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Multiple Equilibria in the Dynamics of Financial Globalization

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Abstract

It is often argued that financial globalization involves threshold effects: countries should have a minimum level of preconditions in place before they can reap the benefits of financial integration. We investigate what this means for the dynamics of *de facto* financial globalization, using recently developed threshold and sample splitting methods. We find that there are indeed signs of multiple equilibria in the dynamics of financial integration. We confirm that the main cause for these non-linearities is the quality of the institutional context, as measured by corruption, investment profile, capital account balance and aggregate growth prospects.

Keywords: financial globalization, multiple equilibria, threshold conditions, institutions.

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1 Introduction

Neo-classical growth theory suggests that financial globalization is a good thing. It predicts increased efficiency in the global allocation of capital. Furthermore, there is scope for improved international risk sharing and capital deepening. This should be particularly good news for developing economies, as they are relatively capital poor and hence can expect long-term net flows of capital from industrial countries. In addition, they face high volatility in income and consumption growth, which could be smoothed if insurance instruments would be available. If this is the case, then why do we fail to observe such financial flows (Lucas (1990))? Even more, why do we often observe capital flight, where capital flows from poorer to richer countries (Collier et al. (2001))? Why is it often claimed that financial globalization increases output growth volatility in low income countries?

In a recent paper, Rogoff et al. (2006) take a look at the vast literature on the benefits of financial globalization. They argue that besides the traditional channels described above, there is also a broad set of indirect effects associated to financial integration, which they refer to as the "collateral benefits" of financial globalization. These benefits include local financial sector development, institutional development, better governance and macroeconomic discipline. They suggest that these benefits are potentially more important for economic growth, through their effect on total factor productivity (TFP). However, they also note the existence of various "threshold conditions". These are preconditions that have to be in place for financial globalization to be growth/TFP enhancing. Some key thresholds are related to financial market development, institutional quality and (corporate) governance, macroeconomic policies and trade integration.

Alfaro et al. (2005b) also attempts to answer the question as to why not more capital is flowing from rich to poor countries. They find that institutional quality is the most important factor determining capital flows to developing countries. Acemoglu et al. (2003) focus on the role of institutions as a mediating channel through which financial globalization affects economic growth and volatility. They conclude that institutions are the driving forces,

while policies can be regarded as symptoms of the institutional setup. Alfaro et al. (2005a) make a distinction between institutions and policies and find again that, using the same instruments for institutions as Acemoglu et al. (2003), institutions are the main driving force in successful financial integration.

In this paper, we will examine what the interaction of *de facto* financial integration with the institutional context means for future international financial integration of a country. To do so, we will extend the framework of Rogoff et al. (2006) by including a feedback mechanism. We will argue that the interaction of *de facto* financial integration with institutions may lead to multiple equilibria, where some economies converge to a stable equilibrium characterized by poor financial integration and preconditions that fall below an institutional threshold. The low level of financial flows are insufficient to generate the "collateral benefits" needed to surpass the thresholds, hence they are trapped. On the other hand, some economies will converge to a high level equilibrium, characterized by large financial flows and favorable preconditions.

As such, if we confine ourselves to the outcome, *de facto* financial globalization, we expect to find signs of conditional convergence. An important parameter in the dynamics of financial globalization is the point at which the distribution bifurcates. If we can lift a country's *de facto* financial globalization above this implicit threshold, it will be more likely to translate into collateral benefits that are above the threshold, and safeguard a high level of financial integration in the future. Furthermore, it would also be interesting to find a mechanism that prevents countries that are above the threshold from falling below it. In theory, by combining these two strategies, we could eliminate the low level stable equilibrium.

The empirical part of the paper estimates piecewise linear regressions, based on recently developed threshold and sample splitting models Hansen (2000). Our measure of global financial integrations is taken from the External Wealth of Nations II data-set (Lane and Milesi-Ferretti (2001, 2006)), and is measured as the sum of total assets and total liabilities of a country, scaled by population. Our measures for the institutional context of a country

are the often used International Country Risk Guide (ICRG) data published by the PRS group. Various other controls are included and are taken from the World Bank's World Development Indicators On-line.

The paper is organized as follows. In the next section, we adapt the framework of Rogoff et al. (2006) to make it more dynamic. We also refer to the relevant literature to carefully explain all the links and interactions within the framework. Section 3 explains how our framework may lead to multiple equilibria in the dynamics of *de facto* financial globalization, and presents an appropriate econometric model. Next, we outline our empirical strategy. Section 5 describes the data we will use in the application, while section 6 presents the results. The last section concludes.

