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Abstract

The aim of this paper is to investigate the long run relationship between the development of banks and stock markets and economic growth. We make use of a Johansen-based panel cointegration methodology allowing for cross-country dependence to test the number of cointegrating vectors among these three variables for 5 developing countries. In addition, we test the direction of potential causality between financial and economic development. Our results conclude to the existence of a single cointegrating vector between financial development and growth and of causality going from financial development to economic growth. We find little evidence of reverse causation as well as bi-directional causality. We interpret this as evidence supporting the significance of financial development for economic development although banks and stock markets may have different effects depending on the level of economic development.

JEL-Code: E440, G200, O430.

Keywords: banks, stock markets, economic growth, panel cointegration, causality.

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1 Introduction

One hundred years ago, Schumpeter (1912) already addressed the relation between financial development and economic growth. He asserted that a well-functioning financial system should promote economic growth through the selection of the productive investments which are the most likely to be successful and the efficient allocation of resources (via bank credits) to these innovative technologies. Since then, the financial system has significantly evolved. Access of private companies to funding through financial markets has been improved and stock markets have been established in almost any part of the world. New financial products have also been created which allow better risk diversification and allocation. Although all these improvements may have had a positive impact on economic development in many countries through better resource allocation and risk diversification, recent events have also shown that misused financial innovations can have adverse effects on short run economic stability. Moreover, measures taken to reestablish systemic stability in the wake of the recent subprime crisis have important implications for economic development policies. If financial development facilitates long run economic development, expanding the banking system and stock markets in developing countries might help promote their long run economic growth. One central question is then to investigate whether financial development has had a positive impact on economic growth in the long run. In addition, it is also of prime importance to determine whether the structure of the financial system is relevant. In other words, we want to know whether banks and stock markets can both promote long run economic development.

The goal of this paper is to analyze the potential link between financial development and economic growth in the long run using data from 5 developing countries (Malaysia, Mexico, Nigeria, Philippines and Thailand) between 1977 and 2007. While this question has already been quite extensively investigated in the literature, the contribution of this paper with respect to existing studies is the combination of the following four points within a single framework. First, instead of focusing on the development of the banking system or financial markets alone, this paper integrates both aspects of financial development to highlight the potentially different roles and implications on the growth of financial intermediaries such as banks and financial markets. Second, the use of a panel-based cointegration analysis allows us to investigate the potential existence of a long run equilibrium and causality between both aspects of financial development and economic growth and it

reduces the well-known size and power distortions which arise in time series analyses with short time dimension. Third, while a few papers have already used cointegration analysis in panel data in the same context, our study is the first to apply these techniques to both banking system and financial markets simultaneously. Fourth, our paper is also innovative in the sense that we use a Johansen system approach which allows us to take into account and test for more than a single cointegrating relation among all the variables. Besides, the Groen and Kleibergen (2003) procedure that we implement in this paper accommodates contemporaneous cross-country correlation, which also represents an extension with respect to the existing literature.

The rest of this paper is structured as follows: in the first section, we propose a review of the literature which summarizes current theoretical and empirical research on the link between finance and growth. We then present our data and methodology as well as the results from our empirical investigation.

2 Literature review

In contrast with Schumpeter (1912), several authors argue that if a relationship exists between financial development and economic growth, it is of the reverse direction i.e. financial intermediation occurs as a response to economic growth (see for instance Robinson (1952)).

However, the development of endogenous growth models[1] in the 1980's provided theoretical explanation of the effects of financial development on capital accumulation and economic growth in the long run. Other models focus on the potential impact of financial intermediation on technological innovation and productivity improvement to derive a role for banks and stock markets in promoting long run economic growth. Financial intermediaries allow the investors to decrease the idiosyncratic and liquidity risk that they would bear in the absence of banks (Diamond and Dybvig (1983), Greenwood and Jovanovic (1990) and Bencivenga and Smith (1991)). Greenwood and Smith (1997) come to the same conclusion and extend it to the case of stock markets. Levine (1991) shows that stock markets can also be used to diversify idiosyncratic and liquidity risk through the exchange of illiquid and liquid assets on financial markets.

[1]See among others the models of Romer (1986), Lucas (1988), Aghion and Howitt (1992), Rebelo (1991) or Romer (1990)

While this literature emphasizes the potential causal relation from financial development to economic growth, several studies have put forward a bi-directional causal relationship. Financial development may support economic growth and economic growth is a prerequisite for the formation of a financial system. Using models in which both growth rates and financial development are endogenously determined, Greenwood and Jovanovic (1990) and Greenwood and Smith (1997) define a process which goes from an early stage of low economic growth and inefficient financial system to well-developed financial intermediaries and higher growth rates. Berthelemy and Varoudakis (1996) find the same reciprocal relation between economic growth and banking system development.

From the empirical point of view, many studies have investigated the potential links and causality directions between financial development and economic growth by using varied econometric techniques. The empirical literature on finance and economic development has mainly developed around four econometric approaches: from cross-sectional regressions to panel cointegration through panel and time series estimations.

A large part of the cross-sectional literature focuses on the relation between the banking system and economic growth. King and Levine (1993a), King and Levine (1993b), Levine (1999) and Levine et al. (2000) support the idea of a leading role of banking development for economic growth. Gregorio and Guidotti (1995) and Deidda and Fattouh (2002) show that the effect of financial development on economic growth varies with the level of economic development.

Some authors also investigate the potential role of financial markets in promoting economic growth by using a cross-sectional approach. Atje and Jovanovic (1993) study both the effect of banks and financial markets on economic growth. They conclude to a significantly positive effect of stock market development on economic growth whereas their findings regarding the banking system are not conclusive. Harris (1997) invalidates the results of Atje and Jovanovic (1993) and finds at best a weak relation between stock market development and economic growth. Unlike Atje and Jovanovic (1993), Levine and Zervos (1998) find that both banking system development and stock market liquidity are significantly correlated with future economic growth, suggesting that financial intermediaries and equity markets may provide different and complementary services which eventually help to spur economic development.

Following the cross-sectional literature on finance and economic growth,

panel-based analyses have attempted to solve potential bias of cross-sectional regression arising from unobservable country specific effects. In this context, Levine et al. (2000) use the dynamic panel estimators proposed by Arellano and Bond (1991) and Arellano and Bover (1995). Levine et al. (2000) find a positive correlation between financial intermediaries development and economic growth. Beck and Levine (2004) and Rousseau and Wachtel (2000) find that both stock markets and banks have a positive impact on growth. Unlike most of panel-based studies, Dawson (2003) finds no relationship between financial development and economic growth using a fixed and random effect panel estimator framework.

