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In Search of Financial Globalization Traps

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ABSTRACT

The question whether global financial integration is beneficial for everyone remains highly disputed. It is often assumed that financial globalization involves threshold effects, where integration is worthwhile only when certain preconditions are met. However, it has also been noted that financial account liberalization also brings about considerable additional indirect benefits. These indirect benefits are often the same as the preconditions, such that there exists a complex two-way relationship between financial globalization and the preconditions/additional benefits. Such a relationship can lead to financial globalization traps, where some economies are trapped at a low level stable equilibrium, while others enjoy ever increasing financial integration. In this paper, we use de facto indicators of international financial integration to investigate if the dynamics of financial integration exhibit signs of such thresholds and traps. We present a parametric way of estimating these important parameters, based on recently developed sample splitting and threshold estimation methods. We find that there are indeed signs of multiple equilibriums if we look at the growth rates of total assets and liabilities. We also find that a group of countries are apparently caught in a high debt stock trap.

Keywords: financial globalization, threshold externalities, poverty traps.
JEL Codes: F21, F36, O11.

1. INTRODUCTION

Neo-classical economics 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 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. If this is the case, then why do we fail to observe such financial flows? Even more, why do we often observe capital flight, where capital flows from poorer to richer countries? Why is it often claimed that financial globalization increases output growth volatility in low income countries?

In a recent paper, Kose et al. (2006) 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 enhancing. Some key thresholds are related to financial market development, institutional quality and (corporate) governance, macroeconomic policies and trade integration.

The fact that most of the collateral benefits are also in the list of threshold conditions means that there is bi-directional causality. For example, increased financial integration encourages macro-economic discipline. However, macro-economic stability is a necessary condition to attract foreign capital. Such bi-directional causality potentially causes "financial globalization traps", where some economies converge to a long term equilibrium characterized by poor financial integration and preconditions that fall below the 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. In this setting, an important threshold will in the dynamics of financial integration. Once a country surpasses this threshold, it is more likely to converge to the high level equilibrium. However, if a country experiences a perverse shock that drives it below this threshold, there is a chance that the country will converge to the low level equilibrium.

In this paper, we will adapt the framework of Kose at al. (2006) to study the dynamics of financial globalization. Instead of looking at the effects of financial globalization on economic growth, we will confine ourselves to the effects of current financial integration of future financial integration. Since the interplay between collateral benefits and threshold conditions will also manifest itself in the evolution of financial flows through time, we expect to find evidence of thresholds and multiple equilibriums in the dynamics of financial integration as well. We will use recently developed threshold and sample splitting models to estimate the thresholds, the long-run equilibriums and adjustment to the equilibriums. For this empirical work, we will use the dataset on *de facto* financial integration assembled by Lane and Milesi-Ferretti (2006).

The paper is organized as follows. In the next section, we briefly present the arguments made by Kose et al (2006), and we review the empirical evidence on the relationships between financial globalization and the collateral benefits on the one hand and between financial globalization and the threshold conditions on the other hand. Section 3 explains how a situation where financial globalization creates collateral benefits and where these collateral benefits also act as preconditions for financial globalization results in multiple equilibriums in the dynamics of financial integration. 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. In a recent paper, Kose 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 GDP/TFP growth and reducing consumption volatility.

However, they also recognize that there are 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 pre-conditions, financial integration will increase GDP and TFP, 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 GDP and TFP 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." (Kose et al. (2006), p.4)

This gives rise to a bidirectional causal relation between financial integration and economic performance, which is in fact well documented when combining recent outcomes of two somewhat separate lines of research on financial integration. In the remainder of this section, we will briefly review these two research areas. First we review the literature on the existence of threshold effects for (de facto) financial integration to occur, which is in fact related to solving the so-called Lucas paradox, followed by a review of the literature dealing with the effects of financial globalization on these so-called 'collateral benefits'[1].

First, standard neo-classical theory suggests that (de jure) financial globalization should result in capital flowing from relatively-capital abundant countries to relatively capital-scarce countries as returns to capital are higher in the latter, over time leading to cross-country convergence in capital returns. Poor, developing countries can typically be characterized as being relatively capital-poor and experiencing high volatility income growth. Why is it then that, despite increased (de jure) capital mobility due to capital account liberalization, capital does not flow (more) from rich to poor countries? This factual observation has been put forward most convincingly in Lucas (1990), which is since then usually labeled as the Lucas Paradox.

The formulation of this paradox has since then generated an extensive literature (including Lucas himself), basically showing that the paradox is solved once one relaxes some of the strict standard neo-classical assumptions, used in the original Lucas (1990) formulation[2]. This large number of possible explanations can be structured in the following way[3]: observed capital flows may be lower as predicted by the theory, either because it overstates returns to investment, or, when they do exist, because of factors that prevent foreign investors to take advantage of them, and/or prevent them from effectively appropriating the returns.

A first set of factors refers to the hypothesis that returns to investment in capital-scarce countries may not be as high as predicted by the simple framework[4]. This may be caused by differences between countries in the production function, due to missing factors of production (lack of endowments, human capital, or domestic entrepreurship) or differences in the technology used. Factor productivity may also differ due to differences in institutional quality. But even when high-yielding investment opportunities in poor countries do exist, it may be difficult for foreign investors to because of (de jure) obstacles to capital mobility, because of other international capital market imperfections such as asymmetric information ('information frictions'). A predominant place in this set of explanations is reserved for the role of institutions of the financial type, namely the importance of inefficient domestic financial markets[5].