2 Collateral benefits and threshold conditions

Is financial globalization a good or a bad thing? Answering this question is far from straightforward. Neo-classical growth theory suggests it is a good thing. It predicts increased efficiency in the global allocation of capital. Furthermore, there is scope for improved international risk sharing and capital deepening, with the potential to lower volatility. This should be particularly good news for developing economies, as they are relatively capital poor and hence, according to the theory, can expect long-term net flows of capital from industrial countries. In addition, they face high volatility in income and consumption growth, which could be smoothed if insurance instruments would be available. But the reality is different. Observed capital flows from rich to poor countries are far less than what the model predicts (Lucas (1990)). In addition, the spate of currency and financial crises in the last two decades are often attributed to unfettered capital account liberalizations, not only by activists (Rodrik (1998), Bhagwati (1998), Stiglitz (2000)).

In a recent paper, Rogoff et al. (2006) review the voluminous literature on the benefits and costs of financial globalization and note that it often comes to conflicting conclusions. They attempt to provide a unified conceptual framework to explain these disparate conclusions. Their main argument is that, while the focus is mostly on the traditional channels through which

global financial integration affects growth (i.e. more efficient global capital allocation and international risk-sharing), financial globalization also serves as a catalyst for certain "collateral" benefits. These potential collateral benefits include financial market development, institutional development, improved governance and macro-economic discipline, amongst others. They claim that these indirect effects may be more important in increasing TFP or GDP growth and reducing consumption volatility.

At the same time, they also point to the existence of threshold conditions that interact with financial globalization. By this, they mean that certain preconditions have to be in place to reap the benefits of financial globalization in terms of better macro-economic outcomes. They identify financial market development, institutional quality, governance, macro-economic policies and trade integration as such preconditions. If an economy is above a certain threshold with regards to these preconditions, financial integration will increase TFP and GDP, while the risk of crises diminishes. If a country fails to meet these thresholds, financial globalization increases the risk of crises, while the effect on TFP and GDP remains unclear. They note that:

> "The framework also points to a fundamental tension between the costs and benefits of financial globalization that may be difficult to avoid. Financial globalization appears to have the potential to play a catalytic role in generating an array of collateral benefits that may help boost long-run growth. At the same time, premature opening of the capital account in the absence of some basic supporting conditions can delay the realization of these benefits, while making a country more vulnerable to sudden stops of capital flows." (Rogoff et al. (2006), p.4)

Acemoglu et al. (2003) note that countries that have pursued distortionary macroeconomic policies appear to have grown slower, with higher standard deviations of growth and higher sudden drops in GDP. However, they argue that the main underlying determinants are institutions. They find that an institutional setup that places constraints on the executive, guarantees property rights, a minimum amount of equal opportunity and relatively broad

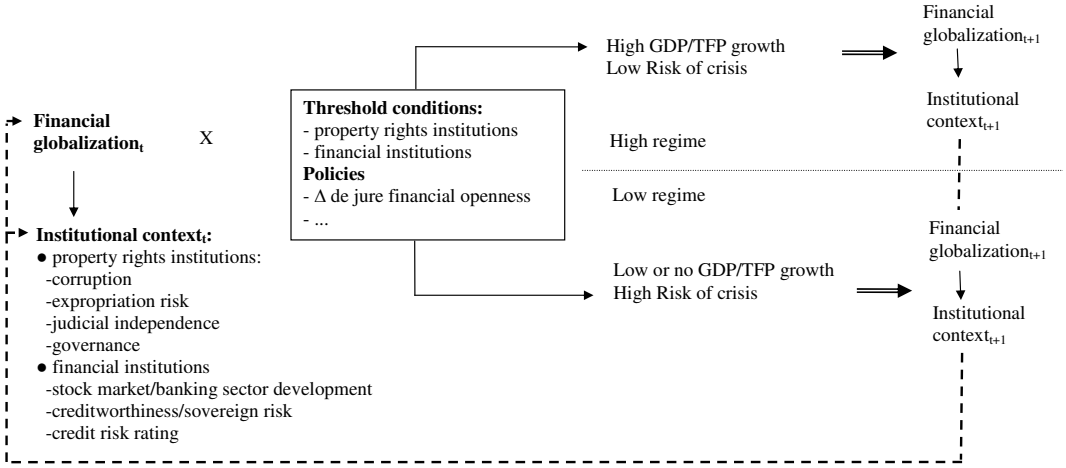
based education, etc. leads to higher growth and less volatility. They find that if they control for the quality of institutions, macroeconomic policies do not appear to play a direct role. As such, they view distortionary macroeconomic policies not as the cause of low growth or high volatility, but rather as a symptom of weak institutions. Alfaro et al. (2005b) also consider endogeneity of institutions and, using the same instruments as Acemoglu et al. (2003), find that the effect of institutional quality on capital inflows is causal. Klein (2005) finds evidence of an inverted U-shaped relationship between the benefits of capital account liberalization and institutional quality.

