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SHORT - TERM CAPITAL FLOWS AND GROWTH IN DEVELOPED AND EMERGING MARKETS

Pavlos Petroulas

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BANK OF GREECE
Economic Research Department – Special Studies Division
21, E. Venizelos Avenue
GR-102 50 Athens
Tel: +30210-320 3610
Fax: +30210-320 2432

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ABSTRACT

A lot of attention has been directed towards recent financial crises around the world and empirical studies have found that short-term flows increase financial fragility and also increase the probability of financial crises. This study takes a macro-oriented approach and shows that while large and volatile short-term flows have no effect on growth for rich countries, they are growth inhibiting for emerging markets. These results are robust to a large variety of estimation methods and pass stringent extreme bound analysis criteria. Moreover, their magnitude turns out to be of economic importance. The analysis indicates that opening up emerging markets' capital accounts, which implies increased short-term capital flows, is not a clear-cut way to prosperity.

Keywords: Capital flows; Growth; Financial crises; Panel data
JEL Classification: F32; F43; F34; C23

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Correspondence:
Pavlos Petroulas,
Economic Research Department,
Bank of Greece, 21 E. Venizelos Ave.,
102 50 Athens, Greece,
Tel. +30210-320 2643
Email: ppetroulas@bankofgreece.gr

1 Introduction

For a long time economists held different opinions regarding the importance of the financial sector. As early as 1781 Alexander Hamilton argued that "banks were the happiest engines that ever were invented" and on the opposing side people like president John Adams (1819) said that banks harm the "morality, tranquillity, and even wealth" of nations.[1] Adam Smith himself was positioned somewhere in between, but nevertheless pointed out in the *Wealth of Nations* the need for control of the turmoil that follows from the overindulgence of speculative investment by those he called "prodigals and projectors".[2] Today, the amount of literature covering the topic of financial intermediaries as growth promoting is vast. Recent work, theoretical and empirical, has been pointing towards the same direction, namely: well-developed financial markets are good for growth.[3]

Another strand of literature concerns financial crises and problems endemic to financial markets. Market failures may arise due to moral hazard, asymmetric information, incompleteness of contingent contracts, bounded rationality and so forth. As a rule, financial crises are neither rare nor isolated incidents in the financial markets. They seem to pop up decade after decade, and so do models that try to explain them. Recent crises in emerging markets have featured troubled financial institutions and sudden reversals of short-term capital flows. At the heart of the latest class of models like Chang and Velascos' (2000), the so called 'third' generation, is the banking model of Diamond and Dybvig (1983) where banks take liquid deposits and invest part of the proceeds in illiquid assets. In doing so they pool risk and enhance welfare, but also create the possibility of self-fulfilling bank runs.[4] A different approach is taken by Aghion et al. (2004) who analyze the role of financial factors as a source of instability in small open economies. They set up a dynamic model, with a Balassa-Samuelson type of mechanism, where firms face credit constraints that depend on the level of financial development. A basic implication of this model is that economies at an intermediate level of financial development are more unstable than either very developed or very underdeveloped economies, in the sense that temporary shocks have large and persistent effects. In both type of models, the effects on the economy depend on a) a reversal of capital flows, i.e the

[1] In Beck et al. (2000).

[2] The term "projector" is used by Smith in a pejorative sense meaning, among other things, "a promoter of bubble companies; a speculator; a cheat." See Sen (1999), Ch1., p. 26, footnote 19.

[3] See King and Levine (1993), Levine and Zervos (1998), Acemoglu and Zilibotti (1997), Raghuram and Zingales (1998), Levine et al. (2000).

[4] The "first generation" of models concerning financial crises was pioneered by Krugman (1979) and focused on fiscal imbalances coupled with fixed exchange rates. The "second generation" of models was suggested by Obstfeldt (1994a), (1994b) and (1996)., in which central banks may decide to abandon the defense of an exchange rate peg when the unemployment costs of doing so become to large.

volatility and b) on the magnitude of the flows in question.

These features are closely linked to empirical facts since almost all of the countries affected by recent financial turmoil had a common characteristic, namely: large short-term capital inflows, both short-term debt as well as portfolio flows and their reversals. The capital account reversal in East Asia caused a collapse in asset prices and exchange rates. Foreign creditors called in loans and depositors withdrew funds from banks, which magnified the illiquidity of the domestic financial system and resulted in large output costs.[5]

The purpose of this paper is to analyze, whether the magnitude and volatility of short-term capital flows are growth inhibiting. Standard growth regressions combined with panel data and instrumental variable techniques are used in order to estimate the impact of short-term capital flows on economic growth.[6] Moreover, an extreme-bounds analysis in the spirit of Levine and Renelt (1992) is conducted in order to check the robustness of the results.

This paper is organized as follows. Section 2 provides the theoretical and empirical motivation for the study. Section 3 outlines the model and methodological issues that provide the basis for the estimations and Section 4 describes the data. Section 5 presents the results of this paper, while Section 6 investigates their robustness by conducting an extreme-bounds analysis. Section 7 concludes.

2 Theoretical and empirical literature

Numerous papers have been written on the links that exist between financial markets and growth.[7] The development of financial systems and institutions can be seen as a response to the problems created by information and transaction frictions. They facilitate the hedging, diversifying and pooling of risk, they allocate resources, monitor managers and exert corporate control, they mobilize savings, and they facilitate the exchange of goods and services.

The most popular ways to theoretically model the channels through which financial systems may affect growth are via capital accumulation and technological innovation.[8] Whilst the long-run links between the development of financial intermediaries and both physical capital growth and savings are, at best, tenuous, empirical findings tend to support the view that well-functioning stock markets and

[5] See for example Furman and Stiglitz (1998).

[6] Barro and Sala-i-Martin (1995) and Sala-i-Martin (1997).

[7] See Levine (2003) for an extensive survey.

[8] See Romer (1986) and (1990), Lucas (1988), Rebelo (1991), Grossman and Helpman (1991), Aghion and Howitt (1992) and Acemoglou and Zilibotti (1997).

banks promote long-run growth.[9] These findings are consistent with the view that the ability to trade ownership of an economy's productive technologies promotes a more efficient allocation of resources and capital formation as well as faster economic growth. However, this growth promotion seems to be far from smooth since we do observe economic crises in emerging markets. These crises tend to have their epicenter in financial markets, and lead to real economic losses, at least in, the short and medium term. Two recent models attempt to shed some light on the causes of this turbulence.

In the first model, Chang and Velasco (2000) develop a open economy Diamond Dybvig (1983) type of model that assigns a key role to financial structure and financial institutions. In their model the key feature are banks that act as maturity transformers. They take liquid deposits and invest part of the proceeds in illiquid assets. In doing so, they pool risk and enhance welfare, but also create the possibility of self-fulfilling bank runs. The model places international illiquidity at the center of the problem, where illiquidity is defined as a situation in which the financial system's potential *short-term obligations* exceed the liquidation value of its assets. This occurence of short-term obligations exceeding assets may emerge as an optimal response of the banking system to some features of the economic environment. To wit, agents deposit money in the bank that invests part of them in illiquid long term assets with a high return and part is kept to finance agents short term consumption. The early liquidation of long-term assets is costly. Some of the depositors, that are impatient and wish to cosume 'early' will of course withdraw their money. If too many of these agents exist, the bank may not have enough liquidity and hence become vulnerable to a run.

The approach in this model, with its focus on illiquidity, is more relevant for emerging markets since their access to world capital markets is limited. They point out that: banks in mature economies that might face a liquidity problem (as opposed to a solvency one), are likely to get emergency funds from the world capital markets. In contrast, banks in emerging markets typically get plenty of international loan offers when things go well but none when they are experiencing a run against them. Chang and Velasco find that domestic bank runs may interact with panics by foreign creditors. The nature of this interaction depends on the structure of international debt (short- or long-term), on how strongly banks can commit to repay their international obligations and on the willingness of foreign creditors to extend lending in the event of a run. They highlight the fact that the availability

[9] See King and Levine (1993), Beck et al. (2000). However, a recent paper, Favara (2006), casts doubt on the validity of some results.

of foreign loans does not per se pose a danger. It is rather the large loan volumes contracted at short maturities that increases danger and consequently policies that lengthen debt maturity reduce it.

They also show that financial liberalization may increase financial fragility and the incidence of crises even though it is ex ante welfare-enhancing. They argue that crises driven by illiquidity are consistent with observed booms and crashes in asset prices and show that policy distortions can magnify the effects of adverse shocks, causing illiquidity and crises.