Moreover, foreign investors may observe that it is hard for them to appropriate a large share of these returns, because of all kinds of distortionary government policies (linked to a distortionary tax policy,

[1] It is important to note that by restricting the analysis to capital account transactions, we abstract from potentially important sources of foreign finance in the form of current transfers such as (largely official) development aid in the form of grants and (private) remittances, as they in principle appear in the current account.
[2] In fact, as put forward by Ju and Wei (2006), drawing on another paradox using Samuelson's Factor Price Equalization Theorem (FPE), one can easily put forward the extreme alternative hypothesis that too much capital is flowing from rich to poor countries as a consequence of FPE returns to factors are equalized even in the absence of international capital flows and free trade in goods fully substitutes for capital flows. In their paper, they consecutively solve for both paradoxes simultaneously.
[3] The following is largely based on recent overviews such as e.g. Alfaro et al (2005), or Montiel (2006), that structure the large set of explanations along similar lines.
[4] This would obviously call for trying to construct cross-country rates of return, which is inherently difficult for a number of reasons (Obstfeld, 1995). For a recent attempt, see Caselli and Feyrer (2006), who conclude that cross-country marginal productivity of capital is remarkably similar.
[5] See e.g. Gertler and Rogoff (1990), Gordon and Bovenberg (1996), Matsuyama (2004, 2005b) and Stulz (2005). Models along those lines also explain two-way capital flows in poor countries, particularly of FDI inflows and capital flight outflows (see especially Ju and Wei, 2006).

inflation, political stability) or because of sovereign contract enforcement problems with (the 'sovereign risk problem). This leads to all kinds of uncertainties, driving a wedge between potential ex-post returns and ex-ante (subjective, uncertainty-adjusted) investor estimation of returns, resulting in 'waiting behavior' (Dixit and Pindyck, 1994) of foreign investors in the case of largely irreversible investment projects without hard collateral. The reference to collateral (in a more strict sense) gives rise to an interesting overall conceptualization of poor countries lacking all sorts of 'collateral benefits' (see also Kose et al, 2006) so as to 'pull' capital flows from richer countries[6]. The consequences for the subject of our paper are crucial: in absence of reaching a minimal 'threshold' level of this 'collateral', poor countries are largely trapped in a suboptimal level of external capital[7].

Let us now briefly look at the reverse causality leg, i.e. the relationship between financial globalization and income level (and growth). Once de facto financial globalization has occurred, the conventional neo-classical approach goes on to say that financial globalization is beneficial for economic performance. More specifically, financial globalization will lead to a better global allocation of capital, with foreign saving complementing scarce domestic saving, leading to more investment and as such, higher economic growth[8]. Growth will also be spurred indirectly because of all kinds of associated (technology) spillover effects, embedded in these (especially direct investment-related) external resources flowing into the private as well as financial sectors; moreover, conditionality attached to some types of official loans could also generate spillover effects in the public sector. Additionally, financial globalization could result in will result in improved international risk-sharing possibilities, resulting not only in a higher growth rate due to increased possibilities for productivity enhancing specialization of production, but also result in improved insurance against consumption volatility, as external resources might be used to smooth out the detrimental effects of output or income volatility. Especially for developing countries, the welfare gains from international risk sharing might in principle be considerable (van Wincoop, 1999; Pallage and Robe, 2003). On top of that, financial integration should also increase cross-country co-movement of consumption growth (Kose et al, 2006).

Despite this weight of theoretical predetermination, the empirical literature fails to show a robust positive direct causal relationship between financial integration and economic growth and development[9]. Moreover, more in-depth individual country studies show that financial integration in itself is neither a necessary, nor a sufficient precondition for economic growth. Clearly, cross-country differences in the 'capital structure' of financial integration, distinguishing between into external debt, portfolio equity and FDI flows or stocks, might matter. FDI, with its presumably superior risk-sharing and reversal persistence characteristics and its superior (productivity) spillover effects might have a superior impact on economic growth and volatility[10]. Portfolio equity flows, although limited in most developing countries, have

[6] The large set of explanatory factors evidently provokes the crucial (empirical) question as to which factors are the most predominant in explaining the paradox. In their empirical analysis, Alfaro et al (2005, 2006) point at the predominance of institutional factors (as proxied by the International Country Risk Guide, ICRG composite index) to explain the paradox.
[7] Hence, the potential role for development aid to trigger improvements in the level of collateral.
[8] However, these direct welfare gains of financial globalization may not be that large in practice for the typical low-income country. Gourinchas and Jeanne (2006) attempt to measure these benefits and conclude that for the typical low-income country, the welfare gain would be roughly equivalent to a 1.4% permanent increase in domestic consumption.
[9] For a recent and extensive list of individual studies dealing with the quest for a causal relationship between financial globalization and growth, and their summary results, see e.g Obstfeld & taylor (2004), Mishkin (2006), and again Kose et al (2006, table 4A).
[10] As such, labeled sometimes as 'good cholesterol' (Hausman and Fernandez-Arias, 2000). In fact, as these authors show, the entry of capital under the FDI mode need not necessarily be a sign of the strength of the host economy, as it may also be attributed to the desire of the investor for stricter control of its investment.

proven to be able to generate distinct positive effects on economic development (see e.g. Bekaert et al, 2005) although they have proven to be more volatile and more vulnerable to sudden stops and reversal. Overall, debt flows have less promising risk-sharing properties and may be less earmarked for investment purposes, except for official (concessional) debt flows that come with donor conditionality. Furthermore, high debt stocks may be associated with negative investment incentives and reduced growth due to debt overhang effects (Krugman, 1988).

One more promising avenue that may account for this divergence between theoretical and empirical gains of financial globalization is the acknowledgement of non-linearities in the effects, as described in the literature on threshold externalities. The assumption here is that significant (positive) effects of financial globalization on economic development can only be realized when a given threshold level of development is realized (Prasad et al., 2003)[11]. Proxies for this threshold level refer to the level of domestic financial development, the level of institutional quality and governance, the quality of macroeconomic policies, and the degree of trade integration (Kose et al, 2006). Although a lot of empirical research points at the existence of such thresholds, their existence, and the exact type of proxies, is not undisputed (see e.g. Edison et al., 2004).

Finally, one final and somewhat related argument put forward to explain the lack of direct causal effects between financial globalization and economic development simply points at the fact that, once we account for all these threshold proxy effects directly, introducing proxies for financial globalization, be it of the flow or stock type, will not have much additional explanatory power for (cross-country comparative) macro-economic performance.