Another part of the empirical literature makes an extensive use of time series methodologies. This approach not only permits to test causality direction but it also allows to investigate the long run relationship between finance and economic growth. Demetriades and Hussein (1996) finds bi-directional links between finance and economic growth in most cases. Neusser and Kugler (1998) confirm the ambiguity of the causality between finance and growth and the great variability of the results across countries. Luintel and Khan (1999) support the bi-directional hypothesis. On the other hand, Xu (2000) shows strong evidence that financial intermediaries development induces economic growth. Arestis et al. (2001) study potential cointegration between economic growth, stock market and banking development. They show that both banks and stock markets have a positive impact on long run economic growth while the effect of banks is stronger. The results of Caporale et al. (2004) support the hypothesis that financial development fosters economic growth mainly through stock markets.

Recently, a few studies have investigated the relation between finance and growth using panel cointegration techniques. These techniques can notably solve the problem of the small size of samples. Using measures of banking and economic development, Christopoulos and Tsionas (2004) test for cointegrating vectors in a panel of 10 countries. They find a single cointegrating vector and conclude to a long run impact of financial development on economic growth. Apergis et al. (2007) conclude to a bi-directional causality between financial intermediaries development and economic growth.

Another part of the recent literature concludes to the existence of an optimal level of financial development and different effect of financial development on economic growth at different level of development of the financial sector. Graff and Karmann (2006) define the idea of "balanced" financial development conditional on the general level of development of a country

and conclude that financial activity can be both too low and too high. Shen et al. (2011) show that there exists a threshold above which financial development may be detrimental to economic growth. Rioja and Valev (2004a) show that the effect of financial development on economic growth may differ according to their level of financial development. They find that banking system development has a positive impact on economic growth only once it has reached a certain threshold although it is relatively smaller for countries with the group of countries with the highest level of financial development.

3 Data and methodology

3.1 Data

To test the potential link between financial development and economic growth, we use 2 different indicators of the banking system and 3 variables for financial markets. Following the existing empirical literature, we focus on the two main variables which are used for the development of financial intermediaries, that are liquid liabilities (LL) over GDP and private credit by deposit money banks over GDP (PRIV). Although the relevance of liquid liabilities as a measure of the development of the banking system is questioned by some scholars (see for instance Gregorio and Guidotti (1995) or Levine (1997) for a discussion of these financial indicators), we nevertheless choose to include it in our analysis because of its frequent use in the literature. For financial markets, we use 3 indicators which are the stock market capitalization over GDP (MKTCAP), the stock market turnover ratio (TURN) and the stock market value traded over GDP (VALTRAD). MKTCAP is a measure of the size of the financial markets relative to the GDP. The other two indicators are measures of the liquidity of the markets. The turnover ratio is measured as the ratio of the value of the trades of domestic shares divided by the value of listed domestic shares. VALTRAD is computed as the ratio of the value of the trades of domestic shares over GDP. In contrast with TURN which measures liquidity with respect to the size of the financial markets, VALTRAD captures liquidity on an economywide basis. Economic growth is measured as the logarithm of real GDP per capita in local currency (GDP). All financial development indicators are retrieved from the Beck et al. (2009) database which is available from the World Bank's website. Real GDP per capita comes from the World Development Indicator database of the World

Bank. Countries are selected on the basis of data availability for all the 6 variables between 1977 and 2007 (31 yearly observations). Based on this selection criterion, our database is composed of five countries: Malaysia, Mexico, Nigeria, Philippines and Thailand.[2] These countries share the additional characteristic of all being developing countries for which the question of the development of the financial system as a source of economic development is of crucial importance.

3.2 Unit root test

We test the order of integration of our 6 variables using the Pesaran (2007) approach to panel unit root testing. This method allows for heterogeneity in autoregressive coefficients across individuals and cross-sectional dependence through a single common factor which can be appropriately proxied by the cross-sectional mean of the endogenous variables y_{it}[3] and its lagged values. Individual test statistics $t_{\phi_i=0}$ can be computed on the basis of the following cross-sectionally augmented Dickey Fuller (CADF) regression for an AR(p) error structure (Δ denotes first differences):

$$\Delta y_{it} = a_i + \phi_i y_{it-1} + c_i \bar{y}_{t-1} + \sum_{j=0}^{p} d_{ij} \Delta \bar{y}_{t-j} + \sum_{j=1}^{p} \delta_{ij} \Delta y_{it-j} + e_{it}. \qquad (1)$$

Panel unit root tests can then be implemented on the basis of the individual CADF test statistics. The cross-sectionally augmented version of the Im et al. (2003) test (CIPS) can simply be computed as:

$$CIPS = \frac{1}{N} \sum_{i=1}^{N} t_{\phi_i=0} \qquad (2)$$

where t_{ϕ_i} are the individual CADF statistics.

[2]Estimation of cross-country correlations requires the time series dimension of the panel to be sufficiently large. Data availability for developing countries led us to consider the 5 countries which are mentioned in the paper. We performed the analysis with additional countries (e.g.Argentina, Brazil, Chile, India, Peru, Venezuela) and with more control variables (e.g investment, government expenditures, inflation, trade openness) but these attempts failed to achieve convergence."

[3]He defines $\bar{y}_t = \frac{1}{N} \sum_{j=1}^{N} y_{jt}$.

To avoid too strong an influence of extreme values, Pesaran (2007) proposes to use a truncated version of the CIPS statistics ($CIPS^*$) where $t_{\phi_i=0}$ is replaced by $t^*_{\phi_i=0}$[4]:

$$\begin{cases} t^*_{\phi_i=0} = t_{\phi_i=0} & if \ -K_1 < t_{\phi_i=0} < K_2 \\ t^*_{\phi_i=0} = -K_1 & if \ t_{\phi_i=0} \leq -K_1 \\ t^*_{\phi_i=0} = K_2 & if \ t_{\phi_i=0} \geq K_2 \end{cases} \tag{3}$$

Pesaran (2007) reports tables with simulated critical values for CIPS and $CIPS^*$.

The small sample properties of several common factor unit root tests have been studied by Gengenbach et al. (2010) who show that the power and size of the Pesaran (2007) test are satisfactory but might be distorted if more than one factor generates the cross-country dependence. We nevertheless keep this method as a sufficient approximation to guide our decision regarding degree of integration of the variables used in our analysis. Evidence of non-zero orders of integration would lead us to apply a cointegration analysis to our variables.

