More banks or more markets ? New evidence on what matters for growth in developing countries *

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October 2008

Abstract

This paper investigates the link between finance and growth for less developed countries in a sample of 61 countries over the period 1991-2005. Using precise indicators of financial structures based on Levine (2002) and dynamic panel data estimators, our results suggest that banks and markets are complementary. Market size relative to banking sector size and market activity relative to banking sector activity influence growth only in countries where the banking sector is developed. Whereas, market efficiency relative to banking sector efficiency always matters for growth and its effect is exacerbated in countries with high initial incomes.

Keywords : financial structure, growth rate, developing countries, GMM estimators

JEL Classification : E44, G10, G20

*I thank Vincent Bouvatier, Jean Christophe Poutineau and Roland Kpodar for very helpful comments. The usual disclaimer applies.

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1 Introduction

The question of the link between finance and growth is still debated for less developed countries. Even though the relationship between finance and growth is well documented in the theoretical literature, several authors have nonetheless noted that the finance effect is disappearing.[1]

The aim of this paper is to identify the channels through which finance affects growth in developing countries, during the recent period from 1991 to 2005, and to draw conclusions on the design of growth promoting financial systems. We more particularly investigate whether there are conditions under which the financial structures have impacts on economic growth rates and distinguish what characteristic of the financial system: activity (liquidity), size or efficiency, has more effects.

Considering the panel structure of our data, we use system GMM estimators developed by Blundell and Bond (1998). We also use exogenous thresholds, interaction variables and recursive simulations to test the robustness of our results, considering the role that income levels may play in the relationship.
This method helps us look more deeply into the black box of the finance effect.

Our paper differs from previous studies because we study not only the relative contribution of banks and markets to growth but, to be more specific on the finance effect, we also look at different angles of the financial structure. To that purpose, we do not contend in comparing bank sizes relative to stock market sizes and their contributions to growth, but we also investigate the relative roles of structure liquidity and structure efficiency, in a dynamic panel data setting.

Regarding the impact of the financial structure: we find a strong relation between market structure efficiency (relative to banking sector efficiency) and economic growth. We also observe that all our market structure variables (market size and market liquidity) relative to our bank structure variables, exert a positive impact on growth rates but only for a given level of financial development. Banks and markets are therefore complementary. In sum, while market efficiency affects growth in all countries, market size and market activity are positively linked to growth only in countries with similar levels of banking development. Put differently, coutries with more efficient stock markets tend to grow faster and among countries with similar levels of banking development, those with bigger and more active stock markets tend to grow faster.

[1] Levine (2004) distinguishes four different points of views on financial structure and economic growth. The first underlines the roles played by banks, the second defends financial systems based on stock markets, the third pleads for financial services and the fourth stresses the importance of the regulatory framework. Nevertheless, the relationship between finance and growth is not as obvious as before (Manning 2003; Wachtel 2001, 2003 ; Rousseau and Wachtel 2005, 2006) and various reasons are mentioned: initial economic development, the level of per capita income in a country, initial level of financial depth and/or financial crises, econometric weaknesses in dealing endogeneity (on the robustness of the results with different sets of periods or countries or different sets of instrumental variables). This seems to be the case of both developing and developed countries.

Regarding the impact of income levels: we find that income levels do not influence structure activity's impacts on growth rates, whereas in low income countries, the impacts of market size are reduced. In addition, the effect of market efficiency relative to bank efficiency, is larger in countries with higher income levels. Further, we show that initial GDP levels influence the impact of market efficiency on growth rates, however, they do not interact with structure activity nor with structure size in positively influencing growth rates.

Thus, according to these findings, we conclude that the finance growth link still exists in developing countries. However, as to the best design of the financial system, markets and banks are complementary and market based financial systems are not likely to promote growth if the banking sector is not developed. Our main finding is that, in developing countries, the size and activity of the stock markets relative to that of the banks, positively influence growth only if the banking sector is developed enough ; whereas market efficiency relative to banking sector efficiency positively impacts growth and its effect is exacerbated in countries with initially high incomes.

The paper is organized as follows. First, we review some theoretical foundations on which the subject lies, then we introduce our data before discussing our econometric specification. Finally, we go over our results with the baseline regression and with income groupings. The last section concludes and draws policy conclusions.

2 Literature review

The literature on financial structure and economic growth is well documented and several papers have tried to review the theories and empirics explaining the mechanisms through which banks and/or stocks markets impact or not on economic growth rates.[2]
The mechanisms through which banks can promote economic growth are numerous. First, banks help solve information asymmetries. In financial markets, information are public and this usually leads to free rider problems in information acquisition. Investors can refuse to invest in information research because the arbitrage gains are reduced and therefore they prefer to wait until the market reveals them. In addition, because banks favour long term strategies, banking relations are lasting longer therefore bank monitoring is more efficient compared to the case of punctual market operations. The latter can be excessively variable and bad investments are only sanctionned by the prices. Finally, another advantage of banks is that they can gain from economies of scale.
Nonetheless, banks can also have a negative influence on growth. Ang (2008) notes the studies that have demonstrated that banks monitor entrepreneurs and corporate borrowers so they do not default on their debts. The problem is that even if it encourages risk averse behaviour in investments it can also favor investments in tangible assets (which can be used as collateral) rather than in knowledge based assets and therefore it can constrain firms' opportunities to expand and decrease growth.

[2] As mentionned previously, Levine (2004) for instance, distinguishes four different points of views. See also Levine (1997) and Ang (2008).

The arguments defending financial markets can consequently come from criticisms of the roles of banks in promoting growth. First, banks can reach a monopoly position because breaking a bank relation for a client might be very costly as banks rely on their long term knowledge of a borrower when granting loans. Furthermore, the repayments on investments are fixed because for banks, repayments are more important than profitability and it is better to favour longer relations than to find new clients, new opportunities and innovations.
Nevertheless, Durham (2002) notes that stock market development affects economic growth through a long term mechanism, because of liberalization, (Levine and Zervos 1998) and through a short term mechanism. He argues that liberalization reduces the cost of capital, increases aggregate prices in stock markets and in the end leads to an increase in private investment. He defends the effect of valuation on private investment.

