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Financial Integration and Growth: A Nonlinear Panel Data Analysis†

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Abstract

This paper employs Panel Smooth Transition Models (PSTR) to examine the financial integration and economic growth relationship for a large panel data set consisting of 82 countries and for three subsamples, namely emerging, industrial, and developing countries, for 1970-2010 periods. Unlike linear specifications with interaction terms, PSTR models are flexible enough to endogenously determine how the degree of institutional quality, financial sector development, trade openness, budget deficit, inflation volatility and financial integration can have a role in revealing asymmetries in financial integration-growth nexus. Except developing countries, empirical results strongly indicate nonlinear dynamics and imply that the impact of financial integration on growth is asymmetric depending on the threshold effects of these variables which show great variation not only from variable to variable but also for different country groups. As far as whole set of countries is concerned, our findings imply that countries having developed financial systems, qualified institutions and stable macroeconomic environment seem to be benefiting from financial integration. Moreover, nonlinear threshold effects are more apparent and different for emerging countries compared to the industrial countries. Unlike former economies, higher levels of financial integration and trade openness decrease benefits from financial openness for the industrial countries. Besides, high fiscal deficit has more pronounced negative effect on the growth of the industrialized countries compared to emerging economies and other indicators.

Key words: Financial Integration, Economic Growth, Panel Smooth Transition Models, Nonlinearity

JEL Classification: F41, F43, F65, O40, F4, C23

1. Introduction

Following the intensive liberalization of capital accounts in industrial and developing countries in 1980s and 1990s, cross-border capital flows have reached to incredible amounts in recent years. This financial integration process and its macroeconomic outcomes are heavily discussed issues among academic circles and policy makers as witnessed during recent global financial crisis. In neoclassical growth model, financial liberalization facilitates efficient international allocation of capital via allowing the flow of resources from capital-rich developed countries to capital-scarce developing countries. The flow of resources into the developing countries reduces their cost of capital, increasing investment and economic growth (Fischer, 1998; Obstfeld, 1998; Summers, 2000). It also provides indirect benefits such as allowing risk-sharing, fostering the development of domestic financial sector and leading to more stable macroeconomic policies (Obstfeld, 1994; Levine, 2001; Kose et al., 2009, 2010).[1] While financial openness contributes to economic growth through various channels, it can also bring important risks with it. As countries become more integrated with the international financial system, adverse shocks in foreign countries can threat domestic stability through contagion effects. With the financial crises in the late 1980s and 1990s in Latin America and Southeast Asia, it is argued that increased capital flows make developing countries more vulnerable to crises and they are much more negatively affected from this financial globalization process (e. g. Rodrik, 1998; Bhagwati, 1998; Stiglitz, 2002; Calvo et al., 2008), since they have not got better institutions, more developed financial markets and stable macroeconomic policies as in advanced countries. Kose et al. (2009, 2011) argue and provide empirical evidences that countries need to satisfy some initial (threshold) conditions in economic and policy-related characteristics such as financial sector development and institutional quality in order to benefit from capital flows and reduce the risks associated with them.

Financial globalization is now seen as being one of the mechanisms that contribute to the origination of the crisis and its propagation across countries through its effects on rapid domestic credit growth and current account imbalances (Claessens et al., 2010; Giannone et al., 2010; Lane, 2012). An issue which has been discussed in this literature is whether increased interconnectedness of financial markets before and during the recent global crisis have led to similar effects of international financial integration on growth for both emerging and advanced countries. Before the global financial crisis-the so called 'Great Recession', the main focus has been the emerging and developing countries regarding the potential risks of

[1] See Prasad et al. (2003) and Obstfeld (2009) for a more detailed review of direct and indirect channels through which financial globalization promotes economic growth.

financial integration process, while there was no doubt about the positive effects of financial globalization on advanced economies. However, a large number of empirical studies (e.g. Claessens at al., 2010; Rose and Spiegel, 2010, 2011; Lane and Milesi-Ferretti, 2011; Frankel and Savarelos; 2012; Eichengreen, 2010) using cross-country data have shown that advanced countries have suffered more than emerging and developing economies during the crisis.[2] Different financial integration levels and composition of financial flows in advanced and emerging countries are pointed out as main mechanisms behind the contrasting experiences of those countries during global crisis (Lane, 2012; Didier et al. 2012).[3] Even though both advanced and emerging countries have reached high degrees of international financial integration, emerging economies seem to have a lower exposure to international financial flows relative to the advanced economies. As denoted by Lane and Milesi-Ferretti (2007), Lane and Shambough (2010) and Prasad (2011), emerging countries have significantly reduced their net external liabilities by having current account surpluses and have improved liquidity by accumulating foreign-exchange reserves. They have become net creditors to the rest of the world in debt contracts while net debtors in equity contracts as well as improving the maturity profile of their debt and reducing the relative weight of foreign-currency debt during 2000s.[4] Therefore, contrasting with their experiences in the past crises, exchange rate depreciations during 2008 and 2009 led to an improvement in their external positions. These changes in their debt profile, in return, may have reduced the risks of financial integration for emerging economies (Didier et al. 2012). In contrast, advanced countries have heavily relied on external debt in the pre-crisis period. As Lane (2012) emphasized, high debt-equity ratios in external liabilities relative to external assets and "long equity, short debt" profile of many advanced economies clearly carried risks, and hence financial integration amplified the crisis for advanced economies.

As a result, consistently with the recent debate during global crisis, due to the differences in their financial integration levels and relative weight of external debt in their international financial positions, financial globalization may lead to distinct growth effects for advanced and emerging countries. Therefore, the analysis of threshold effects of financial

[2] Among others, Claessens et al. (2010), Berkmen et al. (2012) and Didier et al. (2012) show that countries with higher income per capita, larger current account deficits, higher openness to trade, higher credit growth and more financially integration prior to the crisis suffered greater growth collapses during the global crisis. However, Lane and Milesi-Ferretti (2011) argue that higher international financial integration is positively correlated with output growth.

[3] However, Rose and Spiegel (2010, 2011) find that economic performances of countries during global crisis can mostly be explained by the global factors rather than their initial conditions such as cross-border trade and financial linkages.

[4] The ratio of bank borrowing, other debt to foreign direct investments and short term structure of external debt and foreign currency denominated debt share are among the variables that are shown to be positively correlated with the incidence and severity of currency and financial crises (see, for example, Frankel and Rose, 1996; Radelet and Sachs, 1998; Rodrik and Valesco, 1999)

integration for different country groups is crucial for a more clear-cut analysis of its effect on growth. Moreover, to have a better understanding of the relationship between financial integration and growth, one should take into account both cross section and time variations as well as possible nonlinearity of this relationship. As discussed in detail in the next section, most of the earlier literature seems to be ignoring at least one of these issues in empirical analysis.

This paper aims at contributing to the empirical literature on the link between international financial integration and economic growth by paying a special attention to the potential nonlinearity of this relationship. The arguments that the positive growth effects of financial openness depend on some structural and economic characteristics imply that the association between financial openness and economic growth may depend on threshold conditions changing from variable to variable and country to country. To this end, we examine threshold conditions in financial integration and growth relationship employing non-linear specifications rather than linear ones with interaction effects which is common in the earlier literature as discussed in the next section. To the best of our knowledge, this study is the first to apply Panel Smooth Transition Regression (PSTR) Models developed by Gonzales, Terasvirta and Dijk (2005) to the FI-growth nexus. PSTR models are flexible enough to endogenously determine how the degree of institutional quality, financial sector development, trade openness, budget deficit, inflation volatility and financial integration can have a role in uncovering asymmetries in financial integration-growth nexus. Chen and Quang (2012) employed panel threshold regression model (PTR) of Hansen (1999) to our context which implies only two distinct regimes with sudden changes depending on the financial integration indicators. However, a smooth change of the effect of financial integration on economic growth due to the factors such as levels of financial sector development and quality of institutions may be more plausible. We, therefore, prefer to use PSTR model which is a generalization of PTR model and enables us to characterize not only two distinct regimes but also both sharp and smooth changes and hence infinite number of regimes between these extremes. PSTR specification also outperforms linear panel data models with interaction effects since it allows the endogenous determination of threshold levels not to mention misspecification of linear models if the true relationship is nonlinear.

Empirical results are in line with our expectations in such a way that except other developi ng countries group, we reveal strong nonlinear threshold conditions whose effects show chang es not only for different transition variables but also for different country groups. As far as wh ole set of countries is concerned, our findings imply that countries having underdeveloped fin

ancial systems, poor institutions, unstable macroeconomic environment and high levels of fina ncial integration have no or negative relationship between FI and Growth. Moreover, nonlinea r threshold effects appear to be more pronounced and strong for emerging countries compared to the industrial countries. It seems that in contrast to industrial countries, higher levels of fina ncial integration and trade openness can increase benefits from financial openness for emergin g economies. Besides, compared to other variables and country groups, the effect of fiscal defi cit is more detrimental to the growth effects of financial integration for industrial countries.

