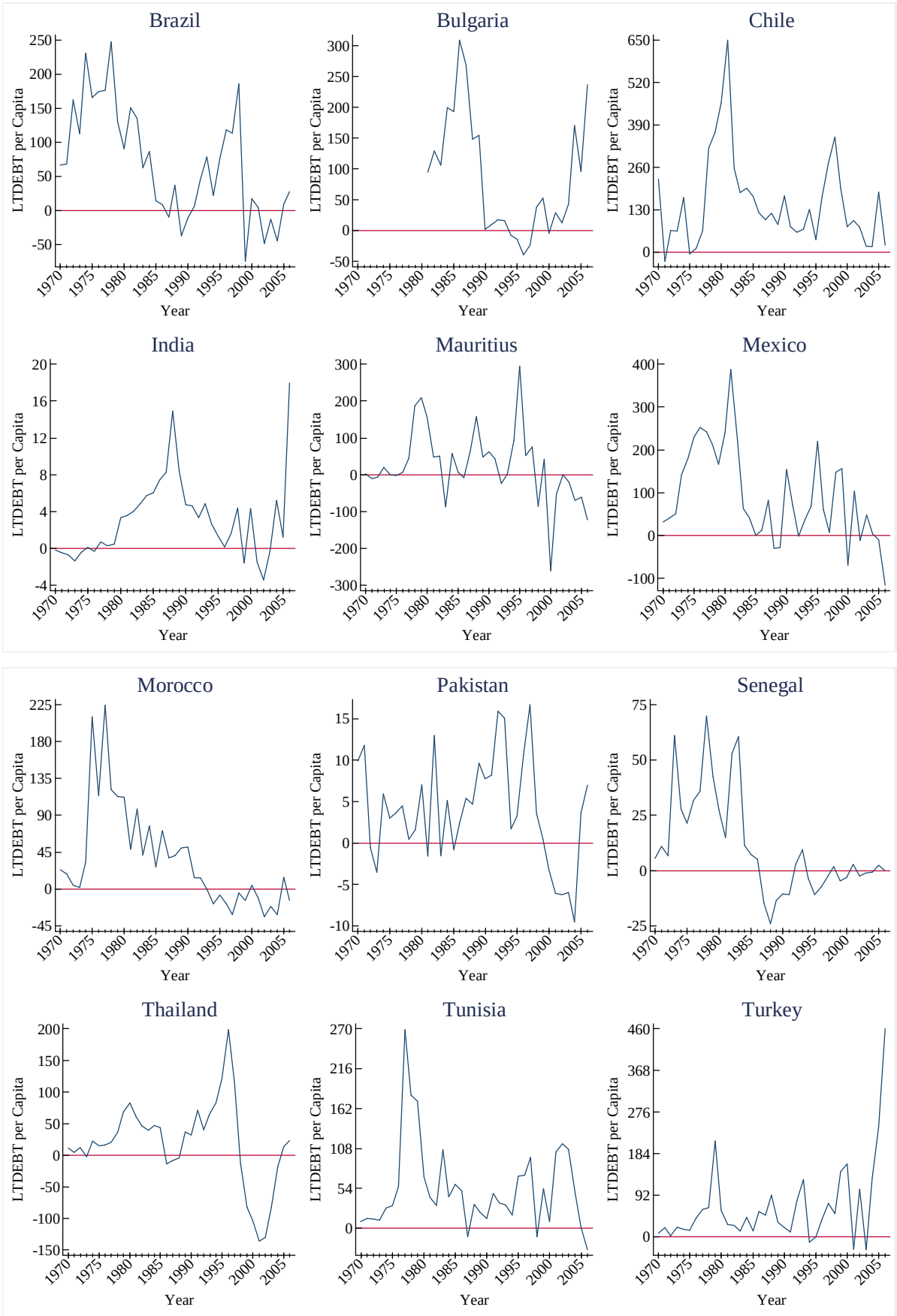


Figure A5.4: Short-term Debt Financing Time Series by Country (2005 $US, 1970-2006)