3.3 Cointegration test

We perform the Groen and Kleibergen (2003) cointegration test and estimation using all potential combinations of banking, stock markets and economic development indicators.[5] This allows us to test for the potential number of long run relationships between them in contrast to the residual-based tests which assume a single cointegration vector. In addition, the Groen and Kleibergen (2003) methodology is a panel Johansen-based approach which also takes into account potential cross-country contemporaneous correlation and which can be used to test the homogeneity of cointegrating vectors. As a result, joint tests (and causality tests as described in Section 3.4) should have more power than tests applied to individual countries and the joint ML estimates should be fully efficient (given the model). Groen and Kleibergen (2003) define a full-system VECM model with unrestricted constant and

[4]The values of K_1 and K_2 are chosen such that the probability that individual test statistics lie within the interval $[-K_1,K_2]$ is high (Pesaran (2007) uses 99.99%)

[5]We decided to work in tri-variate systems instead of including all variables in the analysis for mainly two reasons. First, some financial variables show high levels of correlations which may result in collinearity problems. In addition, we see respectively the two banking and the three stock market series as different indicators of a same variable.

higher order dynamics as:

$$\Delta Y_t = \lambda + \begin{pmatrix} \Pi_{11} & \dots & \Pi_{1N} \\ \vdots & \ddots & \vdots \\ \Pi_{N1} & \dots & \Pi_{NN} \end{pmatrix} Y_{t-1} + \Gamma W_t + \epsilon_t = \lambda + \Pi Y_{t-1} + \Gamma W_t + \epsilon_t$$

where $Y_{t-1} = (y'_{1t-1} \dots y_{Nt-1})'$, Π_{ur} is $Nk \times Nk$ (k is the number of variables), λ is a vector of constants, W_t contains lagged differences of Y_t and ϵ_t is assumed to be IID $N(0, \Omega)$.

Their test is based on the restricted version of the model with Π being restricted to be a block-diagonal matrix denoted by Π_A and in which cross-unit cointegration is ruled out.

$$\Delta Y_t = \lambda + \begin{pmatrix} \Pi_1 & 0 & \dots & 0 & 0 \\ 0 & & \ddots & & 0 \\ 0 & 0 & \dots & 0 & \Pi_N \end{pmatrix} Y_{t-1} + \Gamma W_t + \epsilon_t = \lambda + \Pi_A Y_{t-1} + \Gamma W_t + \epsilon_t,$$

where in our context, Y_t is composed of GDP and one indicator of both banking and financial market development (in this order).

In the presence of within country cointegration, the blocks on the main diagonal of Π_A have reduced rank r ($< k$) and can be expressed as $\Pi_i = \alpha_i \beta'_i$, with α_i and β_i being $k \times r$ matrices. The block-diagonal matrix with $\alpha_i \beta'_i$ being the i^{th} block on the main diagonal has rank $N \times r$ and will be denoted by Π_B. In addition, the homogeneity condition $\beta_i = \beta, \forall i$ can also be considered. With this additional restriction imposed, the matrix Π_B will be denoted by Π_C. Groen and Kleibergen (2003) show that the restriction $\beta_i = \beta$ for $i = 1 \dots N$ can be tested by using the following likelihood ratio test:

$$LR(\Pi_C | \Pi_B) = 2[l_{max}(\Pi_B, \Omega) - l_{max}(\Pi_C, \Omega)] \Rightarrow \chi^2((N-1)r(k-r))$$

where Ω is the covariance matrix of ϵ_t.

In order to test the potential number of cointegrating vectors among the N variables by using a likelihood-ratio test as in Johansen's framework, we need estimates of the matrices Π_A, Π_B (and Π_C if we are interested in the

hypothesis of common cointegrating vectors) as well as estimates of Ω under the rank restriction of Π_B from 0 to k-1 . Groen and Kleibergen (2003) propose a GMM-based procedure to obtain such consistent maximum-likelihood estimates. This procedure consists in applying a stepwise maximization of the log-likelihood given in turn a consistent estimate of the matrix Π (for the imposed restriction on its rank) and Ω. Once maximum-likelihood estimates are obtained from the iterative procedure described by Groen and Kleibergen (2003), the (common-to-all-units) number of cointegrating vectors can be tested using the likelihood ratio statistics:

$$LR(\Pi_B|\Pi_A) = T\left[ln|\hat{\Omega}(\hat{\Pi}_B)| - ln|\hat{\Omega}(\hat{\Pi}_A)|\right]$$

Groen and Kleibergen (2003) prove that this test statistic is asymptotically distributed as (for T $\to \infty$):

$$LR(\Pi_B|\Pi_A) \Rightarrow \sum_{i=1}^{N} tr\left(\int dB_{k-r,i}S_i'\left[\int S_iS_i'\right]^{-1}\int S_i dB_{k-r,i}'\right),$$

where $B_{k-r,i}$ is a (k-r)-dimensional Brownian motion for individual (country) i with identity covariance matrix and S_i is (k-r)-dimensional for each individual i ($S_i(t) = (B_{k-r,i}(t) - \int_0^1 B_{k-r,i}(t)dt, t - \int_0^1 tdt)$.

Critical values are obtained following the Monte Carlo simulation procedure proposed by Johansen (1995) as suggested by Groen and Kleibergen (2003). For each individual i, $tr\left(\int dB_{k-r,i}S_i'\left[\int S_iS_i'\right]^{-1}\int S_i dB_{k-r,i}'\right)$ is approximated by $tr\left(\sum_{t=1}^{T}\epsilon_t Z_t'\left[\sum_{t=1}^{T} Z_tZ_t'\right]^{-1}\sum_{t=1}^{T} Z_t\epsilon_t'\right)$ where ϵ_t is independent $N_{k-r}(0,I)$. Z_t is defined as $(X_{t-1}' - \bar{X}', t - \frac{1}{2}(T+1))'$ where X_t is a $(k-r-1)$ dimensional random walk ($X_t = X_{t-1} + \epsilon_t$). Simulated random walks are independent "within" each individual but are correlated "between" individuals according to the covariance matrix Ω obtained in the test and estimation procedure. We use T=400 and repeat the procedure 5000 times to obtain critical values.

