Financial development, threshold effects and convergence in developing and emerging countries

Jean-Pierre Allegret, Sana Azzabi

Economics Bulletin

Volume 33, Issue 3

Financial development, threshold effects and convergence in developing and emerging countries

Jean-pierre Allegret
EconomiX, UMR 7235 CNRS and University of Paris Ouest Nanterre La Défense

Sana Azzabi
PS2D, University of Tunisia

Abstract

In this paper, we perform GMM dynamic panel data estimations to test the relationship between financial development and growth. Our dataset is composed of 112 emerging and developing countries over the period 1975-2007. More specifically, we test the presence of financial development threshold effects, on the one hand, between financial development and long-term growth, and, on the other hand, between financial development and long-term GDP. We also ask whether such effects may explain the link financial development - convergence/divergence to the advanced countries' growth. As predicted by literature, the very low level of financial development seems to explain the inability of countries to converge to frontier growth rate. But the higher the level of financial development, the lower its positive effect on steady-state per-capita GDP. Finally, the presence of financial development threshold effect between financial development and steady-state growth rate is not confirmed. We support only partially the role that the financial development could play in the acceleration of the convergence of emerging and developing economies towards the world frontier growth.

A previous version of this paper was presented at the Finance and Economics Conference 2012 organized by Lupcon Center for Business Research, 01-03 August 2012, Munich, Germany. We thank the anonymous referees of the journal for their constructive and insightful suggestions. All standard disclaimers apply.

Citation: Jean-pierre Allegret and Sana Azzabi, (2013) "Financial development, threshold effects and convergence in developing and emerging countries", *Economics Bulletin*, Vol. 33 No. 3 pp. 1899-1921.

Contact: Jean-pierre Allegret - jallegret@u-paris10.fr, Sana Azzabi - azzabisana@yahoo.fr.

Submitted: March 05, 2013. **Published:** July 21, 2013.

1. Introduction

The relationship between financial development and economic growth has received a large amount of attention in the economic literature since the late 1960s (Ang 2008, and Levine 2005 and 1997). From the mid-1990s, a new strand of the literature questions the linearity of the relationship between financial development and growth, and identifies the presence of threshold effects. More specifically, it predicts that the contribution of financial development to long term growth depends on the level of economic development (Deidda and Fattouh 2002, Fung 2009, Gaytan and Ranciere 2004, and Rioja and Valev 2004a), the degree of domestic inflation (Huang *et al.* 2010, Rousseau and Yilmazkuday 2009, Rousseau and Wachtel 2002, and Yilmazkuday 2011), or the level of financial development (Aghion *et al.* 2005, Augier and Soedarmono 2011, Berthelemy and Varoudakis 1996, Khan and Senhadji 2003, and Rioja and Valev 2004b).

Berthelemy and Varoudakis (1996) examine the issues of threshold effects and convergence using an endogenous growth model with a financial sector. They show the presence of a threshold effect in terms of financial development between financial development and long term growth by implementing cross-section estimates for 95 countries over 1960-1995. Fung (2009) studies a sample of 57 developed and developing countries from 1967 to 2001 using the Generalized Method of Moments on dynamic panel with fixed effects. First, financial development and economic growth have an interaction that is especially stronger at an early stage of economic development. This interaction tends to weaken as the degree of economic development increases. Secondly, there is poverty traps linked to a very low initial level of financial development, a level that prevents every perspective of convergence in terms of economic growth. Aghion *et al.* (2004) introduce imperfect creditor protection in a multi-country version of Schumpeterian growth theory with technology transfer and explore the mechanisms through which the level of financial development affects the probability of convergence towards the frontier growth rate. Considering a sample of 71 developed and developing countries between 1960 and 1995, Aghion *et al.* (2004) have three main findings. First, the likelihood that a country will converge to the frontier growth rate increases with its level of financial development. Secondly, in a country that converges to the frontier growth rate, financial development has a positive but eventually vanishing effect on the steady-state per-capita GDP relative to the frontier. Thirdly, the marginal impact of financial development on the steady-state growth rate is more favorable than the degree of financial development is low. Rioja and Valev (2004b) distinguish three different groups of countries depending on the stage of financial development. For a panel of 74 countries over the period 1961-1995, they find that the effect of financial development on economic growth is not uniformly positive. They suggest that financial development exerts a strong positive effect on economic growth *only* once it has reached a threshold (14% for private credit and 21% for liquid liabilities). Below this threshold, i.e. for countries with a low level of financial development, financial development has an ambiguous effect on growth (a zero effect for private credit and liquid liabilities, and a positive effect for Commercial-Central Bank ratio)[1].

This paper is related to the previous literature on threshold effects. More specifically, we test the existence of financial development threshold effects, on the one hand, between financial development and long-term growth, and, on the other hand, between financial development and long-term GDP. We also ask whether such effects could explain the link between financial development - convergence / divergence to the frontier growth rate. To this end we perform Generalized Method of Moments estimations for a dynamic panel of 112 developing and emerging countries between 1975 and 2007.

[1] See table IV in appendix for more details about these works.

Our empirical analysis differs from previous studies on three main points. First, we exclude developed countries from our sample. Emerging economies, and to a lesser extent developing countries, have experienced since the end of 80s a significant financial development due to a financial liberalization process. From this standpoint, studying to what extent these countries have reduced their gap relative to the technological frontier provides indirect evidences of the efficacy of the financial reforms. Secondly, unlike most previous empirical works, we consider both threshold effects between financial development and long term growth, and the nature of these effects between financial development and long term GDP. We also test the presence of a positive link between the level of financial development and the degree of convergence to the technology frontier growth rate. This theoretical assumption has received few attentions in the empirical literature. Thirdly, we provide a deeper and more comprehensive approach to analyze the question of financial development threshold effects. To this end, we consider two methods for determining break thresholds. On the one hand, we split the sample into different groups of countries according to their level of financial development. This method allows us to test the existence of exogenous break thresholds. In this approach, break thresholds are imposed in an *ad hoc* way without clear economic justifications. On the other hand, we determine endogenously thresholds breaking by estimating a non-linear specification of growth. Previous literature often identifies endogenous break thresholds using the rolling Chow test. This test imposes a discontinuity in the relationship between financial development and growth. This is not the case of our method (estimation of a non-linear specification of growth) which captures, on a continuous basis, the effect of financial development on growth.

Our main results are as follows. First, we demonstrate the existence of a financial development threshold effect in the link between financial development and long term per-capita GDP: in countries that converge to the frontier growth rate, financial development has a positive but vanishing effect on steady-state per-capita GDP relative to the frontier. Secondly, in line with previous works, mainly Aghion *et al.* (2004), our results confirm partially the role of financial development in the acceleration of the convergence of emerging and developing countries towards the world technology frontier. Thirdly, contrary to what is theoretically expected, we do not validate the assumption that the marginal impact of financial development on the steady-state growth rate is more favorable than the degree of financial development is low.

This article is structured as follows. Section 2 introduces the sample of the studied countries, the choice of the variables and the estimation method. Section 3 is dedicated to the estimations on different groups of countries. In Section 4, we present the results of estimations of a non-linear growth specification. Our empirical analysis draws on the work of Aghion *et al.* (2004). Section 5 checks the robustness of our baseline results. Section 6 concludes.

2. A panel study on finance and growth

2.1 Sample and variable selection

We implement econometric estimations over a panel of 112 emerging and developing countries between 1975 and 2007 (see list A in the appendix for a detailed list of these countries[2]). The data are averaged over 7 non overlapping sub-periods of 5 years each. The use of panel data is justified by the advantages it provides, particularly in terms of taking into

[2] We use the classification of the World Bank dated July 2008 that distinguishes countries according to Gross National Income (GNI) per capita of 2007: the low-income countries are those with a GNI per capita inferior or equal to 935$, the lower middle income countries are those with a GNI per capita comprised between 936$ and 3 705$, and finally the upper middle income countries are those with a GNI per capita comprised between 3 706$ and 11 455$.

account the time dimension and controlling of unobserved heterogeneity of countries[3]. We consider three indicators of financial development defined as follows[4]:
- *Liquid liabilities* (*lly*) is the ratio of liquid liabilities of the financial system to GDP. It equals liquid liabilities of the financial system (currency plus demand and interest-bearing liabilities of banks and nonbank financial intermediaries) divided by GDP;
- *Deposit banks assets/Central bank* (*dbcba*) is the ratio of commercial banks assets to the sum of these assets plus those of the central bank; or *Deposit banks assets (dbay)* which is the ratio of deposit bank assets to GDP;
- *Private credit* (*privy*) provides the amount of the credit allocated to the private sector in terms of GDP.
The data related to these indicators proceed from Beck, Demirgüç-Kunt and Levine. We also consider a set of control variables chosen according to growth theories: the initial level of real GDP per capita (*initial GDP*) reflecting the inclusion of the conditional convergence, the level of educational development (*prim*) as a measure of the human capital stock, the inflation rate (*inf*) and the rate of government spending as a percentage of GDP (*gov*) as indicators of macroeconomic stability (Fischer 1993), the rate of trade openness (*trade*) as an overall indicator of distortions in trade, the black market exchange rate premium (*bmp*) as an overall indicator of internal distortions in the economy (Dollar 1992), and finally the index of civil liberties (*libciv*) or that of political rights (*libpol*) as indicators of institutional development level (Acemoglu *et al.* 2005). A detailed description of these variables as well as the various data sources are provided in table V of the appendix.