In this paper, we will extend and refine the hypothesis in the above mentioned paper in several ways. As in Alfaro et al. (2005a), we will make a clear distinction between institutions and policies. Like these authors, we define institutions as:

> "[the] set of rules constraining human behavior. They consist of both informal constraints (traditions, customs) and formal rules (regulations, laws and constitutions). They create the incentive structure of an economy. Institutions are understood to affect economic performance through their effect on investment decisions by protecting the property rights of entrepreneurs against the government and other segments of society and preventing elites from blocking the adoption of new technologies. (Alfaro et al. (2005a), p. 6).

Hence, we see institutions more as slowly and endogenously evolving fundamentals that are determined on a more political economy level. Policies, on the other hand, are choices made within a political and social structure, i.e. within a set of institutions. Our main hypothesis will be that policies are generally ineffective when institutions are weak. Furthermore, we will add a feedback mechanism to the framework developed in Rogoff et al. (2006), which, together with the threshold conditions and the collateral benefits of financial globalization, may lead to financial globalization traps. However, unlike Acemoglu et al. (2003) and Rogoff et al. (2006), we will confine attention to the dynamics of financial integration. We will investigate what the *de*

Figure 1: The complex dynamics of financial globalization



facto level of financial globalization of a country interacted with institutions and policy means for future financial globalization.

The resulting dynamics of financial globalization can be described by Figure 1, which is adapted from Rogoff et al. (2006). It shows that *de facto* financial globalization at time t has an effect on the institutional context (i.e. the collateral benefits). As in Rogoff et al. (2006) we make a distinction between property rights institutions and financial institutions, since these different institutions may have different effects depending on what is understood by financial integration (eg. FDI versus other forms of foreign liabilities (Wei (2006))). The effect of *de facto* financial globalization on GDP and TFP growth and risk of crises depends on whether some threshold level of institutional quality is present. If financial globalization occurs in a context of strong property rights institutions and financial institutions, this will lead to high GDP and TFP growth and a lower risk of crises. If financial globalization occurs in the context of weak institutions, there is no or low GDP and TFP growth, while the probability of crises increases. These outcomes will in turn determine *de facto* financial integration in the next period, which will again bring along collateral benefits.

The link between GDP or TFP growth and future financial globalization is based on the premise that more productive countries will attract more capital, a property that can be derived from the neo-classical growth models

when we allow for differences in total factor productivity. In a small open economy where output is produced using capital K and labor L via a Cobb-Douglas production function,

$$Y_t = A_t F(K_t, L_t) = A_t K_t^{\alpha} L_t^{1-\alpha} \tag{1}$$

where Y denotes output and A denotes total factor productivity (TFP), and we assume both capital and labor are subject to decreasing returns. It is further assumed that agents can borrow and lend capital internationally. It is easy to see that if all countries share the same technology, the returns to capital would converge:

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

where $f(.)$ is the production function in per capita terms and k denotes capital per capita. Equation 2 implies that resources will flow from capital abundant countries to capital scarce economies. However, this simple models is at odds with the facts, as we do not observe sufficient flows of capital and the implied interest rates do not converge.

The above model has been modified in different ways to match reality closer. For instance, if one argues that total factor productivity A_t may differ between countries, equation 2 becomes

$$A_{it} f'(k_{it}) = r_t = A_{jt} f'(k_{jt}) \tag{3}$$

which implies that capital will flow to the countries that are able to use it most efficiently, since the higher productivity increases the marginal product of capital[1]. However, Alfaro et al. (2005b) note that it is impossible to differentiate between the effect of institutions on investment opportunities versus that of TFP. We think this is not such a problem, as (broadly defined) institutions have been found to be an important determinant of TFP (Prescott (1998)). In our view, even sovereign risk can be attributed to weak institutional context (Reinhart and Rogoff (2004)).

[1]Empirical evidence productivity differences and the resulting capital flows between states in the United States can be found in Kalemli-Ozcan et al. (2005).

The link between institutions, volatility and financial globalization is documented in Acemoglu et al. (2003). Their main argument is that in institutionally weak societies, there are few constraints on rulers. Following a change in the balance of power, groups that gain politically may then attempt to use their new power to redistribute assets and income to themselves, in the process creating economic turbulence. They proceed that the lack of effective constraints on politicians and politically powerful groups implies the gains from coming to power are higher. These higher political stakes may result in increased infighting, which is again reflected in economic turbulence. Furthermore, in such a context, political leaders may be forced to stay in power, and pursue unsustainable policies in order to satisfy various groups. They also argue that, with weak institutions, entrepreneurs may choose sectors/activities from which they can withdraw their capital more quickly, thus contributing to potential economic instability.