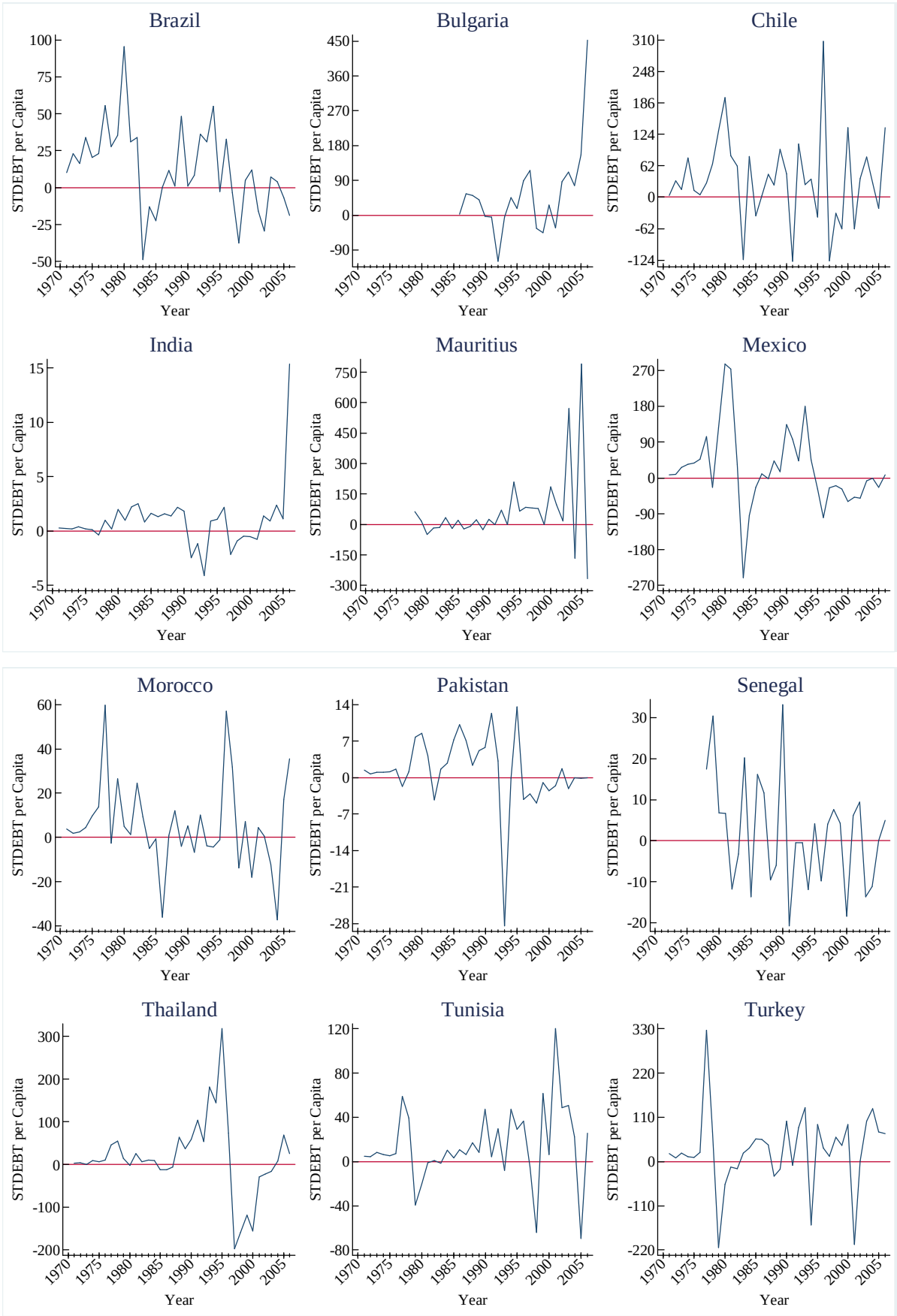
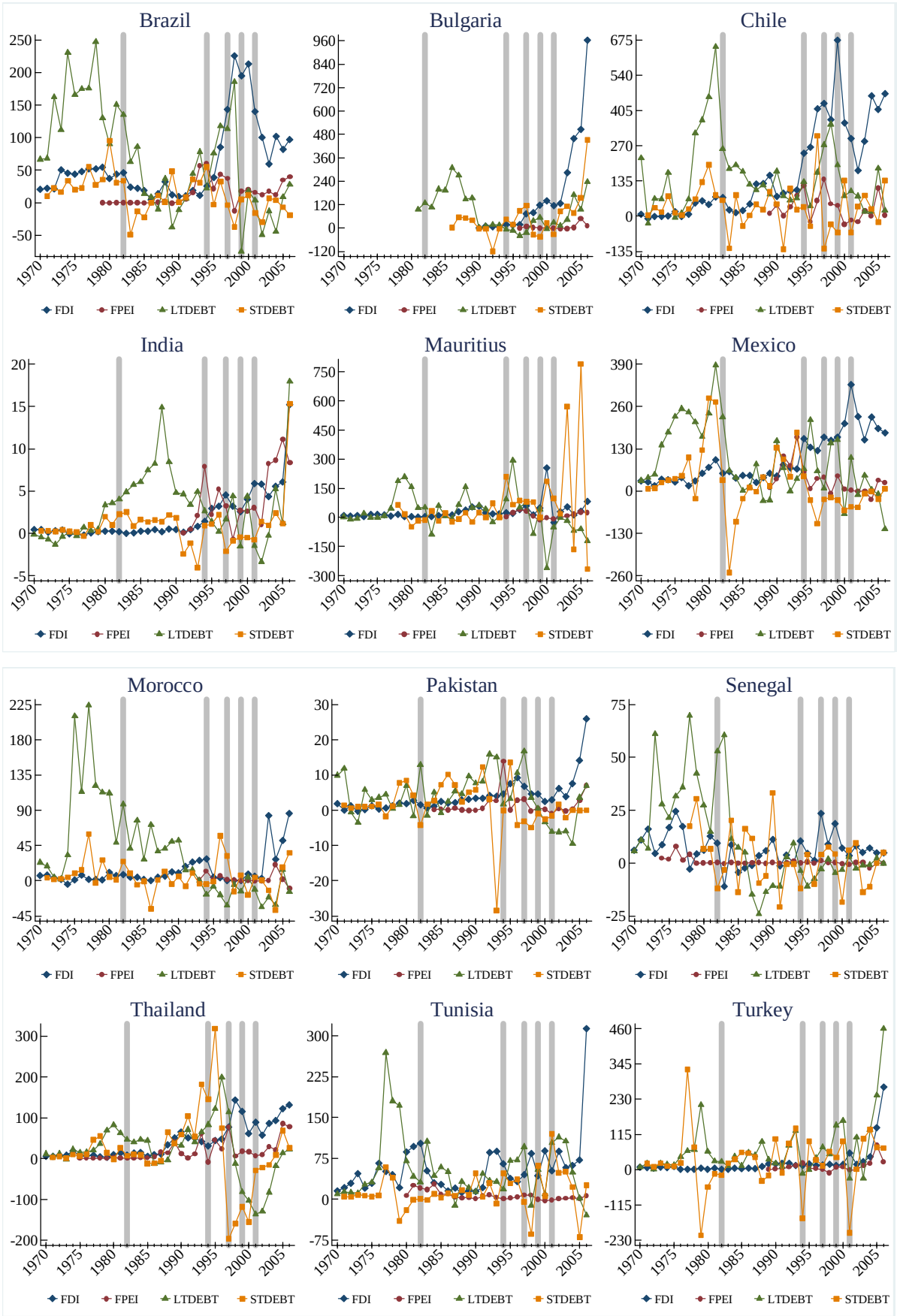