2.2 Econometric methodology

We use the Generalized Method of Moments (GMM) developed for dynamic models of panel data that were introduced by Arellano and Bover (1995), Arellano and Bond (1991), and Holtz-Eakin *et al.* (1990). This method controls for the potential endogeneity of all explanatory variables of the model estimated, unlike the cross-sectional estimator that only controls for the endogeneity of financial development. Furthermore, it has the advantage of generating *internal* instruments that is, instruments based on lagged values of the endogenous explanatory variables of the model. The used estimator is the Generalized Method of Moments *system* estimator proposed by Blundell and Bond (1998). This estimator combines in a *system* the regression in differences with the regression in levels. The instruments for the regression in differences are those that were recommended by Arellano and Bond (1991)[5]. The instruments for the regression in levels are the lagged differences of the corresponding variables[6]. These are appropriate instruments under the assumption of "quasi-stationarity" of these variables[7]. The obtained system of equations is estimated using two-step Generalized Method of Moments procedure which generates consistent and efficient coefficient estimates (Roodman 2009 and 2006, and Sevestre 2002).
The consistency of the GMM estimator depends on the validity of the instruments. To address this issue we consider two specification tests suggested by Blundell and Bond (1998), Arellano and Bover (1995), and Arellano and Bond (1991). The first is a Hansen test of over-

[3] We also justify the use of panel data by the temporal variability of financial indicators over the period 1975 - 2007, as is evident clearly from table VI (column (5)) of the appendix.
[4] These indicators are among the most commonly used in empirical studies on the subject (Aghion *et al.* 2004, Beck *et al.* 2000, Berthelemy and Varoudakis 1996, King and Levine 1993, Levine *et al.* 2000, Levine and Zervos 1998, and McCraig and Stengos 2005). For more details on the definition of these indicators, see Beck and Demirgüç-Kunt (2009), Beck *et al.* (2000), and Levine *et al.* (2000).
[5] Arellano and Bond (1991) propose using the lagged values of the explanatory variables in levels as instruments.
[6] Using additional differences would result in redundant moment conditions (Arellano and Bover 1995).
[7] Under this assumption, there is no correlation between the differences of the explanatory variables and the country-specific effect.

identifying restrictions, which tests the overall validity of the instruments (Kpodar 2007). The second test (serial correlation test) examines the hypothesis that the error term is not serially correlated. In the system difference-level regression we test whether the differenced error term is second-order serially correlated.

3. Estimation on different groups of countries

3.1 Estimated specification

We estimate the following growth equation:

$$g_{it} - g_{lt} = \beta_0 + \beta_f F_{it} + \beta_y (y_{it-1} - y_{lt-1}) + \beta_x X_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (1)$$

where g denotes the growth rate of per-capita GDP, F an indicator of financial development, y the log of per-capita GDP and X a set of other explanatory variables. The indices i, t and l respectively designate the country, the time and the technology leader (the United States). μ_i represents the specific effect to the country, λ_t the specific effect to time and finally ε the error term. We split the sample into two and then into three groups of countries that differ in terms of their average level of financial development. The presence of break thresholds in relation with the degree of financial development is tested in an ad hoc way insofar as we impose exogenous break thresholds (see appendix 3 for more details on the composition of the different groups of countries and on break thresholds).

Following Fung (2009), Aghion *et al.* (2004), and Berthelemy and Varoudakis (1996), the probability of convergence towards the world technology frontier increases with the level of financial development. We therefore predict that the convergence parameter β_y is null for the countries with a low level of financial development ($\beta_y = 0$), and is negative for those with a high level of financial development ($\beta_y < 0$).

Furthermore, following Esso (2009), Aghion *et al.* (2004), and Clark *et al*. (2003), we expect that for countries where financial development is high, steady-state relative output should be independent of the level of financial development. This can only happen if the coefficient β_f equals zero. However, for countries where financial development is low, the coefficient β_f has to be positive, in accordance with Fung (2009) and Aghion *et al.* (2004) according to whom the positive interaction between financial development and long term growth is much stronger than the level of financial development is low.

In sum, we expect that as the level of financial development increases, β_y becomes more and more negative and β_f less and less positive.

3.2 Results of estimates

Tables I and II below report the results of estimating the equation (1) using the Generalized Method of Moments (GMM) developed for dynamic models of panel data, for respectively our two then our three groups of countries[8]. Our regressions satisfy the specification tests. There is no evidence of second order serial correlation and the regressions pass the Hansen specification test. The results in table I show a coefficient β_f that is insignificantly different from zero for countries with a low level of financial development (group I). This coefficient becomes significantly positive when the level of financial development is high (group II). We note, moreover, that according to the conditional convergence theory, β_y presents in all cases the theoretically expected negative sign. This coefficient is not, however, more negative when the level of financial development is important. The probability of convergence of countries in the sample to the frontier growth rate does not seem to increase with the level of financial

[8] The reported results correspond to those of the estimation in two stages (*two step estimation*). We preferred this estimation procedure due to its higher asymptotic efficiency compared to the one step estimation (Sevestre 2002). Moreover, in order to limit the number of instruments used and avoid the bias of the over-instrumentation of the model, we have used the command « collapse » of the software used for the estimation (see Roodman 2009 and 2006). Roodman (2009) demonstrates the superiority of this command from simulation studies).

development, as demonstrated by Berthelemy and Varoudakis (1996) and Aghion *et al.* (2004, 2005) and empirically approved by Aghion *et al.* (2004) and Fung (2009).
Results in table II are more conformed to the literature. The identification of a third group of countries - including those with an intermediate level of financial development - gives more suitable results[9]. Results in table II show a coefficient β_f that is significantly positive for countries with an intermediate level of financial development (group II), and a coefficient β_f that is insignificantly different from zero for those with a higher level of financial development (group III). We thus conclude the presence of a critical average level of financial development (*i.e.* of a critical rate of private credit relative to GDP equal to 26.22%[10]) from which the positive effects of financial development on long term real GDP per capita disappear[11]. In accordance with the conditional convergence theory, we see that the convergence parameter β_y presents, in all cases, the negative sign that is theoretically expected. From an average critical level of financial development, this convergence parameter is more negative as the level of financial development increases. Thus, financial development matters in the convergence process of emerging and developing economies towards technology frontier growth rate. But it is only from an average level of financial development that financial development seems to accelerate the rhythm of convergence of these economies towards the developed countries growth. Below this threshold, *i.e.* for countries where financial development is low enough, the process of convergence seems to be conditioned by factors other than financial development such as the functioning of market mechanisms, the liberalization of trade… Finally, our estimations do not confirm the assumption that the marginal impact of financial development on steady-state growth rate is more favorable than the degree of financial development is low. In fact, contrary to what is theoretically expected by Fung (2009) and Aghion *et al.* (2005), the coefficient β_f (that captures the effect of financial development on long term growth in countries with a low level of financial development) is not significantly positive for these countries (see table II, group I). Our results are consistent with those of Rioja and Valev (2004b). Our last two results allow us to conclude that, for emerging and developing countries with low level of financial development, the degree of financial development has no bearing on the level of long term economic growth or the degree of convergence towards the world frontier growth.

[9] We think that the identification of a third group of countries - including those with an intermediate level of financial development - is susceptible to give more suitable results. In fact, in an analysis with two groups of countries, countries with an average level of financial development may be included among those with a low level of financial development (group I) or a high one (group II).
[10] See list C in the appendix.
[11] It is important to stress that β_f is interpreted differently depending on the group of countries studied. It captures the effect of financial development on the long-term growth for financially underdeveloped countries ($= g_{lt} + \beta_0 + \beta_f F_{it} + \beta_x X_{it} + \mu_i + \lambda_t + \varepsilon_{it}$), and the impact of financial development on long-term GDP ($= -\frac{\beta_0 + \beta_f F_{it} + \beta_x X_{it} + \mu_i + \lambda_t + \varepsilon_{it}}{\beta_y}$) for economies with a medium and high level of financial development. Expressions of long-term growth and long-term GDP are deduced from equation (1).

TABLE I - Growth, financial development and initial relative output (Split-Sample Regressions (Two-way))[‡]

This table presents the results of estimating the equation (1) for a sample of 112 emerging and developing countries (data averaged over seven 5-year periods from 1975-2007). *FD* = indicators of financial development (liquid liabilities to GDP, commercial banks assets to the sum of these assets plus those of the central bank, private sector credit to GDP), *prim* = primary enrollment ratio, *inf* = inflation rate, *gov* = government final consumption expenditure to GDP, *trade* = trade openness ratio and *bmp* = black market exchange rate premium. All variables are introduced in logarithm except inflation (log (1+ inflation rate)). All regressions include time dummies and a constant. The dependent variable is the difference between the domestic economic growth and that of the technology leader ($g - g_l$). In the table, the initial relative GDP refers to ($y - y_l$), *FD* refer to *F*, and *prim*, *inf*, *gov*, *trade* and *bmp* refer to *X*. The null hypothesis of the Hansen test is that the instruments used are valid (not correlated with the residuals). The null hypothesis of the AR (2) test is that the errors in the first-difference regression exhibit no second-order serial correlation. [‡] p-value in parentheses; * significant at 10% level, ** significant at 5% level, *** significant at 1% level. [†] Countries with an average level of private credit to GDP over the period 1975-2007 less than 19.92% [♠] Countries with an average level of private credit to GDP over the period 1975-2007 more than 19.92%.

		SIZE_FINANCIAL INTERMEDIARIES				**ACTIVITY_FINANCIAL INTERMEDIARIES**	
	Expected	Liquid liabilities		Commercial-Central Bank		Private credit	
Variables	sign	Group I[†]	Group II[♠]	Group I	Group II	Group I	Group II
initial relative GDP	(-)	**-0.117*** **	**-0.067*** **	**-0.147*** **	**-0.112*** **	**-0.146*** **	**-0.075*** **
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FD	**(+)**	0.150	**0.122** **	0.131	**0.275***	0.059	**0.083** **
		(0.123)	(0.024)	(0.236)	(0.078)	(0.571)	(0.031)
prim	(+)	**0.204***	0.159	**0.233***	**0.439** **	0.227	0.260
		(0.086)	(0.487)	(0.067)	(0.046)	(0.144)	(0.250)
inf	(-)	0.010	-0.072	0.010	0.024	-0.000	-0.049
		(0.420)	(0.141)	(0.667)	(0.500)	(0.982)	(0.197)
gov	(-)	0.008	-0.157	-0.041	-0.047	0.017	**-0.193***
		(0.955)	(0.187)	(0.786)	(0.766)	(0.934)	(0.098)
trade	(+)	0.124	0.0750	0.184	0.102	0.118	**0.122***
		(0.185)	(0.384)	(0.227)	(0.175)	(0.394)	(0.080)
bmp	(-)	**-0.100** **	**-0.109***	**-0.110***	-0.066	-0.115	**-0.113***
		(0.026)	(0.092)	(0.080)	(0.234)	(0.109)	(0.084)
Observations		140	143	141	146	138	143
Countries		51	48	52	48	51	48
Hansen test (p-value)		0.759	0.245	0.866	0.446	0.603	0.201
AR (2) test (p-value)		0.379	0.240	0.394	0.306	0.456	0.266
Number of instruments		22	22	22	22	22	22