In this paper, we look more closely into the link that has been demonstrated between finance and growth by specifying the financial structure proxies. We use ratios of bank dominance or market dominance and examine the impacts of the relative importance of activity, size and efficiency of each structure. Therefore, not only do we focus on the role of financial structure on growth but also on the relative importance of banks or markets and more particularly on the roles played by their size, their activity and their efficiency. To underpin this analysis, we review the literature on size, liquidity and efficiency of financial structure and their impacts on growth.

Theoretical models of stock markets and growth point out that stock market liquidity affects growth rates positively because it is easier to trade equities in liquid markets therefore financial assets are considered to be less risky and the market reduces rental costs.[3] This encourages investments in long term and higher return projects as firms have easier access to capital through equity issues (Levine 1991, Bencivenga et al. 1995). In the same line, Levine and Zervos (1998) show that the major channel is through productivity growth (liquidity also influences capital accumulation but not private savings).
However, Arestis et al. (2001) and Levine (1997) note the three channels through which stock market liquidity may not promote growth.
First, because operations in the market can be determined only by euphoria and myopic behaviour. Moreover, stock markets may induce too much speculation with destabilizing effects (irrational speculation leading to asset prices bubbles) and can cause a crisis especially when the banking system is at the same time weak (Singh 1997, Keynes 1936, Kindleberger 1978).[4] Non profitable projects can be financed, and insider tradings, short term relations as well as price games can all decrease social efficiencies.
In fact, even if market liquidity allows investors to sell their shares quickly and therefore encourages initial investments, it can also reduce incentives to undertake costly monitoring, it hinders corporate controls and leads to inefficient resource allocation and that slows productivity growth (Levine 1993, 2002).
Further, the higher returns due to higher liquidity can decrease the savings rates

[3] Investors who suffer from liquidity shocks can sell their shares to others before maturity.
[4] This has been the case in the recent subprime crisis.

due to substitution effect and income effect (Demirguc-Kunt and Levine 1996) and the decrease in uncertainty can also diminish precautionary savings.
On the same way, stock markets activities can have bad effects as it can just induce a portfolio substitution effect from loans to stocks without generating any accumulation nor additional resources for growth.

As to stock market efficiency, Yartey and Adjasi (2007) note that this ensures investments are most efficiently used. For instance, because of the threat of takeover, in a free corporate control market with financial discipline, the firm management is encouraged to use assets efficiently.
Further, in efficient stock markets, prices reveal all information about fundamentals. Therefore efficient stock markets reduce the costs of acquiring information and also improve investment decisions and resources allocation (Stiglitz and Weiss 1981). In fact, current stock prices are the present discounted value of future profits and future growth rates are therefore reflected in initial prices.
Finally, because it allows the issue and repurchase of government securities in liquid markets, stock markets help keep appropriate monetary policy.
However, in the case when speculative bubbles emerge in the market, prices on the stock market are not just determined by the expected future cash flows but are guided by irrational behaviour therefore can affect the real sector of the economy (Yartey and Adjasi 2007).
Moreover, well functionning markets can lead to less investments because the takeover threat doesn't reward the manager according to the creation of new wealth but according to the performance of a company's financial assets. In fact, as prices react very quickly to a variety of information and are volatile, profits are possible within a short period of time and therefore managers are not encouraged to take long term investments. In addition, empirics have shown that takeover mechanism takes place on the basis of size rather than performance (Singh 1991, 1997). These problems are further accentuated in developing countries where prices are highly volatile as these countries are subject to weak regulatory framework and great macroeconomic instability (Yartey and Adjasi 2007).

One another interesting matter to look at is the size case. Levine (2002) shows that stucture size (as well as structure activity and structure efficiency) does not influence the growth rates. Moreover finance size is not significant for growth even though finance activity and finance efficiency are.
The quality of institutions is as important as their sizes and the finance effect is conditionned by the quality effect (especially when there is a lack of legal and regulatory framework).

We can see therefore that the debate remains in our three chosen indicators influences on growth. An empirical approach is therefore necessary to disentangle the complex link as to the relative importance of banks and markets for growth when we look at these specific relative indicators, especially in developing countries.[5]

[5]Note that we could also, as in Durham (2002), examine stock market volatility and stock market international integration (Demirguc-Kunt and Levine 1996, Levine and Zervos 1998, Arestis et al. 2001). We do not consider stock market volatility as it should affect negatively economic growth rates. Moreover, considering the countries we study here, it is not necessary

3 Data and econometric specification

We analyze three different structure ratios which are the liquidity (activity), the size and the efficiency of the financial structure, to test if financial structure matters for economic growth, in other words, which aspect of the financial structure is important: its size, its liquidity or its efficiency.[6]

3.1 Data sample and financial structure ratios

Our data consists of a panel of 61 developing countries, in which at least some part of financial activities have been undertaken in markets at any time during the sample period. Table 1 in appendix shows the list of the countries included in the sample. It consists of 14 Low Income Countries (LIC), 22 Lower Middle income Countries (LMC) and 25 Upper Middle income Countries (UMC).[7] The sample period covers 1991 to 2005. The period of study is dictated by data availability in particular on stock market. Before 1990s very few developing countries had stock markets, making it difficult to compare the contribution of stock market development to growth relative to that of the banking system.
As the study focuses on long term growth, data are averaged over 3 years. The period sample is therefore divided in 5 sub periods as follows: 1991 to 1993, 1994 to 1996, 1997 to 1999, 2000 to 2002 and 2003 to 2005.[8]
To capture the characteristics of the financial structure that really matters: activity, size or efficiency of the market or the banking sector, we use indicators developed by Levine (2002). Data are taken from Beck and Levine database (2006).
For the degree of financial activity, we use the following ratio

$$sact = ln(activ) = ln\left(\frac{TVT}{bankcredit}\right)$$

where TVT is the total value traded on the stock market exchange to GDP. This represents the degree of liquidity of the market (it measures market trading relative to economic activity). Bank credit represents the total credit provided by deposit money banks to GDP.

to introduce stock market international integration as these markets are by and large weakly integrated to the rest of the world markets.
Further, Levine (2002) also considers financial structure regulatory, for instance Rajan and Zingales (1998) argue that bank based systems have a comparative advantage in economies with weak legal systems. Data on regulation are, however, based on surveys and are not available in time series, therefore we prefer to use a control variable that proxy regulations and the rule of law.

[6] Considering the stake it can represent in developing countries for economic growth rates, we first concentrate on the relation that exists in developing countries, however, we intend to conduct a study including developed countries later and especially since 1991, when a number of stock markets have started to function.

