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Testing the finance-growth link: is there a difference between developed and developing countries?

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Abstract

We revisit the evidence of the existence of a long-run link between financial intermediation and economic growth, by testing of cointegration between the growth rate of real GDP, control variables and three series reflecting financial intermediation. We consider a model with a factor structure that allows us to determine whether the finance-growth link is due to cross countries dependence and/or whether it characterises countries with strong heterogeneities. We employ techniques recently proposed in the panel data literature, such as PANIC analysis and cointegration in common factor models. Our results show differences between the developed and developing countries. We run a comparative regression analysis on the 1980-2006 period and find that financial intermediation is a positive determinant of growth in developed countries, while it acts negatively on the economic growth of developing countries.

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1. Introduction

How much does financial development spur economic growth? Does financial intermediation affect positively the growth rate of the real GDP? Does the finance-growth link work whatever the level of development of countries? A vast empirical literature aims at providing an answer to these questions. Leeper and Gordon (1992), Roubini and Sala-I-Martin (1992), King and Levine (1993a, 1993b) constitute early attempts to tackle empirically these issues. Using cross-section data, the authors conclude in favour of a positive correlation between financial intermediation and productivity growth, as well as between financial development and capital accumulation. Focusing on the issue of causality, other papers find that developed financial markets induce a strong growth and conclude in favour of bilateral causality (see, among others, Jung, 1986; Rajan and Zingales, 1998; Beck *et al*., 2000; Calderon and Liu, 2003). The possibility that financial intermediation may be beneficial to growth is also evidenced in papers using panel data. Two influential papers are Levine *et al*. (2000)'s and Beck and Levine (2003)'s who report general method of moments (GMM) and dynamic panel estimates.

The significant link between finance and growth or the level of economic development is widely accepted, but the statistical evidence is based on the assumption of a *uniform* finance-growth nexus across countries. This hypothesis may be criticised, since there are several channels through which financial development affects economic growth. These channels have been extensively examined in the theoretical literature and include liquidity effects, financial depth, the role of financial intermediaries, and the reduced cost of information (for a survey of theoretical arguments, see Levine, 2005). Thus, in uncovering the effect of financial intermediation or development on the real sector, we should consider the possibility that the finance-growth nexus varies across nations. If we control for slope heterogeneity in a regression that links financial variables to growth, do we find results that confirm the well-established significant and positive finance-growth nexus? Favara (2003) uses dynamic specifications allowing for slope heterogeneity across countries and find results that are in contradiction with the vast literature suggesting that finance and growth are positively linked. Not only does financial development have a small effect on growth, but also the impact is negative for some combination of variables and sample periods. The variables and model used by the author are very similar to Levine *et al*. (2000)'s, but his sample is slightly larger and includes more developing countries over a longer time period. These contradictions can be due to several reasons, such as a questionable use of econometric methodologies. What is at stake here is the robustness of the tests and estimators applied when one uses panel data.

In this paper, we revisit the evidence of the existence of a long-run link between financial intermediation and economic growth, as regards these methodological problems. To this end, we focus on the issue of cointegration between the growth rate of GDP, control variables and three series reflecting financial intermediation. Using panel data, we investigate the finance–growth link in heterogeneous panels, under the assumption of cross-sectional dependence. Our methodology builds on models with an unobserved common factor structure proposed in the econometric literature to test for unit root and cointegration in panel data (see Bai and Kao, 2004; Bai and Ng, 2004; Banerjee and Carrion-I-Silvestre, 2005; Gengenbach *et al.*, 2006; Edgerton and Westerlund, 2006; Hanck, 2006). The basic idea is that non-stationarity in a variable, or a combination of variables, originates from two sources: the presence of cross-sectional common stochastic trends and non-stationary idiosyncratic components. The proposed methodology allows extracting the common factors and idiosyncratic components in the raw data and applying residual-based tests on the defactored data.

The remainder of the paper is organized as follows. Section 2 briefly sketches out the principles of the econometric approach to test for no-cointegration when a panel is characterized by cross-member dependence. In Section 3, we present the data, while Section 4 contains our comments of the results. Section 5 presents comparative estimations of the long-run finance-growth relationship. Section 6 concludes.