Source: authors

TABLE II - Growth, financial development and initial relative output (Split-Sample Regressions (Three-way))[‡]

This table presents the results of estimating the equation (1) for a sample of 112 emerging and developing countries (data averaged over seven 5-year periods from 1975-2007). *FD* = indicators of financial development (liquid liabilities to GDP, commercial banks assets to the sum of these assets plus those of the central bank, private sector credit to GDP), *prim* = primary enrollment ratio, *inf* = inflation rate, *gov* = government final consumption expenditure to GDP, *trade* = trade openness ratio and *bmp* = black market exchange rate premium. All variables are introduced in logarithm except inflation (log (1+ inflation rate)). All regressions include time dummies and a constant. The dependent variable is the difference between the domestic economic growth and that of the technology leader ($g - g_l$). In the table, the initial relative GDP refers to ($y - y_l$), *FD* refer to *F*, and *prim*, *inf*, *gov*, *trade* and *bmp* refer to *X*. The null hypothesis of the Hansen test is that the instruments used are valid (not correlated with the residuals). The null hypothesis of the AR (2) test is that the errors in the first-difference regression exhibit no second-order serial correlation. [‡] p-value in parentheses; * significant at 10% level, ** significant at 5% level, *** significant at 1% level. [†] Countries with an average level of private credit to GDP over the period 1975-2007 between 1.38% and 14.49%. [♠] Countries with an average level of private credit to GDP over the period 1975-2007 between 14.91% and 24.95%. [♥] Countries with an average level of private credit to GDP over the period 1975-2007 between 26.22% and 90.20%.

		SIZE_FINANCIAL INTERMEDIARIES						**ACTIVITY_FINANCIAL INTERMEDIARIES**		
	Expected	Liquid liabilities			Commercial-Central Bank			Private credit		
Variables	sign	Group I[†]	Group II[♠]	Group III[♥]	Group I	Group II	Group III	Group I	Group II	Group III
initial relative GDP	(-)	**-0.165*** **	**-0.026*** **	**-0.101*** **	**-0.218*** **	**-0.054*** **	**-0.132*** **	**-0.147*** **	**-0.034*** **	**-0.103*** **
		(7.42e-10)	(0.000)	(0.000)	(1.87e-07)	(0.000)	(0.000)	(1.09e-08)	(0.000)	(0.000)
FD	**(+)**	0.024	**0.230****	0.065	0.061	**0.401***	0.326	-0.052	**0.179***	0.039
		(0.869)	(0.030)	(0.624)	(0.739)	(0.096)	(0.114)	(0.572)	(0.052)	(0.303)
prim	(+)	0.022	0.108	**0.437***	0.110	0.364	0.336	-0.001	0.213	**0.449***
		(0.808)	(0.664)	(0.085)	(0.570)	(0.139)	(0.360)	(0.995)	(0.456)	(0.071)
inf	(-)	-0.252	0.023	-0.073	-0.047	-0.008	0.021	-0.309	0.005	-0.061
		(0.475)	(0.438)	(0.197)	(0.631)	(0.614)	(0.824)	(0.159)	(0.821)	(0.102)
gov	(-)	-0.106	-0.112	0.051	-0.066	-0.319	0.072	-0.007	-0.225	0.053
		(0.655)	(0.725)	(0.643)	(0.811)	(0.182)	(0.766)	(0.969)	(0.504)	(0.661)
trade	(+)	0.117	0.122	**0.201***	0.100	0.165	0.251	0.056	0.144	**0.245****
		(0.432)	(0.346)	(0.066)	(0.726)	(0.264)	(0.216)	(0.770)	(0.228)	(0.020)
bmp	(-)	0.033	**-0.145***	**-0.130***	-0.049	-0.168	-0.021	0.016	-0.176	**-0.129***
		(0.813)	(0.094)	(0.088)	(0.566)	(0.360)	(0.760)	(0.846)	(0.118)	(0.074)
Observations		93	90	100	94	90	103	91	90	100
Countries		34	30	35	35	30	35	34	30	35
Hansen test (p-value)		0.338	0.345	0.877	0.118	0.373	0.447	0.309	0.294	0.820
AR (2) test (p-value)		0.626	0.855	0.340	0.420	0.188	0.876	0.745	0.535	0.384
Number of instruments		22	22	22	22	22	22	22	22	22

Source: authors

4. Estimation of a nonlinear growth specification

4.1 Estimated specification

Our previous estimations have the disadvantage of referring to exogenous break thresholds (linked to the level of financial development) which are hard to explain. In fact there is no reason for these to be found at the levels of financial development separating the sample in two or three groups of countries (as we have proceeded). During this analysis, we are also confronted to the problems caused by the limited size of various groups of specified countries. For all these reasons, we hereby adopt a different but complementary approach to study, on one hand, threshold effects between financial development and long-term GDP, and, on the other hand, the link between financial development and probability of convergence. This approach consists in estimating a non-linear growth specification that integrates an interaction term between the level of financial development and the initial relative output ($F_{it} * (y_{it-1} - y_{lt-1})$)[12] :

$$g_{it} - g_{lt} = \beta_0 + \beta_f F_{it} + \beta_y (y_{it-1} - y_{lt-1}) + \beta_{fy} F_{it} * (y_{it-1} - y_{lt-1}) + \beta_x X_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (2)$$

[12] See Appendix C of Aghion *et al.* (2004), where the authors show that equation (2) can be regarded as an approximation to a smooth extension of their theoretical model.

Contrary to the previous analysis (split-sample regressions), this approach allows us to consider the eventual modifications over time of the countries groups, and to continually and progressively capture the impact of financial development.

The coefficient β_{fy} captures the impact of financial development on the degree of convergence of a country towards the frontier growth ($\beta_y + \beta_{fy} F_{it}$). Thus the likelihood of convergence will increase with financial development (Aghion *et al.* 2004, Berthelemy and Varoudakis 1996, and Fung 2009,) if and only if $\beta_{fy} < 0$[13].

Moreover, according to Esso (2009), Aghion *et al.* (2004), and Clarke *et al.* (2003), in countries that converge to the frontier growth rate (*i.e.* countries where financial development is average or high), financial development has a positive but eventually vanishing overall effect on steady-state per-capita GDP relative to the frontier. This impact will vanish for relatively very high levels of financial development (case of the leader). In accordance with these works, we therefore predict that β_f is:

- not negative for countries that converge towards frontier growth ;
- and null for the leader[14].

This can only be verified with a null coefficient β_f.

4.2 Results

Table III exhibits the results of the estimations on dynamic panel of the equation (2). In specifications of *model 1*, we consider as control variables: the initial level of real GDP per capita, the level of educational development, the inflation rate, the rate of government spending, the degree of trade openness and the black market exchange rate premium. In *models 2 and 3*, we also control our results with two measures of institutional development which are: the index of civil liberties (*libciv*) and that of political rights (*libpol*). A large economic literature defends the importance of the contribution of institutional development to the growth process of developing countries (Acemoglu *et al.* 2005). In comparison to other institutional indicators, these measures have the advantage of being available over a long period and for a wide sample of emerging and developing countries. These indices are identified on the basis of a scale going from 1 to 7, with a low score indicating a larger freedom (whether civil or political). The expected sign for these measures is consequently negative[15].

The direct estimated impact of the initial relative GDP on the subsequent growth (β_y) is significantly positive for almost all the cases studied. We can therefore conclude that countries with an extremely low financial development (*F* tends towards zero) fail to converge towards the technology frontier growth[16]. Our results do not, however, support the presence of a significantly increasing relationship between the level of financial development of a country and the probability of its convergence towards the technology leader growth (Aghion *et al.* 2004, and Fung 2009). In fact, in all the estimated specifications, the interactive term enters with a coefficient β_{fy} that is insignificantly different from zero. The estimations results equally exhibit a coefficient β_f that is insignificantly different from zero no matter the indicator of financial development used. We thus highlight the presence of a financial development threshold effect between financial development and long term real GDP per-capita for the sample studied (112 emerging and developing countries). This effect tells that

[13] With a β_{fy} negative, the higher the level of financial development (F_{it}), the greater the convergence parameter ($= \beta_y + \beta_{fy} F_{it}$) is low and the convergence of country *i* is fast.

[14] From equation (2), we can deduce the expression of steady-state relative GDP as follows ($= -\frac{\beta_0 + \beta_f F_{it} + \beta_x X_{it} + \mu_i + \lambda_t + \varepsilon_{it}}{\beta_y + \beta_{fy} F_{it}}$).

[15] There is no evidence of second order serial correlation and the regressions pass the Hansen specification test.

[16] As previously mentioned, we can only speak of convergence if the convergence parameter ($= \beta_y + \beta_{fy} F_{it}$) is negative.

financial development exerts a positive but decreasing impact - as its level rises - on long term GDP. These results support those of the analysis by countries group previously developed and the conclusions advanced by Aghion *et al.* (2004). They are also in line with the empirical investigations conducted by Esso (2009) and Clarke *et al.* (2003). These authors identify the presence of a favorable effect of financial development on long term income per-capita. This effect disappears, however, for the leader country (with a strongly high level of financial development). Examining the relationship between financial intermediaries development and income inequalities across countries, Esso (2009) and Clarke *et al.* (2003) show that incomes inequalities between countries are explained by the presence of financial constraints that reduce the access of economic agents to the credit market. A better development of the financial system within these countries insures the convergence of the GDP per capita of different countries[17].

Regarding control variables, they come in almost all estimated specifications with theoretically expected coefficients. Except for the black market exchange rate premium and trade openness, these variables do not affect, however, in a substantial manner, the growth gap with the technological leader, since in none of the cases studied, they have statistically significant coefficients.

Overall, although we have demonstrated that an underdeveloped financial system prevents the countries (emerging and developing here) to catch up the technological frontier in terms of economic growth, no statically significant link between the degree of convergence and the level of financial development has been identified (coefficient β_{fy} insignificantly different from zero). However, as is shown by Esso (2009), Aghion *et al.* (2004), and Clarke *et al.* (2003), our results highlight the decay of the positive impact of financial development on long term GDP per-capita with the level of financial development (coefficient β_f insignificantly different from zero).