More importantly for the subject of our paper than its ultimate impact on economic development, is the fact that financial globalization can trigger increases in the country's collateral (in the words of Kose et al, improve the collateral benefits), and, as such, have a separate significant indirect effect on economic development. In reviewing the extensive literature in this field, Kose et al (2006) distinguish a set of crucial elements of collateral that are positively influenced by the entry of global capital, such as (i) higher domestic financial development and increased efficiency of domestic financial markets; (ii) increased discipline on macro-economic policies, by increasing the costs of macro-economic policy as this will be penalized by sudden stops and capital flow reversals; (iii) increased quality of the institutional environment, (iv) improved public as well as corporate governance. Somewhat unsurprisingly, this is again largely the same list as that derived from solving the Lucas paradox.

It is important not to underestimate the potential importance of this bidirectional relationship between financial globalization and 'collateral (benefits'), as it might lead to a situation where poorly-collateralized countries get trapped in a vicious circle where lack of collateral prevents them to attract foreign capital, which is crucial needed to increase that same collateral, ands as such, move towards a low-financial globalization equilibrium[12]. In analogy to the literature on poverty traps, this can be coined as a 'financial globalization trap'. Paraphrasing Matsuyama's (2005a) definition of a poverty trap, it can be

[11] For a seminal empirical application to financial globalization, in particular to FDI, see e.g. Borenzstein et al (1998).
[12] It is interesting to note here again that the existence of such traps points at the potential importance of development aid, as an alternative external capital inflow, with its attached conditionality, to act as a vehicle for increasing the collateral level of a poor economy. See also Kraay and Raddatz (2007) referring to poverty traps.

defined as a self-perpetuating condition where an economy, caught in a vicious cycle, suffers from persistent underdevelopment of the stock of external capital[13].

As such, in the next section, we will draw on the emerging literature of traps to develop and empirically test a model of financial globalization traps.

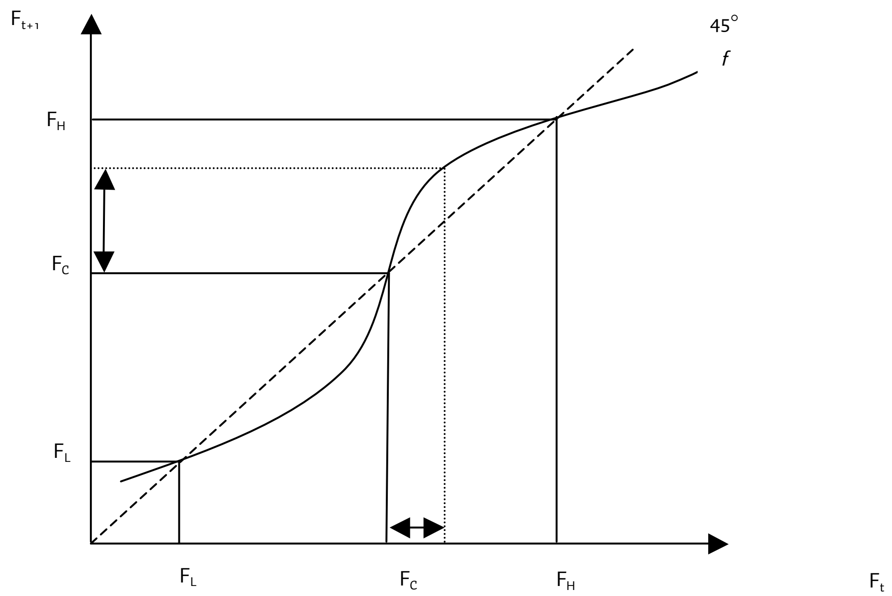
3. THRESHOLDS AND MULTIPLE EQUILIBRIUMS IN THE DYNAMICS OF FINANCIAL INTEGRATION

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. If an economy is sufficiently integrated in the global financial system, this will for instance strengthen the domestic financial sector. 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 macro-economic discipline will not attract a lot of foreign capital. However, there is a positive relationship between global financial integration and macro-economic restraint. Again, we 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, as the lack of safety nets implies an increase in the risk of crises. However, since there is a two way relationship between financial integration and the potential collateral benefits, and the threshold conditions are often the same as the collateral benefits, we expect these economies to be trapped in an equilibrium that is characterized by a low integration in the global financial markets. The resulting dynamics can best be summarized in a recursion diagram as illustrated in figure 1.

[13] A basic recent reference to the literature on poverty traps is Azariadis and Stachurski (2004). See also e.g. Kraay and Raddatz (2007). 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 of a poverty trap. See also Matsuyama (2004) for a model along these lines.

Figure 1: Recursion diagram



In this figure, *f* is a function that describes how financial integration evolves over time. There are three equilibriums in this figure, two stable (F_L 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 1, 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 ε), 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 equilibriums function as local attractors, where the basins of attraction are delineated by the unstable fixed point W_C.

4. THE ECONOMETRIC MODEL

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 autoregression to identify the three equilibriums. An added advantage is that we can also get an estimate of the speed at which countries converge to the stable equilibriums. If F_t is an indicator of financial globalization for a country at time t, a model with two attractors and one threshold can be written as:

(1) $$\Delta F_t = \beta_L.(F_{t-1} - F_L)I_{(F_{t-1}<F_C)} + \beta_H.(F_{t-1} - F_H)I_{(F_{t-1}>F_C)} + \varepsilon_t$$

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

(2) $$\Delta F_t = \beta_L.F_{t-1}.I_{(F_{t-1}<F_C)} + \alpha_L.I_{(F_{t-1}<F_C)} + \beta_H.F_{t-1}.I_{(F_{t-1}>F_C)} + \alpha_H.I_{(F_{t-1}>F_C)} + \varepsilon_t$$

The value of F_C can be found through standard sample splitting and threshold estimation techniques as 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 $F_H = -\frac{\alpha_H}{\beta_H}$ respectively. The standard error of a ratio can be calculated using the standard errors of the estimates with the following formula:

(3) $$F = \frac{\alpha}{\beta}$$

(4) $$\sigma_F = \frac{1}{\beta}\sqrt{\sigma_\alpha^2 + \frac{\alpha^2}{\beta^2}\sigma_\beta^2}$$

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

5. Context and 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 integration and economic development, one usually uses *de jure* measures of integration. These *de jure* measures are often based on the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions*. The most important complaint about these measures is that they do not always reflect the actual degree of integration of an economy into international capital markets. An alternative set of measures are de facto measures of financial globalization, based on actual flows, to get volume-based indicators of financial globalization. The use of these measures owes a great deal to the work of Lane and Milesi-Ferretti (2003, 2006) who constructed a dataset of consistently defined annual measures of stocks of gross foreign liabilities and assets for 145 countries, for the 197-2004 period that define the external wealth of nations (EWN), referred to as the EWN Mark II database. The database also disaggregates these stocks of assets and liabilities into several types of financial instruments, including debt, portfolio equity, FDI, foreign reserves, as well as, for some countries, positions in financial derivatives. We will use these data for our application.