2. Literature Review

Empirical studies generally use two different data sets to analyze the effect of financial integration on economic growth and report conflicting results which may be due to the data set and/or methodologies used in these studies. Some of the earlier empirical analysis are based on cross country regressions and use de jure measures of financial openness-measures of legal restrictions on cross-border capital flows which are based on IMF's Annual Report on Exchange Rate Arrangements and Exchange Restrictions (AREAER). Quinn (1997) and Klein and Olivei (2001) for example, report a positive correlation between capital liberalization and economic growth, though, Rodrik (1998) and Arteta et al. (2001) fail to find a significant and robust association between capital mobility and growth. Edwards (2001) attributes these mixed results to the idea that countries can only take the advantage of capital mobility once they have an advanced financial market showing that capital liberalization has a negative effect for low-income countries while it has a positive effect for high-income countries. Hence, his findings implicitly suggest that empirical studies focusing on different country groups may uncover the reality better.

Another strand of empirical literature which also uses the de jure measures of data argue that the poor results may be a result of not considering the interaction effects between financial integration and some economic and structural factors as well as modelling framework. Klein (2005), Levine (2001) and Chinn and Ito (2002) are among these studies which provide empirical evidences that financial liberalization promotes economic growth when financial markets get more developed and countries have better institutions. While Arteta et al. (2001) find some evidence that positive growth effects of financial liberalization are stronger in countries with strong institutions, these benefits do not grow with financial development. Moreover, Kraay (1998) and Quinn and Toyoda (2008) fail to find positive and statistically significant interaction terms for financial deepness and institutional quality (see also Bakaert et al., 2005; Chanda, 2005). Eichengreen and Leblang (2003), support somehow Edwards' (2001) view that these conflicting results are not surprising as benefits of capital

account liberalization dominate its costs when domestic financial system is robust and there are no crises in the international financial system.[5]

Some empirical studies have examined the role of foreign direct investments (FDI) in order to analyze the growth effects of financial globalization. Among them, Alfaro et al. (2004, 2010) and Hermes and Lensink (2003) argue that a developed financial sector is a prerequisite for FDI to have positive effects on growth. Borensztein et al. (1998)'s results of cross-country regressions suggest that FDI enhances economic growth only for countries with high human capital stock. However, Carkovic ve Levine (2005) neither find a robust link between FDI and growth nor any significant effect of some factors such as human capital, financial development and trade openness on this link.

Although some authors have developed more sophisticated measures of capital controls, this does not prevent de jure measures of financial openness to be criticized as they do not reflect the actual degree of integration of a country into the international financial markets (e.g. Henry, 2007; Kose et al., 2010).[6] Recent studies generally use de facto measures of financial integration based on quantities of actual financial flows which are constructed and recently updated by Lane and Milesi-Ferretti (2007).[7] This data set contains information about stocks of gross external assets and liabilities of 145 countries. Using this de facto measure of financial integration, Edison et al. (2002) investigate the impact of international financial integration on economic growth and assess whether this relationship depends on the level of economic development, financial development, institutional development and macroeconomic policies. They not only fail to find that international financial integration accelerates economic growth, but also cannot reach robust and significant interaction effects in any of those factors. However, Prasad et al. (2007) argue that foreign capital affects growth positively in developed countries while it does not lead to faster growth in developing countries. According to them, the reason behind this is that foreign capital cannot be channeled through productive uses in developing countries and in case of capital inflows, these economies are vulnerable to the appreciation of exchange rate (see also Rodrik and Subramanian, 2009). Recently, Kose et al. (2011) also investigate in detail for certain "threshold levels" for those indicators by using linear panel data models augmented by linear

[5] Prasad et al. (2003), Kose et al. (2009, 2010, 2011) and Cline (2010) provide detailed reviews of the empirical literature.

[6] Among others, Quinn (1997), Chinn and Ito (2005), Mody and Murshid (2005), Edwards (2005) and Edison and Warnock (2003) construct different measures of capital account restrictions based on AREAER.

[7] Comparing the de facto measure of Lane and Milesi-Ferretti (2007) and de jure measure of Chinn and Ito (2005), Levy-Yeyati and Williams (2011) emphasize that there is little correlation between these two measures especially for advanced economies. Then, they prefer to motivate on de facto measure of Lane and Milesi-Ferretti (2007).

and quadratic interaction terms. They find evidences of threshold effects for almost all threshold conditions such as financial market development, institutional quality, trade openness and overall level of development. However, financial sector development and the institutional quality are more robust and statistically significant relative to others. Chen and Quang (2012) examine the threshold conditions in the financial integration and growth relationship employing Panel Threshold Regression models and provide evidence of threshold effects in institutional quality, financial development and inflation.

To sum up, empirical studies do not provide conclusive results on the effect of financial integration on growth, which may be due to the data set, country groups under investigation and/or methodologies used in them. Particularly the use of interaction terms and determination of threshold conditions under a linear framework seem ad hoc approaches to uncover the effect of various factors on the relationships of variables under investigation. To address these issues one should consider a modelling structure which allows determining threshold conditions endogenously and also consider possible asymmetric structures. Therefore we opt for flexible nonlinear specifications called Panel Smooth Transition Regression models which are introduced below.

3. Data and Methodology

3.1. Data and Measurement

We use an unbalanced annual panel dataset of 82 countries for 1970-2010 periods. Our sample consists of 21 industrial, 21 emerging and 40 other developing countries.[8] A detailed list of countries is given in Appendix A. The dependent variable is the growth rate of per capita GDP. As the measure of our main variable of interest, international financial integration, we utilize de facto measure, the ratio of the sum of total stock of external assets and liabilities to the GDP which is provided and recently updated by Lane and Milesi-Feretti (2007). This dataset includes the main categories of portfolio equity, foreign direct investment, debt assets and liabilities, financial derivatives and foreign exchange reserves. The data for the dependent variable and control variables are from World Development Indicators (WDI), Penn World Tables (PWT) and IMF International Financial Statistics (IFS). The description and the sources of variables are given in Appendix.

[8] We employ the country sample of Kose et al. (2011). We just have to exclude a few countries which do not have sufficient data compared to others. The country set of Kose et al. (2011) excludes transition economies of Eastern Europe because of their poor data in pre-transition years and small countries with population under 1 million. Emerging countries roughly correspond to those included in the MSCI Emerging Markets Index. It also excludes transition economies and adds Singapore and Venezuela.

Regarding the transition variables, we consider the economic and structural country characteristics suggested by previous theoretical and empirical studies. Kose et al. (2009, 2010) divide these threshold variables into four main categories: financial market development, institutional quality, trade integration and macroeconomic policies, which are used as transition variables to determine the thresholds conditions. The expected impacts of these threshold conditions and their indicators are as follows:

a. *Financial Sector Development:* Financial sector development has been pointed out as one of the key determinants of the positive growth effects of financial globalization. Theoretically, financial market development facilitates foreign capital to turn into productive investments by allowing efficient allocation of financial flows (see, among others, Wurgler, 2000 and Aoki et al., 2006). Boom-bust cycles due to the sudden stops or reversal of capital flows are generally amplified in financially under-developed economies (Caballero and Krishnamurthy, 2001; Aghion et al., 2004). Therefore, by moderating the adverse effects of financial shocks, it helps to reduce macroeconomic instability. As common in the empirical literature, we focus on financial depth as a measure of financial development. Two proxies for financial depth are used: the ratio of liquid liabilities to GDP (LIQ) and the ratio of private credits to GDP (CREDIT). The former and latter data sets are from Beck et al. (2009) and World Development Indicators (WDI) database respectively.
b. *Institutional Quality (INSQUALITY):* Institutional quality has also received considerable attention as an important factor on the growth effects of financial integration. The quality of corporate and public governance, the level of corruption and the legal framework are important factors that affect the allocation of resources in an economy especially for financially open economies in which more resources are available by capital inflows. The quality of institutions not only has crucial effect on the outcomes of financial integration but also have substantial impact on the composition of capital inflows. A number of authors (e.g. Wei, 2000; Wei and Wu, 2002; Faria and Mauro, 2005) show that better institutional quality helps to attract more FDI and portfolio equity flows which tend to bring more indirect benefits of financial integration. In this study, as the indicator of institutional quality, we use the simple average of six indicators of World Bank Governance Indicators (WBGI), namely, political instability, violence, government effectiveness, regulatory quality, rule of law, and control of corruption.
c. *Trade Openness:* The effect of financial integration on growth may also depend on the degree of country's trade integration. However, there seems to be some confliction in

the direction of the effect that it imposes on the FI-growth nexus. On the one side, according to the previous literature, trade openness improves the growth benefits of financial integration through various channels. Besides reducing the likelihood of crises due to sudden stops and current account reversals (Calvo et al., 2004; Frankel and Cavallo, 2004; Cavallo, 2005), it also alleviates negative growth effects of crises and facilitates to recover from the crises. On the other side, during the global financial crisis, trade openness is acted as one of the transmission channels of the crisis as it increased the exposure to external demand shocks. Claessens et al. (2010), Berkmen et al. (2012) and Didier et al. (2012) show that economies that are more open to trade suffered greater collapses during the crisis. In this sense, it is important to examine the role of trade openness as a threshold condition in the financial integration and growth relationship. In this study, the ratio of the sum of exports and imports to the GDP is used as the indicator of trade openness. It is from Penn World Tables (PWT) dataset.