[17] Esso (2009) distinguishes between the short term relationship and the long term one. He concludes that financial development increases, in the short term, income gaps between the countries, but ensures, in the long term, the convergence of per capita GDP of these latter.

TABLE III - Growth, financial intermediation and initial relative output[‡]

This table presents the results of estimating the equation (2) for a sample of 112 emerging and developing countries (data averaged over seven 5-year periods from 1975-2007). *FD* = indicators of financial development (liquid liabilities to GDP, bank assets to GDP, private sector credit to GDP), *FDINTER* = indicators of financial development interacted with initial relative GDP, *prim* = primary enrollment ratio, *inf* = inflation rate, *gov* = government final consumption expenditure to GDP, *trade* = trade openness ratio, *bmp* = black market exchange rate premium, *libciv* = index of civil liberties and *libpol* = index of political rights. All variables are introduced in logarithm except inflation (log (1+ inflation rate)). All regressions include time dummies and a constant. The dependent variable is the difference between the domestic economic growth and that of the technology leader $(g - g_l)$. In the table, the initial relative GDP refers to $(y - y_l)$, *FD* refers to *F*, *FDINTER* refers to $F * (y - y_l)$ and *prim*, *inf*, *gov*, *trade*, *bmp*, *libciv* and *libpol* refer to *X*. The null hypothesis of the Hansen test is that the instruments used are valid (not correlated with the residuals). The null hypothesis of the AR (2) test is that the errors in the first-difference regression exhibit no second-order serial correlation. [‡] p-value in parentheses; * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

Variables	Expected sign	Liquid liabilities			Private credit			bank assets		
		Model 1	Model 2	Model 3	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
initial relative GDP	(+)	**0.003*** **	**-0.040*** **	**-0.031*** **	**0.055*** **	**0.000*** **	**0.032*** **	**0.029*** **	**0.033*** **	**0.050*** **
		(0.000)	(0.000)	(0.000)	(0.000)	(3.26e-10)	(1.54e-09)	(0.000)	(0.000)	(0.000)
FD	**null**	0.301	0.212	0.208	0.370	0.268	0.318	0.425	0.342	0.380
		(0.187)	(0.362)	(0.311)	(0.119)	(0.249)	(0.217)	(0.113)	(0.182)	(0.115)
FDINTER	**(-)**	0.047	0.021	0.025	0.080	0.049	0.065	0.082	0.066	0.078
		(0.500)	(0.774)	(0.704)	(0.224)	(0.465)	(0.389)	(0.272)	(0.333)	(0.226)
prim	(+)	0.061	0.082	0.086	0.044	0.143	0.094	0.086	0.046	0.044
		(0.565)	(0.574)	(0.450)	(0.736)	(0.258)	(0.457)	(0.463)	(0.747)	(0.748)
inf	(-)	-0.000	-0.000	-0.004	-0.002	0.000	-0.003	-0.003	0.001	-0.001
		(0.983)	(0.964)	(0.822)	(0.870)	(0.968)	(0.826)	(0.851)	(0.909)	(0.944)
gov	(-)	-0.076	-0.097	-0.089	-0.130	-0.146	-0.153	-0.089	**-0.183** **	**-0.193** **
		(0.396)	(0.360)	(0.306)	(0.340)	(0.139)	(0.153)	(0.346)	(0.028)	(0.021)
trade	(+)	0.118	0.092	0.108	**0.225** **	**0.155***	**0.177** **	0.125	0.104	0.122
		(0.134)	(0.296)	(0.198)	(0.020)	(0.053)	(0.037)	(0.214)	(0.179)	(0.179)
bmp	(-)	**-0.120*** **	**-0.126*** **	**-0.115*** **	**-0.091** **	**-0.092** **	**-0.091** **	**-0.126*** **	**-0.124*** **	**-0.124*** **
		(2.82e-05)	(1.78e-05)	(3.16e-05)	(0.037)	(0.040)	(0.043)	(0.002)	(0.001)	(0.001)
libciv	(-)		-0.032			0.078			0.025	
			(0.738)			(0.417)			(0.798)	
libpol	(-)			-0.014			0.024			0.014
				(0.765)			(0.637)			(0.813)
Observations		275	273	273	266	272	272	282	273	273
Countries		94	93	93	93	94	94	99	94	94
Hansen test (p-value)		0.524	0.331	0.589	0.704	0.535	0.752	0.552	0.256	0.349
AR (2) test (p-value)		0.196	0.212	0.182	0.350	0.505	0.471	0.282	0.284	0.273
Number of instruments		32	36	36	25	29	29	32	32	32

Source: authors

5. Robustness study

We have conducted a wide array of sensitivity analysis to gauge the robustness of our findings. The baseline model is modified by using other indicators of financial development, and considering a new countries sample.

We re-estimate the equation (2) by measuring the degree of financial development *via* indicators of the banking sector as well as the stock market, particularly:

For the banking system:

- the ratio of commercial banks deposits to GDP *(bdy)*;
- the ratio of the private credit granted by commercial banks relative to commercial banks deposits *(bcbd)*;
- the ratio of financial system deposits to GDP *(fdy)*.

For the stock market:

- the stock market capitalization ratio *(cap)*: this ratio measures the size of the stock market. It equals the value of domestic equities listed on domestic exchanges divided by GDP;

- the stock market total value traded ratio *(traded)*: this ratio reflects the level of liquidity (activity) of the domestic stock market. It is defined as total shares traded on the stock market exchange divided by GDP;
- the stock market turnover ratio (*turnover*) as efficiency indicator of stock markets : this one is defined as the ratio of the value of total shares traded and market capitalization. It measures the activity or liquidity of a stock market relative to its size;
- the number of firms listed per-capita *(list)*.

The choice of these indicators is highly constrained by their availability over a long period and for an important number of emerging and developing countries. The estimations results are reported in tables VII and VIII in the appendix. The results found confirm those previously identified from traditional indicators of financial development (table III above)[18]. The estimations reveal estimated coefficients β_f and β_{fy} that are not significantly different from zero whatever the indicator of financial development used and/or the set of control variables introduced. These new estimations confirm thus the results issued from the basic model. On the one hand, a threshold effect in the link financial development - long-term GDP appears (threshold in relation to the level of financial development). On the other hand, there seems to be no statistically significant relationship between financial development and the pace of convergence (for the sample countries).

In order to insure the robustness of our results and confirm that they do not come from the nature of the studied sample, we have re-considered the basic model (equation (2)) for a sample of 30 emerging and frontier countries[19]. Relative to other developing countries, this group is more financially developed, especially from the stock markets standpoint. The estimations results for this group of countries are reported in tables IX and X in the appendix[20]. All these results are in line with those previously identified. It should be emphasized that the coefficients of control variables are rarely significant when we approximate the degree of financial development in these countries by that of financial intermediation. These coefficients are, however, more often significant when we refer to indicators of stock market development. This result confirms the importance of financial mutations in this group of countries since the early 90s. Indeed, these mutations led stock markets to play a role more and more important in financing these economies (these results differ somewhat from those of Rioja and Valev (2004b) which do not find significant effects of stock variables).

6. Conclusion

In this paper, we conducted an empirical investigation of the relationship between financial development and growth using Generalized Method of Moments dynamic panel date models. Studying a set of 112 emerging and developing countries over the period 1975-2007, we obtain three main results. First, the analysis by group of countries has shown that the effect of financial development on long-term growth is absent for emerging and developing countries when these economies have a low level of financial development. Secondly, we identify a non-significant effect of financial development on the degree of convergence of the countries studied. More specifically, estimations by countries groups highlight that financial development can accelerate the process of convergence of emerging and developing countries

[18] All the specifications in tables VII and VIII are exempt from the risk of serial auto-correlation of order (2) of the error terms as well as that of invalidity of the used instruments.

[19] These countries are: South Africa, Argentina, Bangladesh, Brazil, Bulgaria, Chili, Colombia, Egypt, India, The Mauritius, Indonesia, Jordan, Kenya, Kazakhstan, Lithuania, Malaysia, Morocco, Mexico, Nigeria, Pakistan, Peru, the Philippines, Poland, Romania, Serbia, Sri Lanka, Thailand, Tunisia, Turkey and Vietnam. MSCI Barra classification (June 2009).

[20] All the specifications in tables IX and X are exempt from the risk of serial auto-correlation of order (2) of the error terms as well as that of invalidity of the used instruments.

only if economies reach a critical threshold of financial development. This result is also supported by that of the interaction analysis, i.e. when we introduce interaction terms between financial development and initial relative output in a non-linear growth specification. Indeed, estimations show no significant correlation between financial development and probability of convergence for the countries in the sample. Thirdly, estimations support the hypothesis that the positive effect of financial development on long-term GDP decreases with the level of financial development.

It is important to stress that our results are robust to the use of other indicators of financial development and the modification of the sample studied. In other words, they provide a plausible explanation for the failure of some countries in catching up world technology frontier growth in spite of technology transfer opportunities available to them. Domestic financial systems that are very underdeveloped may prevent the full benefits of such transfers, and this, despite the magnitude of financial reforms implemented by many of them (Dorrucci *et al.* 2009)[21]. But it is important to keep in mind that our empirical results suggest that financial development is not among the most powerful of forces that contribute to convergence in developing and emerging economies. They qualify those predicted by theory and some results from previous empirical studies.

The results do not allow us, however, to determine the structure of the financial system that is best suited to the growth of emerging and developing economies; a structure that the national authorities of these economies should certainly promote for a faster convergence towards frontier growth (deepening of the banking sector *versus* development of the stock market). Moreover this paper does not treat the issue of financial instability and its implications on the link between financial development, economic growth and convergence. Many studies show that financial instability - that accompanies financial development in some cases - is likely to reduce - or even eliminate - the positive effects of financial development on growth rates (Kaminsky and Schmukler 2008, and Ranciere *et al.* 2008). Finally, we don't explicitly consider - in this paper - the question of the inverse causality between financial development and growth. The direction of causality between these two variables is still the subject of intense debate, not only theoretical but also empirical. While it is well accepted that financial development stimulates growth, it is also obvious that the latter could lead to the development of domestic financial systems (Ang and McKibbin 2007). Several studies argue, moreover, the presence of cross-interactions between financial development and growth (Abu-Bader and Abu-Qarn 2008, Demetriades and Luintel 1997, and Luintel and Khan 1999). Such important issues will be the object of future works.

