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Does Financial Sector Development Augment Cross Border Capital Flows?

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Does Financial Sector Development Augment Cross Border Capital Flows?[*]

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Abstract

The sharp increase in volatility of capital flows in recent years has resulted in many countries altering the regulations governing the flow of foreign capital only to find such changes having a limited impact. We postulate that one reason for the limited effectiveness of such changes in regulations is the level of financial sector development in the country. As a country enhances its level of financial sector development, it also develops more and more sophisticated financial instruments. The more advanced the domestic financial instruments are, and the deeper is the integration of the domestic financial markets with the world markets, the greater is the likelihood of developing strategies to bypass capital account management measures. In this paper, we undertake various empirical techniques to identify the impact of financial sector development on capital flows, accounting for regulatory regime. The empirical results indicate that there is a threshold effect in the financial sector development capital flow relationship. In particular, financial sector development augments greater integration with global capital flows only above a threshold level. Below the threshold level we find financial development reduces the extent of integration with global capital markets.

JEL Classification: F36; F41 and E52
Keywords: Capital Flows, Financial Sector Development, Macroeconomic Management

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1 Introduction

During the last two and a half decades, emerging markets have been subject to the substantial vagaries of capital flows. Gross capital inflows (as a % of GDP) to emerging markets more than doubled from being around 2.8% of GDP in the first quarter of 1990 to around 7.0% in the last quarter of 1996 (Figure A1).[1] However, they collapsed to 1.3% of GDP in the fourth quarter of 1997, as several countries in East and South East Asia entered into a crisis. After remaining subdued for the next few years, inflows started picking up from early 2000s, reaching a peak of 12.5% of GDP in the second quarter of 2007. The onset of the sub-prime crisis in 2007, and the subsequent Global Financial Crisis (GFC) in 2008, resulted in a strong reversal of flows to emerging markets, resulting in gross capital outflows to the extent of 4.9% of GDP. Subsequently, the pursuit of unconventional monetary policy in the advanced economies in the form of low interest rates, to boost aggregate demand, resulted in a large quantum of capital flowing into the emerging markets.

Such heightened volatility in capital flows has significantly enhanced the complexities involved in balancing the diverse objectives of managing the macroeconomy, and has rekindled the debate on imposing various macroeconomic and capital account management measures to manage these capital flows. These measures have been aimed at resisting excessive currency appreciation that would make domestic exports uncompetitive, prevent creation of asset bubbles, bursting of which can entail a significant cost, retain monetary policy autonomy, which is essential to maintain macroeconomic stability, and reduce vulnerability from contagion effects (Magud and Reinhart, 2006). In the post-GFC period, as the unconventional monetary policies in the advanced economies resulted in a surge of capital flows into emerging markets, several countries such as Brazil, Peru, Korea and Indonesia imposed capital flow management measures such as tax on inflows, additional capital requirements for foreign exchange credit exposure, minimum holding period and withholding tax to manage the volatility of these flows. These changes in regulations were reflected in a drop in *de jure* capital account openness in many countries. In contrast, this had a limited impact on *de facto* openness, as generally measured by cross border acquisition of assets and liabilities.

In this paper we postulate that one reason for changes in regulations, reflected in change in *de jure* openness, having negligible impact on *de facto* openness, is the

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[1]As pointed out in Bluedorn et al. (2013), gross inflows arise when the economy incurs more external liabilities (inflows with a positive sign) or the economy reduces its external liabilities (inflows with a negative sign). Thus, gross inflows are net sales of domestic financial instruments to foreign residents. Gross outflows arise when the economy acquires more external assets (outflows with a positive sign) or the economy reduces its holdings of external assets (outflows with a negative sign). Thus, gross outflows are net purchases of foreign financial instruments by domestic residents. Net capital flows are the difference between gross inflows and outflows.

level of financial sector development in a country. In particular, we empirically test the hypothesis that increased financial sector development leads to a higher degree of *de facto* openness, even after controlling for *de jure* capital account openness. As a country enhances its level of financial sector development, it develops more and more sophisticated financial instruments. The more advanced the domestic financial instruments are, and the deeper is the integration of the domestic financial markets with the world markets, the greater is the likelihood of developing strategies to bypass capital flow management measures. Moreover, strategies to evade these measures tend to develop rapidly, especially in the case of selective measures targeting specific kinds of flows. Uniform restrictions tend to be easier to enforce, but they are obviously incapable of altering the composition of flows, which is the key issue from macro-prudential perspective.

The rest of the paper is structured as follows. Section 2 provides a brief review of the literature. In Section 3, we analyze the evolution of *de facto* openness and various determinants found in the literature influencing *de facto* openness. In Section 4, we examines the link between *de facto* openness and financial sector development using a variety of econometric techniques. Finally, Section 5 concludes with the main highlights of the paper.

2 Literature Review

With global capital flows being inherently volatile, many countries have sought to implement measures aimed at managing cross border flow (Bluedorn et al., 2013). These measures have ranged from resisting sharp movements in the exchange rate, retaining monetary autonomy to respond to needs of the macroeconomy, managing the flow of hot money to avoid the formation of asset bubbles and stemming the risks of contagion in the event of a financial crisis occurring in other economies (Coelho and Gallagher, 2010; Magud and Reinhart, 2006). Consequently, many of the financially open economies have employed capital flow management measures at different points in time and to varying degrees.[2]

Cross border capital flows are influenced by numerous factors. In the literature, these factors are classified into two categories, push factors or global factors that are extraneous to the host countries and pull factors, which tend to be country specific (Fratzscher, 2012; Volz, 2012).[3] During the late 1980s and early 1990s, both these

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[2]For details on benefits and costs of financial openness see Prasad et al. (2007b) and Kose et al. (2009).

[3]Global factors include appetite for risk, global liquidity, interest rate differentials due to changes in monetary and fiscal policies in advanced economies and occurrence of crisis in one or more economies. Country specific factors include rates of economic growth, macroeconomic stability, resource endowment, institutional quality and size and fragility of the financial sector.

factors have been found to be major determinants of cross border flows. For instance, the large volumes of capital flows from United States to Latin American and Asian economies were found to be equally sensitive to push and pull factors thus giving them equal significance (Taylor and Sarno, 1997). However, with global capital flows surging to economies with very diverse characteristics in the first half of 2000s it was realized that global factors like cyclical movements in interest rates and risk appetite seem crucial in driving these flows (Forbes and Warnock, 2012; Fratzscher, 2012; Milesi-Ferretti and Tille, 2011; Volz, 2012). In a recent paper Pagliari and Hannan (2017), conduct an empirical exercise, and conclude that push factors tend to be more important compared to pull factors when explaining volatility of capital flows.

The predominance of global factors in recent years have undermined the role played by domestic factors, and has resulted in volume of cross border capital flowing into a country being discordant with the absorptive capacity of that country. This resulted in numerous macroeconomic tensions in the economy, and forced economies to introduce various capital account management measures. However, the efficacy of these measures has been mixed at best. Baba and Kokenyne (2011) conclude that price based capital flow management measures were not significantly effective in discouraging capital inflows or altering their composition in selected Asian and Latin American countries. Hutchison (2012) undertakes a comprehensive review of the empirical evidence on the efficacy of capital controls focusing on the impact of the controls on exchange rate volatility, disruptive effects of volatile short-term and speculative capital flows and loss of monetary autonomy. The paper concludes that there is limited evidence of these measures having an impact on warding off currency crisis or sudden stops, although there is some evidence of these measures slowing aggregate flows in the desired direction and shifting the composition of capital flows towards longer maturity. Capital flow management measures were found to be most successful in providing some autonomy to the monetary authorities. However, most of impact was temporary, and withered away over a period. Studies like Basu et al. (2015) and Sengupta and Sen Gupta (2016) have shown that imposition of *ad hoc* capital flow management measures tend to have negligible impact on cross border capital flow in various Asian economies.

Ariyoshi et al. (2000) point out that a key factor that limits the effectiveness of the capital flow management measures is the presence of developed financial sector, which reduces the cost of circumvention relative to the incentives. Garber (1998) highlight the use of offshore derivatives trading to dodge these measures. Focusing on Brazil, de M. Carvalho and Garcia (2008) highlight numerous examples where sophisticated financial markets helped investors circumvent the capital flow management measures. These have ranged from financial instruments being used to disguise short-term investments as long-term, equity, or trade-finance to use of derivatives.