From the available data, we select and compose four different indicators of financial globalization. The first indicator is the most 'wholesale' in the dataset, taking the sum of the gross stock of total external assets and the gross stock of total external liabilities. This indicator measures the degree of total financial globalization taking into account both inflows and outflows. The second indicator also, but focuses on the equity component (FDI and portfolio equity) of external assets and liabilities only. The following two indicators focus on capital inflows, i.e. external liabilities, only. Our third indicator deals with stocks of external liabilities of the equity type (FDI and portfolio equity), while the fourth indicator focuses on debt liabilities only.

A priori, we expect to find different dynamics for different indicators. For instance, for our broadest indicator of financial globalization, we expect to find traps above and below the threshold; in fact, we expect such dynamics also for the two following equity-related indicators. The reason for taking them both is that this enables us to explore that what extent the difference in values for the two indicators for developed countries (with considerable positions in both equity assets and liabilities), and the lack of difference in values for developing countries (with limited equity asset positions) leads to different dynamics. In contrast, for the indicator for debt liabilities, we expect to find a 'reverse' debt trap (with persistent high stocks of debt for a group of developing countries, confirming the existence of a debt overhang (Krugman, 1988) and even persistent high *changes* in stocks of debt, hinting at the existence of a 'defensive lending' hypothesis (Birdsall et al, 2003).

We will analyze each of these four indicators of financial globalization in turn. We start by estimating the models in equations (5), (1) and (7, see below) on stocks. However, since stocks per se do not control for the size of the economy, results were meaningless and are not reported here. A better way to analyze stocks of external wealth is to express them as a share of GDP (as is usually the case, see the literature review in Kose et al (2006)). Furthermore, since we want to look at the *evolution* of financial globalization over time, we judged that stocks are too persistent and it might be more revealing to look at changes in these stocks over time. For instance, countries that have accumulated large sums of external debt in the past will persistently be ranked amongst the highly globalized economies when we look at stocks, although they might be trapped at a low level equilibrium when we look at changes in financial globalization in recent years. Hence, we also calculated the growth rates (percentages) for each of our four indicators of financial integration.

6. Results

In this part we present the results of the analysis on the dynamics of financial globalization with the data described above. More specifically, for each of our indicators of financial globalization, we will estimate a two regime threshold model as represented in equation (1). However, we will supplement the results of such a model with a simple AR model that does not take into account non-linearities, because it may be interesting to compare the obtained values of the different parameters. So, alongside the results of a model like in equation (1), we will also report the results of a model as in equation (5):

(5) $$\Delta F_t = \beta.(F_{t-1} - F_S) + \varepsilon_t$$

Furthermore, although figure 1 suggests the existence of two stable equilibriums and one unstable equilibrium, it may be that the dynamics are more complex in reality. We will hence also present a TAR model with three regimes like in equation (6) below:

(6) $$\Delta F_t = \beta_L.(F_{t-1} - F_L)I_{(F_{t-1}<F_{C1})} + \beta_M.(F_{t-1} - F_M)I_{(F_{C1}<F_{t-1}<F_{C2})} + \beta_H.(F_{t-1} - F_H)I_{(F_{t-1}>F_{C2})} + \varepsilon_t$$

A model like (6) would consist of two unstable equilibriums and three stable equilibriums. Although formal testing between these alternative models would be desirable, Hansen (1999) describes the challenges to formal inference in such a context. In this paper, we will judge which is the correct model by simply looking at the significance of the additional parameters when a regime is added.

Up to now, we have presented the model as pure time series models. However, the data we have at hand are panel data. Although we will start by pooling the data and estimate the three models on year-country observations, we will also estimate the models with country fixed effects. This has the advantage of controlling for unobservable country specific time invariant effects. The down side is that for fixed effects models, the thresholds and equilibriums lose their universal interpretation. For instance, it will not be correct anymore to say that a country converges to a long run stable equilibrium, but to the stable equilibrium plus an individual specific constant. This has to be kept in mind when interpreting the results.

6.1. Sum of total assets and total liabilities

We will start our search for thresholds and stable equilibriums on the dynamics of financial globalization by looking at the broadest indicator of financial integration: the sum of total assets and total liabilities. Table 1 summarizes the results for the different models based on this first indicator of globalization.

For the pooled data, financial integration measured as the stock of total assets plus total liabilities as a share of GDP does not show any sign of convergence if we do not allow for non-linearities in the dynamics. We do not find a statistically significant stable long term equilibrium, nor do we find a significant adjustment parameter. Things are different for a group of high globalization countries. Country-year observations that are above about 2.6 in the previous period seem to converge to a stable equilibrium of about 18.3. However, adjustment to this stable long run equilibrium is very slow, with an associated half-life of more than 45 years. Below the unstable equilibrium of total assets and liabilities as a share of GDP of 2.6, there is no convergence, and the stable equilibrium is not estimated different from zero. Looking at a three regime threshold specification leads us to the same conclusion. To get an idea of the precision of the threshold estimate, we refer to the log-likelihood ratio sequence in appendix A.1. As can be seen there, the estimated threshold is close to the bound of the search interval, and the confidence interval undefined to the right.