References

Abu-Bader, S. and A. Abu-Qarn (2008) "Financial Development and Economic Growth Nexus: Time Series Evidence from Middle Eastern and North African Countries" *Review of Development Economics* **12**, 803-817.

Acemoglu, D., S. Johnson, and J.A. Robinson (2005) "Institutions as the Fundamental Cause of Long-Run Growth", in *Handbook of Economic Growth* by P. Aghion and S. Durlauf, Eds, vol. 1, North Holland-Elsevier: Amsterdam, 386-472.

Aghion, P, P. Howitt and D. Mayer-Foulkes (2005) "The Effect of Financial Development on Convergence: Theory and Evidence" *Quarterly Journal of Economics* **120**, 173-222.

Aghion, P., P. Howitt, and D. Mayer-Foulkes (2004) "The Effect of Financial Development on Convergence: Theory and Evidence" NBER working paper number 10358.

Ang, J.B. (2008) "A Survey of Recent Developments in the Literature of Finance and Growth" *Journal of Economic Surveys* **22**, 536-576.

[21] Dorruci *et al.* (2009) have thus demonstrated, for a sample of emerging countries, the persistence of a significant gap between these latter's financial development and that of developed countries.

Ang, JB and W.J. McKibbin (2007) "Financial Liberalization, Financial Sector Development and Growth: Evidence from Malaysia" *Journal of Development Economics* **84**, 215-233.
Arellano, M and O. Bover (1995) "Another Look at the Instrumental-Variable Estimation of Error-Components Models" *Journal of Econometrics* **68**, 29-52.
Arellano, M and S. Bond (1991) "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations" *Review of Economic Studies* **58**, 277-297.
Augier, L and W. Soedarmono (2011) "Threshold Effect and Financial Intermediation in Economic Development" *Economics Bulletin* **31**, 342-357.
Beck, T, A. Demirgüç-Kunt and R. Levine (2000) "A New Database on Financial Development and Structure" *World Bank Economic Review* **14**, 597-605.
Beck, T, R. Levine and N. Loayza (2000) "Finance and the Sources of Growth" *Journal of Financial Economics* **58**, 261-300.
Beck, T. and A. Demirgüç-Kunt (2009) "Financial Institutions and Market Across Countries and Over Times - Data and Analysis" World Bank Policy Research working paper number 4943.
Berthelemy, J and A. Varoudakis (1996) "Economic Growth, Convergence Clubs, and the Role of Financial Development" *Oxford Economic Papers* **48**, 300-328.
Blundell, R and S. Bond (1998) "Initial Conditions and Moment Restrictions in Dynamic Panel Data Models" *Journal of Econometrics* **87**, 115-143.
Clarke, G., L.C. Xu, and H.F. Zou (2003) "Finance and Income Inequality: Test of Alternative Theories" World Bank Policy Research working paper number 2984.
Deidda, L and B. Fattouh (2002) "Non Linearity Between Finance and Growth" *Economics Letters* **74**, 339-345.
Demetriades, PO and K.B. Luintel (1997) "The Direct Costs of Financial Repression: Evidence from India" *Review of Economics and Statistics* **79**, 311-320.
Dollar, D. (1992) "Outward-Oriented Developing Economies Really Do Grow More Rapidly: Evidence From 95 LDCs, 1976-1985" *Economic Development and Cultural Change* **40**, 523-544.
Dorrucci, E., A. Meyer-Cirkel, and D. Santabárbara (2009) "Domestic Financial Development in Emerging Economies: Evidence and Implications" European Central Bank Occasional Paper number 102.
Esso, L.J. (2009) "Développement financier, croissance économique et inégalités de revenus entre pays de l'UEMOA" Cellule d'analyse de politiques économiques du CRES, Série de Documents de Recherche, number 2009/17.
Fischer, S. (1993) "The Role of Macroeconomic Factors in Growth" *Journal of Monetary Economics* **32**, 485-511.
Fung, M.K. (2009) "Financial Development and Economic Growth: Convergence or Divergence?" *Journal of International Money and Finance* **28**, 56-67.
Gaytan, A. and R. (2004) "Wealth, Financial Intermediation and Growth" UPF Economics and Business Working Paper number 851.
Holtz-Eakin, D, W. Newey and H. Rosen (1990) "Estimating Vector Auto Regressions with Panel Data" *Econometrica* **56**, 1371-1395.
Huang, H, S. Lin, D. Kim and C. Yeh (2010) "Inflation and Finance-Growth Nexus" *Economic Modelling* **27**, 229-236.
Kaminsky, G and S. Schmukler (2008) "Short-Run Pain, Long-Run Gain: Financial Liberalization and Stock Market Cycles" *Review of Finance* **12**, 253-292.
Khan, M and A. Senhadji (2003) "Financial Development and Economic Growth: a Review and New Evidence" *Journal of African Economies* **12**, 89-110.

King, R and R. Levine (1993) “Finance and Growth: Schumpeter Might Be Right” *Quarterly Journal of Economics* **108**, 717-738.
Kpodar, K. (2007) *Manuel d’initiation à Stata (Version 8)*, Centre d’Etudes et de Recherches sur le Développement International: France.
Levine, R and S. Zervos (1998) “Stock Markets, Banks, and Economic Growth” *American Economic Review* **88**, 537-558.
Levine, R, N. Loayza and T. Beck (2000) “Financial Intermediation and Growth: Causality and Causes” *Journal of Monetary Economics* **46**, 31-77.
Levine, R. (1997) “Financial Development and Economic Growth: Views and Agenda” *Journal of Economic Literature* **35**, 688-726.
Levine, R. (2005) “Finance and Growth: Theory and Evidence” in *Handbook of Economic Growth*, by P. Aghion and S. Durlauf, Eds, vol. 1, North Holland-Elsevier: Amsterdam, 865-934.
Luintel, K and M. Khan (1999) “A Quantitative Reassessment of the Finance-Growth Nexus: Evidence from a Multivariate VAR” *Journal of Development Economics* **60**, 381-405.
McCraig, B and T. Stengos (2005) “Financial Intermediation and Growth: Some Robustness Tests” *Economics Letters* **88**, 306-312.
Ranciere, R, A. Tornell and F. Westermann (2008) “Systemic Crises and Growth” *Quarterly Journal of Economics* **123**, 359-406.
Rioja, F and N. Valev (2004a) “Finance and the Sources of Growth at Various Stages of Economic Development” *Economic Inquiry* **42**, 127-140.
Rioja, F and N. Valev (2004b) “Does One Size Fit All?: A Reexamination of the Finance and Growth Relationship” *Journal of Development Economics* **74**, 429-447.
Roodman, D. (2009) “A Note on the Theme of Too Many Instruments” *Oxford Bulletin of Economics and Statistics* **71**, 135-158.
Roodman, D. (2006) “How to Do xtabond2: An Introduction to "Difference" and "System" GMM in Stata”, Center for Global Development Working Paper, number 103.
Rousseau, P and H. Yilmazkuday (2009) “Inflation, Financial Development, and Growth: a Trilateral Analysis” *Economic Systems* **33**, 310-324.
Rousseau, P and P. Wachtel (2002) “Inflation Thresholds and the Finance-Growth Nexus” *Journal of International Money and Finance* **21**, 777-793.
Sevestre, P. (2002) *Econométrie des données de panel*, Editions Dunod: Paris.
Yilmazkuday, H. (2011) “Thresholds in the Finance-Growth Nexus: A Cross-Country Analysis” *World Bank Economic Review* **25**, 278-295.

Appendix 1

TABLE IV - Financial development threshold effects between financial development and economic growth: a review of empirical literature

Hypothesis tested, sample and period of analysis	Method(s) for determining the break threshold(s), estimated model and econometric methodology	Thresholds found (for endogenous thresholds) or thresholds fixed (for exogenous thresholds)	Main results
	Berthelemy and Varoudakis (1996)		
- The presence of a financial development threshold effect between financial development and long term growth. - 95 countries between 1960 and 1995. - Cross country data.	- The rolling Chow test. - The growth rate of GDP per capita is expressed in terms of: the initial level of financial development, the initial level of educational development and a set of control variables. - OLS.	The first threshold in relation with the initial level of secondary schooling is 6%. The second threshold related to the initial level of financial development is: 15.3% for countries with an initial rate of secondary school enrollment less than 6%, and 21.6% for the rest of countries.	Financial development positively and significantly affects growth in countries with high levels of financial development. This result is valid for countries with an initial rate of secondary school enrollment higher than 6% and for other countries.
	Aghion *et al.* (2004)		
- The presence of financial development thresholds effects in links financial development - long term economic growth/financial development - long term GDP. - 71 developed and developing countries between 1960 and 1995. - Cross country data. - Data base of Levine *et al.* (2000).	- Exogenous thresholds determined after splitting the sample into different groups of countries according to their level of financial development (private credit/GDP). - Endogenous thresholds determined after estimating a non linear specification of growth. -The method of instrumental variables	- The value of the exogenous thresholds is not specified by the authors. - The authors found a critical threshold of 25% in relation with the level of private credit to GDP. This threshold influences the convergence ability of countries to the frontier growth rate.	- The marginal impact of financial development on the steady-state growth rate is more favorable than the degree of financial development is low. - In countries that converge to the frontier growth rate, financial development has a positive but eventually vanishing effect on the steady-state per-capita GDP relative to the frontier. - A country can converge to the frontier growth rate as long as its level of private credit exceeds the critical value of 25%.
	Rioja and Valev (2004b)		
- The variability of the relationship between financial development and growth depending on the level of the first. - 74 developed and developing countries. - Quinquennial data over 1961-1995. - Data base of Levine *et al.* (2000).	The authors consider three groups of countries. They create dummy variables for the group whose level of financial development is very low (below a low threshold) and the group whose level of financial development is very high (level exceeding a high threshold). They estimate repeatedly growth regression, changing each time the location of the two thresholds. The thresholds retained are those corresponding to the most significant results. - The growth rate of real GDP per capita is regressed on financial development crossed with dummy variables and a set of control variables. - Generalized Method of Moments developed for dynamic models of panel data.	Three groups of countries are defined by the pair of thresholds 14% and 30% when financial development is measured by the ratio of private credit/GDP, and 21% and 50% when financial development is measured by the ratio of liquid liabilities/GDP.	- Financial development exerts a strong positive effect on economic growth only once it has reached a certain size threshold. - Below this threshold, the effect is uncertain as different empirical measures of bank-based financial development suggest a zero effect or a positive effect. - The growth effect of financial development declines once it reaches very high levels.
	Fung (2009)		
- The presence of threshold effects between financial development and long term growth. - 57 developed and developing countries over 1967 - 2001. - Panel data.	- Exogenous thresholds determined by reference to the World Bank classification of countries according to the level of GDP per capita. - The growth rate of real GDP per capita is regressed on financial development. - Generalized Method of Moments developed for dynamic models of panel data.	Critical values not specified by the authors.	- Financial development and economic growth have an interaction that is especially stronger when the country is at an early stage of economic development. This interaction tends to weaken as the degree of economic development increases. - There are poverty traps linked to a very low initial level of financial development, a level that prevents every perspective of convergence in terms of economic growth.
	Our study		
- The existence of financial development threshold effects, firstly, between financial development and long-term growth, and, secondly, between financial development and long-term GDP. - The positive link between the level of financial development and the probability of convergence to the frontier growth rate. - 112 emerging and developing countries over 1975 - 2012. - Panel data.	- Exogenous thresholds determined after splitting the sample into different groups of countries according to their level of financial development (private credit/GDP). - Endogenous thresholds determined after estimating a non linear specification of growth. - Generalized Method of Moments developed for dynamic models of panel data.	- For exogenous thresholds, the low threshold is 14.49% and the high threshold is 26.22%, when financial development is measured by private credit/GDP. - No endogenous thresholds detected.	- The existence of a financial development threshold effect between financial development and long term per-capita GDP: from a critical (an average) level of financial development, financial development has a positive but vanishing effect on steady-state per-capita GDP relative to the frontier. - The results support only partially the role of financial development in the acceleration of the convergence of emerging and developing countries towards the technology frontier growth rate. - The assumption that the marginal impact of financial development on the steady-state growth rate is more favorable than the degree of financial development is low is not validated.