In the second model by Aghion et al. (2004) a dynamic open economy is developed that can be used as a framework to analyze the role of financial factors as a source of instability. The basic model has a tradeable good which is produced with internationally mobile capital and a country-specific factor. Firms face financial constraints insofar that the amount they can borrow is limited to be a share of the amount of investible funds.[10] They show that economies at an intermediate level of financial development -as opposed to very developed or underdeveloped- are the most unstable and that temporary shocks will have large and persistent effects. They also examine the effects of financial liberalization on the stability of the macroeconomy. They find that, for an intermediate level of financial development, full financial liberalization may actually destabilize the economy inducing chronic phases of growth with capital inflows followed by collapse with capital flight. An assessment is also made of the macroeconomic effects of specific shocks to the financial sector such as, overlending by banks or overreaction by investors to a change in fundamentals. The model predicts that these shocks have their most persistent effects when financial markets are at an intermediate stage of development.

The basic mechanism that underlyies the model is a combination of two forces: Firstly, greater investment leads to greater output and higher profits. Higher profits improve creditworthiness and fuel borrowing, through capital inflows, that leads to greater investment. This boom in investment however, increases the demand for the country-specific factor and raises its price relative to the output good, (a Balassa-Samuelson type of effect) which lowers profits, resulting in reduced creditworthiness, less borrowing and less investment and a fall in aggregate output. Once investment falls all these forces get reversed and eventually initiate another boom.This endogenous instability causes shocks to have persistent effects and in more extreme cases leads to limit cycles. Why an intermediate level of financial development is important for this result is easy to comprehend. At very high levels

[10] Hence a high share represents an effective and developed financial sector while a low share represents an underdeveloped one.

of financial development, firms' investment is not constrained by cashflow, so shocks to cashflow are irrelevant. At very low levels of financial development, firms cannot borrow much in any case and their response to cash-flow shocks will hence be rather subdued. Here we can also note that Foreign Direct Investment, because it is already financed from abroad, does not induce any instability in the economy.

The two models have certain similarities. Firstly, the problems for emerging markets arise due to reversals in capital flows. Secondly, in both models the reversal comes from capital which is deemed short-term.[11] While short-term capital flows as such do not carry any intrinsic threat towards an economy and while some short-term capital is essential for the economy to run, there are some good arguments for thinking that such flows may not provide only benefits. This view is also supported in empirical analysis. Rodrik and Velasco (1999), show that the short-term debt-to-reserves ratio is a robust predictor of financial crises and that greater short-term exposure is associated with more severe crises when capital flows reverse.[12] Evidence in similar vein are also found in Demirguc-Kunt and Detragiache (1999), where capital account liberalization can make crises more likely. Lastly, a recent paper by Eichengreen and Leblang (2003) shows that capital controls have a significantly positive effect on growth in periods of financial instability but negative when crises are absent and the controls affect the resource allocation in an economy.[13]

2.1 Some stylized facts

There is a long list of possible determinants for the maturity structure of capital flows. For example: it is expected that both the demand and supply for maturity-transformation services increase with financial sophistication, and the volume of

[11] In this context, the distinction played by Meade (1951) between 'temporary' and 'continuing' capital flows and the related concept of reversibility is of importance.The key underlying notion behind this distinction is that of reversibility, the risk that capital pulled in by certain temporary factors could flow out once the attractions waned. An empirical study by Turner (1991) established a stability ranking in the following order: long-term bank loans, foreign direct investment, investment in bonds, investment in shares and lastly short-term credit. Moreover, Chuhan et al. (1996) provide empirical evidence in support of the view that short-term flows are 'hotter' than FDI. Also relevant in this context, are the incentives within internationally active organizations to maximize short-term gains. For example UK external manager's have mandates for around three years and may lose them if they have not performed sufficiently well; monitoring is typically done every three months. The US time horizons seem to be even shorter, with very frequent monitoring and possible changes of mandates every one to two years. Moreover, fund managers fees in these countries are related to the value of funds at year-end or they are even more directly performance related. All this increases the potential for volatility as fund managers cannot 'afford' to make losses and/or to perform worse than average. See Stephany Griffith-Jones (1998) for an extensive discussion.

[12] Their evidence is consistent with the idea that illiquidity makes emerging-market economies vulnerable to panic. Regardless of fundamentals, a large exposure to short-term debt intensifies the cost of a crisis because it magnifies the current-account adjustment and currency depreciation that needs to be undertaken.

[13] This has led to a focus on the preconditions for the development of financial intermediaries and the role of the legal and regulatory framework. Evidence shows that legal systems that protect creditors and enforce contracts are likely to encourage the development of financial intermediaries. See Levine (1997) and (1998). Also, in Chinn and Ito (2006) there is evidence of a positive relationship between the rights of creditors in the case of bankruptcy and financial development..

short-term flows should also increase with the openness of an economy. However, government choices of regulatory policies are also important. Governments have at their disposal a range of financial and regulatory policies that influence the structure of capital flows, and their policies often stimulate short-term capital flows. The Basle capital adequacy standards, for example, encouraged short-term cross-border lending to non-OECD economies by attaching a lower risk weight to short-term loans. The Thai government set up The Bangkok International Banking Facility in 1993, which specifically aimed at attracting short-term funds from abroad. The Korean government was often blamed for having encouraged short-term inflows by making longer-term investments in Korea difficult for foreigners. We can see in Table 1 how short-term flows essentially exploded during the 1990s in several East-Asian countries, with the Korean increase of 926 percent at the top.[14]

Limits on the short-term foreign liabilities of domestic banks, deposit requirements on capital inflows and restrictions on the sale of short-term debt to foreigners are examples of policies that can reduce short-term capital inflows.[15]

Table 1: The Development of Short-Term Capital Flows in East-Asian countries.

	(Million U.S $)					
	Average Short-term Flows			St. Dev. of Short-term Flows		
Country	1979-90	1991-96	1997-00	1979-90	1991-96	1997-00
Korea	1061	10891	16269	950	7245	6001
% increase between periods		926%	49%		663%	−17%
Malaysia	794	1407	1392	574	840	1672
% increase between periods		77%	−1%		46%	99%
Singapore	1946	7325	17120	2295	4796	15815
% increase between periods		276%	134%		109%	230%
Thailand	1475	4879	6455	1617	2647	2658
% increase between periods		231%	32%		64%	4%

[14] Short-term capital flows are in general thought of as flows that are easily reversable. Short-term debt for example is defined to be debt with a 'maturity' of one year or less. The definition of short-term capital flows in this paper is found in section three, Tables 1 and 2 shows short-term capital flows in absolute figures, hence no distinction is made between inflows and outflows. See also figures in Appendix II to see the development of short-term flows over time. The different time periods are reported with respect to financial liberalization and occurred financial crises. The country selection goes to show the differences within some regions.

[15] In 1996, five Asian countries (Thailand, Korea, Indonesia, Malaysia and the Phillipines) received net private capital inflows of approximately $ 93 billion. In 1997, they experienced an outflow of approximately $ 12 billion, which is quite a turnaround in one year.

Table 2: The Development of Short-Term Capital Flows in in L.-A. countries.

	(Million U.S $)					
	Average Short-term Flows			St. Dev. of Short-term Flows		
Country	1979-90	1991-96	1997-00	1979-90	1991-96	1997-00
Argentina	2414	7166	6520	1926	7897	2745
% increase between periods		197%	−9%		310%	−65%
Brazil	2764	15397	7028	2427	15970	5255
% increase between periods		457%	−1%		558%	−67%
Chile	816	1341	2721	547	409	1427
% increase between periods		64%	103%		25%	249%
Mexico	4820	15259	7464	4108	8832	4124
% increase between periods		213%	−51%		64%	4%

Chile's capital-account regime represents a canonical case of successfully changing a country's maturity composition of flows, and has been studied extensively. The Chilean authorities imposed a time dependent reserve requirement on all external credit except equity investments. Evidence in a number of papers find that the restrictions have affected the maturity composition of flows, though not their overall volume. This, together with solid fundamentals and a sound financial system, are probably the main causes that Chile was not affected by the Mexican 'tequila' crises in 1995.[16] We can see in Table 2 that Chile had an increase of 'only' 64 percent of short-term flows in the beginning of the 1990s. This can be compared with increases ranging from 200 up to 450 percent in other Latin American countries.[17]

3 Methodology

We augment a standard growth model with short-term capital flows(X) as well as with other variables (Q) that have been found to be of importance in this context.[18] Hence a general form of our regression can be expressed as:

$$\Delta y = f\left(y_0, h, k, X, Q\right) \tag{1}$$

Where Δy is growth y_0 is initial output, h is investment in human capital and k is investment. A panel data set is utilized in our estimations where we use non

[16] See Valdes-Prieto and Soto (1996) and De Gregorio et al. (2000).

[17] This was clearly shown in the crisis countries in East Asia where external debt levels where relatively low, but the levels of short-term debt relatively high. The crises were caused in part by the refusal of lenders to roll over these short-term loans. Moreover, there is a high cost, beyond the budgetary cost of bailouts, associated with the economic disruption that follows from financial crises: the one of growth slowdown after a crisis.

