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15 November 2012

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Abstract:

This manuscript examines the link between bank lending and economic growth for European Union (EU-27). The period was examined, between 1990 and 2010. We apply a dynamic panel data (GMM-System estimator). This estimator permits the researchers to solve the problems of serial correlation, heteroskedasticity and endogeneity for some explanatory variables As the results show, saving indeed promotes growth. The inflation has a negative impact on economic growth as previous studies. Our results show that domestic credit discourages the growth.

1. Introduction

In recent years, the financial development has become an important issue in the economics literature.

This paper tests the link between bank credit and economic growth. We examine this link for European Union (EU-27). The period 1990-2010 was chosen on the basis of its providing a sufficient number of observations. The methodology uses a panel data approach. The panel is unbalanced due to the lack of information on some countries in all of the years analyzed.

The results presented in this manuscript are generally consistent with the expectations of financial development studies. The remainder of the paper is organized as follows: Section 2 presents the theoretical background; Section 3 presents the econometric model used in this study. Section 4 displays the empirical results; and the final section provides the conclusions.

2. Literature Review

In this section we present a survey of the theoretical models of economic growth and their relationship with financial development. The literature (Goldsmith, 1969; Mckinnon, 1973; Levin et al. 2005) shows that financial system promotes the economic growth. Financial instruments as is domestic credit provided by banking sector, the liquid

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liabilities of the system in the economy, are correlated with gross to domestic savings, and openness trade. According to growth endogenous models these proxies are explanatory variables of economic growth.

Levine et al. (2000), Christopulus and Tsionas (2004) consider that there is a correlation between financial system and economic growth. Hassan et al. (2011) demonstrates that there are arguments to consider a causal direction within financial institutions and economic growth, i.e these proxies reinforce between them. Khan (2001) found causality between financial institutional and economic growth.

There is some robust evidence that international trade is positively correlated with economic growth (Grossman and Helpman 1991, Rebelo 1991, Leitão, 2010, and Hassan et al. 2011). However some authors as in Lai et al. (2006), and Onaran and Stockhammer (2008) found a negative association between openness trade and growth.

According to the literature the financial market is positively correlated with financial services, and this promotes the economic growth. La Porta et al. (1998), Levine et al. (2000), Leitão (2010), Hassan et al. (2011) defend this idea. There is no consensus in domestic credit that this proxy promotes economic growth. Leitão (2010) finds a positive correlation between domestic credit and growth. The author examines the link between financial development and economic growth for European Union Countries and BRIC (Brazil, Russia, India and China) for the period 1980 to 2006. As in Levine et al. (2000), and Beck et al. (2000), the author applied a dynamic panel data.

Hassan et al. (2011), Levine (1997) defend and find a negative impact of credit in economic growth. In fact domestic credit discourages the investment and saving. In this way we can consider a negative correlation within credit and growth.

The empirical studies (Padovano and Galli, 2002, Koch et al., 2005, Lee and Gordon, 2005) demonstrate that a higher taxes system cause a decrease on economic growth. On the other hand fiscal policy can be understood as an indicator control or adjusted to the government spending and the inflation.

3. **Econometric model**

The dependent variable is the real GDP per capita of European Countries for the period 1990 and 2010. The data are taken from World Development Indicators, the World Bank.

This research uses a panel data. The static panel data have some problems in serial correlation, heteroskedasticity and endogeneity of some explanatory variables. The

estimator GMM-system (GMM-SYS) permits the researchers to solve the problems of serial correlation, heteroskedasticity and endogeneity for some explanatory variables. These econometric problems were resolved by Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998, 2000), who developed the first differenced GMM (GMM-DIF) estimator and the GMM system (GMM-SYS) estimator. The GMM-SYS estimator is a system containing both first differenced and levels equations. The GMM-SYS estimator is an alternative to the standard first differenced GMM estimator. To estimate the dynamic model, we applied the methodology of Blundell and Bond (1998, 2000), and Windmeijer (2005) to small sample correction to correct the standard errors of Blundell and Bond (1998, 2000). The GMM system estimator that we report was computed using STATA. The GMM- system estimator is consistent if there is no second order serial correlation in the residuals (m2 statistics). The dynamic panel data model is valid if the estimator is consistent and the instruments are valid.

3.1 Explanatory Variables and Testing of Hypothesis

Based on the literature, we formulate the following hypothesis:

Hypothesis 1: The international trade promotes economic growth.