Appendix 2: Data

TABLE V - Definition of variables

Variables	Definition	Sources
1. Main analysis		
	Variables of interest	
Liquid liabilities	Ratio of liquid liabilities of the financial system to GDP.	Beck and Demirgüç-Kunt (2009)
Deposit banks assets/Central bank	Ratio of commercial banks assets to the sum of these assets plus those of the central bank.	Beck and Demirgüç-Kunt (2009)
Bank assets	Ratio of deposit banks assets relative to GDP.	Beck and Demirgüç-Kunt (2009)
Private credit	The amount of the credit (in terms of GDP) allocated to the private sector by commercial banks and other financial, banking and non-banking institutions.	Beck and Demirgüç-Kunt (2009)
	Control variables	
Real GDP per capita	GDP per capita (constant 2000 US$).	World Development Indicators (2008)
Education	School enrollment, primary (% gross): is the ratio of total enrollment, regardless of age, to the population of the age group that officially corresponds to the level of education shown.	World Development Indicators (2008)
Inflation	Annual percentage change in the index of consumer prices (annual %).	World Development Indicators (2008)
government size	All government current expenditures for purchases of goods and services (including compensation of employees). It also includes most expenditure on national defense and security, but excludes government military expenditures that are part of government capital formation (% of GDP).	World Development Indicators (2008)
Trade openness	The sum of exports and imports of goods and services (% of GDP).	World Development Indicators (2008)
Black market exchange rate premium	The difference between the exchange rate on the parallel market and official exchange rate in % of the latter.	Global Development Network Database (2001)
2. Robustness analysis		
	Variables of interest	
Bank deposits	Ratio of commercial banks deposits to GDP.	Beck and Demirgüç-Kunt (2009)
Financial system deposits	Ratio of financial system deposits to GDP.	Beck and Demirgüç-Kunt (2009)
Bank private credit/Bank deposits	Ratio of the private credit granted by commercial banks relative to commercial banks deposits.	Beck and Demirgüç-Kunt (2009)
Capitalization	Value of listed shares divided by GDP.	Beck and Demirgüç-Kunt (2009)
Total value traded ratio	Total shares traded on the stock market exchange divided by GDP.	Beck and Demirgüç-Kunt (2009)
Turnover	Ratio of the value of total shares traded and market capitalization.	Beck and Demirgüç-Kunt (2009)
Number of firms listed	Number of firms listed per-capita.	Beck and Demirgüç-Kunt (2009)
	Control variables	
Population	Rate of population growth.	World Development Indicators (2008)
Index of civil liberties	The scoring criteria refer mostly to the degree of freedom of expression, demonstration, education, religion....	Freedom House (2008)
Index of political rights	The scoring criteria refer mostly to the degree of transparency, fairness and freedom of elections.	Freedom House (2008)

TABLE VI - Descriptive statistics (1975-2007)

Variables	Mean	Standard-deviation	Min	Max	Growth rate (%)	Observations
Growth of real GDP per capita	0.014	0.018	-0.037	0.060	25.641	112
1. Financial development						
Liquid liabilities	0.353	0.204	0.065	1.030	77. 492	112
Deposit banks assets/Central bank	0.741	0.175	0.276	0.998	13.489	112
Credit to the private sector	0.238	0.173	0.013	0.902	75.882	112
Bank assets	0.289	0.197	0.015	1.091	83.476	112
Bank credits	0.220	0.159	0.013	0.890	84.651	112
Bank deposits	0.277	0.190	0.032	0.946	114.585	109
Bank private credit/Bank deposits	0.901	0.383	0.183	2.003	-23.322	112
Capitalization	0.212	0.272	0.006	1.608	810.541	64
Total value traded ratio	0.051	0.098	0.000	0.463	7734.284	62
Financial system deposits to GDP	0.281	0.190	0.032	0.946	109.105	109
Turnover	0.258	0.501	0.002	2.986	-11.137	62
Number of firms listed	0.172	0.323	0.001	1.701	178.571	66
2. Control variables						
Real GDP per capita	1568.825	1568.549	129.021	7134.463	59.455	112
Education	0.970	0.195	0.351	1.539	30.526	112
Inflation	6.037	56.207	0.024	595.049	895.443	112
Government size	0.153	0.054	0.047	0.360	-8.579	110
Trade openness	0.754	0.352	0.194	1.744	54.234	111
Black market exchange rate premium	0.922	3.154	-0.001	30.647	-86.323	110
Index of civil liberties	4.124	1.303	1.333	6.818	-27.168	109
Index of political rights	4.127	1.560	1	6.937	-28.535	109

Appendix 3: Ranking of countries in the sample

List A: List of countries in the sample (112 emerging and developing countries)
Albania, Algeria, Angola, Argentina, Armenia, Bangladesh, Belize, Benin, Bhutan, Bolivia, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Cape Verde, Central African Republic, Chad, Chile, Colombia, Democratic Republic Congo, Republic of Congo, Costa Rica, Cote d'Ivoire, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Ethiopia, Fiji, Gabon, Gambia, Georgia, Ghana, Grenada, Guatemala, Guinea-Bissau, Guyana, Haiti, Honduras, India, Indonesia, Iran, Jamaica, Jordan, Kazakhstan, Kenya, Kyrgyzstan, Lao People's Democratic Republic, Latvia, Lesotho, Libya, Lithuania, former Yugoslav Republic of Macedonia, Madagascar, Malawi, Malaysia, Maldives , Mali, Mauritania, Mauritius, Mexico, Moldova, Mongolia, Morocco, Mozambique, Nepal, Nicaragua, Niger, Nigeria, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Romania, Rwanda, Samoa, Senegal, Serbia, Seychelles, Sierra Leone, Solomon Islands, South Africa, Sri Lanka, St. Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Sudan, Suriname, Kingdom of Swaziland, Republic Arab Emirates, Tanzania, Thailand, Timor-Leste, Togo, Tonga, Tunisia, Turkey, Uganda, Uruguay, Vanuatu, Venezuela, Vietnam, Yemen, Zambia, Zimbabwe.

List B: First classification of countries by level of financial development
Group I (low financial development*)
Albania, Angola, Argentina, Armenia, Benin, Bhutan, Botswana, Burkina Faso, Burundi, Cambodia, Cameroon, Central African Republic, Chad, Democratic Republic of Congo, Republic of Congo, Ethiopia Gabon, Gambia, Georgia, Ghana, Guatemala, Guinea Bissau, Haiti, Kazakhstan, Kyrgyzstan, Republic Lao PDR, Lesotho, Libya, Lithuania, Madagascar, Malawi, Mali, Mexico, Moldova, Mongolia, Mozambique, Nepal, Niger, Nigeria, Papua New Guinea, Paraguay, Peru, Poland, Romania, Rwanda, Samoa, Seychelles, Sierra Leone, Sudan, Swaziland, Syrian Arab Republic, Tanzania, Turkey, Uganda, Yemen, Zambia.
Group II (high financial development**)
Algeria, Bangladesh, Belize, Bolivia, Brazil, Bulgaria, Cape Verde, Chile, Colombia, Costa Rica, Côte d'Ivoire, Dominica, Dominican Republic, Ecuador, Egypt, Salvador, Fiji, Grenada, Guyana, Honduras, India, Indonesia, Islamic Republic Iran, Jamaica, Jordan, Kenya, Latvia, the former Yugoslav Republic of Macedonia, Malaysia, Maldives, Mauritania, Mauritius, Morocco, Nicaragua, Pakistan, Panama, Philippines, Senegal, Serbia, Solomon Islands, South Africa, Sri Lanka, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Thailand, Timor-Leste, Togo, Tonga, Tunisia, Uruguay, Vanuatu, Venezuela, Vietnam, Zimbabwe.
* Average level of private credit to GDP over the period 1975-2007 less than 19.92% (median of the sample). ** Average level of credit private to GDP over the period 1975-2007 more than 19.92%.

