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Regional evidence on the finance-growth Nexus

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**Regional Evidence on the Finance - Growth
Nexus**

by

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Regional Evidence on the Finance - Growth Nexus

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Regional Evidence on the Finance - Growth Nexus

Abstract

The Finance-Growth Nexus is a classical source of debate among economists. This contribution offers regional evidence on this issue in order to see if it can meet the data within a 140 years old economic union -- Italy -, in the ideal context for its main competitor - New Economic Geography - and in order to avoid pooling between developed and developing countries. The results for this application support the view that finance leads growth, reject its possible endogeneity and shows its robustness even in presence of spatial unobserved heterogeneity by using both cross-section and panel data estimators.

Jel codes: O18, O16, C31.

Keywords: Finance, Growth, Regions, Cross-Section Analysis, Panel Data Analysis.

Introduction

The relationship between financial development and economic growth spurred a long lasting debate among economists. Classical contributions, like Bagehot (1873) and Hicks (1969), argue that innovations in the financial structure in Britain, such as the introduction of the joint-stock company and limited liability, favoured the first industrial revolution by easing the funding of large scale investments. By the same token, Schumpeter (1934) argues that financial development spurs economic growth, not only making capital accumulation easier, but also favouring the funding of innovations.

However, sceptical contributions have been offered too. It is well known Joan Robinson's dictum: "where enterprise leads, finance follows" (Robinson, 1952). Another well known financial development sceptic is Lucas (1988), dubbing as "over-stressed" the causality relationship between finance and growth.

The finance-growth nexus has not received less attention in recent years. It is possible to distinguish various approaches that have been reviewed in Levine (2004) and in Levine (2003), including both theoretical and empirical studies. The latter ones ranged from historical case studies, to firm-level studies, to time series studies on a single country or on a limited number of countries, to cross-sectional and panel data analyses.

Within the cross-sectional and panel data analyses, there have been those focusing on industries, like Rajan and Zingales (1998), and those focusing on countries. The literature review that follows deals mainly with country cross-sectional or panel data studies considering financial development as improvements in the working of banks, however there are also other contributions considering financial development as institutional changes or deepening of the stock market (for instance Levine and Zervos, 1998 or Beck and Levine, 2004 and others reviewed in Levine, 2004).

The aim of this paper is to offer new perspectives on the long-lasting debate above by analysing the effect of financial development, meant as enlargement of the banking sector, on growth by using a regional dataset. In this way, it will be possible to avoid pooling developed and developing countries, where the economic mechanisms at stake may be greatly different, as argued also by Usai and Vannini (2005). However, by focusing on a country, like Italy, where regional disparities have been a long-lasting issue since the achievement of national unity in 1860, it will be possible to keep a substantial variability within the sample.

Moreover, Driffil (2003) claims that New Economic Geography, relying on agglomeration and transport costs, may offer more valuable insights than the theories of the link between finance and growth to explain economic growth. Therefore, a regional dataset may offer valid tests to thoroughly assess the finance-growth nexus, all the more that, as argued by Guiso, Sapienza and Zingales (2004), it represents a limit condition for international financial markets given the high degree of integration of the various territorial units. Furthermore, with difference to Guiso, Sapienza and Zingales (2004), I do not consider indicators of financial development deriving from micro data, rather, as it will appear later, I consider aggregate ones, directly concerning the size of the banking sector. On the other hand, with difference to Usai and Vannini (2005), I descend to a finer level of geographical disaggregation; while they analyse NUTS2 regions, this contribution is concerned with NUTS3 ones², in the attempt to offer results comparable to cross-country studies and to consider small open economies in order to make pregnant the analogy with a hypothetical, fully integrated world economy. Furthermore, while they assess the impact of different kinds of bank on regional growth, I study the impact of different kinds of borrowers on local growth.