3.4 Causality test

Once the number of cointegrating vectors is determined, we test (long-run) causality using the framework proposed by Toda and Phillips (1993, 1994) to

determine whether financial development has an impact on economic growth in the long run and to discriminate between potentially different impacts of financial intermediaries and financial markets. The reverse causality from economic growth to financial development is also tested. If the variables are not stationary, Sims et al. (1990) and Toda and Phillips (1993) show that Wald test statistics for causality from a VAR in levels have nonstandard asymptotic distributions which are functions of nuisance parameters. It is shown that test statistics are chi-square distributed under a set of assumptions in terms of the number of cointegrating vectors and rank of submatrices, which renders causality tests almost unpracticable in VAR in level with integrated variables. In an ECM framework, Mosconi and Giannini (1992) and Toda and Phillips (1993, 1994) show that, under a set of hypotheses, causality likelihood ratio and Wald tests in a cointegrated system are chi-square distributed and more tractable than under a VAR in level setting. Toda and Phillips (1994) propose a test procedure for causality in this context. They start with the following ECM representation where $J(L)$ denotes a p-th order matrix lag polynomial:

$$\Delta Y_t = J(L)\Delta Y_{t-1} + \alpha\beta' Y_{t-1} + u_t.$$

For instance to test the causality from the last n_3 variables to the first n_1 variables, they partition Y_t into three subvectors Y_{1t}, Y_{2t} and Y_{3t} of respective sizes n_1, n_2 and n_3. The null hypothesis of no causality from the last n_3 variables on the first n_1 variables given the n_2 variables Y_{2t} can be written as:

$$H_0 : J_{1,13} = \cdots = J_{p,13} = 0 \quad and \quad \alpha_1\beta_3' = 0,$$

where $J_{i,13}$ corresponds to the coefficients on the i times lagged differences of Y_{3t} in the first n_1 equations, α_1 denotes the first n_1 rows of α and β_3 denotes the last n_3 rows of β.

The first part of the hypothesis refers to short-run causality while the second half is related to long-run causality. Toda and Phillips (1993, 1994) prove that the test statistics related to both subsets of the null hypothesis are chi-square distributed provided $rank(\alpha_1) = n_1$ and $rank(\beta_3) = n_3$. Under these conditions (which are easily tested if $n_1 = n_3 = 1$), Toda and Phillips (1994) propose a sequential procedure to test for causality. This procedure is based on the decomposition of the null hypothesis in three different hypotheses on

short run dynamic parameters, α_1 and β_3 which can be sequentially tested. In this paper, we focus on the long run causality part of this test procedure.

4 Results

4.1 Panel unit root tests

For each of the 6 variables of interest, we test the order of integration. We apply the Pesaran (2007) individual CADF tests and panel CIPS tests. More particularly, we first test the presence of a unit root in twice differenced series. If none of the panel tests rejects the null hypothesis, we then conclude that second differences are stationary. In a second step, we perform the same test on differenced series. If the null hypothesis of a unit root is rejected[6], we eventually test level series which are assumed to be I(1) if the null hypothesis is not rejected and I(0) otherwise. We allow for a linear trend and intercept in level series, for an intercept in first differences and for no deterministic component for second differences. Lag selection is based on the BIC information criteria. The results of these sequential tests are reported in Table 1. Starting with second differences, panel unit root tests reject the null of a unit root for almost all variables and countries in our panel as well as for the panel. Regarding first differences, the panel statistics reject the null hypothesis of a unit root at the 5% level for all the variables. The results related to the individual countries are less clear-cut but might be affected by the relatively low test power which characterizes unit root tests in small samples.[7]

Eventually, level series are shown to have a unit root since none of the panel statistics (and few of the individual ones) is rejected even at the 10% level. Consequently, the results from our panel unit root tests conclude to the presence of a unit root in all level series but not in their difference so that they are shown to be I(1). As a result, we apply in the next section a cointegration analysis which enables us to determine whether there exists one or more long run relationships among the different variables in our panel.

[6]Otherwise, the series is shown to be I(2).

[7]Which is one of the main reasons why we use panel statistics instead of individual unit root tests.

Table 1: Individual CADF and CIPS unit root tests

2nd Difference D=0						
	GDP	LL	PRIV	MKTCAP	TURN	VALTRAD
Malaysia	-2.81**	-4.62***	-1.76	-2.42*	-6.19***	-7.41***
Mexico	-3.76***	-3.90***	-4.53***	-4.52***	-4.78***	-7.06***
Nigeria	-6.37***	-7.11***	-4.15***	-2.70**	-3.32**	2.98
Philippines	-4.79***	-2.39*	-3.16**	-3.58***	-7.41***	-7.40***
Thailand	-3.21**	-3.51***	-3.98***	-5.14***	-3.88***	-2.89**
Panel	-4.19***	-4.31***	-3.51***	-3.67***	-5.12***	-4.36***
Panel (trunc.)	-4.13***	-4.11***	-3.51***	-3.67***	-4.84***	-3.65***
1st Difference D=1						
	GDP	LL	PRIV	MKTCAP	TURN	VALTRAD
Malaysia	-2.57	-2.44	-2.29	-2.09	-5.10***	-4.68***
Mexico	-3.08*	-2.08	-2.64	-1.46	-4.27***	-5.04***
Nigeria	-3.66**	-4.29***	-2.90	-0.80	-0.28	3.08
Philippines	-2.36	-1.41	-2.50	-4.62***	-4.10**	-3.55**
Thailand	-1.98	-1.79	-2.56	-3.88**	-3.45**	-2.70
Panel	-2.73***	-2.40**	-2.58***	-2.57**	-3.44***	-2.58***
Panel (trunc.)	-2.73***	-2.40**	-2.58***	-2.57**	-3.44***	-2.67***
Level D=2						
	GDP	LL	PRIV	MKTCAP	TURN	VALTRAD
Malaysia	0.02	-1.94	-1.49	-0.39	-2.74	-2.88
Mexico	-1.67	-1.21	-3.53*	-2.98	-3.02*	-2.98*
Nigeria	-1.32	-1.76	-1.52	1.13	1.41	5.77
Philippines	-0.56	-1.45	-2.87	-2.57	-2.57	-2.25
Thailand	-1.24	-2.21	-1.96	-2.49	-3.11*	-3.62**
Panel	-0.95	-1.71	-2.27	-1.46	-2.01	-1.19
Panel (trunc.)	-0.95	-1.71	-2.27	-1.46	-2.01	-2.01

Note: ***,** and * respectively denote significance at the 1%, 5% and 10 % level. D=0, 1, 2 respectively mean without deterministic term, with an intercept only and with an intercept and a trend. Critical values are obtained from Pesaran (2007).