d. *Macroeconomic Policies:* Capital account liberalization tends to produce better growth outcomes if it is supported by sound macroeconomic policies including fiscal, monetary and exchange rate policies (Eichengreen, 2000). By avoiding excessive fiscal deficits, countries can limit the risks associated with financial integration (e.g. Kaminsky et al., 2004; Reinhart et al., 2003). Didier et al. (2012) point out to the better macroeconomic framework of emerging economies before and during the global crisis as one of the factors behind their resilience to the crisis. In this paper, we examine the threshold conditions in the monetary and fiscal policies. We use volatility of inflation (INFVOL) as the monetary policy measure. Its data is from IMF International Financial Statistics (IFS) database. The fiscal policy measure is government budget balance as a ratio to the GDP (GOVBAL). It is from World Economic Outlook (WEO) database.

e. *Financial Integration*: There can also be some threshold effects in the degree of financial integration itself. Financial integration may produce its growth benefits once countries reach a threshold level in financial openness. On the contrary, financial integration may be rather riskier as it exceeds some level. Therefore, we also analyze whether the financial integration itself acts as a transition variable.

3.2. Evolution of Financial Integration and Some Stylized Facts

Figure 1 shows the average level of international financial integration for industrial, emerging and other developing countries for the periods of 1970-2010. Even though cross-

border capital flows have considerably increased for all country groups since 1970, industrial countries have the largest financial integration level compared to emerging and other developing countries. The rise in advanced countries' cross-border capital flows have accelerated since 1990, reaching around 700%, which more than doubles the amount in emerging countries in 2010. The sharp fall in 2008 appear to be recovered during 2009 and 2010. Although the average degree of financial integration shows some acceleration after 1997 in emerging economies, it generally exhibits a more gradual rise relative to industrial countries. The capital flow boom in advanced countries after 1990s has not accrued in emerging countries, though mildly increased during global financial crisis. Emerging countries' and other developing countries' financial integration levels display a gradual rise up to 1990 and then, although the former continues to its gradual upward trend there is a steady decline in the latter one jumping to levels of around 350% in the last two years.

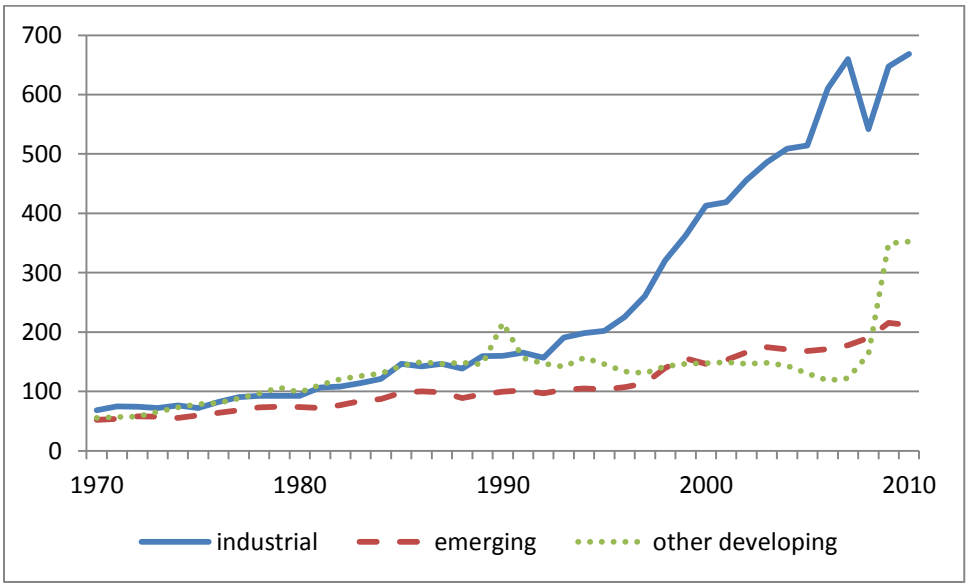

Figure 1: Average Financial Integration Ratio to the GDP (%).
Source: Dataset of Lane and Milesi-Ferretti (2007) (updated version).

Besides the discrepancies in the evolution and the level of financial integration across advanced, emerging and other developing countries, these country groups have very different patterns of capital flows. This discrepancy is more distinct in capital inflows. Figure 2 shows the share of debt liabilities in total liabilities. Emerging countries have gradually declined their share of debt to around 40% after 1985 by increasing the share of FDI and portfolio equity liabilities. Despite this decline in the share of debt in emerging economies, industrial countries have heavily relied on debt liabilities which show a remarkable increase after 1999. On the other side, other developing countries' shares of FDI and portfolio equity have been

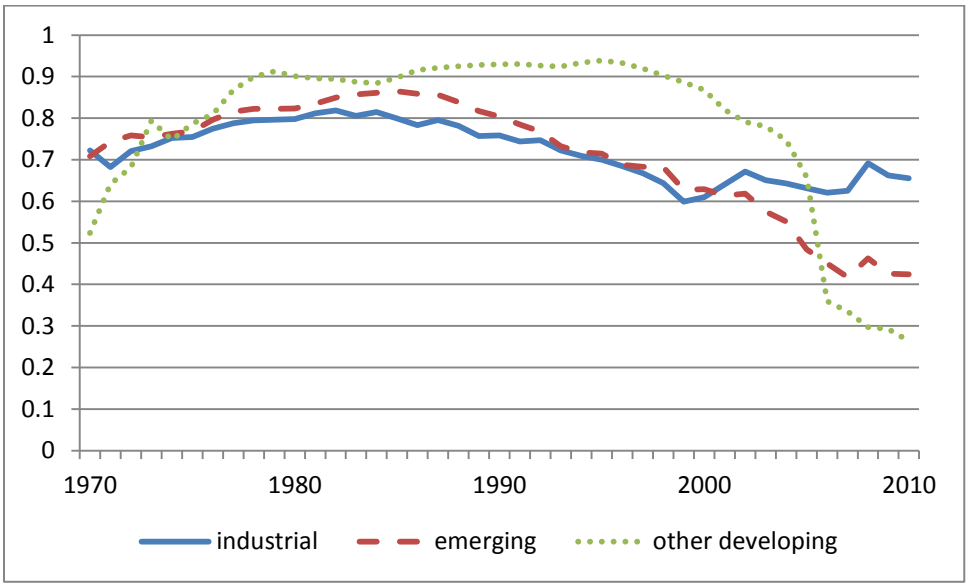

Figure 2: Share of debt liabilities in total liabilities.
Source: Dataset of Lane and Milesi-Ferretti (2007) (updated version).

mostly in low levels due to their under-developed financial markets. Their debt share remains around 90% until 2005.

4. Model and Specification Issues

4.1. Panel Smooth Transition Models

Previous empirical studies on FI-growth nexus seem to have several drawbacks due to data set and/or econometric specifications used. As to the former, cross country analysis fully ignores the effect of changes in time and implicitly assumes that only cross country variations are effective on FI-Growth nexus. Although employing panel data set removes this problem, adherence to linear specification with interaction effects creates the problem of exogenous determination of threshold levels not only in panel data analysis but also in cross section ones. However, the arguments of theoretical and empirical literature imply that the growth effects of financial integration may not be the same for all countries but rather differ according to the levels of some country characteristics such as financial sector development, quality of institutions, trade openness and budget deficit. Hence an empirical approach should address all these issues in such a way that both cross section variations and time changes observed in variables should be taken in to account and modelling procedure should permit endogenous determinations of threshold levels which may change from country to country and variable to variable to handle heterogeneity problem. One way to introduce this heterogeneity to the model is to employ Panel Threshold Regression (PTR) Model proposed by Hansen (1999).