2. The econometric methodology

The framework considered in this paper builds on Bai and Ng (2004) and Gengenbach *et al.* (2006). We consider a regression with a dependent variable Y_{it} and an explanatory variable X_{it}:

$$Y_{it} = \alpha + \beta X_{it} + \varepsilon_{it}. \quad (1)$$

The indices *i* and *t* refer to cross-section and time-series observations, with *i=1,…,N* and *t=1,..,T*. Though we assume a bivariate system (with only one explanatory variable) for ease of exposition, the arguments can be extended to a multivariate regression. ε_{it} is an error term that is *iid*. Both the dependent and explanatory variables have a factor structure:

$$Y_{it} = D_{it}^{Y} + \lambda_i^{Y'} F_t^{Y} + e_{it}^{Y}, \qquad X_{it} = D_{it}^{X} + \lambda_i^{X'} F_t^{X} + e_{it}^{X} \quad (2)$$

D_{it}^{Y} and D_{it}^{X} are deterministic unobserved components (individual specific effects and/or individual specific polynomial trend functions). F_t^{Y} and F_t^{X} are two vectors of common factors and λ_i^{Y}, λ_i^{X} are vectors of factor loadings. The common factors describe the behaviour of a 'representative' member of the panel, while the factor loadings capture the distance of an individual from the representative member. e_{it}^{Y} and e_{it}^{X} are idiosyncratic components reflecting the specific behaviour of an individual that is independent of the remainder of the panel.

Both the common factor and idiosyncratic components are assumed to follow autoregressive processes:

$$F_t^{Y} = \Gamma^{Y} F_{t-1}^{Y} + V_t^{Y}, \quad F_t^{X} = \Gamma^{X} F_{t-1}^{X} + V_t^{X}, \quad t = 1, \cdots, T, \quad (3)$$

$$e_{it}^{Y} = \gamma^{Y} e_{it-1}^{Y} + w_{it}^{Y}, \; e_{it}^{X} = \gamma^{X} e_{it-1}^{X} + w_{it}^{X}, \; i = 1, \ldots, N \text{ and } t = 1, \ldots, T, \quad (4)$$

where Γ^{Y}, Γ^{X} are matrices of coefficients and γ^{Y}, γ^{X} are coefficients. V_t^{Y}, V_t^{X}, w_{it}^{Y}, w_{it}^{X} are respectively matrices and vectors of stationary components. Suppose that some of the autoregressive coefficients equal 1. In this case, some of the common factors and/or idiosyncratic components have a unit root. The common factors, the idiosyncratic components or both may drive the non-stationarity in the data. This implies several cases of cointegration: 1/ cointegration between the common stochastic trends of *Y* and *X* alone (that is cross-member cointegration), 2/ cointegration between the *I(1)* idiosyncratic components, 3/ both types of cointegration.

Standard panel unit root and cointegration tests, when applied to series with a factor structure, suffer from severe distortions and theoretical problems (see Banerjee *et al*., 2004; Urbain, 2004; Gengenbach *et al*., 2006; Urbain and Westerlund, 2006). A major caveat is that the distributions of the test statistics are 'contaminated' by the presence of unit root in the factors. Recent papers on panel unit root and cointegration tests suggest working with de-factored

series, which are original series from which the common factors have been removed. The procedure we employ here involves two steps.

Step 1. We first apply a PANIC analysis (panel data analysis to the idiosyncratic and common components) as proposed by Bai and Ng (2004). The approach consists in testing for the presence of a unit root in the common factors and idiosyncratic components separately instead of considering the observations X_{it} and Y_{it} directly. Indeed, if one component is *I(1)* and the other *I(0)*, it could be very difficult to establish that a unit root exists from the original observations, especially if the stationary component is large. In this case, unit root tests on the series X_{it} and Y_{it} can be expected to be oversized while stationarity tests will have no power.