[18] See Barro and Sala-I-Martin (1995), Mankiw et al. (1992).

overlapping 5-year period averages. The reasons for this are several: Firstly, using panel data, we avoid long-run simultaneity. Moreover, the time variation of the data is, in this case, particularly interesting, since the time period when countries liberalized their capital accounts, and faced increased short-term capital flows, varies significantly. Secondly, using non overlapping 5-year period averages, we avoid business cycle co-variation in our results since we also use period dummies and we avoid multicollinearity issues which are present in shorter time-periods.[19]

However, using panel data in growth regressions brings forth the issue of methods for estimating dynamic panels. Since initial income appears on the right hand side we have a part of the dependent variable as an explanatory variable. This problem is resolved by using 'out of sample' data to instrument for y_{t-1}, and making it a strictly exogenous variable.[20] Another issue in panel data concerns the presence of heteroscedasticity in several dimensions. In our case it is heteroscedasticity between countries that is likely to be most important. The largest country in the sample is 60 times larger than the smallest in terms of population, and growth tends to vary less in large countries than in small ones. One standard solution to this is to weight countries in such a manner that the weight attached to each country is inversely proportional to the standard deviation of the error term.[21] The fact that we can rarely be certain about the nature of cross-section heteroscedasticity is, according to Greene (1999), a minor problem since weighted least squares estimators are consistent regardless of the weights used, as long as the weights are uncorrelated with the disturbances. In our case, tests show that the data does not exhibit any heteroscedasticity in the time dimension but does within the country dimension.[22]

Even if some econometric problems can be corrected the suspicion of endogeneity in some of the right-hand side variables will always be present. Coping with the possibility of endogeneity seems to be a challenge for the literature of empirical growth economics in general and we will try to address this problem to some extent by using several instrumental variable techniques. As usual, the problem of finding adequate instruments, without losing too many degrees of freedom in the regressions will be present.

[19] See Islam (1995), Fölster and Henrekson (1999) and (2001), Levine and Zervos (1998), Beck et al. (2000), Agell et al. (2006).

[20] Penn World Table 6.1 has for most countries data from 1950 or 1951 and onwards for Real GDP. For some countries, like Singapore, the series start around 1960 and the time interval is 3 years instead of 5. The instrument has an explanatory power larger than 90 percent.

[21] See Baltagi (2001) Ch. 5 and Greene (1999) Ch.12.

[22] LM tests for heteroscedasticity within panels give a χ^2 (1) value of 2.5 and we can not reject the null of constant variance. In the panel dimension however, the LR tests produce a χ^2 (33) value of above 90 in all occasions which clearly rejects the null. Moreover, tests of autocorrelation in the error terms, Wooldridge (2002) and Drukker (2003), accept the null of no autocorrelation, in the regressions. All panel estimations are conducted with White (1980) heteroscedasticity-consistent standard errors and covariance.

4 Data

The data in this study is constructed for the years 1970-2000, depending on data availability. To fill gaps in the series, all time varying variables are averages of non-overlapping 5-year periods.[23] The dependent variable in the regressions will always be the average annual growth rate of real GDP per capita ($\Delta y_{i,t}$). The independent variables that will always be included in the regressions are: (inY), onitial income which is measured as the log of real GDP per capita with the initial year for each subperiod; (Edu), the rate of accumulation of human capital is measured as average schooling years in the total population over age 25; (Inv), investment ratio, which is calculated as the period average of real investment to GDP for each subperiod; (CAR), a measure of capital account restrictions that will follow Dani Rodriks' (1998) guidelines and will be the proportion of years, in every subperiod, for which the capital account was free of restrictions;[24] and, finally, ($OPEN$) openess which is the sum of exports and imports of goods and services measured as a share of gross domestic product in real terms.

When it comes our variable of interest, namely short-term capital flows, things can get a bit complicated since a lack of adequate and available data and different constructions of variables, all with their own advantages and disadvantages are to be found.[25] The definition of short-term capital flows (STF) that will be used originates from Sachs et al. (1995) and has been augmented to include banks as well. Apart from defining short-term flows, the theoretical models discussed above give us some indication as to what characteristics we wish to capture with our variables of interest. To wit, we would want a variable that is able to capture both the magnitude of short-term flows but also the potential for reversal since, in both theoretical models, it is the magnitude of the reversal, which, in turn, depends on the magnitude of inflows, that will define the cost an economy has to bear. Our candidate for this volatility measurement that is constructed from short-term capital flows and that will be used in the regressions takes the following form:[26]

$$VSTF = \frac{1}{n}\sum_{0}^{n} \left| STF_t - STF_{t-1} \right|,$$

which represents the average absolute change in short-term capital flows and

[23] See Appendix III for exact details on how the variables are constructed and their sources.

[24] A note of caution is in order since capital controls come in various shapes and forms, the measure used here is a crude and imperfect proxy for what we are trying to capture.

[25] See Furman and Stiglitz (1998) and Arteta et al. (2001).

[26] A potential additional merit of the volatility measure is that it is less prone to simultaneity bias. It is easier to argue that growth causes short-term capital to flow in or out of a country. But it is perhaps harder to argue that growth will affect the volatility of short-term capital flows.

where n is the number of years in each subperiod.

However, we would want to scale this volatility measure by some economically relevant variable. Again, following the theoretical models, of Chang and Velasco and Aghion et al., two variables come in mind. The first is reserves ($VSTF/RES$) and the second is GDP ($VSTF/GDP$). The former will capture a country's vulnerability to a Diamond-Dybvig run and is closer to the spirit of Chang and Velasco;[27] The latter provides an intuitive way to measure the impact of short-term capital flows on an economy in line with Aghion et al.[28] The volatility measure also allows the possibility of an additional interpretation. If volatility has a positive impact on growth, the country can be viewed as having well-functioning financial markets that put funds to their most productive use. If, on the other hand, the volatility measure has a negative impact on growth, then we have poorly performing financial markets.[29]

When it comes to country selection it is known that mixing rich and poor countries does not represent a good test of what theory predicts, if there are reasons to believe that markets, in this particular case financial markets, behave differently in developing countries compared to developed. This study will include the richest developed and developing countries, divided into two sub-samples. The prerequisite being that the countries have a, more or less, functioning financial sector. A final selection of 34 developed and developing countries was made. The cutoff point for this selection is the poorest OECD country, measured by GNP per capita at PPP rates, which is Turkey; the measurement is prior to the 1995 Latin American crises.[30] So, the rich countries selected are: Australia, Austria, Canada, Denmark, Finland, France, Greece, Iceland, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States, and the developing countries are: Argentina, Brazil, Chile, Colombia, Israel, Korea, Malaysia, Mauritius, Mexico, Singapore, Thailand, Turkey, Uruguay, Venezuela.

[27] Furman and Stiglitz (1998) comment on this variable and say that: "The ability of this variable, by itself, to predict the crises of 1997 is remarkable". They also comment on the fact that the higher this ratio is, the more likely it is that a country is pursuing other problematic policies.

[28] We can note that Easterly et al. (2000) find that private capital flows volatility increases growth volatility, which is negatively correlated with growth.

[29] The division into subsamples can be seen as implicitely taking account of the institutional environment. Concerning the effects of institutions on growth, see Acemoglu et al. (2001) and Rodrik et al. (2004).

[30] We exclude the Arabic oil producing countries and all tax havens from the sample. We also exclude countries due to data shortage for the period of interest. These are Belgium, Germany, Hong Kong, and Luxembourg.

5 Results

In order to exploit the time variation of our sample we use panel estimation techniques. These estimations take various forms in order to address a number of econometric issues that arise with each form of estimation. However, we can make some a priori hypotheses about our results, since theory gives some guidance for the effect of short-term capital flows on growth and it also gives guidance regarding how empirical studies should be specified. For example, both Aghion et al. (2004) as well as Chang and Velasco (2000) claim that one should find a negative effect only in emerging markets, i.e. markets that do not have a very high level of financial development.