So given the importance of institutions, is there any role left for policies? In theory, the role seems rather limited. Since we define policies as the choices made within a set of institutions, the credibility of these policies will be as good or bad as the institutional context in which policy is made. This is indeed what Acemoglu et al. (2003) find: once they control for the quality of institutions, policy seems to be insignificant. However, Alfaro et al. (2005a) find that, although institutional quality is an important determinant of capital flows, policy is important in explaining the *changes* in the level of capital flows. In our paper, we will also investigate the effects of policies empirically.

In analogy to the literature on poverty traps, this can be coined as a 'financial globalization trap'. Paraphrasing Matsuyama (2008)'s definition of a poverty trap, it can be defined as a self-perpetuating condition where an economy, caught in a vicious cycle, suffers from persistent underdevelopment of the stock of external capital[2]. As such, in the next section, we will draw

[2]A basic recent reference to the literature on poverty traps is Azariadis and Stachurski (2005). See also e.g. Kraay and Raddatz (2005). In fact, the latter refer to low savings trap situation as a possible explanation of this poverty trap. In analogy to this, a financial globalization trap could refer to a low-equilibrium foreign savings situation. As a matter of fact, such a financial globalization trap might in itself be one reason for the existence

on the emerging literature of micro-economic poverty traps to develop and empirically test a model of financial globalization traps.

3 Thresholds and multiple equilibria in the dynamics of financial integration

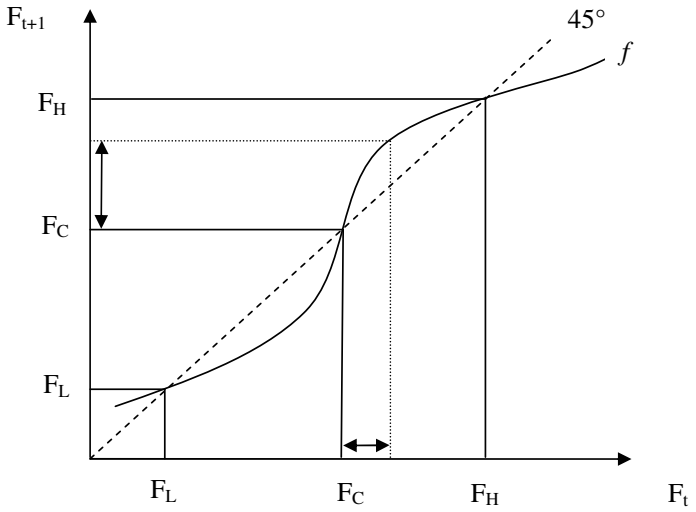
The above seem to suggest that the threshold effects are not only present in the relationship between financial globalization and economic growth, but should be visible in the dynamics of the indicators of financial globalization as well. If an economy is sufficiently integrated in the global financial system, this will for instance strengthen the domestic financial institutional context. A sophisticated and well regulated financial sector increases the probability of participation in the global financial market. Hence, we are confronted with a self sustaining mechanism. The mechanism also works in the opposite direction. An economy that is characterized by poor property rights institutions will not attract a lot of foreign capital. However, if global financial integration strengthens such institutions as collateral benefits, we again have a self-sustaining effect of a poorly integrated economy trapped at a low level equilibrium.

Hence, the existence such self-sustaining mechanisms will also be apparent in the evolution of *de facto* indicators of financial globalization over time. Economies that meet the necessary preconditions will converge to a high level equilibrium that is characterized by a consistent high level of financial integration in the world economy. Economies that do not have the preconditions in place will find it difficult to integrate in the world economy. The resulting dynamics can best be summarized in a recursion diagram as illustrated in figure 2.

In this figure, f is a function that describes how financial integration evolves over time. There are three equilibria in this figure, two stable (F_L

of a poverty trap. See also Matsuyama (2004) for a model along these lines.

Figure 2: Recursive Diagram



and F_H) and one unstable (F_C). F_C is an unstable equilibrium in the sense that if an economy has an indicator of financial integration equal to F_C in period t, it is predicted to have F_C in the next period as well. However, if the relationship is stochastic (for instance by adding a mean zero shock), then any nonzero shock will drive the economy away from F_C. For instance, if the shock is positive (but smaller than F_H), then financial integration will be $f(F_C + \varepsilon)$ in the next period, which is larger then the initial shock. In the second period, without further shocks, the predicted level of financial integration is $f(f(F_C + \varepsilon))$, which is again an increase (again provided that $f(F_C + \varepsilon) < F_H$. This will go on until the economy arrives at F_H, the high stable equilibrium. The reverse happens when an economy starts from the unstable equilibrium and experiences a negative shock. In that case, it will end up at the lower equilibrium F_L. Hence, the high and low equilibria function as local attractors, where the basin of attraction are delineated by the unstable fixed point F_C.