4.2 Panel cointegration tests and estimation

Since all the series in our data set have been shown to be I(1), we test within-country cointegration for all possible combinations of the economic development indicator plus an indicator of bank and stock market development (6 combinations). We follow the Groen and Kleibergen (2003) methodology which allows us to test the number of cointegrating relationships among each triplet (Johansen-like approach) while taking into account potential cross-country contemporaneous correlation.[8] Indeed, residual-based tests which are based on the assumption of a single known cointegration relation might provide biased results if the number of cointegrating vectors is higher than one. This paper is the first to apply Johansen-like panel cointegration approach to the link between banks, stock markets and economic growth. In addition, we notice that the Groen and Kleibergen (2003) methodology makes the assumption of a common number of cointegrating vectors for each country.

The number of lags is selected by using information criteria in country-by-country maximum likelihood estimation and is allowed to lie between 0 and 2.[9] Cointegration testing corresponds in this context to a test of the rank of the matrix Π. This can be done by using the likelihood ratio test methodology proposed by Johansen (1995) and extended to the panel framework by Groen and Kleibergen (2003). We start with a number of cointegrating vectors equal to zero ($rank(\Pi) = 0$) and compute the likelihood ratio statistic against full rank. We then progressively increase the rank of matrix Π until non-rejection of the null hypothesis whose rank corresponds to the estimated number of cointegrating vectors. Cointegrating vectors are allowed to be heterogeneous across individual countries. As mentioned above, the homogeneity hypothesis can and will nonetheless be tested. We report the results of Groen and Kleibergen (2003) cointegration tests in Table 2.

Joint cointegration test outcomes in Table 2 conclude to the existence of a single cointegrating vector (for each of the five countries) among GDP, bank and financial market development except for the combination of GDP, LL and VALTRAD. To test the robustness of this result, we perform the same

[8] Cross-country cointegration is not permitted in this context which is nevertheless not a strong restriction given our topic of interest. Indeed, long run relationships between financial development and economic growth of different countries are expected not to be of importance given the domestic nature of all the variables in our data set.

[9] Higher number of lags is not allowed because of the sample size.

Table 2: Panel cointegration tests

				Crit. Val.	
	Rank	Tstat	10%	5%	1%
GDP-LL-MKTCAP	0	141,81*	133,75	147,02	175,51
	1	54,87	66,50	76,74	99,10
	Rank				
GDP-LL-TURN	0	161,24**	133,46	146,20	175,60
	1	62,03	66,39	76,78	98,79
	Rank				
GDP-LL-VALTRAD	0	173,99**	133,61	147,49	177,97
	1	67,83*	66,65	77,09	98,06
	2	1,26	13,49	18,97	34,20
	Rank				
GDP-PRIV-MKTCAP	0	145,31*	133,80	147,01	174,44
	1	42,19	66,43	76,53	98,63
	Rank				
GDP-PRIV-TURN	0	145,38*	133,11	146,33	174,60
	1	66,53	67,12	77,30	99,18
	Rank				
GDP-PRIV-VALTRAD	0	150,36**	133,32	146,51	175,04
	1	39,38	66,46	76,79	98,33

Note: ***,** and * respectively denote significance at the 1%, 5% and 10 % level.

Table 3: Likelihood ratio test of the homogeneity restriction of the cointegration vector β

			Crit. val.		
	Tstat	Rank	10%	5%	1%
GDP-LL-MKTCAP	46,72	1	13,36	15,51	20,09
GDP-LL-TURN	84,73	1	13,36	15,51	20,09
GDP-PRIV-MKTCAP	52,27	1	13,36	15,51	20,09
GDP-PRIV-TURN	48,07	1	13,36	15,51	20,09
GDP-PRIV-VALTRAD	40,50	1	13,36	15,51	20,09

test for different lag structures. We sequentially add and drop one lag to each country and each specification (except the triplet GDP-LL-VALTRAD). The existence of a single cointegrating vector is confirmed in 50% of the cases (70% of the cases in which one lag is dropped). On the whole, these results suggest that there exists a single long run relationship between financial developments and economic growth i.e. the process is driven by two stochastic trends. It is the purpose of the next sections to determine whether we can identify a causal linkage between financial development and economic growth and vice-versa. In the remainder of the paper, we focus on the 5 combinations growth-banks-stock markets for which panel cointegration tests provide evidence of the existence of a single cointegrating vector.

In addition to testing the number of cointegrating relations in a framework with heterogeneous cointegrating vectors, we can also test the joint homogeneity of these cointegration vectors for the 5 countries. We report the results of the tests for the homogeneity restriction in Table 3. The homogeneity restriction is rejected for all triplets economic growth, banking system and financial market development for which the rank of matrix Π is equal to one.[10] Beside providing a test for the number of cointegrating relationships, the Groen and Kleibergen (2003) methodology also computes maximum likelihood estimates of the cointegrating vector and adjustment coefficients. We report these estimates in Table 4.

We use the following normalization under the assumption of a single coin-

[10]The rejection of the homogeneity of the cointegration vector is an indication that we cannot expect more accurate findings from including more (heterogeneous) countries in the analysis.

Table 4: Adjustment parameters and cointegrating vectors estimation

GDP-LL-MKTCAP					
	α_1	α_2	α_3	$-\beta_{2,i}$	$-\beta_{3,i}$
Malaysia	0,007	0,097	0,090	-5,819	0,699
Mexico	-0,011	0,057	0,096	-7,975	0,263
Nigeria	-0,006	-0,005	0,003	71,543	42,957
Philippines	-0,079	-0,039	-0,034	2,158	-1,735
Thailand	0,054	0,089	1,025	-1,084	-0,636
GDP-LL-TURN					
	α_1	α_2	α_3	$-\beta_{2,i}$	$-\beta_{3,i}$
Malaysia	0,020	0,087	-0,037	-3,716	0,749
Mexico	-0,017	0,041	-0,527	-5,604	0,407
Nigeria	-0,256	0,039	-0,030	1,644	-2,748
Philippines	-0,387	-0,114	0,046	-0,025	0,282
Thailand	-0,001	0,027	-0,597	-2,603	0,737
GDP-PRIV-MKTCAP					
	α_1	α_2	α_3	$-\beta_{2,i}$	$-\beta_{3,i}$
Malaysia	0,034	0,108	-0,072	-2,498	0,618
Mexico	-0,469	-0,302	-0,138	1,781	-1,021
Nigeria	-0,148	-0,086	0,045	6,009	0,256
Philippines	-0,227	-0,172	-0,129	1,557	-0,488
Thailand	0,039	0,173	0,026	-1,830	0,697
GDP-PRIV-TURN					
	α_1	α_2	α_3	$-\beta_{2,i}$	$-\beta_{3,i}$
Malaysia	-0,010	0,056	-0,598	-1,995	2,263
Mexico	-0,116	-0,028	-1,623	1,093	0,604
Nigeria	-0,295	0,011	0,005	7,428	-4,160
Philippines	-0,092	-0,173	0,018	0,909	-0,022
Thailand	0,002	0,000	0,044	7,392	-16,247
GDP-PRIV-VALTRAD					
	α_1	α_2	α_3	$-\beta_{2,i}$	$-\beta_{3,i}$
Malaysia	0,010	0,041	-0,619	-3,421	1,301
Mexico	-0,079	-0,089	0,026	5,829	-6,511
Nigeria	-0,363	-0,026	-0,038	3,698	-18,709
Philippines	-0,022	-0,064	0,007	5,250	-2,335
Thailand	-0,001	0,307	0,540	-0,287	-1,648