Consequently, while a large volume of the existing research, including Rajan and Zingales (1998), Levine (2005) and Demetriades and Andrianova (2005) have found that a deep and well-functioning financial system is a key element behind economic growth, it can have unintended consequences like limiting the effectiveness of capital flow management measures.[4] A large volume of literature has focused on the reverse channel of causation i.e. increased *de facto* openness has fostered greater financial sector development through different ways. Liberalization of the capital account would help interest rates achieve their competitive equilibrium by easing financial repression (McKinnon, 1973; Shaw, 1973). This would significantly improve the efficiency of resource allocation. Chinn and Ito (2006) point out that dismantling of capital controls widens the availability of funds for borrowers while allowing domestic and foreign investors to engage in improved portfolio diversification. Finally, the resultant rise in competition because of capital account liberalization would also weed out the existing inefficient financial systems and thereby increase the overall efficiency level of the financial system (Claessens et al., 2001; Stiglitz, 2000). Baltagi et al. (2009) also argue that both trade and financial openness, as well as quality of economic institutions, explain a large part of the variation in financial sector development across countries.

3 Evolution of Key Variables Impacting Capital Flows

Over the last two and a half decades, most countries have significantly liberalized cross border movement of capital. Cross-border holding of financial assets and liabilities, a measure of *de facto* openness, developed in Lane and Milesi-Ferretti (2007), rose sharply from being equal to world GDP in early 1990s, to a peak of over 300% of world GDP in 2007 (Figure 1). Immediately, after GFC, there was a drop in *de facto* openness due to rise in risk averseness among global investors and diminished cross-border activity by banks in the advanced economies. The unconventional monetary policies introduced in various advanced economies to aid their recovery led to a rise in cross border acquisition of assets and liabilities from 2009 onwards, especially in the advanced economies. However, the onset of the Eurozone crisis in 2010, and tapering of its bond buying program by the Federal Reserve Bank in United States in 2013 have resulted in the extent of *de facto* openness remaining stagnant over the last few years.

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[4]However, the relationship between financial sector development and growth is not monotonic. Law and Singh (2014) provide an overview of the literature that explains the non-linear relationship between financial sector development and growth. The reasons forwarded for the non-linear relationship extend from the financial sector competing with the rest of the economy for scarce resources to financial sector developing instruments that have limited beneficial impact on the real sector but can promote excessive risk-taking behavior, and lead to a costly crisis.

One of the factors driving the increase in cross-border holding of assets and liabilities during the 1990s and 2000s could be the progressive liberalization of the guidelines governing the ownership of these assets and liabilities. Figure 1 highlights the evolution of a *de jure* capital account liberalization index, which is based on the legal restrictions imposed on cross-border financial transactions.[5] The index is developed in Chinn and Ito (2006). However, as is evident, the increase in *de jure* openness is relatively muted compared to evolution of *de facto* openness. Thus there are factors, other than liberalization of capital flow management measures, that have contributed to rise in volume of cross-border transactions.

One such factor is the stance of monetary policy followed in the advanced economies. For a substantial period since the early 2000s, advanced economies have pursued a lax monetary policy, allowing the balance sheets of the central banks in these economies to expand substantially (Figure 2). The pace of accumulation of central bank assets (as a % of GDP) in advanced economies started increasing since the mid-1990s and continued till 2006. The signals of onset of the sub-prime crisis, and the subsequent onset of the GFC led to a temporary decline in the accumulation of assets by the central bank. In the aftermath of GFC, central banks of the advanced economies implemented unconventional monetary policies to restore financial market stability and bolster economic activity. Apart from sharply reducing policy rates, these policy measures included a large volume of asset purchases to reduce long-term yield and rekindle aggregate demand. Sahay et al. (2014) point out that Quantitative Easing (QE) by the United States led to a 750% increase in the balance sheet of the Federal Reserve Bank.

Rising trade openness has often been cited as influencing capital flows through a variety of channels. Antras and Caballero (2009) argue that in less financially developed countries trade integration increases the incentives for capital to flow into these economies. In such economies there exist numerous financial constraints that misallocate capital across sectors. Trade alleviates this misallocation problem, thereby incentivizing capital to flow into these countries. Taylor and Wilson (2006) also establish a positive effect of trade on financial flows, arguing that trade decreases asymmetric information and hence enhances capital flows. Furthermore, with increasing openness to international trade, it becomes difficult to maintain restrictions on capital flows as greater trade openness provides numerous opportunities for evading these capital flow restrictions by misinvoicing the trade transactions (Patnaik et al., 2012).

Moreover, Rajan and Zingales (2003) argue that unless trade and capital account openness proceed in a collaborative manner there are increased chances economic dis-

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[5]This index measures the level of capital account openness based on restrictions on cross-border financial transactions reported in the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER).

tortions. For example, opening up to trade, without a commensurate level of capital account openness can lead to financial repression as the domestic industry would demand finance at cheaper rates to challenge foreign competition. Similarly, liberalizing flow of foreign capital alone can result in domestic large firms, by getting selective access to foreign funds, to be at an advantage compared to its competitors. The last two and a half decades have witnessed trade openness, measured as the ratio of the sum of exports and imports to a country's GDP, increasing across various countries (Figure 3). This ratio rose to its peak levels by 2006 before the sub-prime crisis and the subsequent GFC led to a sharp drop in the ratio during 2007 to 2009. The ratios have recovered a bit thereafter but continues to be well below its peak level.

The quality of institutions in an economy is also an important factor in driving capital flows. Investors often base their decisions on the quality of institution in the host country, apart from the economic pull factors. The standard neoclassical theory predicts that capital will flow to countries with a higher expected net value of investment. However, this expected value can be affected by institutional quality as the latter takes into account property rights and credibility of government policy. An improvement in institutional quality should attract greater capital inflows as investors look for safer investments (flight to quality). At the same time, better institutions would also result in domestic agents allocating more capital in the residence country instead of taking it abroad. The quality of institution is assessed using the set of institutional variables available from the Worldwide Governance Indicators (WGI), estimated by Kaufmann et al. (2009). The indicators encompass (i) likelihood of an unconstitutional change in government with or without violence, (ii) credibility of policies and its independence from political pressures, (iii) government's ability to implement policies to boost private sector development, (iv) extent to which citizen's are able to participate in selecting their government and their freedom of expression, (v) extent to which public power is exercised for private gain and (vi) extent to which agents have confidence in and abide by the rules society, especially those related to contract enforcement, property rights, police and the courts. These indexes have been normalized to have zero mean and unit standard deviation.

The evolution of these indicators are outlined in Figure 4. It is evident that across the different indicators, institutional quality in advanced economies is better than emerging markets. Since these indicators are highly correlated, ($R^2 \geq 0.7$), we create an institutional quality index by extracting a component of the six governance indicators, using the principal component analysis (Figure 5). This index also reduces the measurement error and sorts out multicollinearity issues.

Although, across all the indicators, there is limited variation for a country group over the period 1996 to 2015, there is considerable variation within the countries.

Figure 5 shows that in 2014, the institutional quality index ranged from -1.81 for Equatorial Guinea to 2.32 for New Zealand. Generally, countries in sub-Saharan Africa, Latin America, Middle East and South Asia have negative values, while the OECD economies and selected economies of East and South East Asia have positive values.

Furthermore, overall economic growth can also influence the cross border acquisition of assets and liabilities, as a healthy GDP growth is associated with new investment opportunities arising in that economy and thereby attracts both domestic and foreign investors.

Finally, in this paper, we argue that a key determinant of cross border flow of capital is the extent of financial sector development in an economy. During the last two decades, alongside a rising capital account openness, several countries have experienced an unprecedented progress in the development of the financial sector (Figure 6). Moreover, this increase in the level of financial sector development is robust to different indicators of financial sector development. As can be seen in Appendix Tables A1, barring the ratio of stock market capitalization to GDP, all the other measures of financial sector development are highly correlated with each other ($R^2 \geq 0.65$). These trends towards deregulation and privatization in financial sector can influence the behavior of domestic and foreign investors, and thereby on the volume and composition of capital inflows and outflows.