Table 1: Total assets and total liabilities

			Stock as share of GDP		Growth rates (%)	
			pooled	Fixed effects	pooled	Fixed effects
AR		Adj (β)	0.002	-0.064 **	-0.631 **	-0.668 **
		s.e.	0.003	0.005	0.014	0.014
		Equilibrium (F_S)	-31.290	0.259	12.926 **	12.494 +
		s.e.	51.487	2.262	0.564	7.290
TAR(1)	Lower regime	Adj ($β_L$)	0.000	-0.039 *	-0.884 **	-0.903 **
		s.e.	0.015	0.019	0.051	0.054
		Equilibrium (F_L)	-111.828	2.256	8.904 **	7.546 *
		s.e.	4007.370	2.449	0.666	2.999
	Estimated threshold (F_C)		2.599	2.599	11.255	11.255
	Higher regime	Adj ($β_H$)	-0.015 **	-0.089 **	-0.661 **	-0.693 **
		s.e.	0.004	0.007	0.019	0.019
		Equilibrium (F_H)	18.351 **	5.018 **	14.939 **	12.457 **
		s.e.	5.513	1.126	0.962	3.944
TAR(2)	Lower regime	Adj ($β_L$)	-0.018	-0.014	-0.884 **	-0.904 **
		s.e.	0.123	0.029	0.051	0.054
		Equilibrium (F_L)	2.357	5.654	8.904 **	7.505 *
		s.e.	16.085	13.298	0.664	2.990
	Estimated threshold (F_{C1})		0.585	1.565	11.255	11.255
	Middle regime	Adj ($β_M$)	-0.013	0.018	-0.809 **	-0.872 **
		s.e.	0.020	0.075	0.125	0.129
		Equilibrium (F_M)	5.055	1.650	14.137 **	12.401 **
		s.e.	7.956	11.383	3.438	4.388
	Estimated threshold (F_{C2})		2.599	2.608	23.752	23.752
	Higher regime	Adj ($β_H$)	-0.015 **	-0.089 **	-0.706 **	-0.731 **
		s.e.	0.004	0.007	0.022	0.023
		Equilibrium (F_H)	18.351 **	5.055 **	18.573 **	15.638 **
		s.e.	5.514	1.136	1.552	3.926
Number of observations			4050	4050	3920	3920

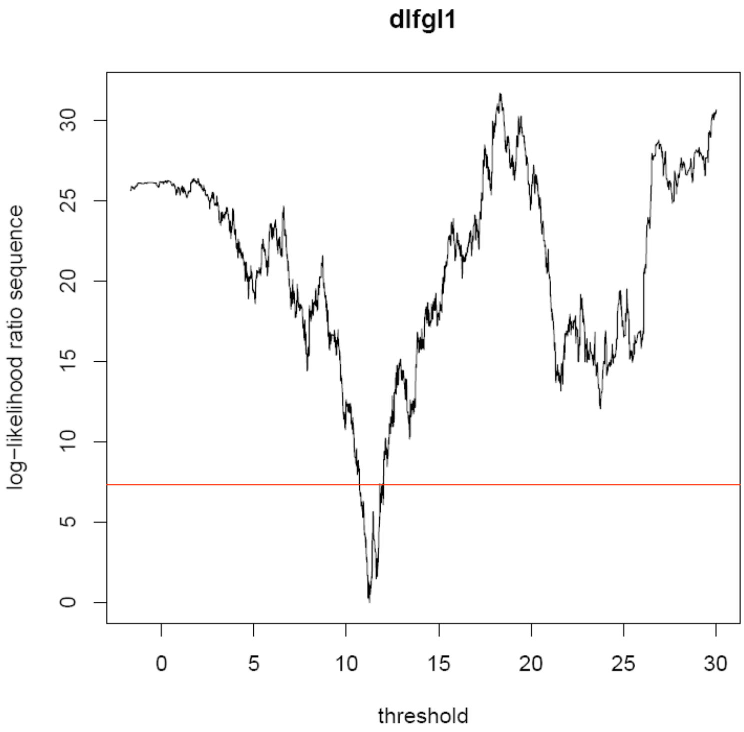
Notes: s.e. stands for standard error. **,* and + denote significance at 1,5 and 10 percent respectively. Estimation is such that there is at least 10 percent of the observations in each regime.

When we include fixed country effects, results do not change much. The AR model now shows signs of adjustment to a long run stable equilibrium. However, this equilibrium is not significantly different from zero. When we allow for nonlinear adjustment for low and high globalization country-year observations, we see that the adjustment in the low regime vanishes. The estimated threshold is similar to the one found in the pooled model. However, adjustment is faster now (with a shock needing only about 7 years to return to half its initial value), and the long term stable equilibrium is about 5, which is much more reasonable than the value found in the pooled model. The three regime TAR model again leads us to the same conclusion, and in addition completely removes adjustment in the lower regime.

More interesting results are obtained for the dynamics in the changes in the sum of total assets and total liabilities. Here, we see that for the pooled AR-model, there is evidence of convergence to a long-run stable equilibrium characterized by a 13 percent yearly increase in the sum of total assets and total liabilities. Deviations from this equilibrium are corrected at a rate of 63 percent per year, leading to a half-life of just over 8 months. It becomes even more interesting when we allow for non linear adjustment, conditional on being a high globalized country or a low globalized country in the previous period. Country-year observations that have a growth rate in financial integration at t-1 that is less than 11.25 percent converge to a steady state growth rate of 8.9 %, while those that are above converge to a growth rate of about 15 percent. Note that adjustment to in the lower regime is twice as fast as in the higher regime (with respective half-lives of four months and eight months). The precision of the estimate threshold is also very high, as can be judged from the log-likelihood ratio sequence plotted against the thresholds depicted in figure 2 below. In this model, the low level long term equilibrium is below the threshold, which in turn is below the high level equilibrium. Both adjustment parameters in the low and high regime are statistically significant. In other words, the intertemporal dynamics of the growth rate of our broad indicator of financial globalization seems to be adequately described by a process as depicted in figure 1.

Allowing for two unstable equilibriums basically adds an additional regime at the top of the distribution. However, here we find that the high unstable equilibrium is estimated to be higher than the high level stable equilibrium. The answer to what happens here is less clear cut, as the confidence intervals for the high level threshold and the high level stable equilibrium overlap. The log-likelihood ratio sequence for the high level threshold is given in appendix A.2.