Finally, given that the Bank of Italy collects financial data distinguishing between long and short term credit, it will be possible to assess the impact of different financial structures on the local

² NUTS is the French acronym for Nomenclature of Territorial Units for Statistics used by Eurostat. In this nomenclature NUTS1 refers to European Community Regions and NUTS2 to Basic Administrative Units, with NUTS3 reflecting smaller spatial units most similar to counties in the US. It is worth noting that the cross-sectional dimension of the datasets used here is very similar to those used in the cross-country studies reviewed in Levine (2004).

growth rate. This is particularly interesting because studies on financial structure usually focus on its effect on firm size or on the opportunities for firm growth more than on its aggregate effect on economic growth performance as here (Caprio and Demirgüç-Kunt, 1997).

The rest of this paper is structured as follows. First there will be a brief review of cross-section and panel data studies on the link between finance and growth and on firm debt structure in order to grasp what could be the most suitable specification for a model trying to explain these issues. Afterwards, I will illustrate the collected data. Finally, I will consider both a cross-sectional and a panel data analyses trying to understand respectively if the level of financial development at the beginning of the period of observation can be considered as a good predictor of the subsequent local growth rate and if financial development appears to be positively and significantly correlated with growth even using sophisticated instrumental variables estimators. Given the regional nature of the dataset, it is not possible to neglect the problem of spatial correlation between the different provinces. Therefore, I will explicitly test for spatial correlation in the residuals, that might lead to biased standard errors and unreliable t-statistics.

Furthermore, when dealing with the cross-sectional dataset, in order to overcome the problems highlighted by Driffil (2003) and Manning (2003), I will group provinces in accordance to the region they belong to and I will make use of the one way error component model in order to control for possible omitted variables, also testing if the Random Effect or the Fixed Effect estimator fits the data better and providing different estimators in order to check for potential model misspecifications (Baltagi, 2003). I will also compare the instrumental variable estimator with the other estimators in order to account for potential endogeneity problems.

Literature Review

Since the seminal contributions by King and Levine (1993a, b) new attention has been devoted to the issue whether financial development is either a premise or a consequence of economic growth.

Various studies have followed differing for model specifications and, consequently, conclusions.

King and Levine (1993a, b, c), extending the analysis of Goldsmith (1969), carry out a cross-sectional analysis of a dataset of 80 countries over the period 1960 -- 1989 in order to answer the question whether financial development can be considered a predictor of future long-run growth, not neglecting also its effect on capital accumulation and productivity growth.

In particular four measures of the level of financial development are proposed:

- DEPTH: capturing the size of financial intermediaries (liquid liabilities of financial intermediaries over GDP);
- BANK: the ratio of private bank credit over the bank credit plus central bank credit;
- PRIVATE: the ratio of the credit allocated to private enterprises over the total domestic credit;
- PRIVY: the ratio of the credit to private enterprises over GDP.

The model specification is as follows:

$$G(j)=a+b[F(i)]+gX+e \quad (1)$$

where $G(j)$ is either per capita GDP growth, or per capita capital stock growth or productivity growth; $F(i)$ is either DEPTH or BANK or PRIVATE or PRIVY and X is a set of controls (income per capita, education, political stability, indicators of exchange rate, trade, fiscal and monetary policy). These contributions conclude that the level of financial development at the beginning of the period can be considered as a good predictor of future economic growth.

More recently, much research effort has been devoted to analysing potential biases deriving from the endogeneity of financial development measures with respect to growth. Levine (1998, 1999)

and Levine, Loayza, and Beck (2000) use the La Porta et al. (1998) measures of legal origin as instrumental variables. In particular, La Porta et al. (1998) show that legal origin -- whether a country's Commercial/Company law derives from British, French, German, or Scandinavian law -- considerably affects the letter and the enforcement of national credit laws, achieving different results in the protection of external investors and promoting financial development to different extents.

Levine, Loayza, and Beck (2000) analyse 71 countries adopting the generalized method of moments (GMM) estimator and considering a model similar to (1), where G is real per capita GDP growth over the 1960-95 period. $F(i)$, the measures of financial development, are instrumented with the legal origin indicators. The variables included in X , the conditioning set, are treated as exogenous ones. Levine, Loayza, and Beck (2000) use linear moment conditions, which amounts to the requirement that the instrumental variables (Z) be uncorrelated with the error term (e), implying that legal origin may affect per capita GDP growth only through the financial development indicators and the variables in the conditioning information set, X .