Foreign investors tend to be hampered by the lack of knowledge of domestic conditions while investing in a distant location. They are neither aware of the risks nor the opportunities of the local markets as well as local investors. Financial intermediaries, by extending their knowledge about local market risks to foreign investors are able to provide credibility to potential profit thereby stimulating their entry. A well developed financial sector also promotes cross border capital flow by facilitating interactions between foreign firms and local firms. Similarly, portfolio flows are contingent on certain level of financial sector development such as a well developed equity and bond markets. Furthermore, a well developed financial sector is able to generate instruments through financial engineering that can circumvent existing capital flow management measures.

The relationship between *de jure* capital account openness and *de facto* openness across countries with different levels of financial sector development is highlighted in Figure A2.[6] It is evident that in countries with low levels of financial sector development

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[6]Here financial sector development is proxied by the ratio of credit provided by domestic financial institutions to the private sector to GDP. We calculate the average of this ratio for a country over the period 1990 to 2015. We take median value of this ratio, taking out the outliers. Countries placed above the median value are categorized as countries with high levels of financial sector development, while countries with values above the median are characterized as countries with low levels of financial sector development. Annual averages for *de facto* and *de jure* openness are calculated by taking the mean of values for a country over the period 1990 to 2015. To test the robustness, we use alternate measures of financial sector development like ratio of liquid liabilities to GDP, ratio of credit by the banking system to private sector to GDP, and

there is no relationship between *de jure* and *de facto* openness. However, for economies with high levels of financial sector development, there exists a significantly positive relationship between *de jure* and *de facto* openness. Moreover, Figure A2 also shows that for a given level of *de jure* capital account openness, countries with high level of financial sector development exhibit higher degree of *de facto* openness compared to countries where the financial sector is less financially developed. For example the average *de jure* openness in countries with high levels of financial sector development at 0.68 is not substantially different from that in countries with low levels of financial sector development, where *de jure* openness averages 0.58. However, the average level of *de facto* openness at 2.3 in the former is nearly double of 1.2 witnessed in the latter.

Thus our main testable hypothesis is that for similar degrees of *de jure openness*, countries with higher financial sector development experience greater cross border acquisition of assets and liabilities. We focus on the period 1990 to 2014 across advanced and emerging markets.

4   Empirical Strategy

4.1   Data Sources

As discussed above, *de facto* capital account openness is measured by the ratio of foreign assets and liabilities to GDP, and the data is sourced from External Wealth of Nations dataset built in Lane and Milesi-Ferretti (2007). The authors estimate external assets and liabilities for 211 industrial and developing countries using the international investment position figures published by national central banks, governments and multilateral agencies over the period 1970 to 2015. The dataset covers total foreign assets and liabilities as well as breaks down these to FDI, debt, and portfolio assets and liabilities.

For *de jure* capital account openness, we use the index developed in Chinn and Ito (2006). The index is based on information regarding restrictions in the International Monetary Fund's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). Specifically, the index is the first standardized principal component of the variables that indicate the presence of multiple exchange rates, restrictions on current account transactions, on capital account transactions, and the requirement of the surrender of export proceeds. The dataset covers 182 countries over the period 1970 to 2014.

Financial sector development can be captured in a variety of ways. One can focus on the banking sector as well as the stock or bond market. However, availability of cross-

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ratio of financial system deposits to GDP. The results are broadly similar across different specifications.

country data on development of the stock market, bond market or the mutual fund is limited, as can be seen in Appendix Table A1. Hence we focus on the banking system, and focus on the ratio of credit provided by the banking system to the private sector to GDP as our main indicator of financial sector development. To check the robustness of our results, we also use alternate indicators of financial sector development including the ratio of domestic credit to the private sector to GDP. The data is sourced from Financial Development and Structure developed in Beck et al. (2010) and updated in Cihak et al. (2012). The dataset covers 203 countries over the period 1960 to 2014.

To capture the impact of unconventional monetary policies we consider the interest rate differential between an individual country and the risk free rate. Given the extremely low probability of default by the United States on its treasury securities we consider the interest rate on these securities as the nominal risk free rate. However, global investors would be not only focus on nominal returns but would be concerned about the real return, which would be influenced by exchange rate movements, which in turn would be impacted by relative price differentials. Hence we focus on real interest rates by considering the real risk free interest rate for the individual countries, and taking the difference with the US risk free rate to obtain the real interest rate differential. The data is sourced from World Development Indicators.

Data on institutional variables is sourced from Worldwide Governance Indicators of World Bank, and is based on Kaufmann et al. (2009). As described in Section 3, WGI focuses on six dimensions of governance for over 200 countries over the period 1996 to 2015, and covers (a) Voice and Accountability, (b) Political Stability and Absence of Violence, (c) Government Effectiveness, (d) Regulatory Quality, (e) Rule of Law and (d) Control of Corruption. Using principal component analysis we create an institutional quality index. Data on other variables that impact cross border acquisition of assets and liabilities such as openness to trade and economic growth are sourced from World Development Indicators. While trade openness is calculated as the ratio of external trade (import and export) to GDP in current US Dollar, economic growth is measured as the annual GDP growth in constant 2000 US Dollar.

4.2   Estimation Strategy

4.2.1   Static Panel Analysis

Given the above dataset our empirical model is given by the following equation

$$Y_{it} = \alpha_i + \beta X_{it} + \Psi Z_{it} + \Phi \Gamma_{it} + \epsilon_{it} \tag{1}$$

where i refers to country and t represents the time periods. Here Y is the dependent variable i.e. the extent of *de facto* openness. While X refers to the main variable of

interest i.e. the extent of financial sector development, Z refers to the key control variable i.e. *de jure* openness. Finally, Γ is a vector of other variables described above that influence *de facto* openness.

We estimate Equation (1) using the feasible generalized least square estimation (FGLS) methodology, and the results are reported in Table 1. Under FGLS, the estimation strategy assumes the presence of AR(1) autocorrelation, and that the coefficient of the AR(1) process is specific to each panel. Furthermore the error structure is assumed to be heteroskedastic. At the aggregate level we find there is no relationship between *de jure* openness and *de facto* openness. This is in line with Figure A2 which shows *de jure* openness is not a good indicator of *de facto* openness in countries, which have low levels of financial sector development.

In contrast, a rise in financial sector development, measured by the credit the financial sector provides to the private sector (% of GDP), is associated with an increase in cross border acquisition of assets and liabilities (as a percentage of GDP). De facto openness increases by 1.48 to 1.64 percentage points of GDP as financial sector development improves by one percentage point. As countries improve the level of financial sector development, financial institutions are able to promote greater integration with global capital markets by providing information to foreign investors to incentivize their entry, facilitating interactions between foreign firms and local firms, developing markets such as equities and bond markets, and creating instruments through financial engineering that can circumvent existing capital flow management measures.

Across most of the specifications in Table 1, interest rate differential does not have any significant impact on *de facto* openness. Only in specification 5 we find a positive and significant relationship between interest rate differential and *de facto* openness. In contrast, GDP growth rates shows up as a significant and negative determinant of *de facto* openness. While this may seem counterintuitive as it implies that countries, which are growing at a rapid rate, and presumably generating more investment opportunities are witnessing lower volume of cross border capital flow. However, the outcome can be explained by the fact that it is typically the emerging markets that are witnessing rapid growth, and these economies continue to experience lower volume of capital flows, compared to the advanced economies which account for bulk of the cross border transactions, but are growing at a much lower rate.

Table 1 also indicates that increased trade openness is associated with greater capital flows, underlying the fact that trade openness alleviates the constraint of resource misallocation and asymmetric information, thereby incentivizing capital flows. Similarly, the institutional quality index also positively influences capital flows as investors are more confident of investing in countries, which boasts of better institutions. When we use individual metrics of institutional quality, we find control of corruption, regu-

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latory quality and government effectiveness have a significant impact on capital flows.

However, there exists great deal of divergence among countries at various stages of development. To understand this we undertake a subsample analysis where we look at how the above set of factors impact cross border acquisition of assets at different income levels. To do this we focus on countries across different income groups as per World Bank's classification. These include high income, upper-middle income, lower-middle income and low-income economies. The results are reported in the Appendix in Tables A2 to A5. We find important difference across the different income groups. First, *de jure* openness shows up as an important determinant of capital flows for the high income group, and not the other three. This could be driven by the fact that among the high-income countries the enforcement of laws guiding the openness of capital account is expected to be robust, and therefore *de facto* and *de jure* openness would show some degree of co-movement. In the other income groups, a lack of enforcement would create a divergence between *de facto* and *de jure* openness in some countries, while in others due to variety of reasons foreign investors may be reluctant to invest despite abolition of capital flow management measures.