List C: Second classification of countries by level of financial development
Group I (low financial development*)
Albania, Angola, Armenia, Benin, Bhutan, Botswana, Burkina Faso, Burundi, Cambodia, Central African Republic, Chad, Democratic Republic of Congo, Republic of Congo, Gabon, Gambia, Georgia, Ghana, Guinea Bissau, Haiti, Kyrgyzstan, Republic Lao PDR, Lesotho, Madagascar, Malawi, Mali, Mozambique, Niger, Nigeria, Romania, Rwanda, Sierra Leone, Sudan, Syrian Arab Republic, Tanzania, Uganda, Yemen, Zambia.
Group II (intermediate financial development **)
Argentina, Cameroon, Cape Verde, Costa Rica, Dominican Republic, Ecuador, Ethiopia, Guatemala, India, Jamaica, Kazakhstan, Libya, Lithuania, Former Yugoslav Republic of Macedonia, Maldives, Mexico, Moldova, Mongolia, Nepal, Nicaragua , Pakistan, Papua New Guinea, Paraguay, Peru, Poland, Samoa, Senegal, Serbia, Seychelles, Solomon Islands, Sri Lanka, Suriname, Swaziland, Timor-Leste, Togo, Turkey, Zimbabwe.
Group III (high financial development***)
Algeria, Bangladesh, Belize, Bolivia, Brazil, Bulgaria, Chile, Colombia, Côte d'Ivoire, Dominica, Egypt, El Salvador, Fiji, Grenada, Guyana, Honduras, Indonesia, Iran, Jordan, Kenya, Latvia, Malaysia , Mauritania, Mauritius, Morocco, Panama, Philippines, South Africa, St. Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Thailand, Tonga, Tunisia, Uruguay, Vanuatu, Venezuela, Vietnam.
* Average level of private credit to GDP over the period 1975-2007 between 1.38% and 14.49%. ** Average level of private credit to GDP over the period 1975-2007 between 14.91% and 24.95%. *** Average level of private credit to GDP over the period 1975-2007 between 26.22% and 90.20%.

Appendix 4: Results

TABLE VII - Growth, financial intermediation and initial relative output (other indicators)[‡]

This table presents the results of estimating the equation (2) for 112 emerging and developing countries (data averaged over seven 5-year periods from 1975-2007). FD = indicators of financial development (commercial banks deposits to GDP, private credit granted by commercial banks relative to commercial banks deposits, financial system deposits to GDP), FDINTER = indicators of financial development interacted with initial relative GDP, prim = primary enrollment ratio, inf = inflation rate, gov = government final consumption expenditure to GDP, trade = trade openness ratio, bmp = black market exchange rate premium, libciv = index of civil liberties and libpol = index of political rights. All variables are introduced in logarithm except inflation (log (1+ inflation rate)). All regressions include time dummies and a constant. The dependent variable is the difference between the domestic economic growth and that of the technology leader $(g - g_l)$. In the table, the initial relative GDP refers to $(y - y_l)$, FD refers to F, FDINTER refers to $F * (y - y_l)$ and prim, inf, gov, trade, bmp, libciv and libpol refer to X. The null hypothesis of the Hansen test is that the instruments used are valid (not correlated with the residuals). The null hypothesis of the AR (2) test is that the errors in the first-difference regression exhibit no second-order serial correlation.
[‡] p-value in parentheses; * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

	Expected sign	Commercial banks deposits			Financial system deposits			Private credit /Commercial banks deposits		
Variables		Model 4	Model 5	Model 6	Model 4	Model 5	Model 6	Model 4	Model 5	Model 6
initial relative GDP	(+)	**0.030*** **	**0.028*** **	**0.022*** **	**0.027*** **	**0.049*** **	**0.044*** **	**0.000** **	**0.000*** **	**0.000*** **
		(0.000)	(3.09e-09)	(2.83e-09)	(6.88e-05)	(3.80e-08)	(3.88e-08)	(0.000)	(0.000)	(0.000)
FD	**null**	0.342	0.360	0.347	0.347	0.403	0.390	0.346	0.137	0.142
		(0.123)	(0.260)	(0.263)	(0.499)	(0.256)	(0.260)	(0.301)	(0.605)	(0.575)
FDINTER	**(-)**	0.061	0.073	0.071	0.069	0.087	0.085	0.140	0.072	0.074
		(0.372)	(0.427)	(0.420)	(0.656)	(0.401)	(0.395)	(0.173)	(0.340)	(0.317)
prim	(+)	0.068	0.160	0.178	0.163	0.155	0.172	-0.077	0.002	-0.000
		(0.538)	(0.147)	(0.135)	(0.135)	(0.171)	(0.165)	(0.696)	(0.986)	(0.998)
inf	(-)	0.007	0.013	0.011	0.008	0.014	0.012	-0.035	-0.022	-0.023
		(0.640)	(0.535)	(0.578)	(0.758)	(0.519)	(0.559)	(0.265)	(0.423)	(0.431)
gov	(-)	-0.080	-0.125	-0.132	-0.095	-0.114	-0.120	0.225	0.099	0.104
		(0.478)	(0.163)	(0.103)	(0.409)	(0.235)	(0.167)	(0.145)	(0.476)	(0.474)
trade	(+)	0.131	0.115	**0.135***	**0.145***	0.123	**0.145***	**0.299** **	**0.196***	**0.200***
		(0.119)	(0.178)	(0.099)	(0.090)	(0.156)	(0.086)	(0.014)	(0.072)	(0.074)
bmp	(-)	**-0.130*** **	**-0.116*** **	**-0.117*** **	**-0.110*** **	**-0.115*** **	**-0.115*** **	**-0.118** **	**-0.102** **	**-0.103** **
		(0.001)	(0.005)	(0.002)	(0.009)	(0.006)	(0.002)	(0.044)	(0.019)	(0.023)
libciv	(-)		0.002			-0.005			-0.049	
			(0.979)			(0.952)			(0.583)	
libpol	(-)			0.042			0.040			-0.012
				(0.461)			(0.494)			(0.815)
Observations		279	276	276	279	276	276	290	285	285
Countries		99	97	97	99	97	97	100	98	98
Hansen test (p-value)		0.135	0.287	0.403	0.129	0.289	0.400	0.479	0.466	0.571
AR (2) test (p-value)		0.294	0.617	0.552	0.757	0.587	0.521	0.223	0.207	0.168
Number of instruments		33	26	26	25	26	26	31	28	28

TABLE VIII - Growth, stock market and initial relative output[‡]

This table presents the results of estimating the equation (2) for 112 emerging and developing countries (data averaged over seven 5-year periods from 1975-2007). FD = indicators of financial development (value of listed shares divided by GDP, total shares traded on the stock market exchange divided by GDP, turnover ratio, number of firms listed per-capita), FDINTER = indicators of financial development interacted with initial relative GDP, prim = primary enrollment ratio, inf = inflation rate, gov = government final consumption expenditure to GDP, trade = trade openness ratio, bmp = black market exchange rate premium, libciv = index of civil liberties and libpol = index of political rights. All variables are introduced in logarithm except inflation (log (1+ inflation rate)). All regressions include time dummies and a constant. The dependent variable is the difference between the domestic economic growth and that of the technology leader $(g - g_l)$. In the table, the initial relative GDP refers to $(y - y_l)$, FD refers to F, FDINTER refers to $F * (y - y_l)$ and prim, inf, gov, trade, bmp, libciv and libpol refer to X. The null hypothesis of the Hansen test is that the instruments used are valid (not correlated with the residuals). The null hypothesis of the AR (2) test is that the errors in the first-difference regression exhibit no second-order serial correlation. [‡] p-value in parentheses; * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

	Expected	Capitalization			Total value traded			Turnover			Number of firms listed		
Variables	sign	Model 4	Model 5	Model 6	Model 4	Model 5	Model 6	Model 4	Model 5	Model 6	Model 4	Model 5	Model 6
initial relative GDP	(+)	**0.113*** **	**0.000*** **	**0.002*** **	**0.027*** **	**0.053*** **	**0.040*** **	**0.005*** **	**0.042*** **	**0.010*** **	**0.069*** **	**0.071*** **	**0.107*** **
		(5.98e-09)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(1.45e-10)	(4.28e-06)	(2.13e-06)	(2.37e-08)
FD	**null**	0.152	0.030	0.065	0.084	0.040	0.051	0.075	0.135	0.064	0.067	0.071	0.096
		(0.120)	(0.608)	(0.267)	(0.402)	(0.570)	(0.426)	(0.628)	(0.313)	(0.761)	(0.633)	(0.648)	(0.489)
FDINTER	**(-)**	0.038	-0.004	0.004	0.011	0.008	0.010	0.008	0.035	0.007	0.024	0.019	0,035
		(0.258)	(0.777)	(0.780)	(0.703)	(0.709)	(0.606)	(0.877)	(0.429)	(0.915)	(0.623)	(0.675)	(0.439)
prim	(+)	0.443	0.020	0.002	-0.093	0.225	0.215	0.154	0.429	0.217	0.257	0.262	0,246
		(0.287)	(0.921)	(0.991)	(0.868)	(0.359)	(0.487)	(0.804)	(0.375)	(0.746)	(0.480)	(0.460)	(0.593)
inf	(-)	-0.130	**-0.120***	**-0.146** **	-0.116	**-0.194***	**-0.165** **	-0.146	-0.128	**-0.160***	**-0.143** **	**-0.141** **	**-0.161** **
		(0.196)	(0.068)	(0.027)	(0.271)	(0.095)	(0.031)	(0.127)	(0.209)	(0.057)	(0.022)	(0.047)	(0.030)
gov	(-)	-0.243	-0.101	-0.166	-0.034	-0.226	**-0.167***	-0.077	-0.070	-0.128	-0.136	-0.122	-0.104
		(0.212)	(0.368)	(0.146)	(0.812)	(0.100)	(0.098)	(0.701)	(0.665)	(0.543)	(0.294)	(0.424)	(0.631)
trade	(+)	0.030	0.047	0.069	0.015	0.101	0.109	0.057	0.113	0.083	0.096	0.079	0.145
		(0.830)	(0.440)	(0.326)	(0.813)	(0.183)	(0.281)	(0.640)	(0.288)	(0.600)	(0.268)	(0.419)	(0.127)
bmp	(-)	-0.069	-0.025	-0.036	-0.010	-0.018	-0.019	-0.037	-0.051	-0.044	-0.048	-0.023	-0.053
		(0.614)	(0.361)	(0.170)	(0.914)	(0.634)	(0.685)	(0.552)	(0.377)	(0.550)	(0.550)	(0.715)	(0.491)
libciv	(-)		0.035			-0.001			0.054			0.173	
			(0.673)			(0.985)			(0.635)			(0.137)	
libpol	(-)			-0.046			-0.035			-0.040			0.010
				(0.257)			(0.519)			(0.533)			(0.852)
Observations		124	124	124	119	119	119	124	124	124	131	131	131
Countries		52	52	52	52	52	52	52	52	52	55	55	55
Hansen test (p-value)		0.284	0.306	0.309	0.229	0.205	0.106	0.146	0.213	0.163	0.230	0.294	0.110
AR (2) test (p-value)		0.493	0.461	0.394	0.455	0.226	0.259	0.207	0.322	0.214	0.278	0.334	0.215
Number of instruments		17	36	36	17	32	32	26	28	28	33	30	30