Despite PTR model offers a more convenient approach for estimating the endogenous threshold effects relative to the sample splitting or linear interaction methods, it has some restrictions that may not fully adapt to real world. In PTR Model, observations are divided into homogenous groups or regimes according to the values of transition variable, where the switch from one regime to another is sharp. In practice, this sudden change across regimes may not always be feasible. Instead, gradual change of coefficients as a function of an observable variable can be more realistic. Panel Smooth Transition regression (PSTR) model developed by Gonzalez, Terasvirta and van Dijk (2005) and Fok, van Dijk and Franses (2005) are preferred in this paper as these models are flexible enough to take in to account both sharp and smooth regime changes. A PSTR Model is a generalization of PTR model of Hansen (1999) and unlike the latter one it, allows the regression coefficients to change gradually from one state to another. In other words, there can be infinite number of regimes between these two extremes, each one is being characterized by a different value of the transition variable and whereby allowing to incorporate the possibility of heterogeneous agents responding to developments at different times and to handle heterogeneity both in cross section and time dimensions. Moreover, in this framework any structural change through time or with respect to particular transition variable can be detected without ex ante information of change.

Following Gonzalez, Terasvirta and van Dijk (2005), PSTR model with two extreme regimes within our context can be written as follows:

$$\Delta y_{it} = \mu_i + \beta_0' X_{it} + \beta_1' X_{it} g(s_{it}; \gamma, c) + u_{it} \qquad (1)$$

for i=1,.....,N and t=1,....,T where N and T denote cross-section and time dimensions of the panel, respectively. $g(s_{it}; \gamma, c)$ is logistic transition function given by;

$$g(s_{it}, \gamma, c) = \left(1 + \exp\left(-\gamma \prod_{j=1}^{m} (s_{it} - c_j)\right)\right)^{-1} \qquad (2)$$

with $\gamma > 0$ ve $c_1 \leq c_2 \leq \ldots \leq c_m$.

The dependent variable Δy_{it} is the growth rate of real GDP per capita, μ_i represents fixed individual effects, X_{it} is the vector of explanatory variables which consists of the financial integration (FI) as the main variable of interest and other control variables of the growth model and u_{it} is the error term. Our control variables include the initial GDP per capita (INITIAL) as the conditional convergence term, population growth (POPGROWTH),

investment (INV), trade openness (TRADE), and government spending (GOV).[9] The transition function $g(s_{it};\gamma,c)$ is a continuous function of the transition variable s_{it} which is normalized to be bounded between 0 and 1. m is the number of location or threshold parameters. According to González et al. (2005), it is sufficient to consider only the cases of m = 1 or m = 2 to capture the nonlinearities due to regime switching. The case m=2 refers to the logistic quadratic PSTR specification in which the transition function has its minimum at (c1+c2)/2 and takes the value of 1 both at low and high values of s_{it}. In other words, the regime dynamics is similar for both high and low values of transition variable, whereas the middle ground may have different dynamics and therefore may represent a dynamic structure which returns both from high and low values to the normal levels in the same fashion. The case m=1 corresponds to the logistic PSTR model characterizing the two extreme regimes with distinct dynamics which are associated with low and high values of s_{it} . When transition function $g(s_{it};\gamma,c)$ is equal to 0, the regression coefficients are equal to β_0 , describing the first extreme regime and when $g(s_{it};\gamma,c)$ is equal to 1, $\beta_0+\beta_1$ characterizes the second extreme regime. Logistic function permits a gradually monotonic transition from regime one specified by β_0 to the other regime specified by $\beta_0+\beta_1$ as $((s_{it}-cj)$ increases with the change being centered about c_j. Hence, unlike the case where m=2, logistic model allows distinct dynamics for low and high values of transition variable with smooth transition from one to another. We prefer to use m=1, since it is more flexible in capturing different dynamics that can be observed in our case and also contains panel threshold model as a special case. When $\gamma\to\infty$, the PSTR model reduces to the panel threshold regression (PTR) model introduced by Hansen (1999) where the first regime is described by β_0 and the second regime is characterized by β_1. When $\gamma\to 0$, the transition function becomes constant and the model collapses into a linear panel regression model with fixed effects. In logistic PSTR model, if the threshold variable s_{it} is different from FI, the elasticity of real GDP per capita growth with respect to financial integration for the i^{th} country at time t is defined by:

$$e_{it}=\frac{\partial\Delta y_{it}}{\partial FI_{it}}=\beta_0+\beta_1 g(s_{it},\gamma,c) \qquad (3)$$

The coefficient changes slightly if the transition variable s_{it} is a function of FI. For instance, if FI itself is used as the transition variable, i.e $s_{it}=FI_{it}$, then the elasticity of real GDP per capita growth with respect to financial integration is defined as:

$$e_{it}=\frac{\partial\Delta y_{it}}{\partial FI_{it}}=\beta_0+\beta_1 g(s_{it},\gamma,c)+\beta_1\frac{\partial g(s_{it},\gamma,c)}{\partial FI_{it}}FI_{it} \qquad (4)$$

[9] We do not include years of secondary schooling as the indicator of human capital which is only available in 5-years span.

For the estimation of the parameters of the model, the fixed effects estimator and the nonlinear least squares estimator (NLLS) are jointly used. The individual effects are removed first and then the NLLS is applied to the transformed data.

In a PSTR modelling framework if a transition variable is included as a regressor, it will have both direct and indirect effects; i.e, as transition variable it will indirectly govern the regime change. We therefore include the transition variables as regressors to control for both effects.

4.2. Modelling Procedure

Before estimating the PSTR model, it is essential to test the linearity against PSTR alternative. Testing the linearity can be done by testing $H_0: \gamma = 0$ or $H_0': \beta_0 = \beta_1$. The test will be non-standard since the PSTR model contains unidentified nuisance parameters.[10] As a solution to this problem Luukkonen, Saikkonen, and Terasvirta (1988) proposed replacing the transition function $g(q_{it}, \gamma, c)$ with its first-order Taylor-series expansion around $\gamma = 0$ to obtain a testing sequence in the following auxiliary regression:

$$\Delta y_{it} = \mu_i + \beta_0^{*\prime} X_{it} + \beta_1^{*\prime} X_{it} q_{it} + \beta_2^{*\prime} X_{it} q_{it}^2 + \ldots\ldots + \beta_m^{*\prime} X_{it} q_{it}^m u_{it} \qquad (5)$$

Then, testing linearity is equivalent to testing $H_0 : \beta_1^* = \beta_2^* = \cdots = \beta_m^* = 0$. If SSR_0 equals the sum of squared residuals under H_0 and SSR_1 equals the sum of squared residuals under H_1, then F-version of the LM statistic is:

$$LM_F = [(SSR_0 - SSR_1)/K]/[SSR_0/(TN - N - K)]$$

where K is the number of explanatory variables. The linearity test is conducted for all potential transition variables and for all samples. In order to estimate PSTR models, we conduct a two dimensional grid search over the values of c and γ. Conditional on transition function determined by these values, we search initial values for other parameters. These values are then used as initial values of coefficients in nonlinear estimation. All variables are included in all models and then deleted one by one on the condition that such deletions reduce the Akakike Information critieria, (AIC).

[10] The location parameter c is not identified under both null hypothesis, while β_1 is not identified under H_0 and γ is not identified under H_0'.

5. Empirical Results

5.1. Linearity Test Results

Linearity test results are provided in Table 1. For all countries, emerging and industrial countries sub-samples, the null hypothesis of linearity is rejected against the alternative of PSTR model for all transition variables with the exception of institutional quality for latter group. For other developing countries, the null hypothesis of linearity is rejected for liquid liabilities, private credits, trade openness and government budget balance[11]. These results indicate that there is a strong evidence of nonlinearity in the FI-growth relationship and any linear model is highly likely suffer from misspecification problem since asymmetric effects of one variable on the other cannot be characterized by linear specifications with symmetric error terms.

Table 1: Test of Linearity

		Transition Variables						
		Liquid Liabilities	**Private Credits**	**Inst. Quality**	**Trade Openness**	**Inf. Volatility**	**Gov. Bud. Balance**	**Financial Integration**
All countries	LM_F-test statistic	3.342	4.641	1.924	3.960	4.429	19.692	2.587
	p-value	0.001	0.000	0.062	0.000	0.000	0.000	0.016
Emerging Countries	LM_F-test statistic	4.404	2.688	5.045	3.647	3.199	8.494	1.993
	p-value	0.000	0.009	0.000	0.001	0.004	0.000	0.064
Industrial Countries	LM_F-test statistic	4.952	12.196	0.781	6.762	9.057	2.800	12.076
	p-value	0.000	0.000	0.603	0.000	0.000	0.010	0.000
Other Developing Countries	LM_F-test statistic	7.638	1.788	0.821	5.914	1.441	16.157	1.443
	p-value	0.000	0.085	0.569	0.000	0.195	0.000	0.194

5.2. Estimation Results for Whole Sample

Table 2 shows the PSTR estimation results for all countries sample. Each column represents the parameter estimates associated with different transition variables. In each

[11] We estimated PSTR models for other developing countries but could not manage to find statistically significant results for any of the transition variables and therefore we do not discuss this country group.

column, we report β_0 and β_1, β_0 refers to the coefficient of the low regime (i. e. when g(.)=0) while the coefficient of the high regime is $\beta_0 + \beta_1$ (i.e. when g(.)=1). There is, however, a continuum of regimes between these two extremes and in between these extremes, the elasticity is defined as a weighted average of the parameters β_0 and β_1. Since the null hypothesis of linearity is rejected for all seven transition variables in all countries sample, we estimate the PSTR model for all of them.