In three of the four sub-samples viz. high income, upper middle income and lower middle income economies, financial sector development continues to be a positive significant determinant of *de facto* openness, across almost all specifications. However, in the case of low income economies, the coefficient becomes negative but continues to remain significant. The opposite sign in the low-income countries could be explained by the fact that greater development of financial sector would be associated with some residents opting to invest their money within the country instead of sending it abroad.[7] This leads to a decline in cross border flow of capital.

The coefficient on interest rate differential is largely insignificant for most specifications across the various income levels. In only a couple of specifications in upper- and lower-middle income countries we find the coefficient being positive an insignificant. In contrast, the coefficient on trade openness is significant and positive for all specifications across all the country groups, reiterating the importance of a country's opening up to trade in facilitating greater movement of capital across borders.

The institutional index also shows up as a significant determinant of capital flows across all income levels, barring the low-income economies. In the low-income countries the coefficient has a negative sign but is insignificant.

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[7]Financial development is highly correlated with GNI per capita (Atlas Method), with an $R^2 \geq 0.8$ across the entire sample. Thus countries in the low-income group also tend to be characterized by low levels of financial sector development.

4.2.2 Dynamic Panel Analysis

One major limitation of the static model is that it does not account for the fact that financial sector development could potentially be an endogenous regressor. As described in Section 2, a large volume of literature has identified the role of capital account openness in improving the financial sector through numerous channels. Moreover, since our measure of de facto openness is based on acquisition of foreign assets and liabilities, and hence is a stock measure, it is likely to be highly persistent. In such instances, it could result in dynamic panel bias and cause biased estimates. To address both these issues i.e. endogeneity and dynamic panel bias, we resort to generalized method of moments i.e. Difference-GMM articulated in Arellano and Bond (1991). Under the Differnce-GMM, the model is first differenced to remove the state-specific effects, and the endogenous variables with their lagged levels being used as instruments. Thus Equation (1) transforms to

$$\Delta Y_{it} = \alpha_i + \lambda \Delta Y_{it-1} + \Delta X_{it} + \Psi \Delta Z_{it} + \Phi \Delta \Gamma_{it} + \Delta \epsilon_{it} \tag{2}$$

Table 2 reports the results of Difference-GMM estimation. We focus on specification (5) of Table 1, taking into account the lagged dependent variable (Y_{it-1}) and endogeneity of financial sector development. We report the results for the entire sample as well as the country groups split according to the income levels.

As expected the lagged dependent variable is large and significant in the case of full sample as well as the various sub-samples. Furthermore, the results indicate that even after taking into account the persistence in *de facto* openness and endogeneity of financial sector development, the hypothesis that greater development of the financial sector leads to greater acquisition of cross border assets and liabilities largely holds. As before *de jure* capital account openness is a significant predictor of de facto openness only in the case of high income countries. Lack of enforcement of capital flow management measures and limited interest amongst investors in investing in some countries create a dichotomy between de facto openness and *de jure* openness among the countries of the other income groups.

Among the other explanatory variables, both GDP growth rate and interest rate differential continue to be a significant predictor of de facto capital account openness in countries belonging to either lower middle income or low income group. This continues to be in line with the results obtained in Table 1. Improvement in institutional quality continue to have a positive and significant impact on de facto capital account openness in upper and lower income countries. In contrast, in low-income economies, an improvement in institutional quality is associated with lower de facto openness, although the effect is not significant. A large part of the cross border movement in capital in

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these economies takes the form of capital flight (Ndikumana and Boyce, 2003; Ngeno, 2000) due to fear of expropriation rising out of political instability and unsound economic policies. An improvement in institutional quality can help allay these concerns, and incentivize the residents in these economies to invest in domestic assets thereby reducing cross border flow of capital. Finally, trade openness ceases to be a significant predictor of de facto openness in this specification.

A key problem with the original Arellano-Bond estimator is that if the autoregressive parameter of the endogenous variable is sufficiently large, and there are a limited number of time-series observations, the Difference-GMM estimator will have a low precision and downward bias. To overcome this, Arellano and Bover (1995) and Blundell and Bond (1998) articulate the System-GMM, which improves the precision and reduces the bias. Under a System-GMM, two simultaneous equations are estimated. In the first one original equation in levels is used with lagged first difference as instruments, while in the second one first-differenced equation is used with lagged levels as instruments.

Although the results of the System-GMM in Table 3 are broadly similar to the Difference-GMM outlined in Table 2, there are some important differences. De facto capital account openness continues to show strong persistence, with the lagged value showing up as a significant predictor across all the specifications. Institutional quality also continues to be an important predictor in upper- and lower-middle income countries, while GDP growth is negatively related to *de facto* openness in lower-middle and low-income countries. Middle- and low-income countries continue to find that following a monetary policy that results in higher real interest rates relative to the United States helps them to attract more capital flows. Trade openness continues to remain an insignificant variable.

An important difference, between System-GMM and Difference-GMM estimation results relate to the size of the coefficient on the financial sector development variable. Across the full sample, as well as sub-samples of high, upper-middle and lower-middle income economies, the impact financial sector development on de facto capital account openness is significantly higher under the System-GMM specification compared to the Difference-GMM. Thus accounting for the persistence in key variables results in the impact of financial sector development on de facto openness to be considerably large. Moreover, across both Difference-GMM and System-GMM, the impact of financial sector development on de facto openness is highest in the high-income economies, followed by upper-middle and lower-middle income countries. Consequently, our results indicate that as countries move across the income spectrum, the impact of financial sector development on capital account openness increases steadily.

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4.2.3   Threshold Panel Analysis

A key finding from the sub-sample analysis above is that across various empirical spec-ifications, the relationship between financial sector development and *de facto* openness is not linear. In low-income countries, which are also countries with lower level of finan-cial sector development, an improvement in the level of financial sector development is associated with either a drop in the level of *de facto* openness or an insignificant impact. On the other hand, for lower-middle, upper-middle and high income countries, which are characterized by better developed financial sector, there is a significant positive impact of financial sector development on *de facto* openness. Thus there is a threshold effect on the relationship between financial sector development and *de facto* openness. Only above a certain threshold level of economic development the level of financial sector development is beneficial for *de facto* openness. In this section we formally test this hypothesis employing threshold regression.

Threshold regression has been widely used to study economic relationships between key macroeconomic variables including financial sector development and growth, in-flation and growth etc. However, according to our knowledge, ours is the first paper that is using this empirical tool to analyze the relationship between financial sector development and *de facto* openness. We use the dynamic panel threshold model devel-oped by Kremer et al. (2013), which is the that extends the original static setup model introduced in Hansen (1999) to endogenous regressors. [8] We consider the following threshold model of financial sector development and *de facto* openness.

This paper introduces a dynamic version of Hansen?s panel threshold model to shed more light on the inflation-growth nexus. By applying the forward orthogonal devia-tions transformation suggested by Arellano and Bover (1995), we combine the instru-mental variable estimation of the cross-sectional threshold model introduced by Caner and Hansen (2004) with the panel threshold model of Hansen (1999). In the dynamic model, the endogeneity of important control variables is no longer an issue. This per-mits us to estimate the critical level of inflation for economic growth for industrialized and non-industrialized countries albeit the endogeneity problem of initial income.

$$Y_{it} = \alpha_i + \beta_1 X_{it} I(X_{it} \leq \gamma) + \delta_1 I(X_{it} \leq \gamma)$$
$$+\beta_2 X_{it} I(X_{it} \geq \gamma) + \Phi\Gamma_{it} + +\epsilon_{it} \qquad (3)$$

While Y_{it} and X_{it} continue to be the *de facto* openness and financial sector de-velopment, Γ_{it} denotes the partly endogenous control variables. However, now X_{it}

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[8]We would like to express our gratitude to Alexander Bick for sharing the MATLAB code for the panel dynamic threshold tests.

is both the threshold variable, and the regime dependent regressor. Following Bick (2010), we allow for differences in the regime intercepts (δ_i). Within Γ_{it} initial income is considered as the endogenous variable, while the remaining are the control variables described above.