Levine, Loayza, and Beck (2000) also cover a longer time span than King and Levine (1993a,b), including the years from 1989 to 1995, they better deflate financial development indicators and they add a new measure of overall financial development, called Private Credit. This new measure of financial development equals the value of credits by financial intermediaries to the private sector divided by GDP and it is different to PRIVY above because this includes credits issued by the monetary authority and government agencies, whereas Private Credit includes only credits issued by banks and other financial intermediaries. This measure isolates credit issued to the private sector and therefore excludes credit issued to governments, government agencies and public enterprises.

Regarding deflation of the financial development indicators, while financial intermediary balance sheet items are measured at the end of the year, GDP is measured over the year. Levine, Loayza, and Beck (2000) deflate end-of-year financial balance sheet items by end of year consumer price indices (CPI) and deflate the GDP series by the annual CPI. Then, they compute the average of the

real financial balance sheet item in year t and $t-1$ and divide this average by real GDP measured in year t .

Levine, Loayza, and Beck (2000) is an important contribution not only for instrumenting financial development indicators in a cross-sectional analysis, but also for its use of dynamic panel data estimation, as in Beck, Levine and Loayza (2000). To exploit both time series and cross-section variation, they employ data averaged over five-year periods, avoiding to use data at annual frequency in the attempt to capture long run relationships. Panel data estimation makes it possible to take care of cross-country heterogeneity and to instrument not only financial development variables but also the variables belonging to the conditioning set.

Levine, Loayza, and Beck (2000) use the system GMM estimator to examine the relationship between financial intermediary development and growth, while Beck, Levine and Loayza (2000) examine the relationship between financial development and the sources of growth, i.e., productivity growth, physical capital accumulation, and savings.

Regarding the frequency of the data it is worth recalling that Beck and Levine (2004) check if the annual frequency of the data affects the results compared to the five years one. They find that the relationship between Bank Credit and growth disappears when moving to annual data. Connecting this result to Loayza and Ranciere (2002), they argue that short-run surges in Bank Credit are good predictors of banking crises and slow growth, while high levels of Bank Credit over the long-run are positively associated with economic growth. These results emphasize the significance of using sufficiently low-frequency data to move beyond cyclical effects.

It is instructive to consider more in depth the research strategy followed by Levine, Loayza and Beck (2000). In order to control for other factors associated with economic growth not linked to financial development, they present regression results by using three different conditioning sets:

- a simple conditioning information set, including the constant, the logarithm of initial per capita GDP and the initial level of educational attainment;

- a policy conditioning information set, including the simple conditioning information set above plus measures of government size, inflation, the black market exchange rate premium, and openness to international trade;
- a full conditioning information set, including the policy conditioning information set plus measures of political stability (the number of revolutions and coups and the number of assassinations per thousand inhabitants) and ethnic diversity.

Due to potential nonlinearities, the natural logarithms of the regressors are considered when taking the models to the data.

To come to the literature regarding the finance term structure, it has mainly dealt with firm level data of developing countries. On the one hand, there are those thinking that pervasive market imperfections prevent firms in developing countries to have long-term relationships with banks and, therefore, to finance far reaching projects that lead to economic growth. On the other hand, it has also been pointed out that short term credit induces banks to take better control of borrowers and projects and that public banks focusing on long term credit will have to face the same accounting and monitoring problems as private ones. Moreover, short term credit can better reflect new information, but long term credit can protect firms from creditors' imperfect information and opportunistic behaviour as well as temporary shocks (Caprio and Demirgüç-Kunt, 1997; Diamond, 1991).

The dataset here analysed offers a particular standpoint to assess the effect of finance structure on growth because Italy is known for the importance of small firms, but also for the social ties that often connect various firms and firms to banks on the ground of geographic proximity leading to the formation of industrial districts (Observatory of European SMEs, 2003a and 2003b; Becattini et al., 1992). These are two countervailing forces as small firms are usually discriminated when applying for long term credit, but at the same time the milieu of industrial districts may favour the formation

of long term relationships between banks and firms allowing to fund long term projects by short term credit.