The coefficients of the control variables have the expected signs in both extreme regimes for all transition variables. The magnitudes of the coefficients change in some cases from low to high regime, whereas their signs do not. The coefficient of initial GDP per capita is negative confirming the conditional convergence hypothesis. The population growth adversely affects growth as in Solow growth model. Trade openness has positive effect in low and high regimes consistently with neoclassical approach. The negative impact of government spending and positive coefficient of investment are as expected.

In order to examine the role of financial integration, our main variable of interest, we consider the threshold condition of financial development with two indicators; ratio of liquid liabilities to the GDP and the ratio of private credits to the GDP. According to empirical results presented in the first and second columns in Table 2, in the low regime where financial development level is below the estimated thresholds of 33% and 17% for liquid liabilities and private credits respectively, the growth effect of financial integration is zero, $\beta_0 = 0$. However, in the high regime which corresponds to the financial sector development above these threshold levels, the effect of financial integration is positive, $\beta_0 + \beta_1 > 0$. As to the quality of institutions, the estimates in the third column $\beta_0 = -2.026,$ show that the effect of financial integration is substantially negative in the low regime, nevertheless this negative effect diminishes and converges to zero as the quality of institutions gets better in high regime, $\beta_0 + \beta_1 \cong 0$. The statistically insignificant coefficients of financial integration in both regimes, fourth column, indicate that trade openness does not lead to an asymmetric relationship between financial integration and economic growth. Fifth column shows the impact of inflation volatility, the monetary policy indicator, as the transition variable. When volatility of inflation is below the threshold level, financial integration promotes economic growth, though this positive effect decreases and the growth effect of financial integration becomes noticeably negative in the second extreme regime.[12] This result clearly reveals that macroeconomic

[12] The coefficient in the second extreme regime is equal to $\beta_0 + \beta_1$, that is, 0.110+(-0.688)=-0.578.

Table 2: PSTR Parameter Estimates for Whole Sample

	Transition Variables						
	Liquid Liabilites	Private Credits	Institutional Quality	Trade Openness	Inflation Volatility	Gov. Budget Balance	Financial Integration
FI1	0	0	-2.026** (0.858)	-0.171 (0.166)	0.110** (0.054)	-0.151 (0.259)	0.654* (0.355)
INITIAL1	-4.049*** (0.681)	-4.041*** (0.834)	-7.382*** (1.788)	-5.569*** (0.862)	-4.997*** (0.724)	-7.998*** (2.500)	-4.235*** (0.681)
POPGROWTH1	0	0.604*** (0.190)	-0.816** (0.177)	-0.419 (0312)	-0.815*** (0.243)	4.191 (2.760)	0
TRADE1	0.037*** (0.008)	0.036*** (0.009)	0.072*** (0.016)	0.128*** (0.033)	0.041*** (0.010)	0.148* (0.085)	0.025** (0.010)
GOV1	-2.269*** (0.078)	-0.224*** (0.066)	-0.365*** (0.122)	0	-0.252*** (0.081)	-0.605** (0.297)	-0.260*** (0.061)
INV1	0.255*** (0.038)	0.273*** (0.034)	0.182*** (0.037)	0.224*** (0.036)	0.208*** (0.030)	0.267*** (0.047)	0.222*** (0.037)
TRANSITION1	-0.028*** (0.010)	-0.018*** (0.006)	0	-	-0.001 (0.000)	-	-
FI2	0.052* (0.029)	0.069** (0.032)	2.023** (0.862)	0.198 (0.173)	-0.688** (0.352)	0.161 (0.258)	-0.651* (0.347)
INITIAL2	0.599*** (0.165)	0.605*** (0.154)	-7.382*** (1.788)	0.951*** (0.220)	-4.997*** (0.724)	1.002 (0.685)	-4.235*** (0.681)
POPGROWTH2	-1.136*** (0.301)	-1.579*** (0.340)	-0.816** (0.177)	-0.419 (0.312)	0.543** (0.262)	-4.741*** (2.660)	-1.004*** (0.382)
TRADE2	0.037*** (0.008)	0.036*** (0.009)	0.072*** (0.016)	-0.094*** (0.032)	0.041*** (0.010)	-0.054 (0.015)	0.020*** (0.007)
GOV2	-2.269*** (0.078)	-0.224*** (0.066)	-1.371*** (0.155)	-0.431*** (0.097)	-0.252*** (0.081)	0.508 (0.377)	-0.260*** (0.061)
INV2	0.255*** (0.038)	-0.059 (0.036)	0.099* (0.057)	0.224*** (0.036)	-0.080** (0.033)	0.267*** (0.047)	0.222*** (0.037)
TRANSITION2	-0.028*** (0.010)	-0.018*** (0.006)	5.610*** (1.632)	-	-0.001 (0.000)	-	-
c	33.204*** (0.044)	17.695*** (0.147)	0.405*** (0.001)	52.31*** (0.554)	4.468*** (0.016)	-11.348*** (0.001)	308.015*** (0.181)
γ	443.594 (422.245)	1.132*** (0.113)	401.2*** (98.210)	0.158*** (0.007)	12.82*** (1.277)	3001.88 (225.020)	1.289*** (0.110)
AIC	2.894	3.131	2.384	3.147	2.914	2.763	3.167
SBC	2.917	3.154	2.445	3.168	2.940	2.806	3.186
Obs.	2914	3106	969	3183	2724	1625	3183

Notes: The values in parenthesis are the standard errors of coefficients corrected for heteroskedasticity. (*), (**) and (***) denotes significance levels of 10%, 5% and 1% respectively. c is the estimated threshold parameter and γ is the estimated slope parameter. AIC and SBC denote the Akaike and Schwarz Information Criteria, respectively. Insignificant parameters are dropped from the regression one by one due to the improvement of Schwarz Information Criteria. Among the explanatory variables, TRANSITION represents the transition variable in that column of the regression.

stability is an important pre-condition for financial integration to generate positive growth effects. As long as the government budget balance which is the indicator of fiscal policy is concerned, the coefficient of financial integration is negative in the low regime and positive in the high regime but both are statistically insignificant. In the last column, financial integration itself is introduced as the threshold condition. As seen, when the level of financial integration is below the estimated threshold level of 308%, it affects growth positively; when this threshold level is exceeded, however, the positive growth effect of financial integration nearly disappears. This in turn implies that moderate levels of financial integration should be preferred to high levels in order to benefit from financial integration. This is actually what is observed during the recent economic crisis as developed countries having high financial integration compared to others suffered more.

It is worth to note that the estimated slope parameters γ, are relatively small for all transition variables except for liquid liabilities, institutional quality and government budget balance. Hence for the latter three transition variables the estimated PSTR models imply sharp transitions across regimes, compared to private credits, trade openness, inflation volatility and financial integration. In other words, fitted PSTR model behaves like a PTR model in practice in three cases and the estimated parameters of financial integration can be divided into two extreme regimes.

To sum up, PSTR parameter estimates for the whole sample reveal that countries having undeveloped financial systems, poor institutions, unstable macroeconomic environment and high levels of financial integration are more prone to adverse effects of financial integration on economic growth.

Another point that deserves explanation is that as emerging, advanced and other developing countries display different figures in their engagement in financial integration process, aggregation of these country groups can conceal some important aspects of the relationship between financial integration and growth. We, indeed, find strong distinct nonlinearities in the former two groups of countries but not for the other developing countries. Empirical results are discussed below.

5.3. Estimation Results for Emerging Countries Sample

Table 3 provides parameter estimates of the PSTR model for emerging countries. For emerging economies, the asymmetric relationship between financial integration and economic growth is more pronounced in almost all threshold conditions relative to the whole sample.