tegrating vector:

$$\beta_i = \begin{pmatrix} 1 \\ -\beta_{2,i} \\ -\beta_{3,i} \end{pmatrix}$$

If economic growth is positively linked to financial development in the long run in country i, we should expect the sign of the cointegrating vector estimates ($-\beta_{2,i}$ and $-\beta_{3,i}$) to be negative.[11] Cointegrating vector estimates indicate that for almost all possible triplets and countries we can find a positive link between economic development and banking or stock market development but rarely with both banks and financial markets. This may be seen as a first indication of the impact of financial development in its widest sense (i.e. banks and financial markets) on economic growth since at least one source of fund provision and risk diversification plays a positive role with respect to long run economic development. We need to check the significance of these long run relationships. The purpose of the next sections is to test the existence of long run causality between financial development and economic growth as well as the causality in opposite direction from economic growth to financial development. Ljung-Box tests for serial correlation in the residuals are reported in Table 5.

4.3 Does financial development foster long run economic growth?

So far, we have found evidence in favor of the existence of a single long run relationship between economic growth, banking system and financial market development. Our final objective is now to test whether the causal link from finance to economic development and/or from economic development to finance is statistically significant. We follow the methodology proposed by Toda and Phillips (1993, 1994) to test for causality within a VECM framework. Their procedure consists in testing both short run and long run causality. Short run causality is based on a test of the coefficients on the lagged differences while long run causality requires a stepwise procedure where the corresponding α and β significance is tested. Since our interest lies in the

[11] Indeed, the normalization allows us to rewrite the equilibrium relation as:

$$GDP = \beta_2 BANK + \beta_3 STOCKMARKETS$$

Table 5: P-values of Ljung-Box tests for autocorrelation in the residuals of the model without cross-country cointegration (up to 4 lags)

		LL-MKTCAP	LL-VALTRAD	PRIV-MKTCAP	PRIV-TURN	PRIV-VALTRAD
	GDP	6.8%	68.9%	51.7%	41.9%	28.4%
Malaysia	Bank	38.7%	29.1%	46.0%	27.9%	35.7%
	Mkt	28.0%	4.6%	21.2%	34.6%	8.5%
	GDP	89.6%	72.9%	18.2%	83.4%	52.0%
Mexico	Bank	55.5%	83.5%	7.7%	65.6%	7.1%
	Mkt	44.2%	85.4%	29.1%	56.4%	93.9%
	GDP	31.9%	56.8%	9.6%	74.2%	0.0%
Nigeria	Bank	94.4%	64.7%	44.8%	73.9%	12.0%
	Mkt	98.8%	24.2%	99.3%	42.1%	93.5%
	GDP	65.2%	9.5%	5.6%	73.4%	0.1%
Philippines	Bank	9.4%	42.7%	0.7%	10.7%	3.0%
	Mkt	16.8%	77.3%	20.4%	60.2%	38.5%
	GDP	28.4%	33.1%	30.3%	4.4%	49.8%
Thailand	Bank	51.4%	51.7%	9.5%	6.0%	27.2%
	Mkt	50.6%	90.9%	12.9%	45.4%	39.5%

long run causal link between finance and growth, we focus on the long run causality part of the test. In addition, the specifications of our tests (the causal link between variables two by two, one cointegrating vector) are such that Toda and Phillips (1994) assumptions are fulfilled and we can start by testing the nullity of α and, if it is significant, of the corresponding β by using chi-square distributed test statistics.[12] The results of causality test from financial development to economic growth are reported in Table 6.

Joint tests of long run causality all support the hypothesis that finance has a causal effect on economic growth in the long run. In two specifications (GDP-LL-TURN and GDP-PRIV-MKTCAP), both banks and financial markets are shown to significantly affect economic growth in the long run. Results from country-by-country tests are less clear-cut. Evidence of causality from finance to growth is not present under all combinations of indicators (e.g. there is no evidence of causality in the triplet GDP-PRIV-

[12]Chi-square distribution of the test statistics is also confirmed by Groen and Kleibergen (2003) in their framework.

Table 6: Long run causality test: Finance → Growth

GDP-LL-MKTCAP	α_1	$-\beta_2$	$-\beta_3$	Conclusion
Malaysia	0,007***	-5,819***	0,699	B
Mexico	-0,011	-7,975***	0,262	NC
Nigeria	-0,006*	71,543***	42,957	B
Philippines	-0,079**	2,158	-1,735	NC
Thailand	0,054	-1,084	-0,636	NC
Joint test (Tstat)	16,131***	28,993***	6,82	B
GDP-LL-TURN	α_1	$-\beta_2$	$-\beta_3$	Conclusion
Malaysia	0,0199***	-3,716***	0,749*	B, M
Mexico	-0,017	-5,604	0,407	NC
Nigeria	-0,256***	1,644***	-2,748	B
Philippines	-0,387	-0,025	0,282	NC
Thailand	-0,001	-2,603***	0,737**	NC
Joint test (Tstat)	20,019***	16,166***	16,571***	B, M
GDP-PRIV-MKTCAP	α_1	$-\beta_2$	$-\beta_3$	Conclusion
Malaysia	0,034***	-2,498***	0,618***	B, M
Mexico	-0,469***	1,781***	-1,021***	B, M
Nigeria	-0,148***	6,009***	0,256	B
Philippines	-0,227***	1,557***	-0,488***	B, M
Thailand	0,039***	-1,830*	0,697***	B, M
Joint test (Tstat)	54,252***	51,427***	62,476***	B, M
GDP-PRIV-TURN	α_1	$-\beta_2$	$-\beta_3$	Conclusion
Malaysia	-0,010	-1,995***	2,263***	NC
Mexico	-0,116***	1,093	0,604***	M
Nigeria	-0,295	7,428	-4,160	NC
Philippines	-0,092	0,909	-0,022	NC
Thailand	0,002**	7,392	-16,247***	M
Joint test (Tstat)	17,856***	7,294	28,508***	M
GDP-PRIV-VALTRAD	α_1	$-\beta_2$	$-\beta_3$	Conclusion
Malaysia	0,010	-3,421***	1,301***	NC
Mexico	-0,079***	5,829	-6,511	NC
Nigeria	-0,363	3,698***	-18,709***	NC
Philippines	-0,022	5,250***	-2,335	NC
Thailand	-0,001	-0,287	-1,648	NC
Joint test (Tstat)	19,893***	29,983***	1,408	B