[7] We use the World Bank classification that identifies developing countries as the groups of Low Income Countries (LIC) as well as Lower Middle income Countries (LMC) and Upper Middle income Countries (UMC). The World Bank classification is based on the 2006 countries' gross national income (GNI) per capita. They are calculated using the World Bank Atlas method. LIC encompass countries with incomes of \$905 or less, LMC: incomes between \$906 and $\$3,595$ and UMC: incomes between $\$3,596$ and $\$11,115$.

[8] By taking 3 year- averages, we smooth out any short term fluctuations in growth rates as in Levine, Loayza and Beck (2000) for instance. Evidence has also shown that business cycles tend to be shorter in duration in developing countries (see for instance Rand and Tarp 2002).

The size of financial structure is measured as follows:

$$ssize = ln(size) = ln\left(\frac{MC}{bankcredit}\right)$$

where MC is the degree of market capitalisation which is the deflated value of listed shares to GDP.
To measure the efficiency of financial structure, we use the following indicator:

$$seff = ln(eff) = ln\left(\frac{TVT}{overheadcosts}\right)$$

where the overhead costs represent an accounting value of bank's overhead costs as a share of its total assets.
The TVT reflects the liquidity of the stock markets but can be replaced by the turnover ratio.

3.2 Econometric specification

First, we reexamine the relationship between financial structure and economic growth. We use a standard growth equation which can be written as:[9]

$$y_{i,t} - y_{i,t-1} = \alpha y_{i,t-1} + \beta_1 FS_{i,t} + \beta_2 D_b FS_{i,t} + \Gamma X_{i,t} + \eta_i + \epsilon_{i,t}$$

We are in presence of a dynamic panel data model, with cross sections and time series dimensions as well as a lagged variable. Unlike Levine (2002) who uses cross country regressions, we use panel data, allowing to take into account country specific effects and estimate a dynamic specification. All variables are in logarithm therefore the regression directly yields elasticity coefficients of growth with respect to explanatory variables.
The variable $y_{i,t}$ is the logarithm of the real per capita GDP, $X_{i,t}$ represents a set of explanatory variables, other than lagged per capita GDP, used as control variables η_i is an unobserved country specific effect, $\epsilon_{i,t}$ is the error term and i and t represent country and time period respectively. The presence of the lagged GDP is common in growth models as it accounts for the conditional convergence.[10]
Our structure indicators ($FS_{i,t}$) implies that as the financial structure ratios increase, the country is considered to be more market based (than bank based). In fact, if the estimation result suggests a significant coefficient for $FS_{i,t}$, it means that financial structure matters for growth. If this coefficient is positive, it implies a greater role for market struture compared with bank dominated structure, whereas a negative coefficient means a greater role played by banks. Nonetheless, because our data is comprising of different economies, the indicator

[9] As in the literature on finance and growth, see for instance Levine, Loayza and Beck (2000), the growth equation is

$$y_{i,t} - y_{i,t-1} = (\beta - 1) y_{i,t-1} + \beta' X_{i,t} + \eta_i + \epsilon_{i,t}$$

which can be rewritten as $y_{i,t} = \beta y_{i,t-1} + \beta' X_{i,t} + \eta_i + \epsilon_{i,t}$, and we keep the expression with $\alpha = \beta - 1$.

[10] A Wooldridge test for AR(1) serial correlation on the residuals from the regression in the fixed effects least squares suggests a strong serial correlation therefore the lagged dependant variable is needed as an explanatory variable.

($FS_{i,t}$) might be high only because the country has really well developed markets indeed or because bank development (or financial development in general) is low. We therefore include as in Levine (2002) a dummy variable that takes into account the fact that financial system development across the period (or the level of initial financial system development) might influence the effect of structure indicators on economic growth rate.
This dummy variable D_b takes the value of 1 if financial system development is low and a value of 0 otherwise. It is constructed in two ways as in Levine (2002). First we isolate the mean value of TVT, MC, *bankcredit* and *overhead* for each country throughout the sample period. We qualify the country as having a low financial system development (throughout the sample period of 15 years) if TVT, MC, *bankcredit* are lower than the median value of all countries and *overhead* higher than the median. Table 5 in the appendix lists the sample specification.[11]

We start our estimations with a set of variables determining economic growth which are the initial level of real GDP per capita (representing conditional convergence), the level of workforce education (accounting for human capital, which is also common in endogenous growth model) and other control variables such as openness to international trade, inflation and government consumption. We also include our dummy for low financial system development.
To make sure that the ratios that we use do not pick up the impact of financial development in general, we use as proxies for financial development private credits by deposit money banks to GDP (which exclude credits granted by the government) and bank assets as a share of GDP.
Tables 6 and 7 in the appendix present descriptive statistics for all the variables. Data are extracted from the World Bank Indicators (2007), the International Financial Statistics (2006), and all the structure indicators stem from Beck and Levine (2006).

The data set has time series and cross sectional dimensions and the covariates (control variables) might not be strictly exogenous, but can be predetermined (correlated with past observation specific disturbances) or endogenous (correlated with past and current observation specific disturbances).
Blundell and Bond (1998) (BB) develop a system GMM estimator to address issues associated with predetermined and endogenous variables (see Appendix B for details). It consists in :

- using, first difference GMM estimator and lagged levels of explanatory variables as instruments for equations in first differences, as developed in Arellano and Bond (1991)(AB)
- and using lagged differences of explanatory variables as instruments for the equations in levels

The moment conditions for the equations in levels are:
$E\left\{(y_{i,t-1-s} - y_{i,t-2-s})(\eta_i + \epsilon_{i,t})\right\} = 0$, for $t \geq 2$ and $0 \leq s < t-1$.

[11] We can also define the low financial system development by using initial values instead of the mean values but the results are not reported as they do not change the conclusions on financial structure.