Step 2. (2a). If we detect stochastic trends among the common factors and if all the idiosyncratic components are *I(0)*, then cointegration between X_{it} and Y_{it} occurs only if the *I(1)* common factors of X_{it} cointegrate with the *I(1)* common factors of Y_{it} . In this case, we have cross-member cointegration. The null of no-cointegration is tested using a Johansen type test. *(2b).* Suppose that both *I(1)* common factors and *I(1)* idiosyncratic components are detected. Then cointegration tests are applied separately on the common and idiosyncratic components. We conclude that X_{it} and Y_{it} are cointegrated if the null of no-cointegration is rejected for both the factors and the idiosyncratic components. Tests on the de-factored series (*i.e*. on the idiosyncratic components) are performed using Pedroni (1999, 2004)'s procedures.

3. The data

We consider 89 countries annually observed from 1980 to 2006: 26 OECD, 21 Latin America and Caribbean (LAC), 17 Middle East and Asia (MEA) and 27 Africa. The countries are listed in Table A1, and the sources and definitions of the data are given in Table A2 in Appendix.

Financial intermediation variables. We use four measures of financial intermediation. We first consider real credit by financial intermediaries to private sector as a ratio of real GDP (CREDIT). This variable is used in Levine *et al*. (2000). We further consider the real domestic credit by the banking sector in percentage of the real GDP (CREDBANK). The main difference with the former indicator comes from the fact that it does not isolate credit issued to the private sector. We also consider a measure of banking intermediation (BANKING) as the ratio of deposit money bank domestic assets to the sum of domestic assets from deposit money banks and central bank. The use of such an indicator was first suggested by King and Levine (1993a, 1993b) and captures the ability of commercial banks to find profitable loans more easily than central banks. As in King and Levine (1993a), we finally consider a variable of financial depth (FIDEPTH), which is the ratio of liquid asset of the financial system to real GDP.

Control variables. The set of control variables includes a proxy for initial conditions, that is the lag real GDP per-capita (GDP(-1)), trade openness (OPEN) measured as the sum of exports and imports over GDP, a proxy of relative productivity (PROD) that is the ratio of GDP per worker for a country to the GDP per worker in the group of G7 and finally the ratio of gross domestic investment to GDP (GDI). The choice of these variables is common in the literature that explores the finance-growth nexus. Relative productivity summarizes the contribution of the quality of the factors of production to the long-run growth, while the rate of investment variable is motivated by the fact that a deeper financial intermediation leads to higher factor accumulation.

4. Testing for cointegration between financial intermediation and growth

Regarding the OECD countries, the application of our two-step procedure shows the existence of cointegrating relationships between financial integration and economic growth.[1] This conclusion is valid for the common components, but also when considering the idiosyncratic components. Turning to the developing countries, the main difference with the OECD countries is that we cannot find a long-run relationship between the financial intermediation and growth when considering the idiosyncratic components. This occurs because, either the idiosyncratic component of the endogenous variable is *I(0)* (the case of MEA and African countries), or the idiosyncratic components of the financial variables are themselves *I(0)* (the case of LAC countries). One can consider that common factors refer to the intra-individual dynamics, since they reflect the behaviour of something common to the countries over time. Idiosyncratic components capture the inter-individual differences. According to the above results, the developing countries are not heterogeneous enough—in terms of the financial intermediation channels that are conducive to growth—so that the time series properties of the finance-growth link may be very different from those of disaggregated data if the countries were considered individually. Considering the countries' specificities does not provide any information on the existence of a long-run relationship. Conversely, in the developed countries, there are several elements that distinguish the countries from each other. Some of these elements are of a microeconomic nature. For instance, the success of the link between financial intermediation and growth depends upon the capacities of individual firms to mobilize the available funds and transform them into profitable and innovative projects that promote growth (see, for instance, Rajan and Zingales, 1998). Other differences among the countries come from differences in technology, profit rates, investment and demand opportunities. These create differences in the amount of financial need needed by the firms (see Demirgüç-Kunt and Maksimovic, 1998). In the developing countries, such differences are not acute since, for some of them, they rely on loans by foreign donors (the domestic banking markets are characterized by severe market frictions).