Given the need for a strongly balanced panel data for panel dynamic threshold regression model and the requirement of a large number of cross section units with a small number of time periods, we average the data set over four year periods i.e. 1996-1999, 2000-2003, 2004-2007, 2008-2011 and 2012-2015. This gives us 5 observations for each country with a total of 610 observations. The results of the panel dynamic threshold regression model are presented in Table 4. The estimated financial sector development threshold of of 0.243 implies credit to private sector from banking and non-banking sources comprise 24.3% of GDP. There are 236 observations below the threshold, with a majority of these being in the first two periods, i.e. 1996-1999 and 2000-2003. The regime dependent coefficients of financial sector development i.e. $\hat{\beta}_1$ and $\hat{\beta}_2$ have the expected signs and are significant. Financial sector development is negatively correlated with *de facto* openness ($\hat{\beta}_1 = $ -0.367) when financial sector development is below the threshold, while the opposite is true at higher levels of financial sector development ($\hat{\beta}_2 = 0.689$).

Given the high correlation between the level of financial sector development and GNI per capita, the fitted line shows that the threshold level of financial sector development (0.243) corresponds to GNI per capita of around 900 (current US$, Atlas method). This corresponds to almost the middle of the range of the cap for classifying low income countries, which increased from 785 in 1997 to 1045 in 2014 (Fantom and Serajuddin, 2016), and is thus consistent with our results obtained in Sections 4.2.1 and 4.2.2.

Thus, the threshold regression analysis shows that there is a non monotonic relationship between financial sector development and *de facto* openness. At very low levels of financial sector development, an improvement in financial sector development reduces *de facto* openness as domestic investors are incentivized to reduce outward investment, and invest within the domestic economy. After financial sector development crosses the threshold, a further increase in financial sector development leads to an increase in *de facto* openness, reflecting increased cross border acquisition of foreign assets and liabilities.

5   Conclusion

In this paper we investigate the relationship between financial sector development, proxied by credit provided to the private sector from banking and non banking sources

(% of GDP), and cross border acquisition of assets and liabilities or *de facto* openness. To that aim we built an empirical model analyzing this relationship, controlling for numerous factors found in the literature to influence the cross border acquisition of assets and liabilities. These include, regulations governing the acquisition of these assets and liabilities, interest rate differential, economic growth and extent of trade. Initial static panel data analysis shows that financial sector development has a strong positive and significant influence on *de facto* openness. A sub-sample analysis based on GNI per capita highlights that the positive influence is largely driven by high, upper-middle and lower-middle income economies, with the nature of relationship reversing in the case of low income economies. Across the various specifications, we find regulations governing the cross border acquisition of assets and liabilities have a significant impact on these cross border operations only in the high income countries.

The robustness of these results are verified by incorporating the dynamic panel specification where we account for presence of some persistence in cross border acquisition of assets and liabilities, and that *de facto* openness influences development of the financial sector through numerous channels, and is hence an endogenous regressor. We find our results to be robust with financial sector development continuing to be a significant predictor of *de facto* openness in high, upper-middle and lower-middle income countries, In the case of low income economies, while both System-GMM and Difference-GMM estimations indicate a negative relationship, the relationship is significant only in the case of System-GMM estimation.

A major contribution of the paper is the adoption of the dynamic panel model to capture the threshold level of financial sector development, where the relationship between financial sector development and *de facto* openness switches from being negative to positive. The empirical results indicate that the financial sector development threshold level corresponds to the middle of the range of the cap for classifying low income countries over the period we cover, thereby validating our finding that the relationship is generally negative in low income countries, but becomes positive as financial sector development and income level increases.

Our analysis indicates that once countries have crossed a threshold level of financial sector development, any further increase in financial sector development results in enhanced linkage with global capital markets by allowing greater cross border acquisition of assets and liabilities through a variety of channels. These include reducing information asymmetry for foreign investors, facilitating interactions between foreign firms and local firms and developing instruments through financial engineering that can circumvent existing capital flow management measures. Consequently, more finance is not necessarily always better as it can result in domestic economy becoming integrated with global capital markets to an extent that is detrimental to macroeconomic stability.

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By getting channelled towards easily collateralized, non-tradable investments like real estate, foreign capital can engender asset price booms and bust, which are costly for the real economy. Volatile foreign capital flows can also cause sharp valuation swings in the equity market and abrupt movements in the real exchange rate, both of which can have strong implications for the real sector (Prasad et al., 2007a; Subramanian et al., 2007).

Consequently, it is very important for the policymakers to know the optimal level of financial sector development. Instead of solely focusing on increasing the extent of financial sector development, the policymakers should strive to strengthen the quality of intermediation. The financial sector has limited standing of its own, and derives its strength and resilience from the real economy. Thus the real sector should be the driver of the financial sector, not the other way round.

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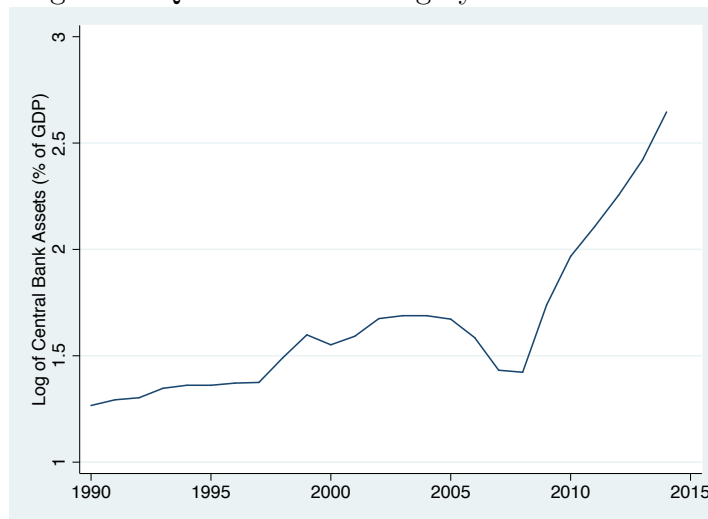# List of Figures

Figure 1: Evolution of Capital Account Openness
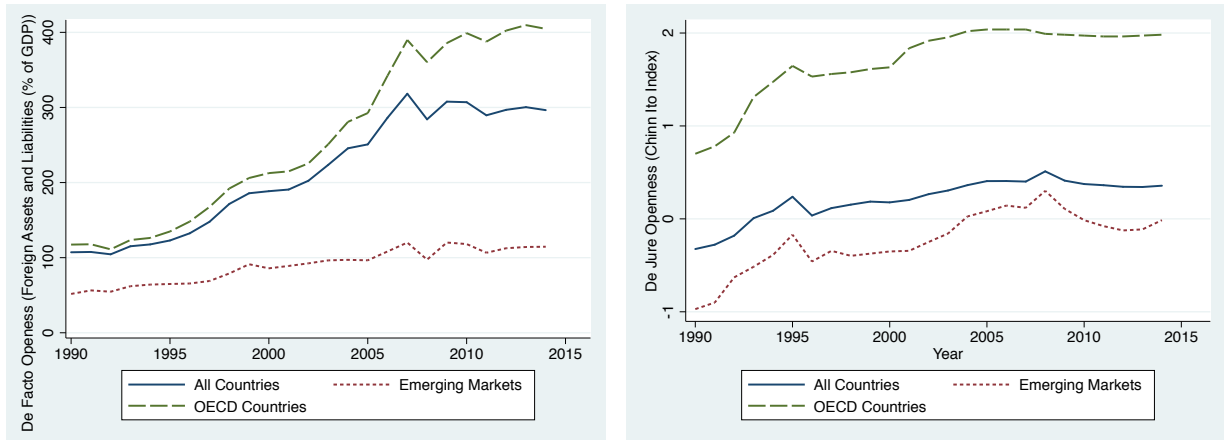
(a) De Facto Openness

(b) De Jure Openness
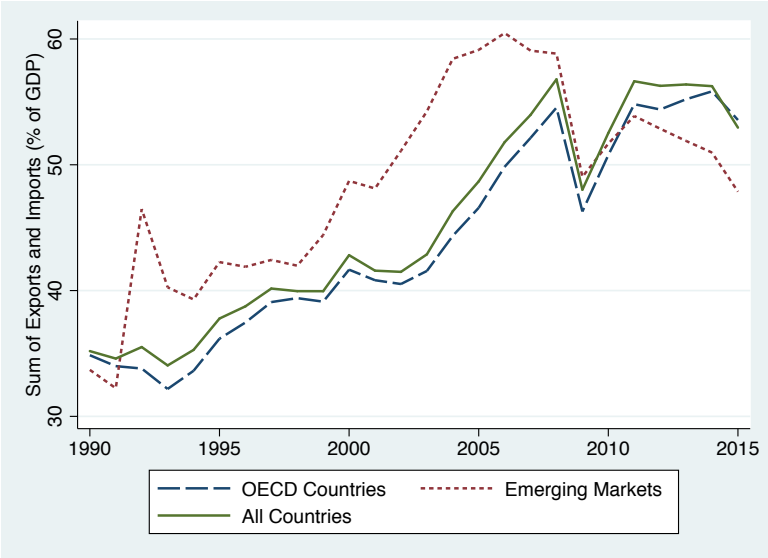
Source: Authors' estimates based Lane and Milesi-Ferretti (2007) and Chinn and Ito (2006).