Introducing explanatory variables: $E\{(x_{i,s} - x_{i,s-1})(\eta_i + \epsilon_{i,t})\} = 0$, for all $t \geq 2$ and $s \geq 2$ if $x_{i,t}$ is strictly exogenous ;
$E\{(x_{i,t-s} - x_{i,t-1-s})(\eta_i + \epsilon_{i,t})\} = 0$, for all $t \geq 2$ and $0 \leq s \leq t-1$ if $x_{i,t}$ is predetermined ;
$E\{(x_{i,t-s} - x_{i,t-1-s})(\eta_i + \epsilon_{i,t})\} = 0$, for all $t \geq 3$ and $1 \leq s \leq t-1$ if $x_{i,t}$ is endogenous.
Then, combining the equations in levels with the equations in differences make many moment conditions become redundant. We choose the BB estimator because it performs better than Arellano and Bond's estimator when the autoregressive coefficient is relatively high and the number of periods is small.[12] We use the one step estimator and include time dummies in all our estimations. It is in fact important to note that in two step GMM estimation (which is in general asymptotically efficient), when there are too many instruments over a very limited sample, it is difficult to approximate the optimal weigthing matrix (which could be singular) and therefore the efficiency gain over one step can be small (Roodman (2006)).[13]
Moreover, the validity of the internal instruments used must be checked to make sure that the results are valid. As noted by Roodman (2007) the use of system GMM estimators must be done with great caution and several checkings have to be made before relying on the estimation results especially when T is small and the number of instruments which are internally determined is high. Because too many instruments "can overfit the endogenous variables and therefore fail to remove their endogenous components and biases the coefficient estimates" Roodman (2007), we keep the number of instruments to the minimum in order to avoid small sample overfitting bias and "collapse" our instruments as suggested by Roodman (2007).[14] For the lagged real GDP per capita, we use as instruments the first difference variable starting at $t-1$ for the equations in levels and for the equations in first difference, we use the level lagged starting with 2 periods. For structure indicators, which are considered predetermined (influenced by past levels but not current levels), we use as instruments, the variables in levels starting from a lag one period and keep the number of instruments to the minimum to maintain (the number of instruments are mentionned in our results tables).[15] We use the same for other control variables which are predetermined.

[12] Blundell and Bond (1998) estimation requires that the series ($y_{i,1}$, $y_{i,2}$,...,$y_{i,T}$) are mean stationary that is they have a constant mean $\frac{\eta_i}{1-\alpha}$ for each country i.

[13] However, using the two step estimator with the downward bias corrected by Windmeijer (2005) yields similar results. Results from AB estimations and two step estimations are available upon request.

[14] The validity of the BB estimators are checked using the p-values of a Hansen-Sargan test of over-identifying restrictions. It is a test for joint validity of the full instrument checking whether the instruments, as a group, appear exogenous. We also check the p-values of the Arellano-Bond test for AR(2) serial correlation of the residuals. See appendix B for more details.

[15] Considering the structure indicators as endogenous yield similar results.

4 Results

4.1 Baseline results on financial structure

Table 1 shows the results of our financial structure indicators regressions and economic growth rates. In regressions (1), we use the different financial structure indicators: activity, size and efficiency, with a set of explanatory variables that explain economic growth. As in previous studies in the literature, we see that financial structure does not matter for growth, however, our results suggest that it is precisely the size of the financial structure and its liquidity that do not influence growth. We find, however, that market structure efficiency relative to banking sector efficiency has a positive impact on economic growth.[16] Note that for our sample of developing countries, we do not find the convergence phenomenon for initial GDP that is usually observed in the literature using samples of more developed countries.

4.2 Complementarity of banks and markets

Considering the extensive literature on financial development and economic growth, we control our results for the level of financial development. Using either bank credit to the private sector as a share of GDP or bank assets as a share of GDP (representing banking sector development) in regressions (2) and (3), we find that financial structure indicators and more precisely market structure indicators relative to bank structure indicators, become significant.[17] Therefore, banking sector development sheds light on the roles of market activity, market size and market efficiency on economic growth. Put differently, market structure have a positive influence on growth but only with a given level of banking sector development. Among countries with similar levels of banking development, those with more efficient stock markets tend to grow faster.[18]

In brief, the relative size and activity of the financial structure (whether it is bank based or market based) do not influence economic growth in developing countries. It is only market efficiency relative to bank efficiency that contributes to increasing economic growth rate.
Yet, for a given level of banking sector development, market size, market liquidity and market efficiency have positive effects on economic growth. This result suggests that banks and markets are complementary in exerting influence on growth.[19]

[16] Our results show that we cannot reject the null hypotheses of validity of our lagged instruments and of no second-order serial correlation in the residuals.

[17] This result holds even after controlling for the effect that low levels of financial system development have on the structure ratios. In fact, the effect that market structures have on growth is reduced but not cancelled.

[18] However, testing the opposite way round does not yield significant results. When we control financial structure indicators with indicators of market development (turnover, total value traded or market capitalization), we do not observe significance of any of the financial variables, except for structure efficiency, and controlling with both banking sector development and market development, yield the same results as before. These results are available upon request.

[19] Note that initial GDP is also turning inconsequential when we control by banking sector development(significant with structure activity and size). Moreover, banking sector development is not significant with structure efficiency, but as we have seen previously, structure efficiency matters independently on growth.

Table 1: Financial structure indicators and growth

	Activity			Size			Efficiency		
	1	2	3	1	2	3	1	2	3
Initial GDP	**0.099**	0.009	0.049	**0.115**	-0.014	0.015	**0.105**	0.002	0.049
	(0.049)*	(0.031)	(0.043)	**(0.058)***	(0.021)	(0.043)	**(0.050)****	(0.023)	(0.038)
Structure	0.011	**0.028**	**0.023**	0.012	**0.050**	**0.066**	**0.029**	**0.027**	**0.026**
	(0.016)	**(0.011)*****	**(0.011)****	(0.025)	**(0.023)****	**(0.028)****	**(0.017)***	**(0.010)****	**(0.010)****
Financial system dummy	-0.007	**-0.025**	-0.017	0.008	**-0.054**	**-0.065**	-0.029	**-0.025**	**-0.024**
	(0.014)	**(0.011)****	(0.012)	(0.044)	**(0.025)****	**(0.034)***	(0.019)	**(0.011)****	**(0.011)****
Bank private credit		**0.088**			**0.072**			0.029	
		(0.031)***			**(0.023)*****			(0.027)	
Bank assets			0.048			**0.080**			0.005
			(0.041)			**(0.039)****			(0.036)
Observations	203	203	203	201	201	201	204	195	197
Number of group(pays)	56	56	56	56	56	56	57	55	55
Hansen (p-value):	0.91	0.13	0.27	0.85	0.08	0.36	0.24	0.22	0.25
AR(2) stat p-value:	0.55	0.63	0.56	0.47	0.78	0.75	0.47	0.86	0.78
Number of instruments:	17.00	25.00	25.00	17.00	31.00	31.00	17.00	31.00	31.00

Notes Standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%
All regressions include our explanatory variables, time dummies and constant. To save space, we do not report them but detailed results are available upon request.