Note: ***,** and * respectively denote significance at the 1%, 5% and 10 % level. B, M and NC respectively mean causality from banking development to economic growth, causality from financial markets to economic growth and no evidence of causality from finance to growth.

VALTRAD) and does not have the expected sign in every case. Nevertheless, causality from finance to growth is supported by the data for all countries under at least one specification. Our results are also in line with Deidda and Fattouh (2002) and Rioja and Valev (2004b) who show that banking development has a positive impact on economic growth only once a certain threshold of development has been reached. For the three relatively more developed countries in the sample (i.e. Malaysia, Mexico and Thailand), the results seem to confirm the positive impact of banking development on long run economic growth while the effect of financial market development is less clear and even negative in some cases.[13] Looking at the other two countries, results seem to suggest that banking development is detrimental to long run economic growth (especially for the least developed country in the sample, i.e. Nigeria). On the other hand, the effect of financial markets is never shown to be negative for these two countries and is even significantly positive under two specifications. This seems to suggest that although financial development has an overall positive impact on long run economic growth, the structure of the financial system (banks or stock markets) is not neutral.

4.4 Does economic growth cause financial development?

While we have found some evidence of long run causality from finance to growth in the previous section, we can test the reverse causality: from economic growth to financial development. For instance, evidence of bi-directionality between finance and growth is provided in Luintel and Khan (1999), Calderon and Liu (2003) or Demetriades and Hussein (1996). As a consequence, we apply the same methodology as in the previous section to long run causality from economic growth to in turn banking system and financial market development. The results are reported in Tables 7 and 8. Starting with long run causality from economic growth to banking system development, our methodology does not support the demand-following hypothesis under which financial markets would simply respond to the need of the developing real economy for institutions able to efficiently allocate capital. Indeed, none of the joint tests but one rejects the null hypothesis of absence of causality. Individual country statistics do not provide more support to the

[13] In addition, we test the equality of betas for this group of countries. Coefficient equality is rejected in most cases. This seems to confirm that the homogeneity of cointegrating vectors should not be imposed, even for countries which are relatively close in terms of economic development.

hypothesis of a long run relation going from economic growth to banks since the absence of causality is rejected in only 5 (out of the 25) specifications. Turning to the results of causality tests from economic growth to financial markets, we reach the same conclusion of no strong evidence of causality from economic growth to finance in the long run. Once again, the joint tests reject the absence of causality only in one specification while individual tests rarely conclude to causality from economic growth to stock markets development. As a result, our tests support neither the bi-directional hypothesis under which finance would cause economic growth and vice-versa nor the demand-following. Our results are in line with Xu (2000), Christopoulos and Tsionas (2004) (who also focus on developing countries) and Apergis et al. (2007) who support the supply-leading hypothesis using indicators of the banking sector only while Demetriades and Hussein (1996), Luintel and Khan (1999) and Calderon and Liu (2003) support the bi-directional hypothesis. Regarding the studies which consider both stock market and banking development, our results are consistent with those of Rousseau and Wachtel (2000), Arestis et al. (2001), Caporale et al. (2004) and Beck and Levine (2004).

4.5 Robustness check: testing the absence of long run causality between finance and growth

As an additional robustness check, we test the null hypothesis of the absence of long run causality from finance (banks and stock markets) to growth and from economic development to finance. Rejecting the absence of causality in both direction would reinforce our conclusions based on unidirectional causality tests. Indeed, if the absence of causality in both direction is rejected, this implies that there must exist at least one direction of causality which is significant. In this case, results from unidirectional tests support the causality going from finance to growth. This test corresponds to jointly testing $\alpha_{1,i} = 0$ and $\beta_{1,i} = 0$. Results of this test can be found in Table 9. The existence of long run causality between economic development and finance is confirmed in most of the specifications. Based on these results, we can conclude that there must exist long run causality between finance and growth in at least one direction. Since unidirectional tests tend to favor the causality going from finance to growth, the results that we have obtained in this section somewhat strengthen our initial conclusions.

Table 7: Long run causality test: Growth → Banks

GDP-LL-MKTCAP	α_2	$-\beta_1$	Conclusion
Malaysia	-0.564**	-0.172	NC
Mexico	-0.457***	-0.125	NC
Nigeria	-0,351	0.0140	NC
Philippines	-0.084***	0.463	NC
Thailand	-0.097**	-0.922	NC
Joint test (Tstat)	19.958***	0.066	NC
GDP-LL-TURN	α_2	$-\beta_1$	Conclusion
Malaysia	-0.325***	-0.269***	C
Mexico	-0.229	-0.178	NC
Nigeria	0.064	0.608***	NC
Philippines	0.003	-40.260	NC
Thailand	-0.070*	-0.384***	C
Joint test (Tstat)	22.519***	4.720	NC
GDP-PRIV-MKTCAP	α_2	$-\beta_1$	Conclusion
Malaysia	-0.270***	-0.400**	C
Mexico	-0.538***	0.561**	C
Nigeria	-0.517	0.166***	NC
Philippines	-0.268***	0.642	NC
Thailand	-0.317***	-0.546	NC
Joint test (Tstat)	22.755***	11.317**	C
GDP-PRIV-TURN	α_2	$-\beta_1$	Conclusion
Malaysia	-0.111	-0.501**	NC
Mexico	-0.031**	0.915	NC
Nigeria	0.082	0.135	NC
Philippines	-0.157***	1.100***	C
Thailand	-0.000	0.135	NC
Joint test (Tstat)	2.261	15.328***	NC
GDP-PRIV-VALTRAD	α_2	$-\beta_1$	Conclusion
Malaysia	-0.140	-0.292	NC
Mexico	-0.519	0.172	NC
Nigeria	-0.097	0.270	NC
Philippines	-0.336	0.190	NC
Thailand	-0.088	-3.483	NC
Joint test (Tstat)	10.828*	0.106	NC

Note: ***,** and * respectively denote significance at the 1%, 5% and 10 % level. C and NC respectively mean causality from economic growth to bank development and absence of evidence of causality. Betas are based on normalization on the tested dependent variable.