5. Comparing the estimates of the developed and developing countries

We now estimate the long-run relationships. We split the countries into two groups on the basis of our findings. We cannot apply the same estimators to the groups of developed and developing countries. Indeed, for the OECD countries we find cointegration relationships between both the common factors and idiosyncratic components, while cointegration is only found in the common factors for the group of MEA, LAC and African countries. In light of our discussion in the previous paragraph, for the OECD countries, we thus need an estimator involving aspects of both homogeneous behaviours (due to common factors) and heterogeneous behaviours (due to idiosyncratic components). In this respect, for OECD countries, we apply the pooled mean group (PMG) method proposed by Pesaran *et al.* (1999). It restricts the long-run coefficients to be equal across countries, but allows for short-run coefficients and variances to differ across groups. This amounts to assuming that, though the level of financial intermediation has similar effects in the long run, there are heterogeneous adjustments across countries to changes in the level of financial intermediation. For the MEA, African and LAC countries, as a consequence of our previous discussion, pooling the data yields enough information about the link between growth and financial intermediation. We

[1] To save space, results relating to the application of the PANIC analysis, Johansen-type test and panel cointegration tests are not reported but are available at: http://economix.u-paris10.fr/docs/302/Cointegration_tests_results.pdf.

thus apply the generalized method of moments (GMM) usually employed in dynamic panel models.

Let us first comment the results relating to OECD countries. Estimates of the long-run coefficients based on the PMG estimator are displayed in Table 1. Note that, although we consider short-run coefficients in the regressions, our main interest is on the long-run relationships. The short-run coefficients are considered here since they influence the estimates of the long-run coefficients. We control for the cross-sectional dependence by demeaning the data, taking each variable in deviation from its cross sectional mean. The estimates suggest that in three models out of four, the relationship between financial intermediation and growth is positive, though the elasticities seem small in magnitude. Private credit is significant only at the 10% level of confidence in model 2, but insignificant in model 4. The impact of financial depth is increased when other macroeconomic variables are appropriately controlled for. We, however, find a negative impact of banking intermediation in model 1. Favara (2003) also finds that, when using panel estimators with heterogeneous slope coefficients, the relationship between finance and growth can sometimes be puzzlingly negative. One explanation of the negative sign of the variable BANKING may be that, the size of the banking system inadequately captures the beneficial effect of financial intermediary development on growth. The financial depth seems more appropriate to measure the channels through which finance positively affects growth in the developed countries, namely the amelioration of information frictions and the reduction of transaction costs. Another explanation of the negative sign may be that the OECD sample is composed of a majority of countries with a market-based financial development. So, BANKING is not the appropriate variable.

Comparing the usual estimates found in the literature to ours, we observe that the latter are much smaller in magnitude. For instance, using a GMM estimator, Levine *et al*. (2000) obtain an elasticity of 1.52 for private credit, 2.95 for liquid liabilities and 2.43 for banking intermediation. We checked that our findings are not due to misspecifications. The models pass the h-test. Indeed a p-value greater than 0.05 indicates no significant differences between the PMG and mean group estimator, thereby suggesting that our assumption of long-run homogenous coefficient is valid. Also, the lags in our models were appropriately selected in an ADRL model using Akaike criterion. The higher magnitude of the elasticities of the financial variables obtained in the literature may come from the fact that, assuming homogeneous impact of finance on growth across countries in a dynamic model where units are heterogeneous, yields upward biased estimated. This is not to say that those results are false, but the estimates are not robust to the estimators used and the presence of idiosyncratic components can lead to misleading conclusions.

The non-financial variables, when significant, have the expected signs. We find a positive impact of the degree of openness on growth, a positive impact of productivity and of the investment rate. The lagged real GDP shows a convergence phenomenon between the OECD countries.