4.3 Role of income levels

It is also important to consider that the finance-growth link might suffer from the influence of other variables. Recent literature has shown that financial development does not influence economic growth in a linear way as there are evidence of thresholds effects. More importantly, as mentionned before, if the link is widely accepted, it nowadays suffers in several aspects and thus, it is fundamental to look at the "black box" in the relation and take a look at what obstructs the finance effect. Several authors noted indeed that the finance-growth relationship does not seem to work anymore. In this line, a number of them explained that it is because growth process differs across developed and less developed countries. For instance Boyd and Smith (1996) suggest that banks are particularly important at low levels of economic development but as income rise, however, countries benefit from becoming more market based so that optimal degree level of financial structure changes with income per capita.
Durham (2002) remarks that the link between finance and growth must take into account the different subdivisions across different levels of incomes. Stock market development promotes growth in developed countries but not in developing economies. He summarizes the arguments in two parts. First, the effects of economic growth determinants depend on the country's development characteristics. A seminal paper is Gerschenkron (1962) who finds that economic development opposes across different levels of initial incomes.[20] Second, equity markets have different characteristics across different levels of countries' incomes. For instance, the trading system in developed countries is more demand driven compared to the one in developing economies and local information is less appropriate. Further, equity markets in developed countries are more efficient whereas anomalies are more robust in emerging markets and information and signals of productive enterprises are less effectively distributed.
Ang (2008) points out studies showing that in developing countries stock markets are still immature and are subject to informationnal problems and this lack of transparency can weaken the markets and undermine rather than promote growth. He also notes that the link between finance and growth is well established but nonetheless, developing countries are different as their structural and institutional aspects can have a direct effect on financial development's impact on economic growth.
Finally, we have seen previously that initial GDP's influence on economic growth rates in developing countries is not robust when we control it with levels of banking sector development. Since our sample is comprising of developing countries only (of which higher income levels are several emerging countries), it is important to consider initial GDP levels.

We assess whether income levels (suggesting various structural and institutional characteristics) influence the impacts of structure indicators on economic growth by looking at what are the effects of income levels and initial GDP on the impact of financial structure on growth. We use different ways of distinguishing these effects such as slope dummies, income interaction effects and recursive

[20] For instance positive consequence of foreign direct investment requires an absorptive capacity with respect to initial GDP and human capital development, or according to the legal based view, it requires an appropriate political and constitutional environment that depends on initial income.

simulations.

4.3.1 Income level groups

We first consider exogenous thresholds and use World Bank 2006 income classification, LIC, LMC and UMC, as possible thresholds.
We follow Gaytan and Rancière (2004) use of slope dummies. However, in order to identify the contributions of each group of incomes, we test the separate cases and look at three different equations, each of them taking into account the possible impact that different income levels can have on growth rates. We estimate the following equation:

$$y_{i,t} - y_{i,t-1} = \alpha y_{i,t-1} + \gamma FS_{i,t} + \gamma_2 D_k FS_{i,t} + \beta' X_{i,t} + \eta_i + \epsilon_{i,t}$$

where D_k is a dummy variable that takes the value 1 if country i belongs to the group of countries k and k is successively the group of LIC, LMC and UMC countries defined previously.

The coefficient γ represents the mean effect of the whole sample of countries and also the effect of the countries not considered in the dummy variable and $\gamma + \gamma_2$ the possible effects of the group of countries taken into account in the dummy variable.

Our results using these exogenous thresholds are summarized in Table 2 and suggest that, even though we observe as previously that for a given level of banking sector development market activity has a beneficial influence on economic growth rate, we do not find any income effects on structure activity's influence on economic growth.
However, for structure size, we observe that low income levels reduce the effects of market size on economic growth rate whereas for higher income levels (LMC and UMC) structure size effects are missing.
Regarding market efficiency, the effects are positive whatever the income levels and low incomes reduce the mean effect of financial structure efficiency on economic growth.
Therefore, market efficiency relative to bank efficiency influences on growth is exacerbated in high income countries.

Table 2: Financial structure indicators and growth and income groupings effects

	Activity			Size			Efficiency		
	LIC	LMC	UMC	LIC	LMC	UMC	LIC	LMC	UMC
Initial GDP	-0.004	0.005	0.003	-0.007	-0.008	-0.001	0.010	0.003	0.008
	(0.030)	(0.032)	(0.036)	(0.019)	(0.019)	(0.021)	(0.023)	(0.030)	(0.023)
Structure	**0.025**	**0.025**	**0.031**	**0.049**	0.042	0.057	**0.030**	**0.047**	**0.019**
	(0.010)**	**(0.015)***	**(0.011)*****	**(0.022)****	(0.025)	(0.036)	**(0.010)*****	**(0.024)***	**(0.009)****
Dummy LIC*Structure	-0.012			**-0.044**			**-0.016**		
	(0.013)			**(0.021)****			**(0.009)***		
Dummy LMC*Structure		0.004			-0.000			-0.030	
		(0.010)			(0.020)			(0.020)	
Dummy UMC* Structure			-0.013			-0.037			-0.012
			(0.011)			(0.034)			(0.010)
Financial system dummy	**-0.020**	**-0.025**	**-0.025**	**-0.036**	**-0.046**	-0.055	**-0.023**	**-0.030**	-0.016
	(0.008)**	**(0.010)****	**(0.011)****	**(0.019)***	**(0.023)****	(0.033)	**(0.008)*****	**(0.017)***	(0.010)
Bank private credit	**0.094**	**0.090**	**0.080**	**0.065**	**0.073**	**0.067**	0.035	0.027	0.015
	(0.029)***	**(0.029)*****	**(0.029)*****	**(0.023)*****	**(0.022)*****	**(0.022)*****	(0.028)	(0.034)	(0.021)
Observations	203	203	203	201	201	201	195	195	195
Number of group(pays)	56	56	56	56	56	56	55	55	55
Hansen (p-value):	0.10	0.15	0.13	0.14	0.26	0.24	0.23	0.27	0.09
AR(2) stat p-value:	0.78	0.73	0.68	0.92	0.52	0.48	0.94	0.73	0.88
Number of instruments:	20.00	26.00	26.00	38.00	38.00	38.00	32.00	32.00	32.00

Notes Standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%
All regressions include our explanatory variables, time dummies and constant. To save space, we do not report them but detailed results are available upon request.