Table 3 presents the first regression results of the panel data estimations. Our observations consist of non-overlapping five-year periods in an unbalanced data set. All regressions include period dummies in order to prevent spurious correlation and are corrected for heteroscedasticity across panels. Moreover, in order to avoid biases due to the dynamic panel the initial income variable is instrumented by using out of sample values as instruments. In the first panel the estimations do not include country dummies and the explanatory variables, investment, education and openness are instrumented by their lagged values in order to avoid endogeneity issues.[31] These estimations, however, suffer from omitted variable bias, since country specific effects which account for observable and unobservable effects that are constant over time are missing. The second panel in Table 3 includes country specific effects which, while correcting for the omitted variable bias, automatically create issues of endogeneity bias since the within-estimations have an error term that contains an average of all time periods. Hence, lagged variables are no longer valid instruments and the estimations are conducted on contemporaneous levels, with the exemption of initial income, which is instrumented by out of sample data and is still valid. The discrete time model used for estimations in Panel I and Panel II, respectively, can be expressed as:

$$\Delta y_{i,t} = c + \delta_t + \beta_1 y_{i,t-1} + \beta_2 h_{i,t-1} + \beta_3 k_{i,t-1} + \beta_4 X_{i,t} + \beta_5 Q_{i,t-1} + \varepsilon_{i,t} \quad (2)$$

$$\Delta y_{i,t} = \alpha_i + \delta_t + \beta_1 y_{i,t-1} + \beta_2 h_{i,t} + \beta_3 k_{i,t} + \beta_4 X_{i,t} + \beta_5 Q_{i,t} + \varepsilon_{i,t} \quad (3)$$

[31] In a pure cross country regression setting the traditional growth variables, investment education, initial income and openess are highly significant, which validates the model specification. For a more general discussion concerning estimation of growth models See Appendix IV.

Table 3: Five-year Period Regressions for the Effects of Short-Term Capital Flows on Growth.

	Weighted Panel Data Regressions 1970-2000. No fixed effects					
Panel I	*All Countries*	*All Countries*	*Rich Countries*	*Rich Countries*	*Developing Countries*	*Developing Countries*
InY	-0.65^{**}	-0.67^{**}	-1.12^{**}	-1.14^{**}	-1.47^{**}	-2.01^{***}
	(2.09)	(2.15)	(1.98)	(1.98)	(2.48)	(3.40)
INV.	0.06^{**}	0.05^{**}	0.04	0.04	0.10^{***}	0.07^{**}
	(2.39)	(2.12)	(1.03)	(1.18)	(2.87)	(2.26)
EDU.	0.05	0.07	-0.04	-0.04	0.13	0.29^{**}
	(0.84)	(1.09)	(0.71)	(0.63)	(1.11)	(2.43)
VSTF/RES	0.05		0.15		-2.45^{***}	
	(0.28)		(0.82)		(3.70)	
VSTF/GDP		-6.32		5.60		-35.73^{***}
		(1.26)		(1.24)		(4.01)
CAR	-0.11	-0.13	-0.23	-0.25	-0.08	0.85
	(0.34)	(0.39)	(0.84)	(0.95)	(0.14)	(1.51)
OPEN	0.005^{**}	0.01^{**}	0.01	0.003	0.003	0.02^{***}
	(2.14)	(2.55)	(1.43)	(0.73)	(0.72)	(4.74)
$R^2_{\cdot}$	0.19	0.20	0.26	0.27	0.51	0.55
Obs.	170	170	100	100	70	70

	Weighted Panel Data Regressions 1970-2000. Fixed effects included					
Panel II	*All Countries*	*All Countries*	*Rich Countries*	*Rich Countries*	*Developing Countries*	*Developing Countries*
InY	-1.07^{**}	-1.05^{*}	-1.22^{**}	-1.24^{**}	-0.18	-0.68
	(2.02)	(1.94)	(2.55)	(2.51)	(0.20)	(0.73)
INV.	0.07^{**}	0.07^{**}	0.05	0.04	0.01	0.03
	(2.24)	(2.27)	(1.25)	(1.09)	(0.16)	(0.86)
EDU.	0.02	0.03	-0.03	-0.04	0.17	0.75^{***}
	(0.10)	(0.16)	(0.20)	(0.26)	(0.68)	(2.92)
VSTF/RES	-0.12		-0.03		-3.76^{***}	
	(0.65)		(0.25)		(6.49)	
VSTF/GDP		-0.98		0.30		-40.00^{***}
		(0.20)		(0.07)		(5.43)
CAR	-0.40	-0.40	-0.77^{***}	-0.75^{***}	-0.03	-0.07
	(1.42)	(1.41)	(3.19)	(3.08)	(0.06)	(0.12)
OPEN	0.01^{*}	0.01^{*}	0.06^{***}	0.06^{***}	-0.01	-0.02^{***}
	(1.77)	(1.74)	(4.81)	(4.37)	(1.10)	(2.67)
$R^2_{\cdot}$	0.45	0.45	0.55	0.55	0.69	0.65
Obs.	186	186	110	110	76	76

White heteroskedasticity-consistent standard errors and covariance. Time dummies included.

Note: *, ** and *** denote significance at the 10, 5, and 1% levels, respectively.

Even if all the estimations in Table 3 have their own potential deficiencies they show some interesting trends concerning our volatility variables. In the first two columns, when all countries are in a common pool, short-term capital flows have no significant effect on economic growth. On the other hand, when one divides the countries into two subsamples, different patterns begin to emerge.We see that the impact of short-term capital flows ($VSTF/RES; VSTF/GDP$) on growth seem to follow the theoretical predictions that were presented previously and have a strong negative impact for developing countries, while not affecting rich economies.[32]

The first variable of short-term flows to reserves indicates that emerging markets suffer from illiquidity problems within their financial sector, which makes, according to theory and empirical observation, financial crises more likely and therefore hampers growth. The second variable, which measures short-term flows to GDP has also a significant negative effect on growth. What is more, the magnitude of the results are of economic significance, with the former showing that a one standard deviation increase (38.5%) decreases growth by 0.94 percentage points per year, while a one standard deviation increase in the latter (3.1 %) decreases growth by 1.1 percentage points per year. The above results concerning the impact of $VSTF/RES$ and $VSTF/GDP$ on growth for the emerging markets are robust to both country and time period exclusions, as well as estimation methods. Nor do the results hinge on the correction of heteroscedasticity accross panels.[33]

Rich countries seem to follow somewhat the mainstream results in the fixed effects setting, in the sense that capital account restrictions are significantly negative for growth and increased openness to trade is good for growth. The results obtained that refer to the developing sample differ somewhat in their indications and possible explanations. Firstly, we see that increased trade has a negative impact on growth in Panel II and a positive impact in Panel I. Secondly, we see that the variable measuring capital account restrictions is insignificant in both specifications.[34] All other variables, such as initial income, investment, education and openness, have expected signs and their magnitudes do not seem to deviate from largely from other estimated growth regressions.

Finally, even if the problem of a dynamic panel is avoided above there are still a number of estimation problems with their respective biases that have to be addressed. Due to these problems the results can, at this stage, only be viewed as

[32] Hausman tests tend, in general, to reject the null of no differences between the two models when $VSTF/RES$ is used, but not for $VSTF/GDP$.

[33] See Appendix IV.

[34] However, a small note of caution is in order concerning the CAR variable. Since it is a crude and imprecise measure it might not fully capture all properties of interest.

correlations and give us only indications of potential trends. Hence, we have to move on to insrumental variable regressions.

5.1 IV-Estimations

The first step in the instrument approach is try and rid our estimations of the endogeneity problems that occur due to country specific effects. A simple differencing, $\Delta growth_t = f(\Delta x_t)$, of the regression removes the country specific effects. This rids us of the potential omitted variable bias without changing the underlying effects of the explanatory variables on growth. However, since the dependent and independent variables are in contemporaneous time periods, the potential for endogeneity still exists and we need to find valid instruments for our explanatory variables. We utilize methods proposed by; 1) Anderson and Hsiao (1982) using lagged levels or differences (AHL/AHD); 2) Arellano and Bond (1991), called the 'difference' estimator and 3) Arellano and Bover (1995) and Blundell and Bond (1997), called the 'system' estimator in order to estimate our regressions.

Table 4: IV-Regressions for the Effects of Short-Term Capital Flows on Growht.

	Panel Regressions, 1970-2000. Developing countries.					
	AHL[a]	*AHD*[a]	*Difference*[b]	*Difference*[b]	*System*[c]	*System*[c]
InY	−8.39	−17.85*	−1.62	−1.72	−1.72*	−2.17**
	(0.99)	(1.93)	(0.88)	(0.94)	(1.97)	(2.65)
INV.	−0.56	−0.59	0.02	0.07	0.07*	0.06*
	(1.18)	(1.27)	(0.28)	(0.85)	(1.94)	(1.82)
EDU.	17.35	21.76	−0.03	0.34	0.28	0.34**
	(0.50)	(0.58)	(0.05)	(0.59)	(1.61)	(2.03)
VSTF/RES	−2.49**		−3.05***		−1.85**	
	(2.16)		(3.03)		(2.30)	
VSTF/GDP		−25.83*		−33.26**		−26.67**
		(1.94)		(2.32)		(2.38)
CAR	−4.56	−5.51	0.23	0.25	0.64	0.57
	(0.84)	(0.94)	(0.25)	(0.28)	(1.04)	(0.94)
OPEN	−0.27*	−0.28*	−0.01	−0.01	0.01	0.02**
	(1.79)	(1.81)	(0.76)	(0.64)	(1.56)	(2.03)
Sargan test			0.99	0.94	0.60	0.69
Serial corr. test	0.84	0.71	0.15	0.03	0.27	0.24

Note:*, ** and *** denote significance at the 10, 5, and 1% levels respectively. Time dummies included.