All the studies above conclude that financial development plays a first-order role in explaining economic growth. However, both Manning (2003) and Driffil (2003) have recently argued that they may not properly consider the role of country heterogeneity. Indeed these two contributions observe that the effect of financial development on growth disappears once inserting dummies for some subsets of countries either according to the continent they belong to or because they had an outstanding growth performance (the "Asian tigers", for instance).

The results above lead Driffil (2003) to conclude that New Economic Geography may provide a better story regarding growth and catching up, relying on agglomeration economies and transport costs. For this reason, as stated above, assessing the impact of financial development on growth at the regional level carries a particular interest.

Model Specification and Data Issues

I will accomplish this task considering both a cross-sectional and a panel dataset of respectively 94 and 73 Italian provinces (NUTS3 regions).

When performing the cross-sectional regressions, the model specification will be very similar to those of King and Levine (1993 a, b, c). More specifically I will adopt a model specification like (1), regressing the percentage growth rate of real per capita value added in the Italian provinces between 1986 and 2003 (G) on a financial development indicator and a number of controls.

Controls (X) include the sum of exports and imports over value added in 1986 (EIY), the number of students enrolled in the secondary school over local resident population in 1986 ($STUDENTSPOP$), the value of finished public infrastructures over value added in 1986 ($OPPUBVA$), the number of crimes per head ($CRIMESH$) and the level of provincial value added per head in 1986 ($VA0POP$).

Regarding the deflation of value added, I will use the consumer price index (CPI) which is measured in Italy in the main cities of regions (NUTS2) and provinces (NUTS3). Most of the cross-

sectional estimates rely on the CPI of the region (NUTS2) main city. This choice may introduce some measurement error in the dependent variable but this kind of measurement does not affect coefficient estimates and standard errors (Wooldridge, 2001). VA0POP is not affected by measurement error as 1986 is taken as base year. On the other hand, using the CPI of the province (NUTS3) main city entails losing about one third of the observations. To overcome this problem I offer results for the preferred estimator not only deflating value added by the regional CPI but also by the provincial one.

Given that this paper is concerned with provinces, exports and imports only include international trade and not trade with other Italian provinces, which is of course not registered at the custom. However, more internationalised regions may achieve faster growth by exploiting at best international comparative advantages, so it appears advisable to include also this control.

As far as the indicators of financial development (F) are concerned, two possibilities are available:

- the ratio of total short term credit over value added in 1986 (CREDY);
- the ratio of long-term credit over value added in 1986 (LTCREDY).

Therefore, the measures of financial development here adopted are very similar to PRIVY used by King and Levine (1993a, b, c), with the exception of the distinction between short and long term credit which is new to this literature. Having tested for the absence of endogeneity of CREDY and of biases deriving from unobserved spatial heterogeneity I will decompose CREDY according to the kind of borrower and I will show evidence also regarding the following indicators of financial development:

- the credit to financial and insurance companies over value added;
- the credit to the public administration over value added;
- the credit to non financial enterprises with a public structure over value added;

- the share of credit to private firms over total credit;
- the credit to non financial private enterprises over value added (close to PRIVATE CREDIT in Levine, Loayza and Beck, 2000);
- the credit to households and non profit organisations over value added.

To sum up, the variables involved (with their data sources in parentheses) are:

- value added (Tagliacarne Institute);
- exports (ISTAT, the Italian national statistical office);
- imports (ISTAT);
- inflation measured in the region main city in CPI (ISTAT);
- the number of student enrolled in the secondary school (ISTAT);
- the value of finished public infrastructures (ISTAT);
- the value of short term bank credit (Bank of Italy);
- the value of long term bank credit (Bank of Italy);
- the value of short term credit to financial and insurance companies (Bank of Italy);
- the value of short term credit to the public administration (Bank of Italy);
- the value of short term credit to non financial enterprises with a public structure (Bank of Italy);
- the value of short term credit to private firms (Bank of Italy);
- the value of short term credit to non financial private enterprises (Bank of Italy);
- the value of short term credit to households and non profit organisations (Bank of Italy).
- the resident population (ISTAT).

