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Financial Development and Economic Growth: A Panel Data Approach

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Abstract. *The relationship between financial development and economic growth has been studied long time in economics (Adam Smith and Schumpeter). Structural reforms and the integration of financial markets have been attracting the interest of the academic community.*

This manuscript examines the link between financial development and economic growth. The European Union Countries (EU-27), and BRIC (Brazil, Russia, India and China) were examined, between 1980 and 2006. Using a static and dynamic panel data approach, the results demonstrate that the financial development contribute to economic growth. Our study also consider productivity and trade, these proxies confirm the positive effect on economic growth.

Keywords: economic growth; financial development; panel data and globalization.

JEL Codes: C33, E44, O16.
REL Codes: 8E, 11B.

Introduction

In the 1990´s emerged the empirical models that analyse the impact of financial sector on economic growth (King, Levine, 1993, Millner, 1998). This manuscript examines the link between financial development and economic growth. There are good reasons for studying this topic. In the 1980's we assisted financial reforms on OECD countries. International economics showed the rapid economic growth on Asian countries during the 1970s and 1980s. The domestic credit increased considerably as the result of financial reform. This study examines the *link* between financial development and economic growth using an unbalance panel data for the period 1980-2006. We select EU-27 countries d BRIC countries (Brazil- Russia, India and China).

In static panel data models, Pooled OLS, fixed effects (FE) and random-effects (RE) are used. The RE estimator was excluded because our sample is not random. Furthermore, the Hausman test rejects the null hypothesis RE versus FE. Therefore, the regression coefficients are estimated using fixed effects. The results presented in this paper are consistent with the predictions of financial sector development affect economic growth. We also decided to introduce a dynamic panel data. This methodology is most frequently used in the growth literature (GMM-SYS). The estimator used GMM-System permits the researchers to solve the problems of serial correlation, heteroskedasticity and endogeneity of some explanatory variables. These econometric problems were resolved by Arellano and Bond (1991), and Blundell and Bond (1998, 2000). To estimate the dynamic model, we applied the methodology of Blundell and Bond (1998, 2000). The remainder of the article is organized as follows: section 2 presents the theoretical background; section 3 explains the relationship between financial development and economic growth; section 4 presents the econometrical model; section 5 shows the estimation results, the final section provides conclusions.

Literature review and empirical studies

In this section we present a survey of theoretical and empirical models of financial development and economic growth. When we consider the relationships between financial development and economic growth we need to consider different opinions (Levine, 2003). There are not consensuses in the literature. According to Levine (1997) the financial development could be

explained by the access to credit and financial services. The classical models as in Schumpeter (1912) have the similar opinion. Schumpeter (1912) defended that financial development accelerates growth. In 2005, Levine refers a relevant consideration. The economy, i.e the market gives information about investment projects, risk diversification and international trade. Other points of view have Robinson (1952), Millner (1998), and Lucas (1988). Robinson considers that financial development simplifies the "channels" of economic growth. Millner (1998) refers that financial markets promote the economic growth, but it will be necessary to consider others explanatory variables. In other words, the financial development is endogenous across to real growth. Lucas (1988) has the similar opinion. Goldsmith (1969) and Mckinnon (1973) consider a positive correlation between economic growth and financial development. La Porta et al. (1998) and Levine et al. (2000) measure the impact of financial development on economic growth. The authors also found a positive correlation.

Levine et al. (2000) and Beck et al. (2000) explain the correlation between financial development and economic growth, with finance – endogeneity proxies. Levine et al. (2000), and Beck et al. (2000) introduced an excellent contribution; these authors create new instruments variables to financial development and apply a dynamic panel data approach, GMM estimator. Levine et al. (2000) analyse the correlation between financial intermediation and growth. Beck et al. (2000) study the link between financial development and the sources of growth as in productivity, physical capital, and savings.

La Porta et al. (1998) introduced the legal origin as instruments variables. The study of Neusser and Kugler (1998 applied to OECD countries for the period 1960-1993) does not support the idea that financial development could explain economic growth.

Modeling finance development and economic growth

We consider that economic growth (Levine, 1997, Beck et al., 2000, and Levine et al., 2000) is equal to:

$$Growth_{it} = f\left(CREDIT, BANK, IPC, TRADE, PROD\right) \tag{1}$$

$$\begin{aligned} &\partial f / CREDIT > 0, \partial f / BANK \succ 0, \partial f / IPC < \\ &< 0, \partial f / \partial TRADE > 0, \partial f / PROD \succ 0 \end{aligned} \tag{2}$$

where:

Growth is the growth rate of real GDP;
CREDIT is the private credit;
BANK is the deposit money banks;
IPC is the consumer price;
TRADE is the ratio of exports plus imports;
PROD is the productivity.

Econometrical model

Following the literature our study applies a static panel data (Fixed Effects), and a dynamic panel data (GMM-SYS). The dependent variable used is economic growth; this variable is measured as growth rate of real GDP per capita in country. The data for explanatory variables is sourced from the World Development Indicators (2009). The source used for dependent variable was World Bank.

Explanatory variables

Hypothesis 1: Financial development stimulates the economic growth.