[a] Regressions corrected for cross-sectional heteroscedasticity, |t|-statistics in parenthesis.

[b,c] |t|-statistics in parenthesis.

The 'system' estimator is utilized in Beck et al. (2000) as well as Eichengreen and Leblang (2003) for similar exercises and seems to be the most efficient in terms of instrumenting.[35] The general drawback in all these instrumental approaches lies in the loss of degrees of freedom. The differencing and lagging of our variables reduces the degrees of freedom available for statistical inference. However, the results obtained from these approaches, coupled with the results from Table 3, can be used as some form of benchmark and provide strong indications of the effects of short-term capital flows on growth in emerging markets.

Table 4 presents the results obtained from the IV regressions for the developing sample, which present the main idea behind the paper. Any departures from conventional results for the full or rich country sample will be duly noted. For the 'difference' and 'system' estimator we report the first step results of the estimations, since the second step estimates have a severe downward bias in their standard errors. The Sargan test of overidentified restrictions as well as tests for autocorrelation in the error structure are also presented. The null hypothesis for these tests should be accepted for valid estimations.[36]

The results in Table 4 show that the instruments for our variables of interest are not only significantly negative, they are also robust across the spectrum of estimation methods. Wald tests confirm that our point estimates for $VSTF/RES$ and $VSTF/GDP$ are not significantly different from each other. These IV-results confirm the initial findings of a significant negative impact on growth from short-term capital flows in emerging markets. Moreover, when we compare the results in Table 3, Panel I and the results obtained from the 'system' estimation we see that they exhibit similarities.[37] Wald tests of all variable coefficients and model Hausman tests confirm this by accepting the null of no differences. Again, the magnitude of the results are of economic significance. The system estimator shows that a one standard deviation increase of $VSTF/RES$ (38.5%) decreases growth by 0.71 of a percentage point per year, while a one standard deviation increase of $VSTF/GDP$ (3.1 %) decreases growth by 0.92 of a percentage point per year.

These findings support the view that: a) potential omitted variable bias in Panel I is probaby of low importance and b) the model estimated in Panel I is correctly

[35] One general problem with the AH instruments though is that they tend to be inefficient. The 'difference' estimator is a GMM method and uses, for each observation in the data, the maximum available lags as instruments. Lastly, the 'system' estimator is an additional GMM method and, in addition to the 'difference' approach, lagged differences as instruments for the levels of our variables.

[36] The serial correlation test for the AH estimations is suggested by Drukker (2003) and Wooldridge (2002), while the tests for serial correlation in the GMM estimations are suggested by Arellano and Bond (1991).

[37] We have to keep in mind that the results in Table 3 are subject to panel heteroscedasticity correction, while the GMM estimates are not. If the regressions in Table 3 are conducted without the correction, the results obtained show no sinificant differences.

specified and not subject to potential endogeneity bias. By contrast, Panel II in Table 3, which includes country specific fixed effects, seems to suffer from bias in the estimates.

If we try to link the results obtained to a more coherent explanation, then the following presents itself as a possibility: Rich countries and developing countries differ in several aspects when it comes to factors promoting growth.[38] For emerging markets, the indications are that increased short-term capital flows as such are not clear-cut ways to prosperity. The indications are rather that increased openness to capital flows, especially short-term flows, is something countries embark on sequentially as they develop, in order to reap the benefits of growth.

The results so far have been pointing towards the idea that volatile short-term capital flows have a detrimental effect on growth for emerging markets.[39] Even so, there are certainly objections to the estimations above. One could be the fact that we should be controlling for macroeconomic imbalances in an economy instead of controlling for trade and capital account liberalization. This follows on, to some extent, from the idea that a financial crisis can be triggered if a country suffers from unsustainable macroeconomic imbalances. Large and unsustainable macroeconomic imbalances will make countries 'riskier' and we will therefore observe larger short-term capital flow volatility.

One way to lessen potential objections and strengthen the results obtained from our estimations is to include additional control variables in our regressions. The results indicate that the esimations in Table 3, Panel I, have at least two advantages. Firstly, we do not incur any severe losses in degrees of freedom and secondly the estimates do not seem to be subject to potential biases. Hence, these estimations can serve as valid benchmarks and the results can be further examined by conductiong a robustness check through the application of an extreme-bounds analysis (EBA) in the spirit of Levine and Renelt (1992). By adding variables to our regressions we will be able to control for a variety of observables that may potentialy affect growth. The EBA mirrors the approach adopted in cross-country regressions that search for growth determinants.[40]

[38] The IV-results for the developed sample, even if not presented, show a consistency with Table 3, where openess has a positive significant effect on growth, while capital account restrictions have, in general, a negative effect on growth.

[39] No such indications exist for developed economies. The variable $VSTF/GDP$ becomes slightly positive significant in the 'system' estimation, with a p-value of 0.093, for the developed sample. Otherwise, all other estimations show an insignificant impact of short-term capital flows on growth, both for the developed as well as the whole sample.

[40] See Sala-i-Martin (1997).

6 Robustness check

The sole purpose of this section is to investigate the robustness of the results obtained for emerging markets in the base regression. Since the main purpose of this paper has been to investigate the effects of short-term capital flows in emerging markets, it follows quite naturally to restrict the extreme-bounds analysis to incorporate only emerging markets.

An EBA is used to test the robustness of coefficient estimates to alterations in the conditioning set of information. Levine and Renelt's (1992) (LR) empirical application of Leamer's (1983) EBA has adopted the common feature of cross-country growth regressions, where explanatory variables are entered independently and linearly, hence the EBA implies regressions of the form:

$$\Delta y = \alpha_j + \beta_{ij} I + \beta_{mj} M + \beta_{Zj} Z_j + \varepsilon \tag{4}$$

where Δy, is as previously per capita GDP growth, I is a set of variables always included in the regression, M is the variable of interest and Z_j is a subset of three variables chosen from a pool (Z) of additional control variables. The model has to be estimated for all possible combinations of $Z_j \in Z$. Each model j produces one point estimate of the variable of interest β_{mj} and its corresponding standard deviation σ_{mj}. The lower extreme bound is defined as the lowest point estimate $\beta_{mj} - 2\sigma_{mj}$ and the upper extreme bound as the highest point estimate $\beta_{mj} + 2\sigma_{mj}$. If β_{mj} remains significant and of the same sign *at the extreme bounds*, then we can maintain a fair amount of confidence that the partial correlation and the variable of interest can be considered to be *'robust'*, otherwise the variable will be considered *'fragile'*.

The I variables in this EBA will consist of the explanatory variables in the base regression and the M variables are as always ($VSTF/RES$) or ($VSTF/GDP$). The pool of Z variables consists of variables that have been used in Sala-i-Martin (1997), Levine and Renelt (1992) or Fölster and Henrekson (2001). In order to restrict the number of Z variables we can discard variables that are constant over time (such as land area), that are not available for parts of the timeframe examined, or that are simply irrelevant for the sample of countries used in this analysis (such as revolutions and coups). The final selection of the Z pool consists of the following ten variables: Government share of GDP (GOV), growth of government share (GOVG), overall budget balance as a share of GDP (BUDGET), inflation (INF), the standard deviation of inflation (SDINF), the share of urban population (URBAN), log of life

expectancy (LIFEX), labor force growth (LFG), current savings (SAVE), and the growth of the consumption share of GDP (CONSG).[41] All variables are instrumented by their first lagged level. Lastly we can note that the first five variables can be viewed as controls for various potential macroeconomic imbalances.

There are several objections to the LR methodology. One is that it introduces multicollinearity, inflates the coefficient standard errors and exaggerates the range on the coefficient of interest. This multicollinearity problem is, according to LR (1992), a reflection of weak data. Another objection is brought forward by Sala-i-Martin (1997). He notes that there is a 'reverse data-mining' problem. If you try different combinations of control variables it is almost guaranteed to find one or several combinations of control variables that renders the coefficient of interest insignificant or even causes it to change sign. In this sense the EBA may be 'too strong'. On the other hand if the variable(s) of interest passes a test that is 'too strong' it should be considered as 'good news', that is by passing a 'too strong' test, they should not have problems passing any weaker tests.

Table 5: Sensitivity Results for Emerging Markets
Weighted panel regressions, 5-year averages (1970-00)

	M-variables:					
	VSTF/RES			*VSTF/GDP*		
	High	**Base**	**Low**	**High**	**Base**	**Low**
β	−3.64	−2.45	−2.13	−44.52	−35.73	−30.75
S.E.	0.69	0.66	0.72	8.96	8.91	9.57
$t-stat.$	−5.25	−3.70	−2.96	−4.97	−4.01	−3.21
$Z-variables$	*LFG* *LIFEX* *GOV*		*SDINF* *CONSG* *SAVE*	*LIFEX* *BUDGET* *GOV*		*INF* *GOV* *SAVE*
Obs.	70	70	68	69	70	68
R^2	0.55	0.50	0.51	0.56	0.55	0.55
Robust/Fragile		**Robust**			**Robust**	

The results from the robustness test for the regressions on the emerging markets sample using ten conditioning variables are presented in Table 5. Where the 'Base' refers to the regression estimates for the emerging market sample in Table 3, Panel I and does not include any Z variables.