The international trade is measured by $TRADE_{it} = X_i + M_i$.
Where :
X_i represents the annual exports of each trade partner at time t and M_i, represents the annual imports. The data for trade were collected from World Bank. We expected a positive sign for this proxy.
It should be noted that the previous studies (Grossman and Helpman 1991, Rebelo 1991) found a positive relationship between openness trade and growth.

Hypothesis 2: The domestic credit discourages the economic growth.

Shaw (1973), Hassan et al. (2011) provide theoretical and empirical supports for this hypothesis.

CREDIT – Domestic credit provided by the banking sector, which includes all credit to various sectors on a gross basis, with the exception of credit to the central government.

BANK- Domestic credit provided by the banking sector, which covers claims on private non-financial corporations, households, and non-profit institutions.

Hypothesis 3: The higher level of government consummation discourages the growth.

Hypothesis 4: There is a positive correlation between savings and investment.

Pagano, (1993), and Hassan et al. (2011) consider that saving promote economic growth.

Hypothesis 5: The growth is negatively correlated with inflation.

ICP- is inflation, i.e, measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The studies of Gillman and Kejak(2005), and Fountas et al. (2006) found a negative effect on growth. The data was collected by World Bank.

3.2 Model Specification

$$Growth_{it} = \beta_0 + \beta_1 X_{it} + \delta t + \eta_i + \varepsilon_{it}$$

Where $Growth_{it}$ is real GDP per capita, and X is a set of explanatory variables. All variables are in the logarithm form; η_i 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 with E (ε_{it})=0; Var $(\varepsilon_{it}) = \sigma^2 \succ 0$.

The model can be rewritten in the following dynamic representation :

$$Growth_{it} = Growth_{it-1} + \beta_0 + \beta_1 X_{it} - \rho\beta_1 X_{it-1} + \delta t + \eta_i + \varepsilon_{it}$$

Where $Growth_{it}$ is real GDP per capita, X is a set of explanatory variables. All variables are in the logarithm form.

4. Empirical Results

First of all the correlations and descriptive statistics for panel data is presented in the following tables. Table 1 and 2 present the correlations and summary statistics for each variable. Table 2 shows that LnGrowth, Lnicp and Lntrade appear to have only little differences between means and standard deviations. The same is valid to Lncredit, Lnbank, and Lnsavings.

Table 1: Correlations between variables

```
             | LnGrowth  Lncredit   Lbank   Lntrade Lnsavings   Lnicp
-------------+-------------------------------------------------------------
    LnGrowth|   1.0000
    Lcredit |  -0.2522   1.0000
     Lnbank |  -0.3294   0.9490    1.0000
    Lntrade |  -0.1771   0.5003    0.4875    1.0000
  Lnsavings |  -0.0572   0.1219    0.1320    0.1921   1.0000
      Lnicp |   0.0745  -0.4970   -0.4295   -0.4915  -0.1782   1.0000
```

Table 2: Summary Statistics

```
Variables    |     Obs       Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------------
   LnGrowth  |     431    .4738363    .3604884  -1.993613   1.087541
   Lncredit  |     501    1.830202    .3177701   .8554692   2.452717
     Lnbank  |     506    1.912566    .2881791   1.045252   2.499346
    Lntrade  |     485    .9622464    .8484999  -3.471796   2.564718
  Lnsavings  |     508    1.297263    .1255571   .6654311   1.700747
-------------+--------------------------------------------------------------
      Lnicp  |     502     .567018    .5116398  -1.055102   3.024639
```

Before estimating the panel regression model, we have conducted a test for unit root of the variable. The table 3 presents the results of panel unit root test (ADF-Fisher Chi square).

The most important variables such as economic growth rate (LnGrowth), Lncredit (domestic credit which includes all credit), Lnbank (domestic credit which includes private non-financial corporations, households, and non-profit institutions), savings (Lnsavings),

and inflation (Lnicp) do not have unit roots, i.e, are stationary with individual effects and individual specifications.

Table 3: Panel Unit Roots: ADF Based on augmented Dickey-Fuller tests

```
-------------------------------------------------------------------
ADF- Fischer Chi-square
                                  Statistic      p-value
-------------------------------------------------------------------
 LnGrowth                         195.9888       0.0000
 Lncredit                          92.5702       0.0009
 Lnbank                            72.8034       0.0449
 Lntrade                           60.9398       0.2405
 Lnsavings                         92.8039       0.0008
 Lnicp                            148.2721       0.0000
-------------------------------------------------------------------
```

The table 4 reports model 1 using GMM-System. According to the results displayed in estimator four explanatory variables are statistically significant (LnGrowth$_{t-1}$,Lncredit, Lnsaving, , and Lnicp).