Descriptive statistics regarding both cross-sectional and panel data for the dependent variable and the main indicators of financial development are offered in Table 1 and they show that there is

substantial variability in the sample. The minimum growth rate between 1986 and 2003 was that of the province of Rieti (-0.5%), while the maximum one was that of the province of Potenza (+79.7%). Also financial indicators display remarkable variability. For instance, LTCREDY reached its minimum 1986 value in the province of Benevento (7%) and its maximum one in the province of Rome (31%). Similarly, in 1986 CREDY varied from 10 to 57%, while for instance PRIVATE CREDIT in Levine, Loayza and Beck (2000) varied from 4% in Zaire to 141% in Switzerland, a signal that pooling underdeveloped and developed countries may not be thoroughly informative. Also panel data show a good variability though less marked than in cross-country studies.

Figure 1 offers some geographical evidence regarding the percentage growth rate of per capita value added in the Italian provinces between 1986 and 2003 (G), CREDY and LTCREDY. It also shows the four macro-regions Italy is usually divided into: the North West, the North East, the Centre and the South and Islands. Traditionally, the North West was the most developed part of the country, while the South and Islands was the most backward one³.

As it is possible to see in the upper panel, during the period between 1986 and 2003 the North East, the Centre and the South of Italy experienced a higher growth rate of real per capita value added than the North West. This is a sign of convergence within Italy given the leading position of the North-West with respect to the other macro-regions of the country. Looking at financial indicators it is possible to see that while the ratio of short term credit over value added was much higher in the Northern part of the country, the same did not hold true for long term credit over value added. It is clear that the banking sector in 1986 was mobilising resources from the North to the South helping the catching up process especially financing long term projects.

This scenario drastically changed over the period under analysis. Tables 2 and 3 show that while short term credit was mainly channelled to Northern provinces both in 1986 and in 2003, long term credit was redirected from Southern provinces towards those of the North-East during the same

³ Usai and Vannini (2005) give a descriptive picture of the Italian banking system.

period. From an economic point of view, this means that resources were drying up for the most lagging part of the country to the benefit of regions that were experiencing fast economic growth. From a methodological point of view, it points to the need to consider also panel data estimators in order to better capture the dynamic changes of financial indicators over the period under analysis, besides than to double check the effects that unobserved spatial heterogeneity might have on coefficient estimates.

When dealing with the panel dataset I perform estimates both for a static and a dynamic model. In the first case, I resort to a model specification like 1. I considered both three and six years averages to check if the frequency of the data affects coefficient estimates. Three years averages was also used in de la Fuente (2002). I focused on the two main financial indicators considered in this study, CREDY and LTCREDY. The controls involved are the same as those used when performing cross-sectional estimates, with the exception of OPPUBVA for which it was not possible to find data after 2000. To capture convergence forces I inserted among the controls the real per head value added at the beginning of each of the three (six) years time period (VA0POP) as in Kahn and Senhadji (2001) and in the literature reviewed in Vaona and Schiavo (2006).

When resorting to a dynamic model, I regressed the log of real per head value added on its first lag, the log of the financial indicators and the usual controls. I used the log of the financial indicators to capture possible non-linearities in the relationship of finance and growth as in Levine, Loayza and Beck (2000). I also inserted dummies for the regions that displayed a strong explanatory power in the cross-sectional regressions to check if their effect carries over also in the dynamic panel model specification.

Methods and Results

In this contribution I adopted the following research strategy for both the indicators of financial development above.