[41] This implies $\binom{10}{3} = 120$ possible combinations of $Z_j \in Z$ for each of the variables of interest.

Table 5 shows that the estimated effects of $VSTF/RES$ and $VSTF/GDP$ are robust with respect to the stringent EBA criterion. Both lower and upper bounds are significantly different from zero and both bounds are negative. Overall, the results of the EBA seem to imply that we can have a fair amount of confidence that the negative results between short-term capital flows and economic growth for emerging markets is 'robust'.[42]

7 Conclusions

Recent financial crises around the world have received a lot of attention. Empirical studies have found that short-term flows increase financial fragility and additionaly increase the probability of financial crises. This study has taken a macro-oriented approach and the results support the notion that that high and volatile short-term flows are growth inhibiting for emerging markets. This is not the case though for rich countries where the volatility of short-term capital flows has no effect. The results concerning the negative effects of volatile short-term capital flows on growth for emerging markets seem to be robust to different estimation methods, country and time period exclusion, and pass stringent EBA criteria. Moreover they turn out to be of economic significance, where an increase in volatility of one standard deviation decreases growth by around one percentage point per year.

The results here indicate that, just as there isn't a 'royal road to geometry' there is no 'royal road' to prosperity either by opening up emerging markets capital accounts, which imply increased short-term capital flows. There is no argument that good institutions will counteract 'excessive' short-term flows and develop financial markets so that the benefits of capital account liberalization exceed the costs. Research concerning institutions and the sequencing of liberalizations already abounds. In the meanwhile there is growing evidence that controls can be effective in discouraging short-term flows. The Chilean experience has shown that restrictions have affected the maturity composition of flows, but not their overall volume. In conclusion, if indeed short-term capital flows are growth inhibiting for emerging markets, they should discourage them, perhaps by imposing some form of controls on easily reversable flows in the short run and by developing better institutions in the long run.

[42] The variables STF/RES and STF/GDP are within the EBA bounds and significant when only regressed on growth together with period dummies. Additional explanatory variables, from the base model to the EBA approach do not alter the results. However, we can keep in mind that the set of Z variables used is far from complete and perhaps there are other sets that invalidate the results.

References

[1] Acemoglu D, Zilibotti F. Was Prometheus Unbound by Chance? Risk, Diversification and Growth. Journal of Political Economy 1997;105; 709-751

[2] Acemoglu D, Robinson JA, Johnson S. The Colonial Origins of Comparative Development: An Empirical Investigation. American Economic Review 2001; 91/5, 1369-1401

[3] Agell J, Thoursie P, Ohlsson H. Growth effects of government expenditure and taxation in rich countries: a comment. European Economic Review 2006;50; 211-218.

[4] Aghion P, Bacchetta P, Banerjee A. Capital Markets and the Instability of Open Economies. Journal of Monetary Economics 2004;51; 1077-1106.

[5] Aghion P, Howitt P. A Model of Growth Through Creative Destruction. Econometrica 1992;60; 323-351.

[6] Anderson TW, Hsiao C. Formulation and Estimation of Dynamic Models Using Panel Data. Journal of Econometrics 1982;15; 598-606.

[7] Arellano M, Bond S. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. The Review of Economic Studies 1991;58; 277-297.

[8] Arellano M, Bover O. Another look at the instrumental variable estimation of error-components models. Journal of Econometrics 1995;68; 29-51.

[9] Arteta C, Eichengreen B, Wyplosz C. When does capital account liberalization help more than it hurts? CEPR 2001; Discussion Paper No2910.

[10] Bacchetta P, Caminal R. Do Capital market imperfections exacerbate output fluctuations. European Economic Review 2000;44; 449-468.

[11] Bacchetta P, Wincoop van E 2000. Capital Flows to Emerging Markets: Liberalization, Overshooting, and Volatility: In SEdwards (Eds), Capital Flows and the Emerging Economies – Theory, Evidence, and Controversies, The University of Chicago Press 2000. p. 61-98.

[12] Baltagi HB. Econometric Analysis of Panel Data. Second EditionJohn Wiley & Sons Ltd, England 2001.

[13] Barro RJ, Sala-i-Martin X. Economic GrowthMcGraw-Hill, New York 1995.

[14] Beck T, Levin R, Loayza N. Finance and the sources of growth. Journal of Financial Economics 2000;58; 261-300.

[15] Blundell R, Bond S. Initial conditions and moment restrictions in dynamic panel data models. Journal of Econometrics 1998;87; 115-43.

[16] Budnevich C, Le Fort G. Capital Account Regulations and Macroeconomic Policy: Two Latin American Experiences. Banco Central de Chile 1996; Working Paper No6

[17] Chinn MD, Ito H. What matters for financial development? Capital controls, institutions, and interactions. Journal of Development Economics 2006;81; 163-192.

[18] Chang R, Velasco A. A Model of Financial Crises in Emerging Markets. Quarterly Journal of Economics 2000;116; 489-517.

[19] Chuhan I, Perez-Wuiros G, Popper H. International Capital Flows: Hot or Cold?. The World Bank 1996; Policy Research Working Paper No1669.

[20] Demirgüc-Kunt A, Detragiache E. Financial Liberalization and Financial Fragility. The World Bank 1999; Policy Research Paper No1917.

[21] Diamond DW, Dybvig PH. Bank Runs, Deposit Insurance, and Liquidity. Journal of Political Economy 1983;91; 401-419.

[22] De Gregorio J, Edwards S, Valdés RO. Controls on capital inflows: do they work? Journal of Development Economics 2000;63; 59-83.

[23] Drukker DM. Testing for serial correlation in linear panel-data models. Stata Journal 2003;(3)2; 168-177.

[24] Easterly W, Roumeen I, Stiglitz JE. Shaken and Stirred: Explaining Growth Volatility. Annual World Bank Conference on Development Economics 2000; 191-211.

[25] Edison JH, Klein MK, Ricci L, Sloek T. Capital Account Liberalization and Economic Performance: Survey and Synthesis. NBER 2002; Working Paper 9100.

[26] Eichengreen B, Leblang D. Capital Account Liberalization and Growth: was mr. Mahathir right? NBER 2003; Working Paper 9427.

[27] Favara G. An Empirical Reassessment of the Relationship between Finance and Growth. IIES Stockholm University 2006; Mimeo.

[28] Frankel, J, Rose AK. Currency Crashes in Emerging Markets: An Empirical Treatment. Journal of International Economics 1996;41; 351-368.

[29] Furman J, Stiglitz JE. Economic Crises: Evidence and Insights from East Asia. Brookings Papers on Economic Activity 1998;2; 1-135.

[30] Fölster S, Henrekson M. Growth and the public sector: a critique of the critics. European Journal of Political Economy 1999;15; 337-358.

[31] Fölster S, Henrekson M. Growth effects of government expenditure and taxation in rich countries. European Economic Review 2001;45; 1501-1520.

[32] Greene WH. Econometric Analysis. Third Edition, Prentice-Hall International Editions 1997.

[33] Griffith-Jones S. Global Capital Flows; Should they be Regulated? Palgrave Macmillan 1998.

[34] Grossman G, Helpman E. Quality Ladders in the Theory of Growth. Review of Economic Studies 1991;58; 4-61.

[35] Islam N. Growth empirics: A panel data approach. Quarterly Journal of Economics 1995;110; 1127-1170.

[36] Kim W. Does Capital Account Liberalization Discipline Budget Deficits? Review of International Economics 2003;11; 830-844.

[37] King R, Levine R. Finance and Growth: Schumpeter Might Be Right. Quarterly Journal of Economics 1993;108; 93-115.

[38] Krugman P. A Model of Balance of Payments Crises. Journal of Money, Credit and Banking 1979;11; 311-325.

[39] Larrain F, Laban R, Chumacero R. What Determines Capital Inflows? An Empirical Analysis for Chile. Harvard Institute for International Development 1997; Development Discussion Paper No 590.

[40] Leamer EE. Let's Take the Con Out of Econometrics. American Economic Review 1983;75; 31-43.

[41] Levin R. Financial Development and Economic Growth: Views and Agenda. Journal of Economic Literature 1997;2; 688-726.

[42] Levin R. The Legal Environment, Banks, and Long-run Economic Growth. Journal of Money, Credit and Banking 1998;30; 596-620.