Figure 2: Quantitative Easing by OECD Countries

Source: World Development Indicators (2016)
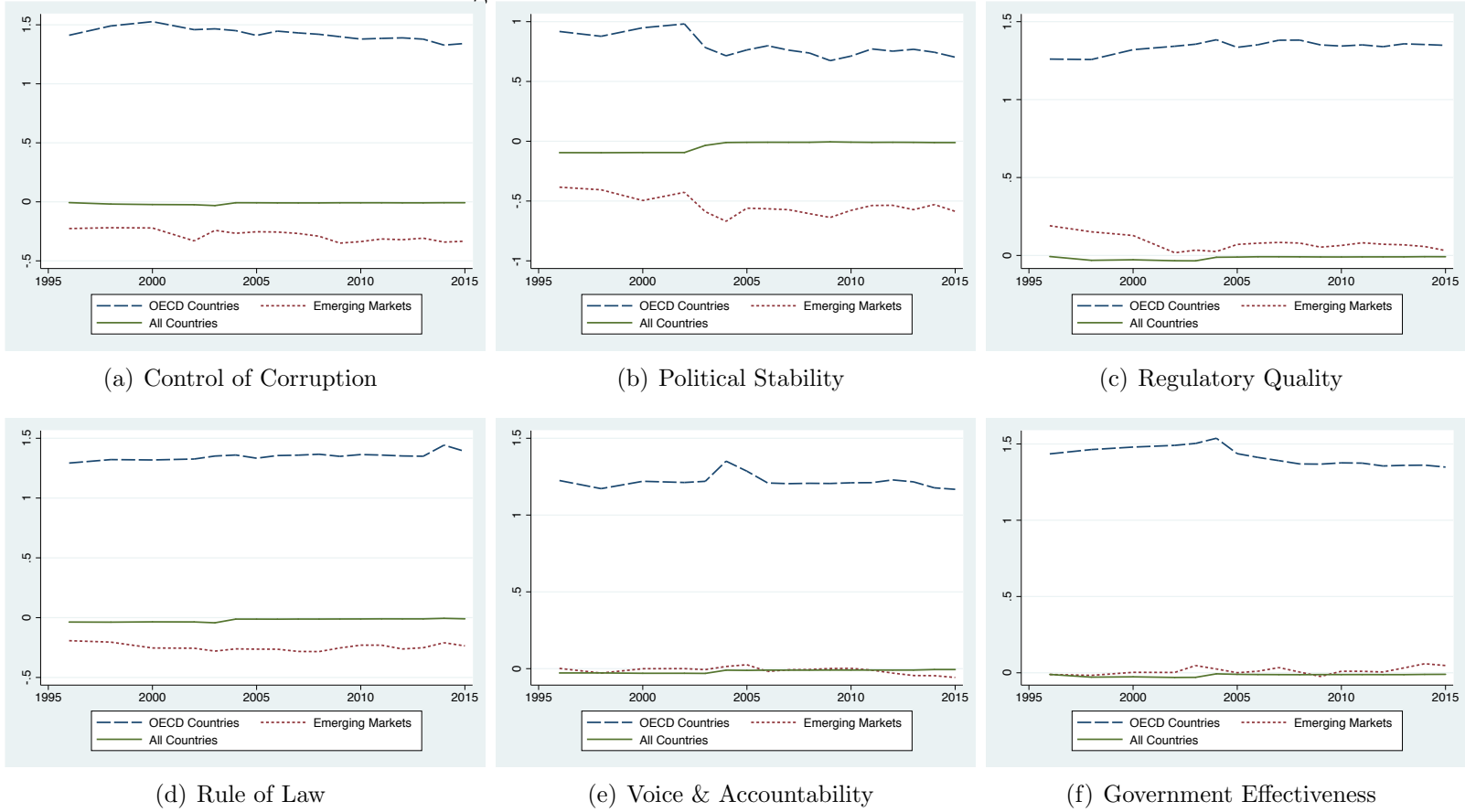
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Figure 3: Evolution of Trade Openness

Source: World Development Indicators (2016)

Figure 4: Evolution of Governance Indicators

(a) Control of Corruption

(b) Political Stability

(c) Regulatory Quality

(d) Rule of Law

(e) Voice & Accountability

(f) Government Effectiveness

Source: Kaufmann et al. (2009) & Authors' Estimates

Figure 5: Institutional Quality Index (2014)

Figure 6: Evolution of Financial Sector Development Indicators
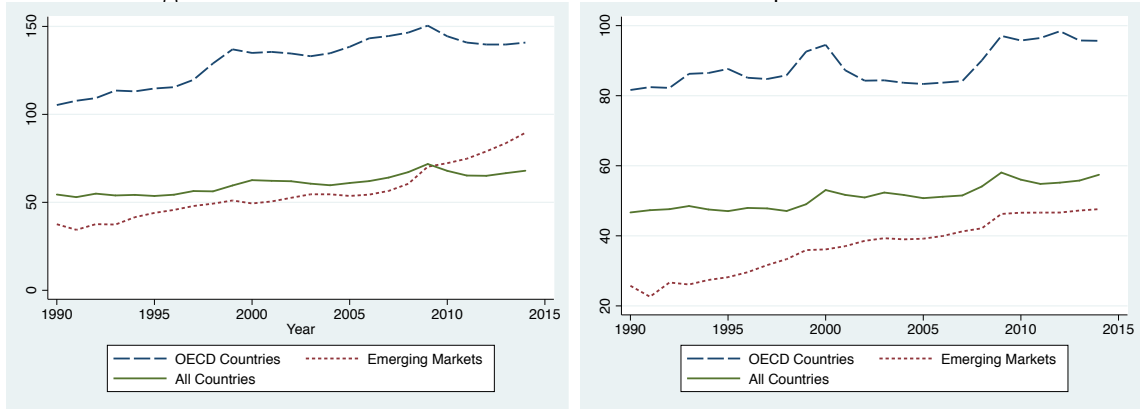
(a) Private Sector Credit by Deposit Banks (% of GDP)

(b) Financial System Deposits (% of GDP)
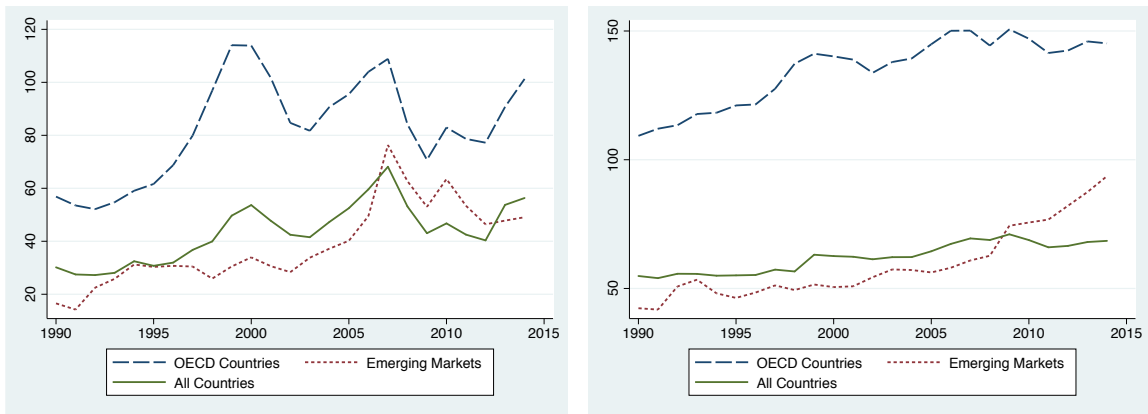
(c) Stock Market Capitalization (% of GDP)