The estimates in the first two columns indicate that, when the level of financial development is

Table 3: PSTR Parameter Estimates for Emerging Countries

	Transition Variable						
	Liquid Liabilities	Private Credits	Institutional Quality	Trade Openness	Inflation Volatility	Gov. Budget Balance	Financial Integration
FI1	-2.098** (1.105)	-1.108* (0.675)	-4.641** (1.968)	0	0.472*** (0.121)	-4.965*** (0.959)	0
INITIAL1	-3.729*** (0.970)	-3.206*** (0.997)	-7.699*** (3.027)	-4.843*** (1.151)	-3.623*** (0.797)	-3.124** (1.283)	-4.537*** (1.065)
POPGROWTH1	-0.978** (0.416)	-1.118*** (0.352)	-10.315*** (2.472)	-1.039*** (0.366)	0	-0.897*** (0.337)	-1.721*** (0.485)
TRADE1	0.120** (0.052)	0.054*** (0.015)	0.086*** (0.021)	0.092*** (0.031)	0.022*** (0.007)	0.086*** (0.0304)	0.027*** (0.008)
GOV1	-0.874*** (0.212)	-0.359** (0.147)	0	-0.253** (0.131)	0	0	0
INV1	0.493*** (0.079)	0.368*** (0.041)	0.219*** (0.075)	0.366*** (0.057)	0.265*** (0.040)	0.225*** (0.078)	0.348*** (0.037)
TRANSITION1	0	0	9.816*** (2.894)	-	-0.174*** (0.056)	-0.387*** (0.150)	-
FI2	2.473** (1.126)	1.464** (0.675)	5.061** (2.049)	0.352** (0.109)	-6.243*** (1.929)	5.123*** (0.975)	0.241*** (0.059)
INITIAL2	-3.729*** (0.970)	-3.206*** (0.997)	-2.995*** (1.006)	0.511 (0.375)	1.592*** (0.292)	-3.124** (1.283)	-4.537*** (1.065)
POPGROWTH2	-0.978** (0.416)	-1.118*** (0.352)	8.569*** (2.488)	-1.039*** (0.366)	-5.304*** (0.925)	-0.897*** (0.337)	0.836* (0.458)
TRADE2	-0.089* (0.204)	-0.019 (0.012)	0.086*** (0.021)	-0.058* (0.031)	0.022*** (0.007)	-0.036** (0.017)	0.066*** (0.005)
GOV2	0.845*** (0.204)	-0.359** (0.147)	-2.292*** (0.661)	-0.253** (0.131)	0	0.505*** (0.186)	-2.333*** (0.195)
INV2	-0.254*** (0.085)	-0.108*** (0.038)	0.219*** (0.075)	-0.125* (0.074)	0.265*** (0.040)	0.225*** (0.078)	0.348*** (0.037)
TRANSITION2	0	0	14.862** (7.256)	-	0.171*** (0.056)	1.019*** (0.264)	-
c	36.760*** (1.901)	49.991*** (0.492)	0.121*** (0.046)	75.378*** (0.746)	15.615*** (0.380)	-6.039*** (0.005)	270.542*** (0.429)
γ	0.090*** (0.008)	0.334*** (0.097)	3.681*** (0.298)	0.278*** (0.031)	0.314*** (0.023)	70.710*** (12.367)	156.396*** (2.044)
AIC	2.779	2.818	2.436	2.823	2.616	2.586	2.809
SBC	2.851	2.882	2.618	2.887	2.690	2.710	2.867
Obs.	778	796	252	810	672	381	810

Notes: The values in parenthesis are the standard errors of coefficients corrected for heteroscedasticity. (*), (**) and (***) denotes significance levels of 10%, 5% and 1% respectively. c is the estimated threshold parameter and γ is the estimated slope parameter. AIC and SBC denote the Akaike and Schwarz Information Criteria, respectively. Insignificant parameters are dropped from the regression one by one due to the improvement of Schwarz Information Criteria. Among the explanatory variables, TRANSITION represents the transition variable in that column of the regression.

below the estimated threshold levels of 36.76% and 50% in liquid liabilities and private credits respectively, financial integration's effect on growth is negative. However, above these threshold levels, this negative effect diminishes and the growth effect of financial integration becomes positive in the high extreme regimes. The low values of γ also show the gradual change of coefficients from their negative values in the first extreme regime to the positive ones in the second extreme regime. We obtain similar results when we use institutional quality as the transition variable. Our findings reveal that for emerging countries with under developed institutions, the effect of financial integration on growth is negative. However, as the quality of institutions passes the estimated threshold level, this negative effect decreases and turns to positive after some point. As to the trade openness, in the low regime where trade openness is below the estimated threshold level of 75%, financial globalization has not any significant effect on growth. However, above this threshold level, its effect becomes significantly positive confirming the view that emerging countries need to attain some degree of trade openness in order to benefit from financial openness. There is again a clear pattern of asymmetry in the FI-growth relationship due to inflation volatility used as the indicator of macroeconomic stability. The positive growth effect of financial integration decreases and turns to substantially negative as volatility of inflation increases suggesting that, in an unstable economic environment, financial integration may damage economic growth. When the threshold variable is government budget balance which is the indicator of fiscal policy, the coefficient of financial integration is negative in the low regime (large budget deficit) while it is positive in the high regime (low budget deficit). The threshold estimate of -6% implies that financial openness can affect growth negatively if the budget deficit exceeds the threshold level. Our results for the threshold conditions of inflation volatility and government budget balance uncover that stability and soundness of monetary and fiscal policies are important pre-conditions in order to have gains from financial openness in emerging countries. This result is in line with the arguments of a number recent studies such as Didier et al. (2012), Frankel et al. (2011), Gourinchas and Obstfeld (2012) and Kose and Prasad (2010) which assert that the resilience of emerging economies to the global crisis can be partly attributed to their combination of macroeconomic and fiscal policy framework. In the last column, the transition variable is financial integration itself. As seen, the effect of financial integration on economic growth is zero when the level of financial integration is below the estimated threshold level of 270% and when this threshold level is exceeded; growth effect of financial integration becomes positive, denoting that higher financial integration levels are beneficial for the positive growth effects of financial integration in

emerging countries. This result is reasonable considering the moderate levels of financial integration in emerging countries relative to the very high levels in advanced economies. As a result, parameter estimates for emerging economies suggest that higher financial development, better institutions, higher degree of trade openness, lower inflation volatility and lower levels of budget deficits enhance the positive growth effects of financial integration for them.

5.4. Estimation Results for Industrial Countries Sample

Table 4 reports the parameter estimates for the industrial countries sub-sample. Since we failed to reject linearity for institutional quality, the PSTR model is estimated for six transition variables. Parameter estimates corresponding to PSTR model with liquid liabilities and private credits do not yield statistically significant coefficients for financial integration in both low and high regimes[13]. In the third column, the threshold condition is trade openness and the threshold parameter is estimated as 87%. Below this threshold level, financial globalization has no effect on growth; while above it, the coefficient of financial integration is statistically significant and negative. This result is not surprising that trade is one of the transmission channels of crisis and high openness to trade in these countries increases the exposure to external demand shocks as witnessed during global financial crisis. For inflation volatility, there exist some weak asymmetric effect in the relationship between financial integration and growth possibly due to low inflation volatility in this country group compared to emerging ones. The most obvious asymmetric pattern for industrial countries is observed when the government budget balance is the threshold variable. If the economy is in low regime with large deficit (i.e., below -7% threshold levels), financial integration's effect is negative and when budget deficit decreases in high regime the impact is positive. Lastly, for advanced countries, the effect of financial integration itself exhibits great variability across two distinct regimes. Up to the threshold level of 99%, its effect is positive and significant. However, the positive effect decreases substantially, as financial integration exceeds its threshold level. The estimated threshold level for industrial countries is lower than the estimated threshold level for emerging countries and for all countries samples. A threshold estimate of 99% is in fact low when we consider advanced countries' high levels of financial integration. However, the bulk of the capital inflows into developed countries consist of debt flows. Therefore, the estimate of a low level of threshold for financial integration can be due to the high reliance of those countries on debt liabilities which are riskier than equity liabilities. This result confirms our hypothesis that different composition of capital inflows in emerging and industrial

[13] High financial sector development and qualified institutions may be causing these results.

countries may result in different threshold effects in FI-growth nexus. A number of recent studies such as Claessens et al. (2010),