[43] Levin R, Loayza N, Beck T. Financial intermediation and Growth: Causality and Causes. Journal of Monetary Economics 2000;46; 31-77.

[44] Levin R, Renelt D. A Sensitivity Analysis of Cross-Country Growth Regressions. American Economic Review 1992;82; 942-963.

[45] Levin R, Zervos A. Stock Markets, Banks, and Economic Growth. American Economic Review 1998;88; 537-558.

[46] Lucas RE. On the Mechanics of Economic Development. Journal of Monetary Economics 1988;22; 3-42.

[47] Mankiw NG, Romer D, Weil DN. A Contribution to the Empirics of Economic Growth. Quarterly Journal of Economics 1992;107; 407-437.

[48] Meade J. The Theory of International Economic Policy Vol 1: The Balance of Payments1951. Oxford University Press, Oxford.

[49] Montiel P, Reinhart CM. Do Capital Controls Influence the Volume and Composition of Capital Flows: Evidence from the 1990s. Journal of International Money and Finance 1999;18; 619-635.

[50] Obstfeldt M. Risk-Taking, Global Diversification, and Growth. American Economic Review 1994 a;84; 10-29.

[51] Obstfeldt M. The Logic of Currency Crises.Banque de France, 1994 b; Cahiers economiques et monetaires 43; 189-213.

[52] Obstfeldt M. Models of Currency Crises with Self-Fulfilling Features. European Economic Review 1996;40; 1037-1047.

[53] Raghuram GR, Zingales L. Financial Dependence and Growth. American Economic Review 1998;88; 559-586.

[54] Rebelo S. Long-Run Policy Analysis and Long-Run Growth. Journal of Political Economy 1991;99; 500-521.

[55] Rodrik D 1998. Who Needs Capital-Account Convertibility? In: Should the IMF Pursue Capital Acount Convertibility? Essays in International Finance 207. Princeton NJ: Princeton University Press 1998.

[56] Rodrik D, Subramanian A, Trebbi F. Institutions Rule: The Primacy of Institutions over Geography and Integration in Economic Development. Journal of Economic Growth 2004;9; 131-165.

[57] Rodrik D, Velasco A. Short-Term Capital Flows. NBER 1999; Working Paper No7364.

[58] Romer PM. Increasing Returns and Long-Run Growth. Journal of Political Economy 1986;94; 1002-1037.

[59] Romer PM. Endogenous Technological Change. Journal of Political Economy 1990;98; 71-102.

[60] Sachs JD, Tornell A, Velasco A. Financial Crises in Emerging markets: The lessons from 1995. Brookings Papers on Economic Activity 1996;1; 147-215.

[61] Sala-i-Martin X. I just ran two million regressions. American Economic Review 1997;87; 178-183.

[62] Sen A. Development as Freedom. Oxford University Press; 1999.

[63] Shiller RJ. Comovements in Stock Prices and Comovements in Dividends. Journal of Finance 1989;44; 719-729.

[64] Stiglitz JE Weiss A. Credit Rationing in Markets with Imperfect Information. American Economic Review 1981;71; 393-410.

[65] Turner P. Capital Flows in the 1980s: A Survey of Major Trends. Bank for International Settlements 1991. Economic Papers, No30.

[66] Valdés-Prieto S, Soto C. The Effectivness of Capital Controls in Chile. Empirica 1998;25; 133-64.

[67] White H. A heteroscedasticity-consistent covariance matrix estimator and a direct test for heteroscedasticity. Econometrica 1980;48; 817-838.

[68] Wooldridge JM. Econometric Analysis of Cross Section and Panel Data. Cambridge, MA: MIT Press; 2002.

Appendix I: ***Descriptive Statistics and Correlation Matrices.***

Descriptive Statistics

	VSTF/RES		*VSTF/GDP*	
	Developed	*Emerging*	*Developed*	*Emerging*
mean	0.44	0.37	0.024	0.032
std	0.54	0.39	0.027	0.031
max	4.32	1.98	0.16	0.19

Correlation matrix of explanatory variables, all countries.

	InY	*INV.*	*EDU.*	*CAR*	*OPEN*	*VSTF/RES*	*VSTF/GDP*
InY	1						
INV.	0.19	1					
EDU.	0.69	0.18	1				
CAR	−0.62	−0.25	−0.45	1			
OPEN	0.03	0.56	−0.09	−0.22	1		
VSTF/RES	0.20	−0.19	0.17	−0.24	−0.12	1	
VSTF/GDP	0.26	0.21	0.05	−0.34	0.58	0.47	1

Correlation matrix of explanatory variables, developed markets.

	InY	*INV.*	*EDU.*	*CAR*	*OPEN*	*VSTF/RES*	*VSTF/GDP*
InY	1						
INV.	0.05	1					
EDU.	0.50	−0.02	1				
CAR	−0.71	0.12	−0.43	1			
OPEN	−0.03	−0.18	−0.05	0.03	1		
VSTF/RES	0.32	−0.33	0.24	−0.39	0.11	1	
VSTF/GDP	0.39	−0.23	0.14	−0.41	0.48	0.70	1

Correlation matrix of explanatory variables, emerging markets.

	InY	*INV.*	*EDU.*	*CAR*	*OPEN*	*VSTF/RES*	*VSTF/GDP*
InY	1						
INV.	0.18	1					
EDU.	0.54	0.23	1				
CAR	−0.35	−0.42	−0.19	1			
OPEN	0.32	0.72	0.05	−0.51	1		
VSTF/RES	−0.04	−0.21	−0.03	0.10	−0.27	1	
VSTF/GDP	0.45	0.48	0.15	−0.39	0.71	0.11	1

Appendix II: ***Development of Short-Term Capital Flows in Selected Countries.***

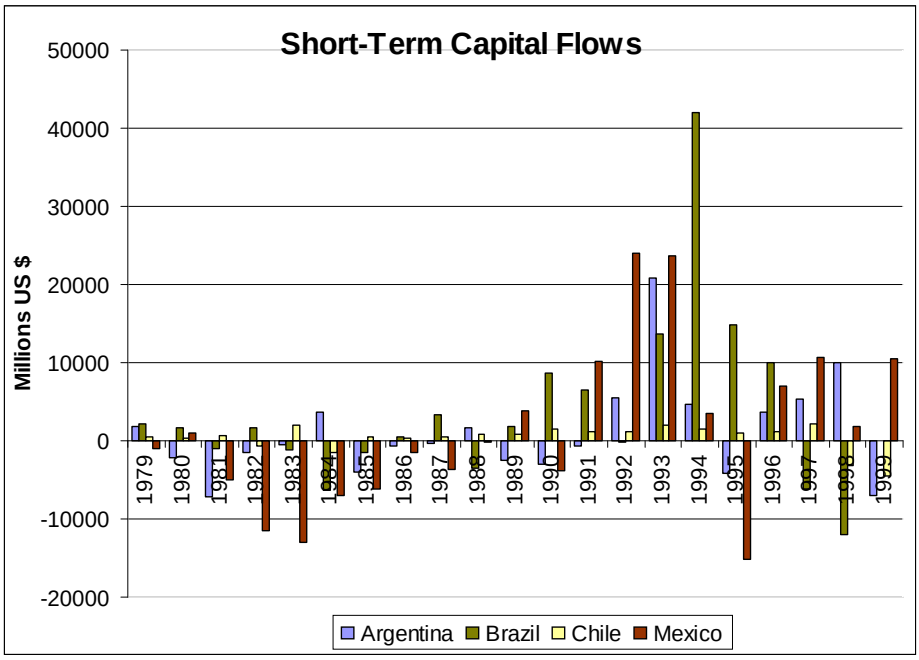

Figure 1: The development of short-term capital flows in millions of U.S dollars in selected Latin American countries from 1979-1999.

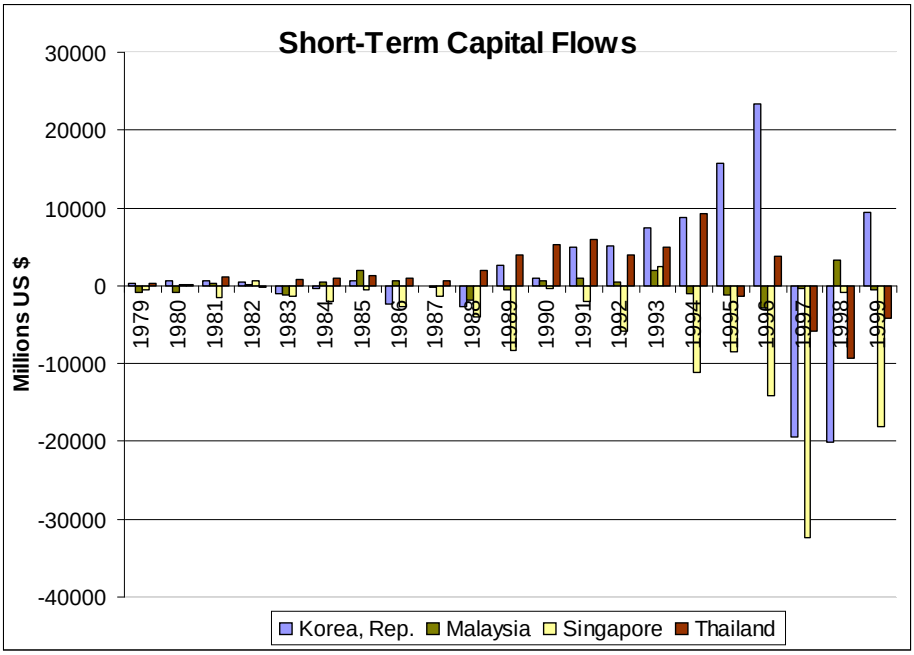

Figure 2: The development of short-term capital flows in millions of U.S dollars in selected East Asian countries from 1979-1999.