(d) Domestic Credit to Private Sector (% of GDP)

(e) Liquid Liabilities (% of GDP)

Source: Cihak et al. (2012) & Authors' Estimates

List of Tables

Table 1: Determinants of De Facto Capital Account Openness (Full Sample)

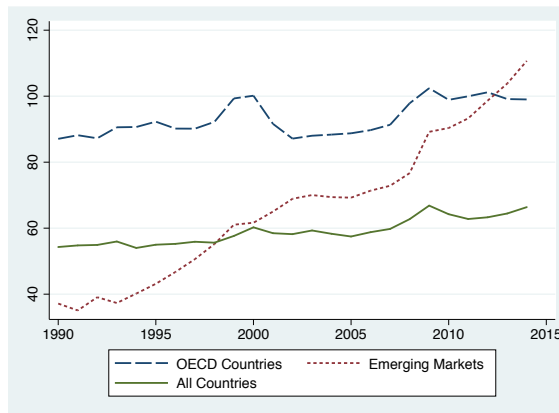|	(1)	(2)	(3)	(4)	(5)
Constant	1.131***	1.119***	1.136***	0.884***	0.860***
	[31.239]	[33.274]	[40.876]	[25.033]	[15.776]
De Jure Openness	0.012	0.011	0.013	0.007	0.008
	[1.455]	[1.277]	[1.621]	[0.823]	[0.605]
Financial Development	1.476***	1.499***	1.565***	1.548***	1.641***
	[16.827]	[17.000]	[18.002]	[17.320]	[14.859]
Interest Rate Differential		-0.04	-0.057	-0.011	0.149**
		[-1.028]	[-1.437]	[-0.274]	[2.392]
GDP Growth			-0.442***	-0.442***	-0.592***
			[-5.413]	[-4.947]	[-4.230]
Trade Openness				0.378***	0.373***
				[8.156]	[6.043]
Institution Quality					0.154***
					[4.815]
Observations	3,929	3,929	3,889	3,875	2,579
Number of Countries	173	173	173	172	172

Source: Authors' Estimates

Notes: Robust z-statistics in parenthesis; *** indicates significant at 1%, ** indicates significant at 5% and * indicates significant at 10%.

Table 2: Determinants of De Facto Capital Account Openness (Difference-GMM)

	Full Sample	High Income	Upper Middle Income	Lower Middle Income	Low Income
Constant	0.669	-1.72	1.455*	0.299***	0.062
	[1.566]	[-0.988]	[1.938]	[3.700]	[0.420]
Lagged De Facto Openness	0.758***	0.739***	0.873***	0.736***	0.891***
	[51.128]	[26.965]	[46.761]	[27.709]	[29.940]
De Jure Openness	0.257	0.610***	-0.036	0.013	0.015
	[1.427]	[3.791]	[-0.195]	[0.506]	[0.163]
Financial Development	0.891**	1.337**	0.997**	0.391***	-0.046
	[2.435]	[2.348]	[2.008]	[3.286]	[-0.096]
Interest Rate Differential	0.208	-0.307	-0.383	0.640***	0.224**
	[0.259]	[-0.121]	[-0.264]	[3.649]	[1.978]
GDP Growth	-3.089**	-4.744	-0.959	-1.232***	-3.508***
	[-2.095]	[-1.010]	[-0.399]	[-3.817]	[-8.184]
Institution Quality	0.068	0.077	0.837**	0.133**	-0.203*
	[0.161]	[0.080]	[1.977]	[1.974]	[-1.780]
Trade Openness	-0.261	-0.036	1.824	0.067	0.132
	[-0.494]	[-0.035]	[1.756]	[0.707]	[0.562]
Observations	1,937	570	535	461	269
Number of Countries	171	51	45	40	25

Source: Authors' Estimates

Notes: Robust z-statistics in parenthesis; *** indicates significant at 1%, ** indicates significant at 5% and * indicates significant at 10%.

Table 3: Determinants of De Facto Capital Account Openness (System-GMM)

	Full Sample	High Income	Upper Middle Income	Lower Middle Income	Low Income
Constant	0.356	1.19	2.279	0.428**	0.027
	[0.698]	[1.589]	[1.457]	[2.383]	[0.249]
Lagged De Facto Openness	0.755***	0.834***	0.779***	0.715***	0.884***
	[26.452]	[46.076]	[5.410]	[10.133]	[23.429]
De Jure Openness	0.087	0.375**	-0.334	-0.007	-0.132*
	[0.523]	[1.981]	[-0.678]	[-0.495]	[-1.729]
Financial Development	1.804***	2.186***	2.062**	1.257**	-0.300**
	[3.881]	[3.329]	[2.308]	[2.264]	[-1.992]
Interest Rate Differential	2.056	-0.373	1.324**	0.482***	0.115**
	[1.454]	[-0.158]	[1.974]	[3.010]	[1.926]
GDP Growth	-3.882**	-2.425	-2.667	-0.813**	-1.611***
	[-2.470]	[-1.091]	[-1.584]	[-2.033]	[-4.510]
Institution Quality	0.665	1.250*	0.300**	0.264**	-0.059
	[1.443]	[1.876]	[2.201]	[1.986]	[-0.524]
Trade Openness	-0.389	0.411	-3.037	-0.142	-0.059
	[-0.545]	[0.444]	[-1.507]	[-0.871]	[-0.339]
Observations	2,577	761	705	611	363
Number of Countries	172	51	45	40	25

Source: Authors' Estimates

Notes: Robust z-statistics in parenthesis; *** indicates significant at 1%, ** indicates significant at 5% and * indicates significant at 10%.

Table 4: Determinants of De Facto Capital Account Openness (Panel Threshold)

| Value of Threshold Parameters	
$\widehat{\gamma}$	0.243
95% Confidence Interval	0.187 0.266
Impact of Financial Sector Development	
$\hat{\beta}_1$	-0.367***
	[-0.051]
$\hat{\beta}_2$	0.689***
	[0.179]
Impact of Covariates	
De Jure Openness	0.058
	[1.166]
Interest Rate Differential	0.925***
	[0.160]
GDP Growth	0.590**
	[0.133]
Institutional Quality	0.923***
	[0.233]
Trade Openness	-0.827
	[1.827]
Number of Observations	610
Number of Countries	122

Source: Authors' Estimates
Notes: Robust z-statistics in parenthesis; *** indicates significant at 1%, ** indicates significant at 5% and * indicates significant at 10%.
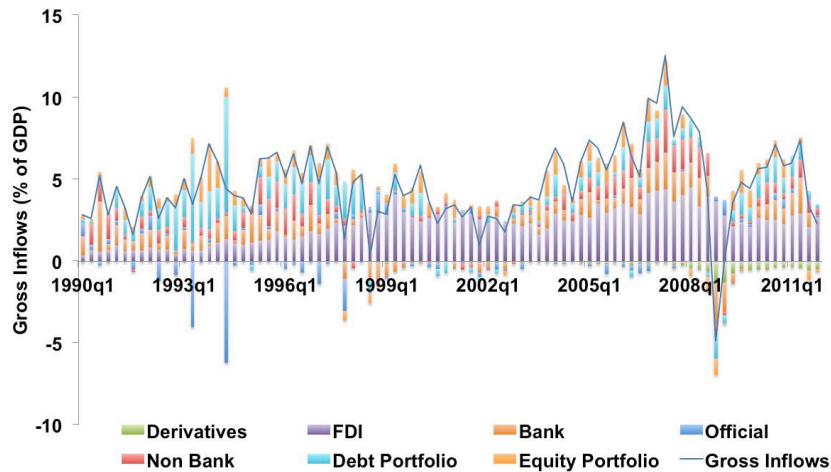
Appendix: List of Figures