Figure 2: Log-likelihood ratio for growth in total assets plus liabilities



6.2. Sum of Equity assets and liabilities

The second indicator of financial globalization is a measure for the equity share in financial globalization. It is the sum of foreign direct investment assets, foreign direct investment liabilities, portfolio equity assets and portfolio equity liabilities. The results of the estimation of the three models, again for pooled and fixed effects and for stocks as a share of GDP and growth rates are given in table 2.

Table 2: Equity assets and liabilities

			Stock as share of GDP		Growth rates (%)	
			pooled	Fixed effects	Pooled	Fixed effects
AR		Adj (β)	0.063 **	0.040 **	-0.675 **	-0.736 **
		s.e.	0.003	0.004	0.012	0.013
		Equilibrium (F_S)	-0.060 +	-1.000 **	17.466 **	25.019 *
		s.e.	0.031	0.160	0.836	11.962
TAR(1)	Lower regime	Adj (β_L)	0.061 **	0.062 **	-1.254 **	-1.346 **
		s.e.	0.011	0.016	0.083	0.093
		Equilibrium (F_L)	-0.058	0.059	7.316 **	3.896
		s.e.	0.045	0.290	0.821	3.634
	Estimated threshold (F_C)		0.645	0.650	6.477	4.109
	Higher regime	Adj (β_H)	0.057 **	0.028 **	-0.672 **	-0.724 **
		s.e.	0.005	0.006	0.013	0.014
		Equilibrium (F_H)	-0.304 *	-1.026	18.391 **	11.194 +
		s.e.	0.155	0.755	1.091	6.689
TAR(2)	Lower regime	Adj (β_L)	0.057 **	0.081 **	-1.254 **	-1.357 **
		s.e.	0.019	0.020	0.083	0.094
		Equilibrium (F_L)	-0.064	0.077	7.316 **	3.568
		s.e.	0.057	0.224	0.818	3.600
	Estimated threshold (F_{C1})		0.393	0.486	6.477	3.741
	Middle regime	Adj (β_M)	-0.044	0.075	-0.532 **	-0.697 **
		s.e.	0.067	0.148	0.065	0.088
		Equilibrium (F_M)	1.331	0.250	16.386 **	9.250
		s.e.	2.161	1.237	3.304	7.301
	Estimated threshold (F_{C2})		0.645	0.646	42.673	30.883
	Higher regime	Adj (β_H)	0.057 **	0.028 **	-0.731 **	-0.754 **
		s.e.	0.005	0.006	0.017	0.016
		Equilibrium (F_H)	-0.304 *	-1.008	30.991 **	16.943 *
		s.e.	0.155	0.752	2.915	6.654
Number of observations			3848	3848	3653	3653

Notes: s.e. stands for standard error. **,* and + denote significance at 1,5 and 10 percent respectively. Estimation is such that there is at least 10 percent of the observations in each regime.

Equity as a share of GDP does not seem to be converge to any equilibrium. On the contrary, adjustment speed in the AR model is estimated to be positive, meaning that a deviation from the estimated equilibrium does not get corrected, but the deviation increases over time. This is both the case for the pooled model as for the fixed effects version of the model. Results are closer to our expectations if we look at growth rates in equity. For the AR model, we find a long run equilibrium of about 17 % for the pooled model, and about 25 percent for the fixed effects model.

For the TAR model with one threshold, we find that in the high regime there is adjustment to a stable equilibrium of about 18 percent equity growth per year for country-year observations that are above 6.5 % in the previous period. The results are less clear cut in the lower regime. First of all, the adjustment is more than 100 percent, implying some degree of 'overshooting'. Nevertheless, over time, this process of repeated overshooting will converge to the stable equilibrium, since adjustment is assumed to be symmetric. As a matter of fact, convergence in the lower regime corresponds to an adjustment speed of -0.746, with an associated half life of about half a year. Hence it is faster than adjustment in the high regime. The second abnormality in the low regime is the fact that convergence is to a stable equilibrium that is estimated to be higher than the estimated threshold. This last problem disappears if we consider the fixed effects version of the model. There, convergence is essentially to a zero equity growth for countries with equity growth below 4 %. Convergence here also involves some degree of overshooting, and adjustment is slower than in the pooled model. Estimation of a two threshold TAR model adds a regime to the top of the distribution. For both the pooled and fixed effects model, the high level stable equilibrium is estimated below the high level unstable equilibrium.

6.3 Equity Liabilities

Our third indicator of financial globalization is the sum of foreign direct investment liabilities and portfolio equity liabilities. Table 3 below reports the results of the different regressions.

Table 3: Equity liabilities

			Stock as share of GDP		Growth rates (%)	
			pooled	Fixed effects	pooled	Fixed effects
AR		Adj (β)	-0.032 **	-0.079 **	-0.719 **	-0.767 **
		s.e.	0.004	0.006	0.014	0.014
		Equilibrium (F_S)	0.368 **	0.762 **	5.242 **	17.637
		s.e.	0.056	0.175	0.731	12.881
TAR(1)	Lower regime	Adj (β_L)	-0.009	-0.024	-1.866 **	-1.849 **
		s.e.	0.007	0.015 *	0.121	0.127
		Equilibrium (F_L)	0.934	-0.007	-13.527 **	-14.726 **
		s.e.	0.812	0.313	2.074	3.656
	Estimated threshold (F_C)		0.388	0.263	-15.017	-15.360
	Higher regime	Adj (β_H)	-0.107 **	-0.140 **	-0.698 **	-0.747 **
		s.e.	0.013	0.010	0.014	0.015
		Equilibrium (F_H)	0.482 **	0.266 **	4.877 **	1.871
		s.e.	0.090	0.065	0.808	7.218
TAR(2)	Lower regime	Adj (β_L)	-0.003	-0.025 *	-1.866 **	-1.856 **
		s.e.	0.008	0.010	0.120	0.127
		Equilibrium (F_L)	2.255	0.005	-13.527 **	-14.688 **
		s.e.	5.864	0.299	2.066	3.636
	Estimated threshold (F_{C1})		0.343	0.371	-15.017	-15.360
	Middle regime	Adj (β_M)	-0.732 **	0.473 *	-0.591 **	-0.662 **
		s.e.	0.236	0.214	0.058	0.059
		Equilibrium (F_M)	0.367 *	0.436	4.088 **	1.132
		s.e.	0.166	0.266	1.080	8.141
	Estimated threshold (F_{C2})		0.388	0.420	28.062	27.749
	Higher regime	Adj (β_H)	-0.107 **	-0.173 **	-0.762 **	-0.790 **
		s.e.	0.013	0.017	0.019	0.019
		Equilibrium (F_H)	0.482 **	0.335 **	17.463 **	10.815
		s.e.	0.090	0.077	2.777	7.304
Number of observations			3973	3972	3738	3738

Notes: s.e. stands for standard error. **,* and + denote significance at 1,5 and 10 percent respectively. Estimation is such that there is at least 10 percent of the observations in each regime.