With GMM-system, the model presents consistent estimates, with no serial correlation (m2 statistics). The specification Sargan test shows that there are no problems with the validity of instruments used. As expected for the Lagged dependent variable (LogGrowth$_{t-1}$) the result presents a positive sign, showing the economic growth have a significant impact on long-term effects.

The coefficient of domestic credit (Lncredit) is negatively correlated with growth. We can infer that domestic credit and growth depend on financial climate.

As we expected the variable of savings (Lnsaving) finds a positive impact on growth. This result is according to previous studies (Pagano, 1993, and Hassan et al. 2011). The coefficient of inflation (Lnicp) finds a negative sign. Gillman and Nakov (2004) found a negative impact for Hungary and Poland.

Table 4: GMM- System Estimator: Model [1]

```
-------------------------------------------------------------------
              |              Robust
Lngrowth      |    Coef.    Std. Err.     z     P>|z|    [95% Conf.Interval]
------------+------------------------------------------------------
    Lngrowth|
       L1.  |  .2199333   .1067308    2.06    0.039    .0107447    .4291218
            |
    Lncredit|  -.4396187  .1576533   -2.79    0.005   -.7486134   -.1306239
    Lntrade |   .0376023  .0474358    0.79    0.428   -.0553702    .1305747
   Lnsavings|   .8211932  .3928464    2.09    0.037    .0512284   1.591158
       Lnicp|  -.1199831  .0713873   -1.68    0.093   -.2598996    .0199335
        cons|   .1138126  .4042725    0.28    0.778   -.6785468    .9061721
       Ar2  |   0.7160
 Sargan Test|   1.00
-------------------------------------------------------------------
```

The null hypothesis that each coefficient is equal to zero is tested using one-step robust standard error. *T-statistics* (heteroskedasticity corrected) are in round brackets. *P* values are in square brackets; ***/**-statistically significant at the 1, and 5 percent level. Ar(2): is tests for 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).The Sargan test addresses the over identifying restrictions, asymptotically distributed X^2 under the null of the instruments' validity (with the two-step estimator).

The model [2] is reported in table 4 a. The model presents consistent estimates, with no serial correlation (m2 statistics). The specification Sargan test shows that there are no problems with the validity of instruments used. The Lagged dependent variable (LogGrowth$_{t-1}$) presents a positive sign, showing the economic growth have a significant impact on long-term effects.

Table 4a: GMM- System Estimator: Model [2]

```
--------------------------------------------------------------------------
             |                Robust
   Lngrowth  |    Coef.    Std. Err.     z     P>|z|    [95% Conf. Interval]
-------------+------------------------------------------------------------
   Lngrowth  |
        L1.  |  .2186726   .1032235    2.12    0.034    .0163582    .420987
             |
     Lnbank  | -.5190514   .2003205   -2.59    0.010   -.9116724   -.1264305
    Lntrade  |  .0274522   .0482217    0.57    0.569   -.0670607    .121965
  Lnsavings  |  .8412859   .4022987    2.09    0.037    .052795    1.629777
      Lnicp  | -.1275726   .0721727   -1.77    0.077   -.2690284   .0138833
      _cons  |  .2897453   .3657885    0.79    0.428   -.427187    1.006678
       Ar2   |   0.8436
 Sargan Test |   1.00
--------------------------------------------------------------------------
```

The null hypothesis that each coefficient is equal to zero is tested using one-step robust standard error. *T-statistics* (heteroskedasticity corrected) are in round brackets. *P* values are in square brackets; **/*-statistically significant at the 5, and 10 percent level. Ar(2): is tests for 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).The Sargan test addresses the over identifying restrictions, asymptotically distributed X^2 under the null of the instruments' validity (with the two-step estimator).

According to the results displayed in estimator four explanatory variables are statistically significant (LnGrowth$_{t-1}$,Lnbank, Lnsavings, and Lnicp). The results are according to the literature.

5. Conclusions

This paper analyses the link between economic growth and bank credit. To this purpose it was introduced explanatory variables as domestic credit, savings, bilateral trade and inflation. The results indicate that the endogenous models have a greater potential to explain economic growth. Drawing from the relationship between economic growth and bank credit , we presented the GMM-system estimator. Our findings suggest that the economic growth is a dynamic process. The study confirms that savings promote the growth. The inflation and domestic credit are negatively correlated with economic growth.

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