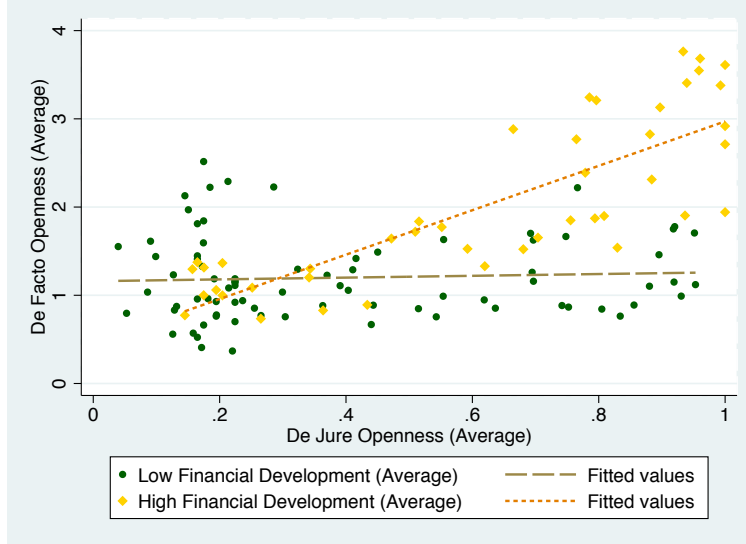Figure A1: Volatility Across Various Types of Capital Flows
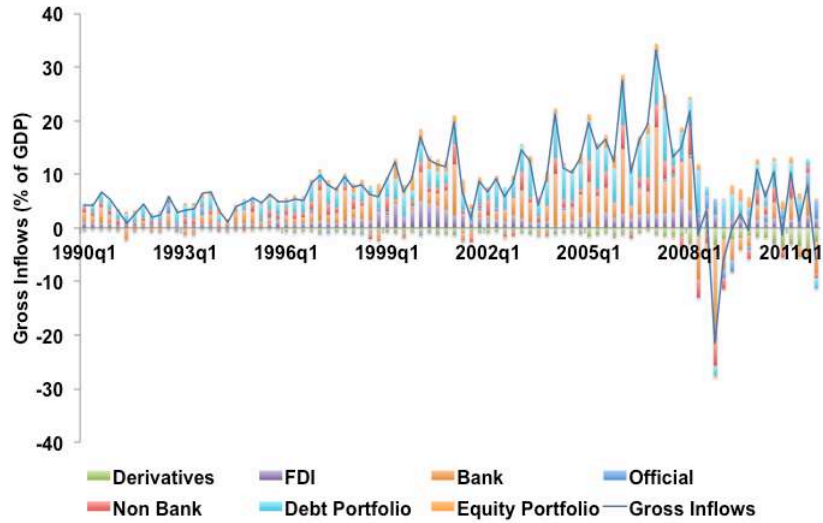
(a) Advanced Economies

(b) Emerging Economies

Source: Bluedorn et al. (2013) & Authors' Estimates

Figure A2: Relationship Between Financial Development and Capital Account Openness

Source: Cihak et al. (2012), Lane and Milesi-Ferretti (2007), Chinn and Ito (2006) & Authors' Estimates

Appendix: List of Tables

Table A1: Various Indicators of Financial Sector Development)

	Observations	Mean	Standard Deviation	Min	Max
Private credit by deposit money banks (% of GDP)	4790	40.13	36.69	0.22	262.46
Domestic credit to private sector (% of GDP)	4835	43.55	40.27	0.00	312.15
Deposit money banks assets (% of GDP)	4794	49.71	41.37	0.23	263.13
Financial system deposits (% of GDP)	4751	44.85	41.91	0.07	479.67
Liquid liabilities (% of GDP)	4758	52.15	41.55	3.29	399.11
Mutual fund assets (% of GDP)	1264	27.14	70.55	0.00	788.28
Stock market capitalization (% of GDP)	2661	47.71	79.98	0.01	1086.34
Stock market total value traded (% of GDP)	2742	21.8	50.48	0.00	822.32

Source: Authors' Estimates from Global Financial Development

Table A2: Determinants of De Facto Capital Account Openness (High Income Countries)

	(1)	(2)	(3)	(4)	(5)
Constant	0.740***	0.721***	0.786***	0.343*	-0.129
	[5.551]	[6.261]	[6.836]	[1.886]	[-0.441]
De Jure Openness	0.086***	0.088***	0.098***	0.083**	0.123*
	[2.821]	[2.901]	[3.255]	[2.474]	[1.809]
Financial Development	2.157***	2.206***	2.258***	2.383***	3.008***
	[12.766]	[13.429]	[13.507]	[12.631]	[12.013]
Interest Rate Differential		-0.431	-0.379	-0.198	0.275
		[-1.452]	[-1.113]	[-0.952]	[1.187]
GDP Growth			-0.06	-0.426	-0.252
			[-0.184]	[-1.141]	[-0.437]
Trade Openness				0.584***	0.697***
				[3.580]	[3.075]
Institution Quality					0.236***
					[2.591]
Observations	1,172	1,172	1,159	1,157	762
Number of groups	52	52	52	51	51

Source: Authors' Estimates

Notes: Robust z-statistics in parenthesis; *** indicates significant at 1%, ** indicates significant at 5% and * indicates significant at 10%.

Table A3: Determinants of De Facto Capital Account Openness (Upper Middle Income Countries)

	(1)	(2)	(3)	(4)	(5)
Constant	0.833***	0.824***	0.843***	0.853***	1.077***
	[17.118]	[17.232]	[16.955]	[13.110]	[12.215]
De Jure Openness	-0.020*	-0.020*	-0.017	-0.017	-0.025
	[-1.858]	[-1.876]	[-1.589]	[-1.530]	[-1.319]
Financial Development	0.874***	0.882***	0.866***	0.851***	1.115***
	[9.296]	[9.323]	[8.616]	[8.292]	[7.879]
Interest Rate Differential		0.008	0.009	0.005	0.186**
		[0.192]	[0.211]	[0.122]	[2.547]
GDP Growth			-0.446***	-0.450***	-0.224
			[-4.033]	[-3.983]	[-1.112]
Trade Openness				0.029**	0.116
				[2.455]	[1.166]
Institution Quality					0.087**
					[1.969]
Observations	1,054	1,054	1,041	1,041	705
Number of groups	45	45	45	45	45

Source: Authors' Estimates

Notes: Robust z-statistics in parenthesis; *** indicates significant at 1%, ** indicates significant at 5% and * indicates significant at 10%.

Table A4: Determinants of De Facto Capital Account Openness (Lower Middle Income Countries)

	(1)	(2)	(3)	(4)	(5)
Constant	1.170***	1.086***	1.103***	0.908***	1.101***
	[18.925]	[19.344]	[21.166]	[15.861]	[17.726]
De Jure Openness	0.014	0.013	0.011	0.006	0.004
	[1.339]	[1.088]	[0.978]	[0.535]	[0.262]
Financial Development	0.099	0.203**	0.197**	0.129**	0.207**
	[0.850]	[1.973]	[1.970]	[1.987]	[2.189]
Interest Rate Differential		-0.076	-0.095	-0.061	0.169**
		[-1.010]	[-1.265]	[-0.833]	[1.983]
GDP Growth			-0.748***	-0.945***	-0.749***
			[-4.465]	[-5.517]	[-3.452]
Trade Openness				0.373***	0.471***
				[6.013]	[7.940]
Institution Quality					0.060**
					[2.119]
Observations	909	909	908	898	612
Number of groups	40	40	40	40	40

Table A5: Determinants of De Facto Capital Account Openness (Low Income Countries)

	(1)	(2)	(3)	(4)	(5)
Constant	1.080***	1.084***	1.111***	0.853***	0.855***
	[18.984]	[19.285]	[19.650]	[11.298]	[8.326]
De Jure Openness	0.023	0.023	0.024	0.014	0.053
	[0.860]	[0.862]	[0.901]	[0.502]	[0.999]
Financial Development	-0.669***	-0.676***	-0.731***	-0.547**	-0.139
	[-2.883]	[-2.924]	[-3.168]	[-2.065]	[-0.403]
Interest Rate Differential		0.001	-0.004	-0.101	-0.007
		[0.017]	[-0.086]	[-1.442]	[-0.081]
GDP Growth			-0.489***	-0.439***	-0.553***
			[-3.746]	[-3.231]	[-2.631]
Trade Openness				0.783***	0.590***
				[7.551]	[4.283]
Institution Quality					-0.066
					[-1.427]
Observations	575	575	568	568	363
Number of groups	25	25	25	25	25