We now turn to the non-OECD countries. Tables 2 and 3 contain the results for the developing countries. We apply a GMM system estimation by combining the regressions in differences with the regressions in levels, as suggested in Arellano and Bover (1995) and Blundell and Bond (1998). The instruments for the regressions in levels are the lagged differences of the endogenous and explanatory variables, while the instruments in the regressions in differences are the lagged values of the variables in levels. The validity of the instruments is tested using the Sargan test for over-identifying restrictions. We use a heteroskedasticity and autocorrelation consistent covariance matrix. As is seen in the Tables all the regressions pass the Sargan test, meaning that our instruments are valid. A striking

difference of these regressions compared to those of the developed countries is the negative impact of the financial intermediation variables on growth in many regressions, whether or not the elasticities are statistically significant. The negative influence of the financial variables on the real economy in the developing countries is frequent in the empirical literature. This finding has received different interpretations. For instance, De Gregorio and Guidotti (1995) find a long-run negative correlation between financial development and growth in a panel data for Latin America and interpret their result as the effects of liberalization experience of the financial markets in these countries. Indeed, as noticed by the authors, during the 1970s and 1980s, Latin American financial markets were exposed to extreme conditions. In this context, according to De Gregorio and Guidotti (1995), their results "*may reflect the effects of experiments of extreme liberalization of financial markets followed by their subsequent collapse*". Berthelemy and Varoudakis (1998) find a similar negative correlation on a panel of 82 countries over the period from 1960 to 1990. They proposed an interpretation in terms of threshold effects in the finance-growth relationship, the threshold being associated with the existence of multiple equilibria. More specifically, two stable equilibria exist: a low equilibrium such that slow growth is coupled with a weak-banking sector, and a high equilibrium such that strong growth is associated with developed financial intermediation. Between these two equilibria, an unstable equilibrium exists which determines the threshold effect of financial intermediation on economic growth. Finally, our results highlight differences among the developing countries. The financial variables are very often significant for the LAC and MEA countries (in three regressions out of four), but quite never significant for the African countries (only one regression). The financial depth seems to be the most determinant financial variable that explains the link between financial intermediation and growth.

6. Conclusion

In this paper, we have re-examined the question of the impact of financial intermediation on economic growth by considering the implications of cross sectional dependence in panel data. We found that this impact is explained by cross-country cointegration in the developing countries, while specific country effects also matter for the developed ones. This finding has some implications in terms of estimation. For the former, pooled-based panel data methods are indicated, while for the latter estimators allowing for possible heterogeneities among the countries are more appropriate. A comparative analysis of the regressions shows a major difference between both categories of countries. While financial intermediation variables positively influence growth in the OECD countries, they enter negatively in the finance-growth relationship for the developing countries. This calls for caution when considering panel data studies where all the countries are included in a same sample.

The present analysis can be extended in several ways. It would be interesting to consider the implications of the common-idiosyncratic decomposition in terms of regression analysis and not only in terms of cointegration testing procedures as we did here. Also, examining the issue of causality in the framework of common factor models would seem a promising approach.

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Table 1. PMG estimator – Long-run coefficients

Sample 1: OECD countries

	Model 1				*Model 2*				*Model 3*				*Model 4*			
	Coef	t-ratio	h-test	p-val	Coef	t-ratio	h-test	p-val	Coef	t-ratio	h-test	p-val	Coef	t-ratio	h-test	p-val
GDP_{-1}	-0.016*	-5.27	2.39	0.12	-0.02*	-8.56	0.01	0.92	-0.072*	-18.36	3.69	0.05	-0.069*	-5.56	1.67	0.20
PROD	-	-	-	-	-	-	-	-	0.072*	28.49	4.36	0.04	0.024*	2.89	0.87	0.35
GDI	-	-	-	-	-	-	-	-	0.072*	20.73	0.25	0.61	0.011	1.34	0.96	0.33
OPEN	-	-	-	-	-	-	-	-	0.048*	21.51	0.08	0.77	0.005**	1.705	0.99	0.32
BANKING	-0.057*	-3.78	0.19	0.66	-	-	-	-	-	-	-	-	-	-	-	-
FIDEPTH	0.08*	3.27	0.16	0.69	0.011*	4.99	0.17	0.68	0.037*	20.01	0.39	0.53	-	-	-	-
CREDIT		-	-	-	0.002**	1.957	1.61	0.20	-	-	-	-	0.002	0.89	1.00	0.32

Note: * Statistically significant at the 5% level of significance. ** Statistically significant at the 10% level of significance. Estimation is on demeaned data. The h-test is constructed as equivalence between the pooled mean group and the mean group estimates (see Pesaran *et al*. 1999). Probability values are provided for this test. A value less than 0.05 leads to reject homogeneity of cross-section's long-run coefficients.