Source: authors

TABLE IX - Growth, financial intermediation and initial relative output: emerging and frontier countries‡

This table presents the results of estimating the equation (2) for 30 emerging and frontier countries (data averaged over seven 5-year periods from 1975-2007). FD = indicators of financial development (liquid liabilities to GDP, bank assets to GDP, private sector credit to GDP), FDINTER = indicators of financial development interacted with initial relative GDP, prim = primary enrollment ratio, inf = inflation rate, gov = government final consumption expenditure to GDP, trade = trade openness ratio, bmp = black market exchange rate premium, libciv = index of civil liberties and libpol = index of political rights. All variables are introduced in logarithm except inflation (log (1+ inflation rate)). All regressions include time dummies and a constant. The dependent variable is the difference between the domestic economic growth and that of the technology leader $(g - g_l)$. In the table, the initial relative GDP refers to $(y - y_l)$, FD refers to *F*, FDINTER refers to $F * (y - y_l)$ and prim, inf, gov, trade, bmp, libciv and libpol refer to X. The null hypothesis of the Hansen test is that the instruments used are valid (not correlated with the residuals). The null hypothesis of the AR (2) test is that the errors in the first-difference regression exhibit no second-order serial correlation. ‡ p-value in parentheses; * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

	Expected	Liquid liabilities			Private credit			Bank assets		
Variables	sign	Model 4	Model 5	Model 6	Model 4	Model 5	Model 6	Model 4	Model 5	Model 6
initial relative GDP	(+)	**-0.049*** **	**-0.029*** **	**-0.038*** **	**-0.065*** **	**-0.030*** **	**-0.073*** **	**-0.070*** **	**-0.022*** **	**-0.108*** **
		(9.34e-07)	(0.008)	(3.20e-06)	(1.15e-05)	(3.78e-05)	(2.50e-05)	(3.22e-08)	(2.37e-10)	(1.18e-10)
FD	**null**	0.030	-0.129	0.019	0.002	0.061	0.000	0.060	0.128	-0.034
		(0.929)	(0.812)	(0.960)	(0.992)	(0.831)	(0.999)	(0.851)	(0.719)	(0.906)
FDINTER	**(-)**	-0.025	-0.049	-0.027	-0.030	-0.012	-0.033	-0.021	0.003	-0.049
		(0.790)	(0.758)	(0.821)	(0.698)	(0.890)	(0.707)	(0.828)	(0.967)	(0.553)
prim	(+)	0.232	0.005	0.172	0.254	0.250	0.267	0.228	0.171	0.244
		(0.563)	(0.989)	(0.665)	(0.557)	(0.454)	(0.476)	(0.597)	(0.653)	(0.514)
inf	(-)	-0.082	-0.091	-0.083	**-0.112** **	-0.081	**-0.109** **	-0.056	-0.033	-0.068
		(0.203)	(0.434)	(0.186)	(0.021)	(0.195)	(0.014)	(0.216)	(0.540)	(0.163)
gov	(-)	-0.052	-0.113	-0.106	-0.069	-0.055	-0.081	-0.050	-0.063	-0.058
		(0.651)	(0.622)	(0.497)	(0.671)	(0.797)	(0.654)	(0.570)	(0.636)	(0.625)
trade	(+)	0.048	0.023	0.049	0.052	0.025	0.048	0.039	-0.018	0.043
		(0.710)	(0.878)	(0.660)	(0.526)	(0.748)	(0.544)	(0.704)	(0.795)	(0.626)
bmp	(-)	-0.054	-0.089	-0.051	0.072	0.124	0.060	-0.115	**-0.137***	-0.104
		(0.557)	(0.194)	(0.512)	(0.705)	(0.495)	(0.787)	(0.312)	(0.090)	(0.265)
libciv	(-)		0.236			0.119			0.103	
			(0.161)			(0.421)			(0.541)	
libpol	(-)			0.001			-0.028			-0.021
				(0.984)			(0.751)			(0.798)
Observations		86	86	86	85	85	85	86	86	86
Countries		28	28	28	28	28	28	28	28	28
Hansen test (p-value)		0.191	0.182	0.132	0.183	0.135	0.161	0.198	0.171	0.276
AR (2) test (p-value)		0.195	0.452	0.451	0.374	0.438	0.463	0.334	0.265	0.378
Number of instruments		19	19	19	19	19	19	17	19	19

Source: authors

TABLE X - Growth, stock market and initial relative output: emerging and frontier countries[‡]

This table presents the results of the equation (2) for 30 emerging and frontier countries (data averaged over seven 5-year periods from 1975-2007). FD = indicators of financial development (value of listed shares divided by GDP, total shares traded on the stock market exchange divided by GDP, turnover ratio, number of firms listed per-capita), FDINTER = indicators of financial development interacted with initial relative GDP, prim = primary enrollment ratio, inf = inflation rate, gov = government final consumption expenditure to GDP, trade = trade openness ratio, bmp = black market exchange rate premium, libciv = index of civil liberties and libpol = index of political rights. All variables are introduced in logarithm except inflation (log (1+ inflation rate)). All regressions include time dummies and a constant. The dependent variable is the difference between the domestic economic growth and that of the technology leader $(g - g_l)$. In the table, the initial relative GDP refers to $(y - y_l)$, FD refers to F, FDINTER refers to $F * (y - y_l)$ and prim, inf, gov, trade, bmp, libciv and libpol refer to X. The null hypothesis of the Hansen test is that the instruments used are valid (not correlated with the residuals). The null hypothesis of the AR (2) test is that the errors in the first-difference regression exhibit no second-order serial correlation. [‡] p-value in parentheses; * significant at 10% level, ** significant at 5% level, *** significant at 1% level.

	Expected	Capitalization			Total value traded			Turnover			Number of firms listed		
Variables	sign	Model 4	Model 5	Model 6	Model 4	Model 5	Model 6	Model 4	Model 5	Model 6	Model 4	Model 5	Model 6
initial relative GDP	(+)	**0.070*** **	**0.031*** **	**0.033*** **	**-0.013*** **	**0.000*** **	**-0.021*** **	**0.058*** **	**0.105*** **	**0.067*** **	**-0.046** **	**-0.158** **	**-0.080*** **
		(4.65e-09)	(1.88e-09)	(1.75e-09)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.018)	(0.016)	(0.006)
FD	**null**	0.093	0.024	0.057	0.017	-0.003	0.017	0.074	0.161	0.103	-0.023	-0.108	-0.037
		(0.417)	(0.789)	(0.515)	(0.735)	(0.964)	(0.773)	(0.458)	(0.203)	(0.338)	(0.925)	(0.626)	(0.849)
FDINTER	**(-)**	0.022	-0.000	0.006	-0.005	-0.011	-0.006	0.003	0.024	0.009	-0.004	-0.031	-0.009
		(0.557)	(0.971)	(0.808)	(0.756)	(0.603)	(0.719)	(0.907)	(0.465)	(0.741)	(0.957)	(0.657)	(0.875)
prim	(+)	-0.201	-0.339	-0.255	-0.344	**-0.489** **	**-0.371* **	**-0.449** **	**-0.532** **	**-0.444* **	0.082	-0.055	0.160
		(0.531)	(0.185)	(0.350)	(0.137)	(0.042)	(0.087)	(0.041)	(0.019)	(0.068)	(0.869)	(0.897)	(0.716)
inf	(-)	-0.096	-0.082	**-0.101* **	**-0.133** **	**-0.127* **	**-0.127*** **	**-0.132*** **	-0.077	**-0.118** **	-0.086	-0.042	-0.089
		(0.193)	(0.222)	(0.051)	(0.023)	(0.070)	(0.009)	(0.008)	(0.232)	(0.015)	(0.574)	(0.685)	(0.449)
gov	(-)	**-0.227* **	-0.118	-0.165	-0.056	-0.020	-0.018	-0.028	0.028	-0.009	-0.014	0.059	0.001
		(0.093)	(0.479)	(0.309)	(0.648)	(0.891)	(0.840)	(0.793)	(0.762)	(0.917)	(0.958)	(0.781)	(0.994)
trade	(+)	-0.059	-0.043	-0.048	0.004	0.023	0.009	0.048	0.074	0.057	0.107	0.105	0.102
		(0.369)	(0.550)	(0.458)	(0.960)	(0.799)	(0.879)	(0.469)	(0.408)	(0.394)	(0.330)	(0.409)	(0.336)
bmp	(-)	-0.381	-0.261	-0.244	-0.009	0.101	0.012	**-0.120*** **	**-0.135** **	**-0.120*** **	-0.148	**-0.216** **	-0.137
		(0.252)	(0.367)	(0.253)	(0.943)	(0.397)	(0.911)	(0.003)	(0.034)	(0.003)	(0.372)	(0.036)	(0.199)
libciv	(-)		0.039			0.097			0.155			0.020	
			(0.794)			(0.423)			(0.183)			(0.894)	
libpol	(-)			-0.053			-0.017			0.027			-0.030
				(0.493)			(0.799)			(0.725)			(0.757)
Observations		82	82	82	79	79	79	83	83	83	82	82	82
Countries		27	27	27	27	27	27	27	27	27	27	27	27
Hansen test (p-value)		0.220	0.240	0.293	0.671	0.373	0.698	0.876	0.670	0.917	0.173	0.106	0.106
AR (2) test (p-value)		0.665	0.865	0.687	0.395	0.368	0.373	0.354	0.480	0.348	0.931	0.902	0.965
Number of instruments		17	19	19	17	19	19	17	19	19	17	19	19

Source: authors