Table 4: PSTR Parameter Estimates for Industrial Countries

	Transition Variable					
	Liquid Liabilities	Private Credits	Trade Openness	Inflation Volatility	Gov. Budget Balance	Financial Integration
FI1	-0.270 (0.254)	0.023 (0.321	0	0.0008 (0.001)	-0.220*** (0.085)	4.174*** (1.224)
INITIAL1	-4.343*** (1.140)	-3.318*** (1.029)	-5.364*** (1.075)	-8.795*** (2.104)	-8.339*** (2.082	-6.645*** (1.609)
POPGROWTH1	-1.52*** (0.470)	0	-1.606*** (0.429)	-1.276** (0.534)	-4.178*** (0.876)	-1.883*** (0.449)
TRADE1	0.071*** (0.019)	0.066*** (0.016)	0.070*** (0.022)	0.061*** (0.021)	0.068*** (0.021)	0
GOV1	-1.624*** (0.197)	-1.637*** (0.180)	-0.793*** (0.136)	-0.895*** (0.135)	-1.036*** (0.218)	-1.076*** (0.212)
INV1	0	0.137** (0.057)	0.213*** (0.065)	0.312*** (0.085)	0.235*** (0.084)	0.179*** (0.066)
TRANSITION1	-0.056*** (0.021)	0.071*** (0.026)	-	-0.649*** (0.256)	-	-
FI2	0.224 (0.184)	-0.004 (0.249)	-0.246*** (0.089)	-0.001* (0.000)	0.356*** (0.056)	-4.170*** (1.180)
INITIAL2	-2.231*** (0.316)	-1.128*** (0.387)	-5.364*** (1.075)	-8.795*** (2.104)	-8.339*** (2.082	-0.458** (0.191)
POPGROWTH2	-1.52*** (0.470)	-2.004*** (0.421)	-1.606*** (0.429)	-1.276** (0.534)	2.719*** (1.037)	-1.883*** (0.449)
TRADE2	0.071*** (0.019)	0.066*** (0.016)	0.070*** (0.022)	0.061*** (0.021)	0.068*** (0.021)	0.056*** (0.014)
GOV2	1.021*** (0.233)	1.087*** (0.237)	-1.048*** (0.336)	-0.895*** (0.135)	-1.036*** (0.218)	-1.076*** (0.212)
INV2	0.447*** (0.061)	0.329*** (0.064)	0.276*** (0.092)	-0.091*** (0.028)	0.235*** (0.084)	0.203*** (0.067)
TRANSITION2	0.052** (0.021)	-0.093*** (0.027)	-	0.543* (0.337)	-	-
c	59.547*** (0.513)	57.115*** (1.783)	87.015*** (0.590)	2.052*** (0.004)	-7.694*** (0.566)	99.08*** (0.857)
γ	0.495*** (0.080)	0.122*** (0.014)	1.370 (0.544)	3139.3** (1453.43)	0.389*** (0.048)	0.634*** (0.223)
AIC	1.655	1.594	1.688	1.623	1.393	1.688
SBC	1.730	1.674	1.745	1.694	1.468	1.750
Obs.	809	818	837	782	585	837

Notes: The values in parenthesis are the standard errors of coefficients corrected for heteroskedasticity. (*), (**) and (***) denotes significance levels of 10%, 5% and 1% respectively. c is the estimated threshold parameter and γ is the estimated slope parameter. AIC and SBC denote the Akaike and Schwarz Information Criteria, respectively. Insignificant parameters are dropped from the regression one by one due to the improvement of Schwarz Information Criteria. Among the explanatory variables, TRANSITION represents the transition variable in that column of the regression.

Berkmen et al. (2012) and Didier et al. (2012) find that the economies that are more open financially and more open to trade, suffered more during the 2008-2009 crisis as also confirmed here.

6. Elasticity Estimates

Given the parameter estimates of PSTR models, it is also possible to obtain the time-varying elasticity of real GDP per capita growth with respect to financial integration for each country and period. Individual elasticity can be computed by Equations 3 and 4. Figure 3 shows the estimated elasticity of real GDP per capita growth rate with respect to financial integration over the period of 1970-2010 for the 21 emerging countries when we use financial development (liquid liabilities) as the threshold variable.[14] For Argentina, Brazil, Chile, Colombia, Indonesia, Mexico, Pakistan, Peru, South Africa, Turkey and Venezuela, financial integration elasticity of growth is negative in almost all years due to their low levels of financial depth. Among these countries, Brazil and South Africa achieve to have positive elasticity after 2008, while Chile and Turkey still continue to have negative elasticity despite the significant rise in their elasticity during the period. Contrary to those countries, China, Jordan and Singapore are the ones which have positive elasticity in the entire period. Apart from these countries, Egypt, India, Israel, Korea, Malaysia, Philippines and Thailand are the emerging countries which shift from negative to positive elasticity in different years by gradually increasing their financial development levels.

Figure 4 shows the estimated individual elasticity for 21 advanced countries using government budget balance as the threshold variable. According to our parameter estimates for industrial countries, government budget balance is threshold variable which leads to the most prominent asymmetric effect between financial integration and economic growth. A number of countries such as Australia, Austria, New Zealand, Norway and Switzerland have positive elasticity in all periods due to their strong fiscal position. However, for other advanced countries, estimated elasticity of real GDP per capita growth rate with respect to financial integration is negative in some years in which they have high levels of fiscal deficit. As expected, during global financial crisis, the elasticity sharply dropped and became negative in countries such as Greece, Ireland, Portugal and Spain which experienced large budget deficit problems.

[14] In empirical literature, financial development is the most emphasized threshold condition for the effects of financial integration on economic growth. Therefore, in order to save space, we only report the individual elasticity for financial development as the threshold condition. Individual elasticities for the other threshold variables are also available upon request.

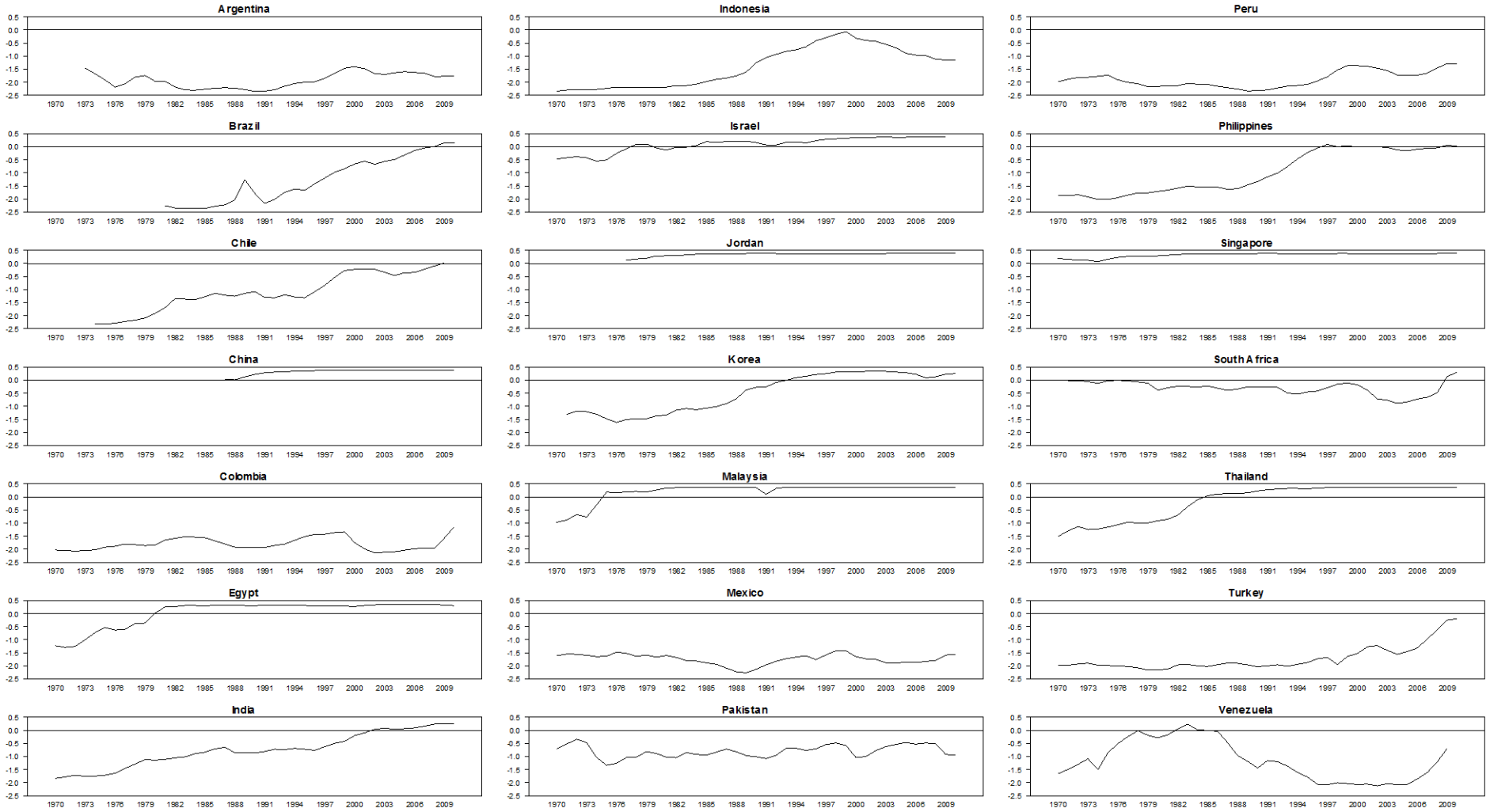

Figure 3: Individual Elasticities of Emerging Countries using financial sector development as the transition variable.