4.3.2 Initial GDP levels

We check the results with an interaction term between the structure ratio and initial income per capita. It helps notice endogeneous thresholds.

$$y_{i,t} - y_{i,t-1} = \alpha y_{i,t-1} + \beta_1 FS_{i,t} + \beta_2 FS_{i,t} * y_{i,t-1} + \Gamma X_{i,t} + \eta_i + \epsilon_{i,t}$$

β_1 represents, for a given level of GDP per capita, the effect of the structure ratio on economic growth rate.
If β_2 is significantly positive, it means that for a higher level of GDP per capita, the structure ratio effect is more important.

Considering initial GDP as the threshold variable, our results in Table 3 suggest that financial structure activity has an effect through interaction with initial GDP and this effect is more pronounced for higher incomes. However, controlling with banking assets do not confirm the results. Therefore, the interaction effect of initial GDP with structure activity is not robust.
For structure size, we do not observe any interaction effect of initial GDP.
These results are consistent with our previous results on income levels.
Whereas, for structure efficiency, results suggest that there is a threshold of initial income under which financial structure has a negative effect on growth. Put differently, banking sector efficiency is better for growth than market efficiency. If this is true for any given value of initial GDP, it therefore means that as initial levels of income rise, it is market efficiency (rather than bank efficiency) that exert a positive influence on growth thus market efficiency (relative to bank efficieny) is better for higher levels of initial incomes.

We check this result on structure efficiency, first by looking at any scale effect that might be in place. In fact, depending on initial GDP, the overall effect of financial structure efficiency might stay positive, that is market structure efficiency stays more important considering the level of banking sector development. That will utterly confirm our previous results.
Our regression results suggest that for financial structure efficiency to have a positive effect on economic growth rates, initial GDP levels per capita must be higher than \$1,366.48. Looking at summary statistics on initial GDP in our sample of developing economies, we see that more than 50% of our data meet this condition. This suggests that there are some scale effects that drive us to take good care in citing a threshold level of initial GDP under which it is banking sector efficiency that affects positively economic growth rates. In fact, we confirm our previous result as to market efficiency affects growth rates positively for a given level of banking sector development.
Nevertheless, we test the robustness of this conclusion by undertaking simulations on initial GDP levels variations.

Table 3: Financial structure indicators and interaction effects with initial GDP.

	Activity		**Size**		**Efficiency**	
	1	2	1	2	1	2
Initial GDP	0.028	0.030	**-0.057**	-0.020	-0.018	0.036
	(0.039)	(0.038)	**(0.031)***	(0.051)	(0.033)	(0.050)
Structure	-0.242	-0.159	-0.054	0.082	**-0.325**	**-0.249**
	(0.146)	(0.130)	(0.230)	(0.243)	**(0.135)****	**(0.116)****
Interaction Initial GDP and Structure	**0.034**	0.022	0.016	-0.001	**0.045**	**0.035**
	(0.019)*	(0.016)	(0.033)	(0.033)	**(0.019)****	**(0.016)****
Financial system dummy	-0.002	-0.004	**-0.065**	**-0.083**	0.016	0.003
	(0.016)	(0.014)	**(0.034)***	**(0.043)***	(0.027)	(0.019)
Bank private credit	**0.110**		**0.109**		**0.104**	
	(0.038)***		**(0.033)*****		**(0.038)*****	
Bank assets		**0.094**		**0.121**		**0.088**
		(0.042)**		**(0.045)*****		**(0.040)****
Observations	203	203	201	201	195	197
Number of group(pays)	56	56	56	56	55	55
Hansen (p-value):	0.37	0.37	0.07	0.18	0.22	0.49
AR(2) stat p-value:	0.65	0.77	0.96	0.63	0.06	0.04
Number of instruments:	21.00	21.00	21.00	21.00	21.00	21.00

Note Standard errors in parentheses * significant at 10%; ** significant at 5%; *** significant at 1%
All regressions include our explanatory variables, time dummies and constant. To save space, we do not report them but detailed results are available upon request.

4.3.3 Simulations on initial GDP

We undertake recursive simulations for each of our three structure variables. The aim is to check if higher levels of initial income rise the impacts that market structure have on economic growth rates.
For that, we choose to observe how financial structure coefficients and their significances change with the addition of an observation of higher initial GDP in the sample. We use a window starting with the median value of initial GDP in our sample and we go on until initial GDP reaches the value of the 95 percentile of our sample. We undertake 50 iterations.
Simulations in Figure 1 suggest that the effects of market activity, market size and market efficiency are more pronounced in samples of countries with higher levels of initial GDP.[21] In fact, the introduction of higher levels of initial GDP in the sample increases market structure significance (activity, size and efficiency) in the regressions. Results also show that even if low levels of financial system development can reduce the structure effects on economic growth rates, the overall effect of market structure is positive.[22]
We also undertake simulations introducing interaction effect between initial GDP and the financial structure variable (see Figures 2 & 3). We do not find any interaction with structure size and structure activity, whereas structure efficiency interacts with initial GDP to influence growth rates. As in our previous regressions, under a certain level of initial GDP, banking sector efficiency matters more than market efficiency, however, in the end when we add the marginal effects and consider initial GDP in these countries, we come to the conclusion that market efficiency positively impact economic growth rates considering the level of banking sector development (see last chart of Figure 3, where we isolate the effects for our significant variables only).
Our simulations confirm all our previous results.

5 Conclusion

In this paper we have investigated the link between financial development and growth using different relative indicators on financial structures. We show the complementarity of stock markets and banks for growth. Market structure (relative to bank structure) influences growth only for a given level of banking sector development. However, for countries with high initial incomes, the effect of market efficiency relative to bank efficiency on growth is exacerbated and this is confirmed by recursive simulations undertaken on our variables.

These results are obtained using relative variables describing financial structure designs. Indeed, without these variables we would find, as in previous literature, a general result that financial structure does not matter for growth. Our results are more specific and suggest that it is structure activity and structure size that do not influence growth rates. Structure efficiency is playing a role especially when countries incomes are high enough to allow financial development to influence growth.

[21] We represent the evolution of the coefficients (with higher levels of initial GDP) in our figures with 95% confidence intervals in dotted lines.
[22] Detailed results are available upon request.