Figure A5.5: All Flow Components by Country (2005 $US per Capita, 1970-2006)



Notes: Vertical lines correspond to Latin American, Mexican, East Asian, Brazilian and Turkish financial crises.

CHAPTER 6

CONCLUSION

6.1 RECAP

The prime objective of the research in the thesis is to investigate the evidence for the Lucas Paradox. Standard economic theory suggests that international capital should flow in search of the highest returns. On the basis that developed countries are capital rich with considerable accrued investment, marginal returns should be relatively low. In contrast, returns should be relatively high in developing countries that are capital scarce with significant investment needs. This implies that international capital flows should favour developing, or lower income, countries relative to developed, high income, countries. However, observed flows are in the reverse direction, hence the Lucas paradox: why is it that capital tends to flow to richer rather than poorer countries?

Many reasons have been suggested to explain the paradox, but the prevailing broad hypothesis is that for considerations of security and reducing risk, capital is attracted to countries with better institutions, and higher income is associated with higher quality institutions. While this does help to explain why capital flows to high income developed countries, we show in Chapter 3 that *within* the set of developing countries the paradox persists: even when allowing for differences in the quality of institutions, capital flows to relatively richer developing countries. The determinants of flows within developing countries are explored in more depth in Chapter 4 but the paradox persists: certain institutions do appear especially important for certain types of capital, but in general differences in the quality of institutions do not explain why capital tends to flow to relatively higher income developing countries.

Another part of the explanation may lie in differences between types of capital. As detailed in Chapter 2, the thesis considers data on four major types of flow—foreign direct investment (FDI), foreign portfolio equity investment (FPEI), long-term debt flows (LTDEBT) and short-term debt flows (STDEBT)—for developing countries over the period 1970-2006. It is not unreasonable to expect that the determinants may differ for the different

types of flow. Most obviously, some such as FDI and LTDEBT are long-term whereas others, such as FPEI and STDEBT, are more transient. These issues are analyzed in Chapter 5 by categorising patterns of each type of flow in terms of trends over time and volatility.