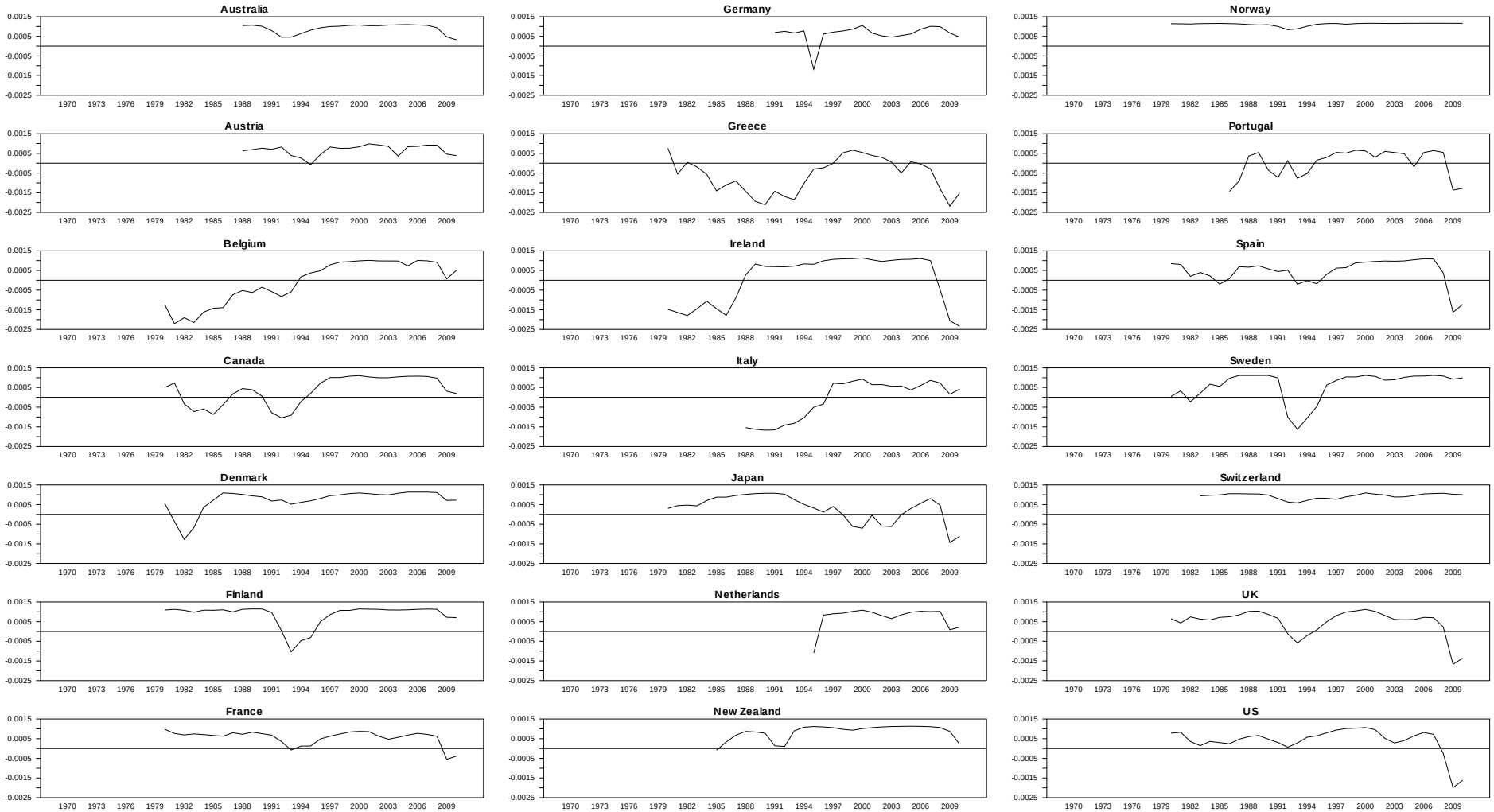

Figure 4: Individual Elasticity of Industrial Countries using government budget balance as the transition variable.

The figures of individual elasticity of emerging and advanced economies clearly point out to the heterogeneity of the growth effect of financial integration across countries and over time. Therefore, it illustrates the advantage of PSTR model over linear panel data models which impose homogeneity assumption.

7. Conclusions

This study provides new empirical evidences on the relationship between financial integration and economic growth using nonlinear econometric techniques. Our results show that the effect of financial globalization on growth is nonlinear and depends on some other factors such as financial sector development, institutional quality, and openness to trade, inflation volatility and budget deficit. Based on the differences in the levels of financial integration and the composition of capital flows in advanced and emerging, we find that threshold effects substantially differ for these country groups.

Even though we find significant asymmetric effects for the whole sample and industrial countries, our results show that nonlinear threshold effects are stronger for emerging countries. For emerging countries, more developed financial system, better institutions, higher trade openness and higher level of financial integration enhance the benefits of financial openness on growth. Additionally, a stable economic environment and strong fiscal balances are important preconditions in the FI-growth nexus. If emerging countries exceed some threshold levels in inflation volatility and budget deficit, financial openness can become highly detrimental for their growth.

The threshold effects exhibit differences for industrial countries. Due to their high financial sector development and qualified institutions, financial development and institutional quality are not among the factors that determine the effect of financial openness on growth for these countries. Instead, government budget deficit is found as one of the most effective threshold condition such that the impact of financial integration can be highly negative for advanced countries with large fiscal deficits. A remarkable result for advanced economies which is also contrasting with emerging countries is that, higher levels of financial integration and higher trade openness can reduce the gains from financial openness in industrial countries. The positive growth effects of financial integration is higher for emerging countries as they increase their financial integration levels whereas higher financial integration ratios tend to reduce the benefits of financial openness for advanced economies. Considering the advanced countries' high reliance on debt flows contrary to the emerging

countries with high share of equity flows in their financial flows, this result can mostly be explained with different engagement of advanced and emerging countries with financial integration process. Empirical results confirm the arguments of Lane (2012) and Didier et al. (2012) that moderate levels of financial integration can be more preferable in order to benefit from financial globalization. They are also consistent with the findings of a number of recent studies such as Claessens et al. (2010), Berkmen et al. (2012) and Didier et al. (2012) which show that the economies that are more open financially and more open to trade, suffered larger collapses during the global financial crisis.

Lastly, we find some asymmetric effects for other developing countries but they are not statistically significant. This result may be attributed to their lower levels in threshold conditions such as financial development, institutional quality and trade openness.

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Appendix

Table 1.A: Country Sample

Emerging	**Industrial**	**Other Developing**	
Argentina	Australia	Algeria	Nepal
Brazil	Austria	Bangladesh	Nicaragua
Chile	Belgium	Bolivia	Niger
China	Canada	Botswana	Panama
Colombia	Denmark	Cameroon	Papua New Guinea
Egypt	Finland	Congo	Paraguay
India	France	Costa Rica	Rwanda
Indonesia	Germany	Dominican Republic	Senegal
Israel	Greece	Ecuador	Sri Lanka
Jordan	Ireland	El Salvador	Sudan
Korea, Republic of	Italy	Ghana	Syria
Malaysia	Japan	Guatemala	Togo
Mexico	Netherlands	Haiti	Trinidad and Tobago
Pakistan	New Zealand	Honduras	Tunisia
Peru	Norway	Iran	Uganda
Philippines	Portugal	Jamaica	United Arab Emirates
Singapore	Spain	Kenya	Uruguay
South Africa	Sweden	Kuwait	Zambia
Thailand	Switzerland	Malawi	Zimbabwe
Turkey	United Kingdom	Mali	
Venezuela	United States	Mauritius	

Table 2.A. Variable Definitions and Sources

VARIABLE	DEFINITION	SOURCE
GROWTH	Growth rate of PPP real GDP per capita (%)	Penn World Tables version 7.1 (PWT)
FI	Financial integration to GDP (%)	Lane and Milesi-Ferretti (2007) (updated version)
INITIAL	Logarithm of real per capita GDP lagged one period	PWT
POPGROWTH	Annual growth rate of population (%)	World Development Indicators (WDI)
TRADE	Exports plus imports to GDP (%)	PWT
GOV	Government consumption as a share of GDP (%)	PWT
INV	Investment to GDP (%)	PWT
CREDIT	Domestic credit to private sector to GDP (%)	WDI
LIQ	Liquid liabilities to GDP (%)	Beck et al (2009)
INSQUALITY	Simple average of six indicators of World Bank Governance Indicators (WBGI) (data available from 1996)	WBGI
INFVOL3	Standard deviation of CPI inflation	IFS
GOVBALGDP	Government fiscal balance (expenditure minus revenue) to GDP (%)	World Economic Outlook (WEO)