For equity liabilities, we also get adjustment if we consider stocks. Judging by the pooled AR-model, countries will converge to a stock of equity liabilities that is about 37 percent of GDP. Adjustment is rather slow, with a shock away from the stable equilibrium taking about 21 years to return to half its initial value. When we estimate a two regime threshold model, it seems most of the adjustment comes from the upper part of the distribution. Above about 39 percent of equity liabilities as a share of GDP, countries tend to converge to a high level stable equilibrium of about 48 percent. Note that adjustment to this equilibrium is much higher than when non-linearities are not taken into consideration (half-life: 6 years). Below 39 percent, there is no sign of significant adjustment, nor of a stable equilibrium. If we estimate a two threshold TAR model, we add an extra regime between 34.3 percent and 38.8 percent with a stable equilibrium located at 36.7 percent. Note that adjustment in this regime is particularly fast, with a half-life of about 6 months.

When we look at the fixed effects model, we see that the adjustment speed in a simple AR model more than doubles, as does the long term stable equilibrium. The two regime TAR model divides the sample into observations below 26 percent, where there is only moderate adjustment, and observations above 26 percent, where there is adjustment to a stable equilibrium that is just above the threshold. When we estimate a three regime TAR model, there is only convincing evidence of adjustment above 42 percent, but adjustment is to a stable equilibrium that is way below this threshold.

When we look at growth rates of equity liabilities, the pooled AR model shows convergence to a steady state of about 5 percent per year. A two regime TAR shows signs of a group of countries that converges to an annual reduction in equity liabilities of more than 13 percent, while another group of countries grows at about 5 percent per year. Note however that the threshold estimate is below the low level stable equilibrium. When we estimate a two threshold TAR, we add a regime at the top of the distribution, but again, the location of the threshold is not according to our expectations. The results for the fixed effects model are along the same lines.

6.4. Debt liabilities

Our final indicator of financial globalization is the stock of debt liabilities. Results are in table 4 below.

Table 4: Debt liabilities

			Stock as share of GDP		Growth rates (%)	
			pooled	Fixed effects	pooled	Fixed effects
AR		Adj (β)	-0.020 **	-0.109 **	-0.840 **	-0.865 **
		s.e.	0.004	0.006	0.013	0.013
		Equilibrium (F_S)	1.530 **	-0.072	12.801 **	4.665
		s.e.	0.372	0.728	0.557	9.182
TAR(1)	Lower regime	Adj ($β_L$)	-0.015	-0.036	-0.663 **	-0.630 **
		s.e.	0.055	0.023	0.036	0.038
		Equilibrium (F_L)	1.467	1.865	11.620 **	9.935
		s.e.	5.316	1.753	0.975	6.771
	Estimated threshold (F_C)		0.445	1.044	30.316	30.558
	Higher regime	Adj ($β_H$)	-0.023 **	-0.129 **	-1.003 **	-1.036 **
		s.e.	0.004	0.008	0.016	0.017
		Equilibrium (F_H)	1.763 **	1.434 **	31.350 **	29.268 **
		s.e.	0.447	0.373	1.488	4.313
TAR(2)	Lower regime	Adj ($β_L$)	-0.015	0.049	-1.634 **	-1.362 **
		s.e.	0.055	0.044	0.120	0.122
		Equilibrium (F_L)	1.467	-0.888	-1.181	-0.416
		s.e.	5.315	1.272	1.180	3.326
	Estimated threshold (F_{C1})		0.445	0.575	-4.234	-3.506
	Middle regime	Adj ($β_M$)	0.536	-0.090	-0.400 **	-0.420 **
		s.e.	0.425	0.064	0.049	0.053
		Equilibrium (F_M)	0.425	1.163	11.807 **	8.252
		s.e.	0.519	1.135	2.203	10.208
	Estimated threshold (F_{C2})		0.554	1.068	30.316	30.133
	Higher regime	Adj ($β_H$)	-0.022 **	-0.130 **	-1.003 **	-1.028 **
		s.e.	0.004	0.008	0.016	0.017
		Equilibrium (F_H)	1.661 **	1.424 **	31.350 **	28.780 **
		s.e.	0.490	0.372	1.470	4.314
Number of observations			4084	4084	3955	3955

Notes: s.e. stands for standard error. **,* and + denote significance at 1,5 and 10 percent respectively. Estimation is such that there is at least 10 percent of the observations in each regime.

Judged by the pooled AR-model, debt liability stock as a share of GDP converges to about 1.5. Adjustment to this long term stable equilibrium is rather slow with an associated half life of about 34 years. After inclusion of country specific intercepts, adjustment speed increases to about 10 percent, but the long term equilibrium becomes insignificant.

When we allow for non-linear adjustment, is seems that convergence only occurs for a group of large debtors. Above an unstable equilibrium that is estimated in the pooled model to be a debt liability of 44.5 percent of GDP, there is convergence to a stable equilibrium of about 1.76. Again, for the pooled model, adjustment is rather slow. Below the threshold, there is no significant adjustment, and the stable equilibrium is not statistically different from zero. After inclusion of country dummies, the threshold increases to debt liabilities that are about equal to the size of GDP. The stable equilibrium is now about 143 percent of GDP. Adjustment speed increases to about 13 percent adjustment per year. Again, below this threshold there is no adjustment. Estimating a three regime threshold model does not change the conclusions of the two regime threshold model. It seems that there is only convergence for a group of large debtor countries. They converge to a long run steady state where debt is about 166-176 percent of GDP.