Table 8: Long run causality test: Growth → Stock Markets

GDP-LL-MKTCAP	α_3	$-\beta_1$	Conclusion
Malaysia	0.063	1.431	NC
Mexico	0.025	3.809	NC
Nigeria	0.116	0.023	NC
Philippines	0.059	-0.576	NC
Thailand	-0.652	-1.572	NC
Joint test (Tstat)	0.771	0.066	NC
GDP-LL-TURN	α_3	$-\beta_1$	Conclusion
Malaysia	-0.028	1.336***	NC
Mexico	-0.214	2.458	NC
Nigeria	0.083	-0.364***	NC
Philippines	0.013	3.552	NC
Thailand	-0.440	1.356***	NC
Joint test (Tstat)	0.055	4.720	NC
GDP-PRIV-MKTCAP	α_3	$-\beta_1$	Conclusion
Malaysia	-0.044***	1.619**	C
Mexico	0.141***	-0.979**	C
Nigeria	0.012**	3.909***	C
Philippines	0.063***	-2.048	NC
Thailand	0.018	1.434	NC
Joint test (Tstat)	4.056	11.317**	NC
GDP-PRIV-TURN	α_3	$-\beta_1$	Conclusion
Malaysia	-1.353***	0.442**	C
Mexico	-0.980***	1.656	NC
Nigeria	-0.021	-0.240	NC
Philippines	-0.000	-45.285***	NC
Thailand	-0.714***	-0.062	NC
Joint test (Tstat)	54.622***	15.328***	C
GDP-PRIV-VALTRAD	α_3	$-\beta_1$	Conclusion
Malaysia	-0.805***	0.769	NC
Mexico	-0.170	-0.154	NC
Nigeria	0.708**	-0.053	NC
Philippines	-0.016	-0.428	NC
Thailand	-0.890	-0.607	NC
Joint test (Tstat)	21.171***	0.106	NC

Note: ***,** and * respectively denote significance at the 1%, 5% and 10 % level. C and NC respectively mean causality from economic growth to stock markets and absence of evidence of causality. Betas are based on normalization on the tested dependent variable.

Table 9: Long run causality test: Growth ↔ Finance

	Malaysia	Mexico	Nigeria	Philippines	Thailand
GDP-LL-MKTCAP	C**	NC	C**	C***	NC
GDP-LL-TURN	C***	NC	C***	NC	C*
GDP-PRIV-MKTCAP	C***	C***	C***	C***	NC
GDP-PRIV-TURN	C**	C**	NC	C***	C*
GDP-PRIV-VALTRAD	NC	C*	NC	NC	NC

Note: ***,** and * respectively denote significance at the 1%, 5% and 10 % level. C and NC respectively mean rejection of the absence of long run causality between finance and growth and absence of evidence in favor of any causality between finance and growth.

5 Conclusions and policy implications

While the debate on the role of financial development on the process of economic growth is far from being new, it has been receiving a renewed interest for several decades. Indeed, knowing whether financial development can promote long run economic growth is of prime importance in terms of development policy in developing countries and also for policies aimed at (re)shaping the financial sector at the global level. If there exists a positive linkage going from finance to economic growth, then developing countries should encourage the development of such institutions. A large body of theoretical literature has been developing since the early 1980's in which the role of financial intermediaries as efficient providers of capital and risk diversifiers to support economic development has been stressed. This supply-leading hypothesis is challenged by the reverse point of view under which financial institutions grow in response to the demand of the real economy. In this case, financial development is a result of economic growth and may not be a requirement for it. In addition, the recent crisis which has affected the financial system and the real economy also accentuates the need to determine whether financial development and innovation promote real growth in the long run while the crisis has shown that misusing instruments intended to better diversify risk could lead to (short run?) destabilization of the real

economy.

Given the importance of the question, many empirical works have tried to determine which of both alternatives is the most relevant. Starting with cross-sectional and panel based analyses, the empirical literature has progressively evolved to using time series techniques. While early findings tended to support the supply-leading hypothesis i.e. causality goes from financial development to economic growth, more recent studies give a less clear-cut answer regarding the direction of the causality (in some cases, the relation is found to be bi-directional). Recent studies increasingly focus on time series techniques such as cointegration and causality tests. However, these techniques have been proven to be affected by power and size distortion in small samples. A potential answer to the weak results from time series analysis is to use dynamic panels. While these techniques have already been used in the current literature, our paper is the first (to the best of our knowledge) to use Johansen-like cointegration analysis in a panel context allowing for potential cross-dependence across countries (which seems quite realistic in macroeconomic panels). In addition, we also extend the analysis to the potentially different impact of two different segments of financial system i.e. banks and financial markets, which has never been studied in a panel-based cointegration context.

Our results indicate that there exists a single long run (cointegration) relationship between indicators of both financial development and economic growth. Focusing on the cointegrating vector with economic growth as the explained variable, we find that the long run equilibrium integrates in most cases at least one indicator of financial development with a positive impact on long run economic growth. Nevertheless, the positive impact is rarely coming from both segments of financial development. We also test long run causality. Joint tests support the hypothesis of a long run causality from financial development. While country-by-country tests show less clear-cut results, they nevertheless tend to support the causal link going from financial development to economic growth. However, they may be consistent with the idea that banking development has a positive impact on economic growth only once a certain threshold of economic development has been reached (see Rioja and Valev (2004b). Indeed, the effect of banking development on economic growth is positive for the relatively more advanced countries in our sample only while it may even be negative for the least developed ones. As a test of potential bi-directionality, we perform the same causality analysis from economic growth to financial development. These tests conclude to the

absence of causality from growth to finance.

From our analysis, it then appears that, if a long run causality exists between financial development and economic growth, it should go from the former to the latter. From the analysis of our data set of developing countries, it seems that promoting the development of the financial system may support long run economic growth. In addition, the structure of the financial system (bank or market-oriented) may matter. For instance banking development has different impact on economic growth depending on the level of economic development. In terms of policy implication our results suggest that developing countries could promote their long-run economic growth by supporting the development of their financial sectors and that the optimal choice of the structure of the financial system may depend on the level of economic development.

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