We use two indicators of financial development: private credit (CREDIT), and commercial – central bank (BANK).

LogCREDIT is ratio of total credit to GDP, i.e. credit by deposit money banks and other financial institutions to private sector divided by GDP in logarithm form.

LogBANK is the logarithm of assets of deposit money banks divided by assets of deposit money banks plus central bank assets. According to the literature (Blanchard, 1981, Levine, 2003) we expected a positive sign.

Hypothesis 2: International trade and productivity promote the economic growth.

We use two proxies: TRADE and productivity (PROD):

LogTRADE is the ratio of total trade to GDP in logarithm form;

LogPROD is value added by the employer. Levine (1997) suggested that financial development promotes economic growth via international trade and productivity. Beck et al. (2000) also analyze the relationship between financial

development and productivity. According to the literature there is a positive correlation between international trade and economic growth. The same is validating between productivity and economic growth.

Hypothesis 3: Macroeconomic stability (instability) encourages (discourage) the economic growth.

We consider the ICP (consumer price): This is a control variable as measure of macroeconomic stability or instability. The expected sign is negative.

Static and dynamic panel data models

Model [1]

$$Growth_{it} = \beta_0 + \beta_1 (CREDIT)_{it} + \beta_2 (ICP)_{it} + \beta_3 (TRADE)_{it} + \\ + \beta_4 (PROD)_{it} + \delta t + \eta_i + \varepsilon_{it}$$

Where $Growth_{it}$ is either per capita GDP growth, X is a set of explanatory variables. All variables are in the logarithm form; η_{it} is the unobserved time-invariant specific effects; δt captures a common deterministic trend; ε_{it} is a random disturbance assumed to be normal, and identically distributed (IID) with E (ε_{it})=0; Var (ε_{it}) $= \sigma^2 \succ 0$.

The model can be rewritten in the following dynamic representation:

$$Growth_{it} = \rho Growth_{it-1} + \beta_1 (CREDIT)_{it} - \rho\beta_1 (CREDIT)_{it-1} + \\ + \beta_2 (ICP)_{it} - \rho\beta_2 (ICP)_{it} + \beta_3 (TRADE) - \\ - \rho\beta_3 (TRADE)_{it} + \beta_4 (PROD)_{it} - \rho (PROD)_{it} + \delta t + \eta_i + \varepsilon_{it}$$

Model [2]

$$Growth_{it} = \beta_0 + \beta_1 (BANK)_{it} + \beta_2 (ICP)_{it} + \beta_3 (TRADE)_{it} + \\ + \beta_4 (PROD)_{it} + \delta t + \eta_i + \varepsilon_{it}$$

The model can be rewritten in the following dynamic representation:

$$Growth_{it} = \rho Growth_{it-1} + \beta_1 (BANK)_{it} - \rho\beta_1 (BANK)_{it-1} +$$
$$+ \beta_2 (ICP)_{it} - \rho\beta_2 (ICP)_{it} + \beta_3 (TRADE)_{it} -$$
$$- \rho\beta_3 (TRADE)_{it} + \beta_4 (PROD)_{it} - \rho (PROD)_{it} + \delta t + \eta_i + \varepsilon_{it}.$$

Analysis of the static panel data estimations

In Table 1, the two equations of the growth can be observed. With the first model, all explanatory variables are significant (LogCREDIT, LogTRADE, and LogPROD at 1% level and LogIPC at 10% level). The variable total credit (LogCREDIT) presents a positive sign, confirming the theoretical forecast proposed by Levine (2005).

Table 1

Financial development and economic growth: fixed effects

Variables	Model [1]	Model [2]	Expected Sign
LogCREDIT	0.342 (2.96)***		(+)
LogBANK		0.087 (1.20)	(+)
LogIPC	-0.026 (-1.85)*	-0.034 (-2.75)***	(-)
LogTRADE	2.06 (4.01)***	1.759 (3.79)***	(+)
LogPROD	0.650 (4.71)***	0.857 (4.64)***	(+)
Adj. R^2	0.305	0.253	
Observations	491	491	

T-statistics (heteroskedasticity corrected) are in round brackets.
***/**- statistically significant, respectively at the 1%, and 10% levels.

Vaona (2007) also found a positive sign. The coefficient of consumer price analyses the level of inflation. This indicator affects GDP growth negatively. Our result supports this hypothesis. We also introduced the variables, international trade (TRADE), and productivity (PROD). Levine (1997), Beck et al. (2000) suggested that financial development promotes economic growth via international trade and productivity. A positive sign effect of international trade (TRADE), and productivity (PROD) were expected and the results confirm this. With the second model, the equation presents three significant variables (LogICP, LogTRADE, LogPROD).

Other considerations relating to the second equation:

i) ICP (consumer price): This is a control variable as measure of macroeconomic instability. The expected sign is negative and the estimated coefficient is negative;

ii) TRADE: We expected a positive impact on growth and the coefficient is positive;

iii) PROD (Productivity): The expected sign is positive, which is confirmed by the estimation.