The basic idea behind the econometric model is that the above mentioned attractors and the threshold can be identified using time series estimation methods. More in particular, we can use methods similar to threshold auto-

regression (TAR), which is a special type of piecewise linear regressions, to identify the three equilibria. An added advantage is that we can also get an estimate of the speed at which countries converge to the stable equilibria. Formally, if F_t is an indicator of financial globalization for an economy at time t, a model with two attractors and one threshold can be written as:

$$\triangle F_t = \beta_L \left(F_{t-1} - F_L\right) I_{(F_{t-1}<F_C)} + \beta_H \left(F_{t-1} - F_H\right) I_{(F_{t-1}\geqslant F_C)} + \varepsilon_t \quad (4)$$

Here, $I_{(F_{t-1}<F_C)}$ and $I_{(F_{t-1}\geqslant F_C)}$ are indicator functions that take the value of 1 if the condition is satisfied and is zero otherwise. Defining $\alpha_L = -\beta_L F_L$ and $\alpha_H = -\beta_H F_H$, (4) can be rewritten as:

$$\triangle F_t = \beta_L F_{t-1} I_{(F_{t-1}<F_C)} + \alpha_L I_{(F_{t-1}<F_C)} \quad (5)$$

$$+\beta_H F_{t-1} I_{(F_{t-1}\geqslant F_C)} + \alpha_H I_{(F_{t-1}\geqslant F_C)} + \gamma X_t + \varepsilon_t$$

The value F_C of can be found through standard sample splitting and threshold estimation techniques as described in Hansen (2000). Furthermore, the low level equilibrium and the high level equilibrium can be calculated from the estimated coefficients as $F_L = -\frac{\alpha_L}{\beta_L}$ and $F_H = -\frac{\alpha_H}{\beta_H}$. The standard errors of these ratios can be approximated using the delta method:

$$\sigma_{F_i} = \sqrt{\frac{\alpha_i^2}{\beta_i^2}\left[\frac{\sigma_{\alpha_i}^2}{\alpha_i^2} + \frac{\sigma_{\beta_i}^2}{\beta_i^2} - 2.\frac{cov(\alpha_i, \beta_i)}{\alpha_i \beta_i}\right]} i = L, H \quad (6)$$

Since the value of the threshold is identified through a grid search, standard errors for this parameter are not available. However, Hansen (1997) provides a straightforward graphical way to construct $\beta-$level confidence intervals for the threshold parameter. It involves plotting the likelihood ratio sequence $LR\left(F_C\right) = n.\left(\frac{\hat{\sigma}_n^2(F_C) - \hat{\sigma}_n^2\left(\hat{F}_C\right)}{\hat{\sigma}_n^2(F_C)}\right)$ and drawing a horizontal line at $c_\xi\left(\beta\right)$, for which selected values are in Table 1 of Hansen (1997).

The method described above has some interesting advantages over non-

parametric methods commonly used to summarize the information contained in recursive diagrams (like for instance in Lybbert et al. (2004)). First of all, it relieves the researcher from having to decide on things like bandwidth and kernel. Secondly, our method also returns the adjustment speed to equilibrium. When the observations are made at a fixed time interval, these parameters can inform us on how long it takes to get to a stable equilibrium after a shock has occurred.

The model of equation (4) is a time-series model. Since our measure of financial flows are recorded yearly, we would need data for a reasonable time-span to come to meaningful estimates. Furthermore, our main hypothesis looks at the effect of institutions on financial integration. Since institutional quality is changing slowly, there may be too little variation if we restrict to single country cases. Hence, we would like to work with a panel data version of the model. One way to accomplish this is to include country fixed effects into equation (4). The model is also expressed as a uni-variate model. This may be too simplistic as a representation of the determinants of financial globalization. We may want to include some controls, especially give our hypothesis that the quality of institutions change the dynamics of financial integration. In principle, this could be done directly by including additional controls and country dummies in equation (4). The downside of this strategy would be that we can not estimate α_L and α_H in equation (5), since this would result in perfect collinearity with the country dummies. In addition, including controls directly in (4) will also affect these parameters, which makes the interpretation as stable equilibria more complicated.

This is why we choose to run an auxiliary regression where we first control for country fixed effects as well as other control variables. After purging the effect of these variables from the financial flows, we proceed with the residual of this regression and estimate (4) as a pooled model.

4 Estimation strategy

In this section, we will outline our main hypotheses we want to test. From the theoretical framework above, we expect that the interaction between *de*

facto financial globalization and the institutional context together with the feedback mechanism leads to conditional convergence of financial globalization. More specifically, we expect a group of countries with better institutions to converge to an equilibrium characterized by high financial integration in global financial markets. On the other hand, we expect a group of countries with bad institutions to remain on the margins of financial globalization. The alternative would be that there is no such conditional convergence, but that all economies converge to the same stable equilibrium.