Some of these results are clearly consistent with the debt overhang hypothesis. The unstable equilibrium of about 45% of GDP is largely consistent with values found in studies that try to find sustainability levels for external debt to GDP.

When we turn to debt liability growth rates, we see that for the pooled AR model, countries tend to converge to a long run stable growth rate of about 13 %. Adjustment is at about 84 % per year, leading to a half life of about 4 and a half months. When we estimate a two regime threshold model, we see that there is a group of countries that have a high debt liability growth rate that converges to a very high stable equilibrium of about 31 percent, with virtually immediate adjustment. Those that have debt liability growth rates below 30 percent at t-1 converge to a constant growth rate of about 11 percent per year, and their convergence is much slower. Estimating a three regime threshold adds a regime where convergence is to a negative growth rate. However, adjustment there is slow, the stable equilibrium is not significantly different from zero, and the unstable threshold is estimated lower than the low level stable threshold.

And finally turning to the fixed effects results, we note that the AR model now returns an insignificant stable equilibrium. In the two regime TAR model, the lower stable equilibrium looses its statistical significance, while the rest remains largely the same as for the pooled version of the model. Also the TAR with two thresholds is similar to the pooled one, except that the stable threshold in the middle regime is not statistical significant anymore.

7. Conclusions

In this paper, we argue that the bi-directional causality between global financial integration and what Kose et al (2006) have termed "collateral benefits", together with the observation that most of the collateral benefits are also threshold conditions, has the potential to create financial globalization traps. The existence of such traps will also manifest itself in the dynamics of indicators of financial globalization. We present a simple econometric model that uses recently developed sample splitting and threshold estimation methods to identify the different equilibriums that arise in this setting. We then apply our method to de facto measures of financial globalization.

We find that, for the broadest indicator of global financial integration (total assets plus total liabilities) there is evidence of multiple equilibriums in the growth rate. Countries that are already well integrated (defined as having growth rates above 11.25 percent per year) converge on average to a high level long term equilibrium characterized by subsequent growth rates of about 13 to 15 percent. Countries that are less well integrated in the global financial system are trapped at a stable equilibrium characterized by growth rates of 7 to 9 percent. One could argue that this is good news: even the low globalizers still have positive growth in financial globalization. However, one should also bear in mind that this will increase global inequality.

We also find that, when using debt liabilities as an indicator of financial globalization, we find that a group of countries that have a high debt stock are trapped at a high level equilibrium, while there is no clear dynamic relationship for the group of countries that have a low debt stock. This indicates that a debt stock of more than 45 percent of GDP creates a structural problem, which can be interpreted as a debt overhang situation with the equilibrium indicating an alternative representation of a debt sustainability ratio.

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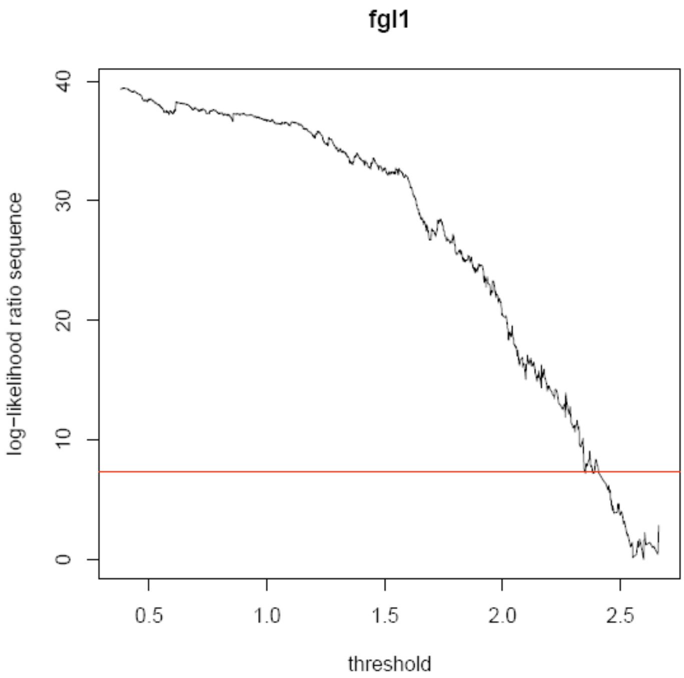
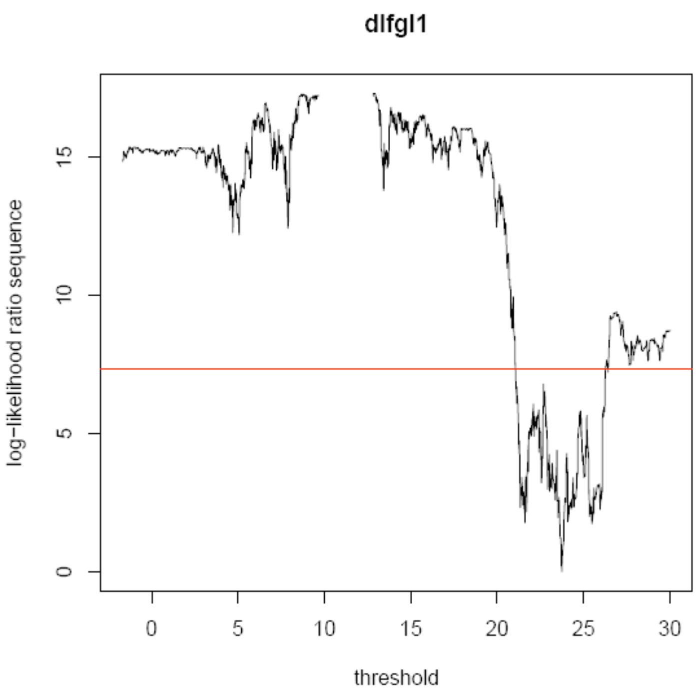
APPENDIX

Appendix A.1.
Log likelihood ratio sequence stocks of assets and liabilities



Appendix A.2.
Log likelihood ratio sequence changes of assets and liabilities (2nd threshold)



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