Table 2. GMM system estimator – Coefficients of the model expressed in first-differences

Samples 2 and 3: Middle East and Asian countries, African countries

	Model 1				*Model 2*				*Model 3*				*Model 4*			
	MEA		AFRICA		MEA		AFRICA		MEA		AFRICA		MEA		AFRICA	
	Coef	t-ratio	Coef	t-ratio	Coef	t-ratio	Coef	t-ratio	Coef	t-ratio	Coef	t-ratio	Coef	t-ratio	Coef	t-ratio
Constant	0.006*	1.82	0.004	0.42	0.009**	1.92	0.0013	0.76	0.013*	6.05	0.0032	0.06	0.013$*	6.17	7.05E-5	0.016
$GROWTH_{-1}$	0.29*	2.91	0.08	0.60	0.258*	2.51	0.02	0.20	0.135**	1.68	-0.006	-0.08	0.104	1.33	-0.0001	-0.001
PROD	-	-	-	-	-	-	-	-	0.186	3.74	0.125*	3.35	0.206*	3.80	0.16*	3.73
GDI	-	-	-	-	-	-	-	-	0.023	0.517	0.016	0.541	0.026	0.562	0.018	0.64
OPEN	-	-	-	-	-	-	-	-	0.039	1.16	0.109*	2.91	0.036	1.16	0.104*	2.68
BANKING	0.024	0.46	0.04	1.49	-	-	-	-	-	-	-	-	-	-	-	-
FIDEPTH	-0.142*	-2.52	-0.10*	-2.53	-0.147*	-2.49	-0.04	-1.53	-0.08*	-2.12	-0.07**	-1.68	-	-	-	-
CREDIT	-	-	-	-	-0.0001	-0.107	-0.04	-1.30	-	-	-	-	-0.009	-0.649	-0.03	-1.49
DUM_9798	0.019	0.66	-	-	-0.003	-0.08	-	-	-0.02**	-1.87	-		-0.024*	-1.96		
DUM_9100			-0.005	-0.279	-	-	-	-	-	-	0.005	0.824				
	Sargan	p-value	Sargan	p-value	Sargan	p-value	Sargan	p-value	Sargan	p-value	Sargan	p-value	Sargan	p-value	Sargan	p-value
	0.0004	0.99	0.0007	0.99	0.0003	0.99	0.016	0.99	0.0003	0.99	0.0026	0.99	0.0004	0.99	0.002	0.99

Note: * Statistically significant at the 5% level of significance. ** Statistically significant at the 10% level of significance. For the Sargan test, the null is that the instruments are not correlated with the estimated residuals.

Table 3. GMM system estimator – Coefficients of the model expressed in first-differences

Sample 4: Latin American and Caribbean countries

	Model 1		*Model 2*		*Model 3*		*Model 4*	
	Coef	t-ratio	Coef	t-ratio	Coef	t-ratio	coef	t-ratio
Constant	0.002*	2.42	0.003*	3.09	0.003*	2.72	0.003*	2.95
$GROWTH_{-1}$	0.228*	2.20	0.233*	2.85	0.172	1.62	0.193*	2.59
PROD	-	-	-	-	0.09*	4.13	0.101*	4.49
GDI	-	-	-	-	0.068*	2.87	0.074*	2.97
OPEN	-	-	-	-	0.077*	3.13	0.066*	2.78
BANKING	0.07*	3.48	-	-	-	-	-	-
FIDEPTH	-0.032*	-3.13	-0.019*	-0.537	-0.2*	-2.40	-	-
CREDIT	-	-	-0.022*	-2.50	-	-	-0.031	-1.06
	Sargan	p-value	Sargan	p-value	Sargan	p-value	Sargan	p-value
	0.0008	0.99	0.0006	0.99	0.0006	0.99	0.0006	0.99

Note: See footnote Table 6.