The first section of this concluding chapter summarises the main findings to try and identify the factors that are likely to explain why poorer developing countries receive lower capital inflows, relative to less poor developing countries, than one be expected given potential returns. Section 6.2 addresses some of the limitations in the research, in particular constraints imposed by the limited availability of good data. Section 6.3 considers possibilities for future research building on the findings from the thesis.

6.2 SUMMARY AND IMPLICATIONS

The thesis begins the study of international capital flows to developing countries over the period 1970-2006 by reviewing the different measures and types of flow and discussing trends in levels, composition and direction over the period (Chapter 2). Chapters 3 and 4 investigate the problem of lower-than-expected capital flows to poorer countries (the Lucas paradox) in the *long-run* and in the *short-run*. In these chapters, total capital is measured as the sum of foreign direct investment and portfolio equity flows. Chapter 5 analyzes the patterns of four types of capital flow and tests hypotheses derived from conventional theory and the information-based trade-off model of Goldstein and Razin (2006).

Aggregating the data according to geographical regions and income groups of developing countries, it is shown that total net capital flows denominated in nominal US dollars, although exhibiting cyclical patterns, have increased dramatically during the last four decades. The first episode of this surge was during the 1970s when total debt inflows were the dominant aggregate component. After a decade of depression due to the Latin American debt crisis (that, as the name hints, severely reduced debt inflows), capital inflows, dominated this time by equity flows, resumed their expansion. This second surge was interrupted in 1997 for about 5 years as a result of the East Asian financial crisis and thereafter the third surge took place. Throughout this period, capital inflows expressed as a share of GDP have been even more cyclical and increased very little. The most remarkable observation is that lower income countries have always received less international capital than higher income countries in relative terms (i.e. less than predicted given their incomes). Having observed a potentially persistent wealth bias in foreign capital allocation even within developing economies,

Chapters 3 and 4 are devoted to the analysis of this anomaly—at least insofar as it is inconsistent with neoclassical predictions.

Chapter 3 examines if the findings of Alfaro *et al*. (2008) hold up if one restricts attention to only developing countries. Using cross-section data for the period 1970-2006 for up to 47 developing countries, we test if the Lucas paradox is resolved by including a measure for institutional quality when the sample excludes developed countries (that have consistently higher measures of institutional quality). As in Houthakker (1965), Baltagi and Griffin (1984), Pesaran and Smith (1995), we interpret the estimation results from cross-section OLS as capturing 'long-run' relationships. Our cross section estimates imply that the paradox remains in the long-run. Hence, the convergence-promoting role of capital flows in international consumption, wealth and development does not seem to be effective; over a period of almost four decades we observe divergence within developing countries.

Chapter 4 uses panel data of 5-year moving averages over 1980-2006 for the same set of countries, and we interpret the estimates as 'short-run' parameters. Employing a variety of static (including within-group fixed effects) and dynamic (system GMM) panel estimators we find that controlling for the quality of institutions still does not remove the Lucas paradox. Thus, the puzzle of rich-to-poor capital flows persists within our sample of developing economies also in the short-run. The explanation may be that returns are not actually higher in poor countries, or that there is little evidence to convince investors that they are higher. Nevertheless, our *intertemporal* (panel) estimations confirm the short-run divergence, with capital flowing to richer countries, prediction of Acemoglu and Zilibotti (1997).

Chapter 5 takes a component-based approach to capital flows and narrows the focus to a sample of 12 emerging market economies that receive the majority of the inflows destined to developing economies. We test hypotheses derived from both conventional theory, that predicts a *maturity*-related (short-term vs. long-term) differentiation among the characteristics of capital flow components, and the information-based trade-off model of Goldstein and Razin (2006), that predicts a *structure*-related (debt vs. equity) differentiation. The analysis distinguishes behavioural aspects of foreign direct investment (FDI), foreign portfolio equity investment (FPEI), long-term debt flows (LTDEBT) and short-term debt flows (STDEBT). Volatility, persistence, predictability, correlation, comovement (or contagion risk) and sudden stop (reversibility) profiles of these components are assessed using annual time series data. The assessments are mainly based on components that are paired according to maturity (i.e. long-term–short-term, under the conventional wisdom) and structure (i.e. equity–debt, under

the information-based trade-off model). It is shown that a structural distinction between capital flow components exists in addition to a maturity oriented distinction. More specifically, equity flows (FDI and FPEI) are found to be less volatile, more persistent, more predictable, more correlated, more contagious and less susceptible to sudden stops than debt flows (LTDEBT and STDEBT). The conventional view that long-term financial flows (LTDEBT and FDI) are more stable than short-term financial flows (STDEBT and FPEI) is not supported by the data; the former are at least as volatile as the latter. Consistent with the prognosis in Bacchetta and van Wincoop (2000), all funding components are detected to have some persistence.