In practice, we will thus test if the piecewise linear model in equation (4) is statistically significant compared to a simple linear model like:

$$\triangle F_t = \beta \left(F_{t-1} - F_S \right) + \varepsilon_t \tag{7}$$

Hansen (1999) describes the challenges of testing between these two alternatives, which is basically a test for linearity. On first sight, since models (4) and (7) are nested, a conventional F (or Wald) test based on the sum of squared residuals of two models seems appropriate:

$$Test_{ln} = n \left(\frac{SSR_l - SSR_n}{SSR_n} \right) \tag{8}$$

where SSR_l is the sum of squared residuals from equation (7), SSR_n is the sum of squared residuals from equation (4) and n is the number of observations. However, due to the presence of parameters that are only defined under the alternative, the asymptotic distribution of the test statistic is non-standard, so we have to use bootstrap methods to judge the significance. At this stage, we expect to find that the difference between the linear model of (7) and (4) is significant.

We also explained in the theoretical framework that the cause of the non-linearities are threshold effects in the interaction between the institutional context and *de facto* financial globalization. As such, we expect that if we condition on the quality of institutions, this non-linearity should vanish. So, as a second test, we expect to find that the difference between the linear model of (7) and (4) is not significant after controlling for institutional quality in the axillary regression. We will also contrast this to the effect of policies.

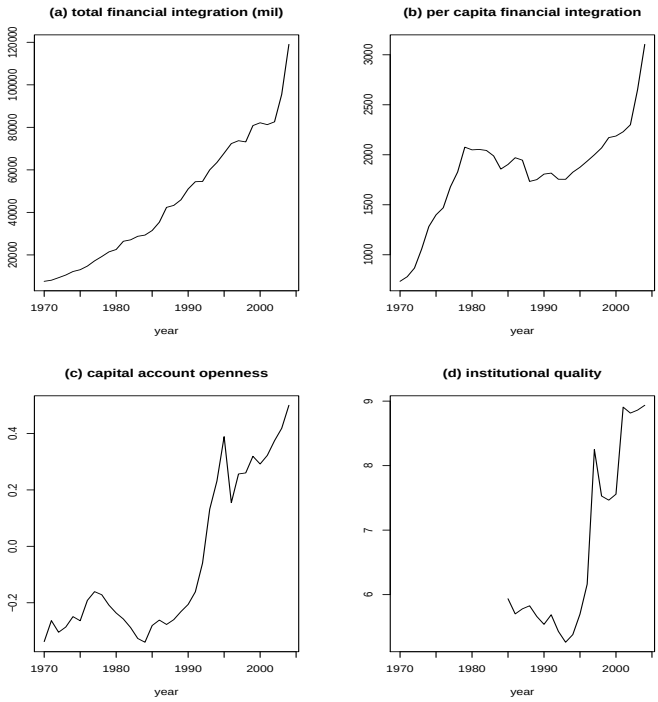
Similar to Acemoglu et al. (2003), we expect that the effect of policies (like *de jure* financial globalization) are of secondary order. Hence we expect that if we control for such policies, the non-linearities in the dynamics of financial integration persist: the difference between the linear model of (7) and (4) will remain significant after controlling for policies in the axillary regression.

5 Data

In order to investigate whether there is indeed threshold behavior in the dynamics of financial integration, we need a suitable measure. In the literature that investigates the relationship between financial openness and economic development, early studies use *de jure* measures of integration, often based on the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). Over time, such measures have come under attack for different reasons. Given the myriad of rules and regulations (eg. controls on inflows versus controls on outflows, quantity controls versus price controls, restrictions on foreign equity holdings, etc.) each country applies, it is not clear how to combine the qualitative AREAER data to a quantitative measure that is suitable for multivariate analysis. But the most important reason is that *de jure* measures do not seem to reflect *de facto* financial globalization. This should not come as a surprise. In the framework developed above, *de jure* restrictions on financial integration can be regarded as policies, whose effectiveness crucially hinges on the quality of the institutional context.

To study the dynamics of financial globalization, we will use *de facto* measures of financial integration. Lane and Milesi-Ferretti (2001, 2006) constructed a data-set of consistently defined annual measures of stocks of gross foreign liabilities and assets for 145 countries, for the 1970-2004 period that define the external wealth of nations (EWN), referred to as the EWN Mark II database. Since we want to capture the extent of integration of a country into the global financial system, we sum total liabilities and total stocks. This in analogy to the well established measure for trade integration we will also use as a control, and which is the sum of imports and exports as a percentage of GDP. However, as in Alfaro et al. (2005a), we will scale by population size.