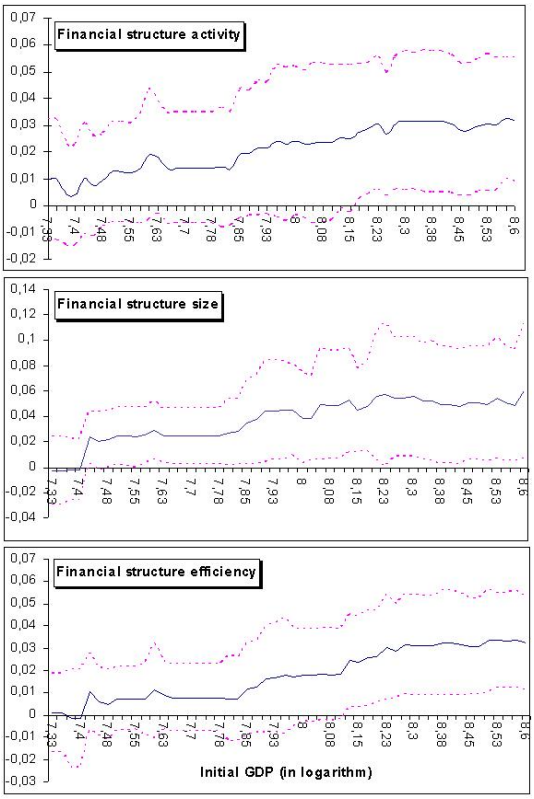

Figure 1: Financial structure indicators simulations with initial income groupings

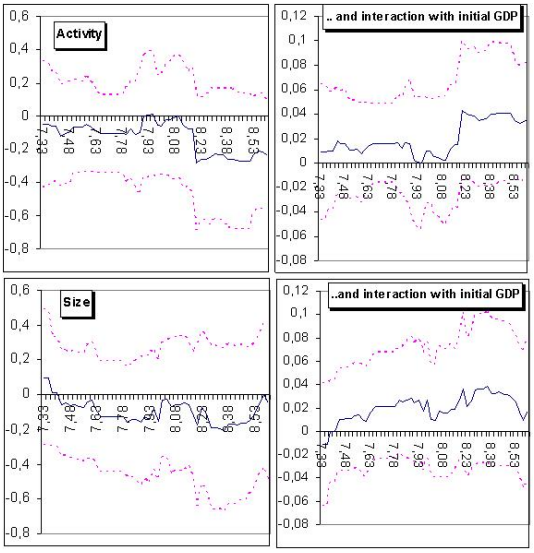

Figure 2: Structure activity and size simulations with initial income groupings

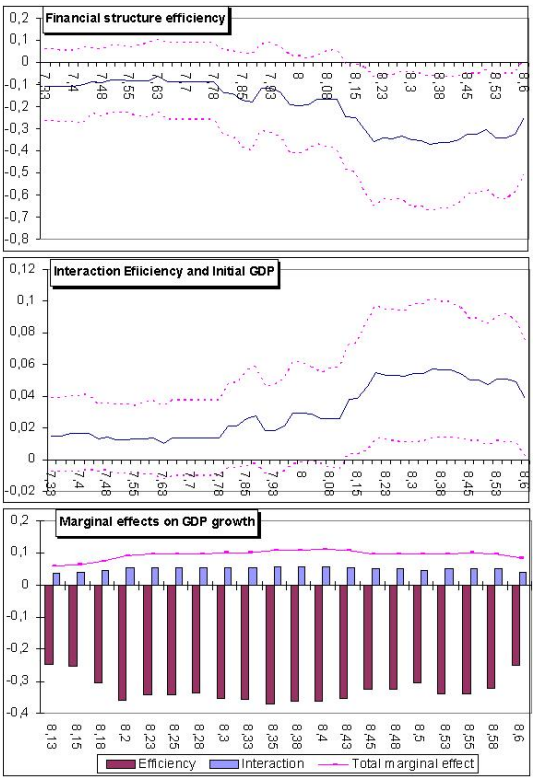

Figure 3: Structure efficiency simulations with initial income groupings

Therefore, because market structure indicators relative to banking sector indicators are not significant to economic growth rates, it is not a prerogative for growth to promote stock market development and more precisely to augment the size of the stock market nor its activity. Whereas, as banking sector develops, a bigger and more active stock market can increase growth and market efficiency remains a determinant variable.

Developing countries seeking to increase their financial resources should first focus on enhancing banking sector development before developing the stock market. In addition, efficiency is a crucial factor compared with size and activity of the financial structure.

Our results already provide insights as to the finance effect. Moreover, since the link between finance and real sector must take into account the fact that financial development can also be a source of volatility of macroeconomic and financial variables and the costs of disturbances in the financial sectors are still difficult to surmount, financial instability is also a variable to be taken into account in future steps, as well as legal environment.

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Appendix A - Descriptive statistics

Table 4: Classification of countries with stock markets by income

LIC	**LMC**	**UMC**
Bangladesh	Bolivia	Argentina
Cote d'ivoire	China	Botswana
Ghana	Ecuador	Brasil
India	Egypt	Bulgaria
Kenya	El salvador	Chile
Kyrgyz rep	Fiji	Colombia
Malawi	Guatemala	Costa Rica
Mongolia	Guyana	Croatia
Nepal	Indonesia	Hungary
Nigeria	Iran, Islamic Rep	Kazakhstan
Pakistan	Jamaica	Latvia
Uganda	Jordan	Lithuania
Zambia	Moldova	Malaysia
Zimbabwe	Morocco	Mauritius
	Paraguay	Mexico
	Peru	Oman
	Philippines	Panama
	Sri Lanka	Papua New Guinea
	Swaziland	Poland
	Thailand	Romania
	Tunisia	Slovak rep
	Ukraine	South Africa
		Turkey
		Uruguay
		Venezuela

Table 5: List of countries with underdeveloped financial system and according to the measures

first period	**mean**
Botswana	**Costa rica**
Costa rica	**Cote d'Ivoire**
Cote d'Ivoire	Ghana
Guatemala	**Guatemala**
Latvia	Kyrgyz rep
Nigeria	**Latvia**
Paraguay	Malawi
Uruguay	**Nigeria**
	Romania
	Swaziland
	Uganda
	Ukraine
	Zambia