One implication is that emerging markets should not only borrow at long maturities (or negotiate to rollover the existing short-term obligations) but also promote the inflow of foreign direct and portfolio equity investments, which are generally well-behaved in terms of patterns over time.

6.3 LIMITATIONS

A number of problems are associated with the quality and coverage of the data used. The basic concern is that data on international capital flows to developing countries have limited frequency, period and country coverage that precludes the formation of larger samples. Increased number of observations with high frequency data, monthly or quarterly for instance, would enable the use of multivariate cointegration and vector error correction models (Johansen, 1988, 1991) in our long-run and short-run analyses.

Measurement errors reduce the quality (accuracy and consistency) of the data. As notified in the statistical manuals of the IMF and World Bank, individual country reporting, currency conversion, valuation and time of recording may cause discrepancies in the data they report.[68] We acknowledge that our variables used as the proxies for the theoretical conceptions could inevitably be subject to measurement error.[69] The quandary is that there is no readily available measure for the measurement error itself. Considering the inquiries on the Lucas paradox, however, we recognize that the risk-return trade-off would be better captured in our specifications through more appropriate measures for country risk and return differentials, should they truly and accessibly exist. Measurement of the marginal product of capital,

[68] See IMF (1993).

[69] Cameron and Trivedi (2005) note that no econometric models (discussed in their book) are protected from the problem of measurement errors.

human capital, labour productivity and total factor productivity at the country-level is still evolving. In particular, first, the data on the quality of institutions is not itself high quality, is often missing and has limited variation over time or even across developing countries; and second, there are no good data on rates of return on capital across countries over time (so one cannot assess the assumption that returns are higher in poorer countries).

The caveat for the behavioural evaluations is that studying multiple attributes within a single framework has led us to choose relatively simple techniques. A thorough analysis of each attribute in separate research projects would have been more reassuring. The finite samples due to short time series of some capital flow components may have given rise to size and power distortions in the unit root tests performed, making the interpretation of their results a matter of judgement (Stock, 1994). Moreover, possible outliers or breaks in the series (especially if early or late in the sample period) could have engendered low power unit root tests.

6.4 SUGGESTIONS FOR FUTURE RESEARCH

It is asserted that developing and emerging market economies fall victim to volatility, fickle market sentiments and stampedes more frequently and severely than their industrialized counterparts due to their inability to execute countercyclical fiscal policies, financial sector underdevelopment (incomplete capital markets, improper or missing insurance markets and sovereign default risk) and weak institutions (fragile political, regulatory, supervisory and legal atmosphere). The persistence in the Lucas paradox and implied non-convergence of real incomes could, therefore, be ascribed to the detrimental impacts of negative shocks that breed excessive volatility in global financial markets. It may also be explained in part by the Linder hypothesis, home market effects in international trade and home bias in international finance. In particular, it should be investigated whether, as a result of poor institutional quality and capital market imperfections, positive shocks are unable to remove the adverse effects of negative shocks (i.e. implicit distortions arising from financing instability and asymmetric swings that are partly treated in the thesis). One possible way to address this would be incorporating volatility measures for both aggregates and components of capital flows within a multivariate vector autoregression (VAR) specification as these additional covariates are atheoretical. Such findings could help explain economic non-convergence (in growth, income, consumption and development) for emerging and developing countries.

Studying the effects of monopoly power and rights on international capital allocation and their role in the Lucas paradox is outside the scope of this work as it may require firm and industry level data. Further research would shed light on that matter of potential interrelationships.

The regularities and reflections set out in the event study of univariate annual country time series could be extended to multivariate and multi-spatial frameworks. Within such a complex environment, an inquiry focusing on the stochastic volatility determination, cyclicality and causal dynamics of the capital flow components (particularly debt flows) seems to be promising future research avenues. Furthermore, investigating the role of volume and volatility of foreign borrowing in sudden stops, currency and banking crises, contagion and economic recessions may provide clarifying comparative evidence across the three generations of financial crises models. Estimating associated probabilities of sudden stops, currency and banking crises through parsimoniously identified seemingly unrelated bivariate probit models would enable such a comparative assessment.

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