Appendix III: ***Data Description of Variables.***

The dependent variable in all regressions is the average annual growth rate of GDP per capita ($\Delta y_{i,t}$) and is computed using the data series of ($RGDPL$) from *Penn World Table 6.1* (PWT 6.1) as: $\left((y_E/y_B)^{1/(E-B)} - 1\right) * 100$ (B=beginning of period, E=end of period). The other variables that are always included in the regressions are:

inY initial income which is measured as the log of real GDP per capita with the initial year for each subperiod using ($CGDP$) from PWT 6.1.

Edu the rate of accumulation of human capital is measured as average schooling years in the total population over age 25 and is reported with the initial year for each subperiod, the (TYR) variable from Barro and Lee's dataset.

Inv investment ratio, which is calculated as the period average of real investment to GDP for each subperiod using (KI) from PWT 6.1.

RES reserves are measured as total reserves plus gold. Data from IFS/IMF.

CAR the measure of capital account restrictions will follow Dani Rodriks' (1998) guidelines and will be the proportion of years, in every subperiod, for which the capital account was free of restrictions. For the developing countries the data used is from Kim (1997) in Rodrik (1998), and complemented for recent years using IMF annual reports on exchange restrictions. For developed countries information is used from Mehrez and Kaufmann (2000).

$OPEN$ the second control variable, which is the sum of exports and imports of goods and services measured as a share of gross domestic product in real terms, using ($OPENC$) from PWT 6.1.

The variable of Short-Term Capital Flows is constructed from IMF's '*Balance of Payments Statistics*' by adding the following lines together:

- **4600 Portfolio Investment; 4998 Errors and Omissions;**
- **Other investment: Assets;** 4724 Loans, Banks, of which short-term; 4727 Loans, Other sectors, of which short-term; 4733 Currency and deposits, Banks; 4734 Currency and deposits, Other sectors
- **Other investment: Liabilities;** 4768 Loans, Monetary Authorities, of which short-term; 4771 Loans, General Government, of which short-term; 4774 Loans, Banks, of which short-term; 4777 Loans, Other sectors, of which short-term; 4789 Other liabilities, Monetary authorities, of which short-term; 4792 Other liabilities, General government, of which short-term; 4795 Other liabilities,

Banks, of which short-term; 4798 Other liabilities, Other sectors, of which short-term.

The IMF's balance of payment statistics measures net inflows as positive and net outflows as negative, irrespective of whether they are classified as assets or liabilities.

EBA Variables

Name	**Description**	**Source**
GOV	Government share of GDP, percent, current prices.	PWT 6.1
GOVG	Growth of Government share of GDP, current prices.	PWT 6.1
SAVE	Current savings, percent, current prices.	PWT 6.1
CONSG	Growth of Consumption share of GDP, current prices.	PWT 6.1
URBAN	Urban Population, percent of total.	WDI 2000 Data on disk
LIFEX	Log of Life Expectancy at birth, no. of years.	WDI 2000 Data on disk
INF	Annual inflation, percent.	WDI 2000 Data on disk
SDINF	Standard Deviation of Inflation, calculated using inflation.	WDI 2000 Data on disk
LF	Growth of Labor Force, annual percent.	WDI 2000 Data on disk
BUDGET	Overall Budget Balance, percent of GDP.	WDI 2000 Data on disk

Appendix IV: ***Cross Country and Robustness Regressions***

Table A: Regressions for the Effects of Short-Term Capital Flows on Growth, 1970-2000.
Cross country regressions: All countries

Explanatory variables								
InY	INV.	EDU.	VSTF/RES	VSTF/GDP	CAR	OPEN	Obs	$R^2_{adj.}$
-1.59^{***}	0.07^{**}	0.25^{**}	-0.59		0.53	0.01^{**}	34	0.53
(3.96)	(2.08)	(2.20)	(0.87)		(0.74)	(2.28)		
-1.52^{***}	0.07^{**}	0.22^{**}		-21.54^{*}	0.57	0.02^{***}	34	0.57
(4.18)	(2.13)	(2.10)		(1.83)	(0.83)	(2.88)		

Note: *, ** and *** denote significance at the 10, 5, and 1% levels respectively.

|t|-ratios in parentheses. All regression include a constant.

As a general note concerning growth regressions derived from traditional growth theory we have to keep in mind some issues. Firstly, we are estimating long-run relationships, hence we need a relatively large time period. Secondly, it is a general theory and putting it to the test for only a selective number of countries will certainly induce selection bias. Thirdly, growth regressions such as these, put emphasis on differences between countries. As we can see from the cross country estimation above, in such a setting the results for initial conditions, education and human capital hold well. However, there is no guarantee that if we conduct a pure time-series analysis that this would be true. Most of the time we do not find these results. Hence when conducting a panel estimation, i.e introduce a time dimension, the weight we put on cross country differences is lessened and it is not surprising that in some cases we do not find these variables significant. Lets, for example, have a sample of only OECD countries from the end of 1980s and perform a growth regression. For most specifications the growth regressions break down and not even initial conditions matter. Hence, a large part of the insignificance of the 'traditional' growth variables in the main results, is deliberate, since we wish to include a time dimension and to restrict our attention to a specific class of countries, namely emerging markets.

Table B: Estimations of Table 3 without Heteroscedastic Errors. Developing Markets

Method:	FGLS	FGLS	FGLS	FGLS	FE	FE
	Panel 1	Panel 1	Panel 2	Panel 2	Panel 2	Panel 2
VSTF/RES		-1.85^{***}		-3.35^{***}		-3.35^{***}
		(2.75)		(5.09)		(4.21)
VSTF/GDP	-35.3^{***}		-39.0^{***}		-39.0^{***}	
	(3.30)		(3.57)		(2.96)	

Note: *, ** and *** denote significance at the 10, 5, and 1% levels respectively |t|-ratios in parentheses.

Table C: Country and Time Period Exclusion, Base Regressions Table 3 Panel 1, Developing Markets

	Dropping:						
	Argentina	Brazil	Chile	Colombia	Israel	Korea	Malaysia
VSTF/RES	-2.34^{***}	-2.01^{***}	-2.23^{***}	-2.92^{***}	-3.07^{***}	-2.66^{***}	-2.26^{***}
	(3.28)	(2.86)	(3.29)	(4.22)	(4.43)	(4.03)	(3.32)
*VSTF/GD*P	-34.2^{***}	-32.0^{***}	-31.9^{***}	-35.2^{***}	-36.6^{***}	-30.4^{***}	-35.2^{***}
	(3.88)	(3.73)	(3.02)	(4.03)	(4.12)	(3.49)	(3.93)
	Mauritious	Mexico	Singapore	Thailand	Turkey	Uruguay	Venezuela
VSTF/RES	-2.58^{***}	-2.96^{***}	-2.42^{***}	-2.42^{***}	-1.83^{**}	-2.11^{***}	-3.06^{***}
	(3.91)	(3.90)	(3.60)	(3.69)	(2.50)	(2.97)	(4.73)
VSTF/GDP	-27.7^{***}	-30.9^{***}	-51.3^{***}	-32.8^{***}	-30.8^{***}	-32.4^{***}	-30.0^{***}
	(3.15)	(3.59)	(4.62)	(3.69)	(3.66)	(3.61)	(3.30)
	1975-1980	1980-1985	1985-1990	1990-1995	1995-2000		
VSTF/RES	-2.19^{***}	-3.84^{***}	-2.14^{***}	-2.47^{***}	-1.76^{**}		
	(3.26)	(4.82)	(3.25)	(3.44)	(2.53)		
VSTF/GDP	-34.8^{***}	-21.7^{**}	-31.3^{***}	-34.4^{***}	-44.0^{***}		
	(4.90)	(2.32)	(3.67)	(3.50)	(3.78)		

Note: *, ** and *** denote significance at the 10, 5, and 1% levels respectively |t|-ratios in parentheses.

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