Figure 3: Evolution of financial globalization



We tried different controls for the auxiliary regression, all taken from the World Developement Indicators On-line. Following the reasoning in Chinn and Ito (2006), we included per capita income in PPP terms, the inflation rate and trade openness, measured as the ratio of the sum of exports and imports to GDP. We also experimented with data on stock market capitalization, but the data had too many missings to be useful. For low income countries, concessional loans may be a substantial part of their total liabilities. Since this component may be determined differently than the other components of financial integration, we decided to use net aid transfers per capita as a control. Data for this variable are taken from the on-line CRS system of OECD/DAC as described in Claessens et al. (2007). We found, after including country fixed effects and net aid transfers per capita, only trade openness to be significant in the auxiliary regression. As including the other controls did not make much difference for the results, we decided to leave them out for reasons of parsimony.

Our measures of institutional quality are the well known International Country Risk Guide (ICRG) data collected by the PRS group. We will include each of them in turn in the auxiliary regression and look if this removes the non-linearities in the dynamics of financial globalization. We will also contrast this with a relevant policy measure. For this, we will use the index of financial openness developed by Chinn and Ito (2006), which is based on principal components extracted from disaggregated capital and current account restriction measures in the AREAER.

Figure 3 plots the evolution over time of the main variables in our regression, averaged over all countries. The first chart (a) gives the evolution of average total assets and liabilities, while (b) plots the same information, but in per capita terms. The third chart (c) gives the evolution of the measure of capital account openness. While we will use this as a policy variable, others use this indicator as a *de jure* measure of financial globalization. The last chart (d) plots the evolution of institutional quality, as measured by the investment profile variable if the ICRG.

6 Results

We started by running a fixed effects model of our measure of trade openness on the log of our measure of financial integration. Trade integration is positive and significant. We then estimate equation (7) using the residual of the axillary regression. Next, we estimate equation (4). We then test for linearity by comparing the residual sum of squared errors from the linear model to the residual sum of squared errors of the piecewise linear model using the likelihood ratio test of equation (8). The linear model is then rejected against the non-linear model for large values of this test. As explained above, to judge the significance of this statistic, one can use bootstrap procedures.

The linearity test of our base model (the one based on the residuals of an auxiliary regression without controlling for the quality of institutions) results in a test statistic of 14.84, with a corresponding p-value of 0.015. This thus means that the dynamics of our measure of financial globalization is better described by a piecewise linear model as in equation (4) compared to a simple linear model like equation (7). The low level stable equilibrium is estimated at 0.031 US per capita. Countries falling below 0.058 US per capita, i.e. the estimated unstable equilibrium or threshold, will move towards this low level equilibrium at a speed of about 18 percent of the deviation from this equilibrium per year. This corresponds to a half-life of about 3.4 years. Countries that have more assets and liabilities than 0.058 US per capita (conditional on the controls included in the auxiliary regression) will move to a high level stable equilibrium of 0.251 US per capita. However, they will move considerably slower then the group of countries converging to the low level equilibrium. It will take 7.6 years for a certain deviation from the high level stable equilibrium to return to half its initial value. Hence convergence to the low level equilibrium is more than twice as fast then convergence to the high level equilibrium. Complete results of the baseline linear and nonlinear model are in table 1.

Now that we have found signs of conditional convergence in the dynamics of financial globalization, we will test if this feature disappears if we control for the quality of institutions. As mentioned above, we will use the well

Table 1: Baseline linear and nonlinear model

	Linear		Nonlinear				
			Low regime			High Regime	
	coef	s.e.	coef	s.e.	thres	coef	s.e.
Equilibrium	0.175	0.032	0.031	0.026	0.058	0.251	0.139
Adjustment	-0.114	0.013	-0.185	0.022		-0.087	0.034

known ICRG data as our measure of institutional quality. We rerun the auxiliary regression, but this time add an indicator of institutional quality. We then repeat the test of the hypothesis that the relationship between financial integration at time t and financial integration in the previous period is linear versus that the relationship is non-linear. If we find that this hypothesis can not be rejected, we may conclude that institutional quality is responsible for the non-linearities. The results of the likelihood ratio test for various indicators of the quality of institutions are in table 2.

Although for most indicators of institutional quality the test statistic becomes smaller after controlling for institutional performance, there are only four measures that make the difference between the linear and the non-linear model insignificant at the 10 percent level. These measures are Investment Profile, Corruption, Risk for GDP Growth and Risk for Current Account as a Percentage of GDP. Controlling for Exchange Rate Stability Risk and Political Risk also reduce the test statistic, but the linear specification still gets rejected at the 10 percent significance level. We also contrasted the effect of institutional quality against the effects of policy. To do so, we include the index of financial openness developed by Chinn and Ito (2006) in the auxiliary regression. As expected, after taking into account the *de jure* degree of financial integration, the dynamics of international financial integration are better described by a model that features two stable and one unstable equilibrium.