APPENDIX

Table A1. List of countries

OECD	*Latin America and Caribbean*	*Middle East and Asia*	*Africa*
Australia	Argentina	Bangladesh	Burundi
Austria	Bolivia	India	Cameroon
Belgium	Brazil	Indonesia	Central Africa
Canada	Chile	Iran Islamic Republic	Chad
Denmark	Colombia	Israel	Congo Republic
Finland	Costa Rica	Jordan	Benin
France	Dominican Republic	Korea	Ethiopia
Germany	Ecuador	Malaysia	Gabon
Greece	El Salvador	Nepal	Ghana
Iceland	Guatemala	Pakistan	Côte d'Ivoire
Ireland	Haiti	Papua New Guinea	Kenya
Italy	Honduras	Philippine	Lesotho
Japan	Jamaica	Singapore	Madagascar
Korea	Mexico	Sri Lanka	Malawi
Luxembourg	Nicaragua	Syria	Mali
Mexico	Panama	Thailand	Mauritius
New Zealand	Paraguay		Morocco
Norway	Peru		Niger
Portugal	Trinidad and Tobago		Nigeria
Spain	Uruguay		South Africa
Sweden	Venezuela		Zimbabwe
Switzerland			Rwanda
The Netherlands			Senegal
Turkey			Sierra Leone
United Kingdom			Togo
USA			Uganda
			Zambia

Table A2. Definition of variables and sources

Financial variables
Financial depth. Ratio of liquid asset of the financial system to GDP. As in King and Levine (1993), we choose M3 or M2 if M3 is not available. The ratio is computed as follows: $\frac{0.5 \times \left(M3_t / CPI_t^e + M3_{t-1} / CPI_{t-1}^e\right)}{GDP_t / CPI_t^a}$ where CPI^e and CPI^a are end-of-period and average CPI and GDP is nominal GDP in local currency. Sources : - Nominal GDP: World Development Indicators (WDI) and International Financial Statistics (IFS). - M2: WDI for the developing countries. For UK and the European countries, we use M3 from Eurostat statistics until 1998 (M3 from 1998 to 2006 is based upon authors' calculation). - CPI end of period: WDI and IFS. - Average CPI: computed from the series of end of period CPI.
Banking intermediation. Ratio of deposit money bank domestic assets to deposit money bank domestic assets plus central bank domestic assets. Source: IFS. Numerator = line 22 and denominator = sum of lines 22 and 12.
Credit to private sector (as a ratio of GDP). Domestic credit to private sector in percentage of GDP. Source: WDI.
Domestic credit by banking sector in % of GDP. The ratio is computed as follows: $\frac{0.5 \times \left(CRED_t / CPI_t^e + CRED_{t-1} / CPI_{t-1}^e\right)}{GDP_t / CPI_t^a}$ where *CRED* is credit by banking sector, CPI^e and CPI^a are end-of-period and average CPI and GDP is nominal GDP in local currency. Sources : - CRED = line 22D (IFS). - CPI end of period: WDI and IFS. - Average CPI: computed from the series of end of period CPI. - Nominal GDP: World Development Indicators (WDI) and International Financial Statistics (IFS).
Control variables
Degree of openness. Sum of real exports and real imports as share of real per-capita GDP. Sources: WDI and OECD.
Gross domestic investment (as share of GDP). Source: IFS and WDI.
Relative productivity. Ratio of GDP per worker for a country to the GDP per worker in Group of Seven (G-7). Source: we collect data on labour force and GDP for each country from the Global Development Finance. We compute the ratio of GDP to labour force to obtain the GDP per worker.
Real per-capita GDP. To obtain the per-capita GDP, we use a population series from the World Bank Development Indicators. To compute the real value, we use the GDP deflator and the CPI if the GDP deflator is not available. Source: WDI.
Dependent variable
Growth. First-difference of *log* of the real GDP.