Table 6: Descriptive statistics for the sample of all countries

Variable	Mean	Std. Dev.	Min	Max	Observations
GDP growth	.050908	.1542019	-1.307499	.8398582	N = 243
Initial GDP	2050.934	1801.769	6.589931	8497.654	N = 243
Activity	.2415312	.4832022	.0000886	3.829037	N = 251
Size	.8769513	.8418844	.0088984	5.9087	N = 250
Efficiency	3.57815	10.10264	.0002725	94.23367	N = 246
Inflation	.4629277	2.908718	-.0055117	47.34915	N = 296
Openness	.7852122	.4209434	.146305	2.53877	N = 295
Education	.8440789	.1654482	.0005618	.9930441	N = 296
Consumption	.1456073	.0541765	-.0849014	.2881006	N = 301
Bank credit	.4464724	1.145078	.0290533	9.970776	N = 283

Table 7: Correlation coefficients for the sample of all countries

	Growth rate	Activity	Size	Efficiency	Initial GDP	Inflation	Openness	Education	Consumption	Bank credits
Growth rate	1.0000									
	243									
Activity	**0.2053***	1.0000								
	0.0025									
	215	251								
Size	0.0248	**0.6461***	1.0000							
	0.7194	**0.0000**								
	213	**246**	250							
Efficiency	**0.3237***	**0.8821***	**0.5062***	1.0000						
	0.0000	**0.0000**	**0.0000**							
	216	**234**	**231**	246						
Initial GDP	0.0691	0.0660	-0.0064	0.1613	1.0000					
	0.2833	0.3357	0.9263	0.0177						
	243	215	213	216	243					
Inflation	**-0.1662***	0.0695	-0.0279	-0.0291	0.0396	1.0000				
	0.0099	0.2755	0.6628	0.6526	0.5413					
	240	248	247	242	240	296				
Openness	0.0301	-0.0946	-0.0126	0.0569	0.0744	-0.0698	1.0000			
	0.6458	0.1365	0.8437	0.3764	0.2561	0.2374				
	235	249	248	244	235	288	295			
Education	**0.2157***	0.0917	-0.0810	0.1621	**0.5519***	0.0131	0.1017	1.0000		
	0.0009	0.1524	0.2073	0.0119	**0.0000**	0.8255	0.0854			
	235	245	244	240	**235**	287	287	296		
Consumption	-0.0211	-0.0360	-0.0013	0.0419	**0.2801***	0.0610	0.3260*	0.0167	1.0000	
	0.7450	0.5723	0.9840	0.5143	0.0000	0.3003	0.0000	0.7767		
	239	248	247	244	239	290	289	290	299	
Bank credits	0.0103	0.0391	-0.1148	**0.4666***	0.0749	-0.0777	**0.2467***	**-0.4983***	0.1051	1.0000
	0.8758	0.5376	0.0699	**0.0000**	0.2560	0.1958	**0.0000**	**0.0000**	0.0808	
	232	251	250	**234**	232	279	**274**	**275**	277	283

Appendix B - Panel data estimation : system GMM

OLS is inconsistent because η_i is correlated with $y_{i,t-1}$ (even if there is no correlation between η_i and $x_{i,t}$.
The LSDV estimator (fixed effects or within group estimator) is obtained after applying OLS to the time demeaning deviation applied to the equation. It eliminates the unobserved individual effects (therefore it gets rid of possible correlation between η_i and $x_{i,t}$) but there will still be correlation between $y_{i,t} - \overline{y}_{i,-1}$ and $\epsilon_{i,t} - \bar{\epsilon}_i$. That is the reason why the LSDV estimator is inconsistent for finite T and $N \longrightarrow \infty$.
Anderson and Hsiao (1981) (AH) suggest an IV estimator consistent with fixed T and $N \longrightarrow \infty$. It starts by eliminating the unobserved heterogeneity by first differencing the model. Then it uses $y_{i,t-2}$ and $y_{i,t-2} - y_{i,t-3}$ as valid instruments (as they are correlated with $y_{i,t-2} - y_{i,t-1}$ but uncorrelated with $\epsilon_{i,t} - \epsilon_{i,t-1}$[23].
The AH estimator is consistent but not efficient as it does not use all the available moment conditions.
Arellano and Bond (1991) (AB) suggest a generalized method of moments (GMM) estimator. As in AH estimator, it relies on first differencing the model first and then uses the orthogonality conditions between the lagged values of $y_{i,t}$ and the disturbances $\epsilon_{i,t} - \epsilon_{i,t-1}$ to obtain an estimator. These conditions can be written as: $E\{y_{i,t-1-s}(\epsilon_{i,t} - \epsilon_{i,t-1})\} = 0$, for $t \geq 2$ and $1 \leq s \leq t$.
Moreover, explanatory variables can be predetermined or endogenous with AB estimator. $E\{x_{i,s}(\epsilon_{i,t} - \epsilon_{i,t-1})\} = 0$, for all $t \geq 2$ and $s \geq 1$ if $x_{i,t}$ is strictly exogenous (the complete time series can be used to instrument $x_{i,t} - x_{i,t-1}$) ;
$E\{x_{i,t-s}(\epsilon_{i,t} - \epsilon_{i,t-1})\} = 0$, for all $t \geq 2$ and $1 \leq s \leq t$ if $x_{i,t}$ is predetermined
$E\{x_{i,t-s}(\epsilon_{i,t} - \epsilon_{i,t-1})\} = 0$, for all $t \geq 3$ and $2 \leq s \leq t$ if $x_{i,t}$ is endogenous.
The AB estimator, also called difference GMM, has proved to generate large sample bias and poor precision and lagged levels of the series provide weak instruments for first differences.
Kiviet (1995), Bun and Kiviet (2003) and Bruno(2005a) LSDVC derive an approximation of the small sample bias with strictly exogenous vector and homoskedastic disturbance and use it to construct a bias corrected LSDV. Bruno extends it to unbalanced panels.
We therefore use the Blundell Bond (1998) estimators (BB). Note that the validity of BB estimators are checked using the Hansen-Sargan test of over-identifying restrictions. It verifies the validity of the instruments, as a group, with a null hypothesis that the instruments are valid. Further, residuals are serially correlated of order one, however, the Arellano-Bond test for AR(2) serial correlation of the residuals must not allow the rejection of the null hypothesis of no second order correlation of residuals.

[23] $y_{i,t-2}$ is usually recommended