The four variables that take out the non-linear are able to inform us on what institutional factors are most important for financial integration. For instance, investment profile is an assessment of factors affecting the risk to investment that are not covered by other political, economic and financial

Table 2: Results of tests for linearity without and with controlling for institutions

	F-val	prob	sig
Institutions			
Bureaucracy Quality	17.15	0.003	**
Composite Risk Rating	12.58	0.036	*
Corruption	7.25	0.269	
Democratic Accountablity	13.07	0.030	*
Economic Risk Rating	12.88	0.031	*
Ethnic Tensions	12.87	0.033	*
External Conflict	16.95	0.006	*
Financial Risk Rating	16.57	0.005	*
Government Stability	13.58	0.020	*
Internal Conflict	13.07	0.020	*
Investment Profile	6.21	0.364	
Law and Order	16.62	0.005	*
Military in Politics	15.30	0.012	*
Political Risk Rating	11.11	0.064	+
Religious Tensions	15.06	0.016	*
Risk for Budget Balance	13.02	0.025	*
Risk for Current Account (share GDP)	8.78	0.174	
Risk for Exchange Rate Stability	11.32	0.051	+
Risk for Foreign Debt	14.28	0.011	*
Risk for GDP Growth	8.00	0.216	
Risk for GDP per Head	16.86	0.006	*
Socioeconomic Conditions	16.20	0.008	*
Policies			
Capital Account Openness	14.27	0.019	*

Note: Tests for linear dynamics against non-linear dynamics. **,* and + denotes significance at 1, 5 and 10 percent. P-values based on 1000 bootstrap replications. Test statistic for baseline model (without control for quality of institutions) is 14.84*.

Table 3: Linear dynamics after controlling for institutions

	eq	s.e.	adj	s.e.
Corruption	0.145	0.028	-0.125	0.013
Investment Profile	0.120	0.026	-0.131	0.013
Risk for Current Account (share GDP)	0.128	0.028	-0.121	0.013
Risk for GDP Growth	0.134	0.028	-0.123	0.013

risk components of the ICRG. The risk rating assigned is the sum of three sub-components, each with a maximum score of four points and a minimum score of 0 points. A score of 4 points equates to Very Low Risk and a score of 0 points to Very High Risk. The three sub-components are Contract Viability/Expropriation, Profits Repatriation and Payment Delays. These factors seem to be important to potential investors in a country.

The degree of corruption in the political system is also important in the allocation of global capital. As argued by the PRS group:

> Such corruption is a threat to foreign investment for several reasons: it distorts the economic and financial environment; it reduces the efficiency of government and business by enabling people to assume positions of power through patronage rather than ability; and, last but not least, introduces an inherent instability into the political process. [...] The greatest risk in such corruption is that at some time it will become so overweening, or some major scandal will be suddenly revealed, as to provoke a popular backlash, resulting in a fall or overthrow of the government, a major reorganizing or restructuring of the country's political institutions, or, at worst, a breakdown in law and order, rendering the country ungovernable. (http://www.prsgroup.com/)

Furthermore, the estimated balance on the current account of the balance of payments, as well as the risk for GDP growth reveal what is deemed to be signs of good institutions that matter for financial globalization.

Table 3 gives full results for the linear models that result from controlling for institutions. The results are similar regardless of what control for institutions is used. Compared to the (misspecified) baseline linear model without

institutional controls, countries converge to a stable equilibrium that is much lower. The speed of adjustment is slightly higher, with an associated half-life of about 5.2 years.

In sum, we find that there are indeed signs of non-linearities in the dynamics of financial globalization. Adjustment to the low level stable equilibrium is about twice as fast as adjustment to the high level stable equilibrium. We also find that controlling for the institutional context eliminates the multiple equilibria. More specifically, the multiple equilibria are due to contract viability/expropriation risk, risks related to profits repatriation, payment delays and corruption. Furthermore, we find that policies, measured by the *de jure* degree of capital account openness, is not the main determinant of the multiple equilibria.

7 Conclusion

In this paper, we study whether the often heard claim that financial globalization is only beneficial to rich countries is valid. We base ourselves on a recent paper that reviews the evidence on the growth benefits of financial integration. That paper presents a framework that tries to explain the often conflicting results found in the literature. We extend this model to enable us to study what this implies for the dynamics of financial integration. We then use data on *de facto* financial integration to check for multiple equilibria in the evolution of external financial stocks using piecewise linear regression and sample splitting methods.

Our main hypothesis is that it is especially the institutional context that is responsible for the observed conditional convergence in global financial integration. Policies, on the other hand, are choices made within a set of institutions, and hence there effectiveness is a consequence of the institutional quality in which they are implemented. Empirically, we thus expect the multiple equilibria in the dynamics of financial globalization to disappear if we control for the quality of institutions, while the multiple equilibria will persist if we control for policies.

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Our results suggest that opening the capital account in a weak institutional context is not to be encouraged. Liberalizing financial markets without strengthening institutions will not automatically result in increased financial integration. In the worst case, it will increase volatility and reduce total factor productivity, resulting in even less financial integration in the future.

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