Analysis of the dynamic panel data estimations

It is usual in the growth literature apply the GMM-System (Blundell and Bond 1998, 2000). The validity of instruments is tested using a Sargan test of over-identifying restrictions and serial correlation. First-order and second-order serial correlation in the first-differenced residuals is test using m1 and m2 statistics (Arellano, Bond, 1991). The GMM system estimator is consistent if there is no second-order serial correlation in the residuals (m2 statistics).

The dynamic panel data is valid if the estimator is consistent. We used the criterion of Windmeijer (2005) small sample correction to have consistent stand errors. As shown in Table 2, the two equations present consistent estimates, with no serial correlation for the GMM-SYS estimator (m1, m2, and statistics). The specification Sargan test shows that there are no problems with the validity of the instruments used for both equations. The instruments in levels used are LogCREDIT(2,7), LogGDP(2,7), LogTRADE (2,7) for first differences. For levels equations, the instruments are used first differences all variables lagged t-1.

The equation [1] presents seven significant variables: ($LogGrowth_{t-1}$, LogCREDIT, $LogCREDIT_{t-1}$, LogTRADE, $LogTRADE_{t-1}$, LogPROD, $LogPROD_{t-1}$). The equation [2] presents nine significant variables ($LogGrowth_{t-1}$, LogBANK $LogBANK_{t-1}$, LogICP, $LogICP_{t-1}$, LogTRADE, $LogTRADE_{t-1}$, LogPROD, $LogPROD_{t-1}$).

Other results relating to the financial development and economic growth:

i) Lagged dependent variable ($LogGrowth_{t-1}$): a positive sign was expected and the results confirm this;

ii) Private credit (CREDIT), and lagged credit ($LogCREDIT_{t-1}$): the expected signs are positive, which is confirmed by the estimations;

iii) Bank (BANK), and lagged BANK ($LogBANK_{t-1}$): the expected sign is positive, and the coefficients of these variables are significantly but with contradictory sign;

ICP (consumer price), and lagged ICP (ICP_{t-1}): the expected sign is negative, and the coefficients of these variables are positive;

iv) Trade (LogTRADE) and lagged trade ($LogTRADE_{t-1}$): the expected sign is positive and the results confirm this;

v) Productivity (LogPROD) and lagged variable ($LogPROD_{t-1}$) are according to the hypothesis formulated.

Table 2

Financial development and economic growth: GMM-SYS

Variables	Model [1]	Model [2]	Expected Sign
$LogGrowth_{t-1}$	0.322 (12.7)***	0.304 (4.04)***	(+)
LogCREDIT	0.146 (9.19)***		(+)
$LogCREDIT_{t-1}$	0.127 (7.95)***		
LogBANK		-0.157 (-11.5)***	(+)
$LogBANK_{t-1}$		-0.141 (-6.53)***	
LogIPC	0.0589 (1.11)	0.214 (3.26)***	(-)
$LogIPC_{t-1}$	0.095(1.34)	0.339 (3.63)***	
LogTRADE	0.108 (3.89)***	0.096 (12.0)***	(+)
$LogTRADE_{t-1}$	0.081 (2.93)***	0.100 (6.78)***	
LogPROD	0.098 (4.73)***	0.170 (16.6)***	(+)
$LogPROD_{t-1}$	0.090 (4.65)***	0.148 (9.10)***	
C	0.002(0.179)	-0.032 (-3.77)***	
M1	0.2795 [0.780]	-1.050 [0.294]	
M2	-0.2555 [0.798]	0.02580 [0.979]	
Wjs	485.8 [0.000] Df=9	539.2 [0.000] Df=9	
Sargan	-3.302 [1.000] Df=521	-2.439 [1.000] Df=521	
Observations	462	462	
Individuals	24	24	

T-statistics (heteroskedasticity corrected) are in round brackets. The null hypothesis that each coefficient is equal to zero is tested using second-step robust standard error. T-statistics (heteroskedasticity corrected) are in round brackets.

*** indicates statistically significance, respectively at the 1% level. P-values are in square brackets. Year dummies are included in all specifications (this is equivalent to transforming the variables into deviations from time means, i.e. the mean across the fourteen countries for each period). M1 and M2 are tests for first-order and second-order serial correlation in the first-differenced residuals, asymptotically distributed as N (0, 1) under the null hypothesis of no serial correlation (based on the efficient two-step GMM estimator). Sargan is a test of the over-identifying restrictions, asymptotically distributed as χ^2, under the null of instruments' validity (with two-step estimator).

Conclusions

The objective of this study was to analyze the link between financial development and economic growth. This relationship is stable, because the development of financial sector can play an important role to be an engine of economic process.

Comparing our findings with other empirical studies, we obtained similar results. Econometric estimations support the hypothesis formulated. Our results are robust with static and dynamic panel data.

The proxy (LogCREDIT) used to evaluate the financial development present a positive correlation on economic growth when we used the fixed effects, and GMM-System. This result is according to the literature (Levine, 2005, Vaona, 2007). Our finding also shows that financial development stimulates the productivity and international trade.

The study has however some limitations. A deeper analysis needs to include other control variables: economic freedom, language and cultural similarity, human capital, and globalization.

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