Given that the model specification does not include important regressors used in the growth literature - such as the size of current public expenditure or an indicator of capital accumulation -, in order to control for omitted variables, I grouped the data of the various provinces according to the region they are in and I used the dataset as if it was an unbalanced panel, given that each region has a different number of provinces. This step is all the more important given that cross-sectional studies of economic growth have been criticized because they cannot account, as panel studies do, for the unobservable level of technology (Islam, 1995; Caselli, Esquivel and Lefort, 1996; de la Fuente, 2002) and, while one can think that major technological differences exist between regions, it is unlikely that they are a very relevant factor within regions. Consequently, following Baltagi (2003), I computed not only the Fixed Effect estimator but also five different Random Effect estimators: the Wallace and Hussain one (WH), the Swamy and Arora one (SA), the Henderson, Fuller and Batese one (HFB) and two MINQUE estimators (MQ0 and MQA). Misspecification errors are usually signalled by the instability of coefficient estimates. Finally, in order to understand if the fixed effect estimator fits the data better than the random effect ones, I compared them by means of a Hausman test. I also performed OLS estimation to allow comparisons between different estimators. As it will appear later, the Fixed Effect estimator is the preferred one.

In order to check for endogeneity of financial development indicators, I relied on the 2SLS estimator. I used as instruments the geographical dummies that do not appear to be correlated with future growth in the Fixed Effect regression and that were able to pass at the 5% level an F-test regarding their correlation with the instrumented variables (Wooldridge, 2001). The choice to include the geographical dummies that are not correlated with future growth is important in order to extract the exogenous part of the finance – growth nexus avoiding to include the dummies of regions where credit flowed due to their good economic prospects. On the other hand, the regional dummies that are not correlated with future growth but that are correlated with the financial indicators may play a similar role to the indicators of legal origin in the cross-country literature. In fact while the letter of the law is the same within a country, the way, the efficacy and the efficiency

with which it is applied may vary from region to region, especially in presence of markedly different local practices within a country, like Italy, that achieved national unity much later than many of the other European countries.

I tested for endogeneity of the financial indicators by means of a Hausman test comparing the 2SLS estimator with the Fixed Effect one. In order to assess the validity of overidentifying restrictions, I also computed the test statistic given by the product between the number of observations and the R^2 of the regression of the residuals of the 2SLS estimator on the control variables and the instruments (Wooldridge, 2001).

Finally, after Anselin (1988), for all the estimators but 2SLS I computed the Moran's I statistic in order to check for spatial correlation in the residuals. For 2SLS I relied on Anselin and Kelejian (1997), given that instrumental variables estimators require a specific Moran's I statistic.

To offer results able to overcome further the critiques against cross-sectional estimates discussed above, I also computed panel data estimators. One of the most used estimators in the growth literature is the System GMM one after Blundell and Bond (1998). Suppose to have the following model

$$y_{i,t} - y_{i,t-1} = (\alpha - 1)y_{i,t-1} + \beta' X_{i,t} + \eta_i + \varepsilon_{i,t} \quad (2)$$

where $y_{i,t}$ is the log of real per capita value added at time t in province i , $X_{i,t}$ is a set of controls including the financial indicators, η_i is an unobserved province-specific effect and $\varepsilon_{i,t}$ is a stochastic error. Bringing to the right $y_{i,t-1}$ it is possible to obtain

$$y_{i,t} = \alpha y_{i,t-1} + \beta' X_{i,t} + \eta_i + \varepsilon_{i,t} \quad (3)$$

Taking first differences

$$y_{i,t} - y_{i,t-1} = \alpha(y_{i,t-1} - y_{i,t-2}) + \beta' (X_{i,t} - X_{i,t-1}) + (\varepsilon_{i,t} - \varepsilon_{i,t-1}) \quad (4)$$

it is possible to elide the unobserved province-specific effect. Supposing that the regressors are predetermined it is possible to obtain consistent estimates of the coefficient performing a GMM estimator that exploits the following orthogonality conditions:

$$E [y_{i,t-s} (\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0 \text{ for } s \geq 2 \text{ and } t = 3, \dots, T \quad (5)$$

$$E [X_{i,t-s} (\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0 \text{ for } s \geq 2 \text{ and } t = 3, \dots, T \quad (6)$$

GMM estimators for dynamic panel models have received a considerable attention in the second part of the nineties in the attempt to overcome their poor finite sample properties (Baltagi, 2003). Blundell and Bond (1998) accomplished this task by considering not only the model in first differences (4), but also the one in levels (3) and exploiting the further orthogonality conditions below:

$$E [\Delta X_{i,t-s} (\eta_i + \varepsilon_{i,t})] = 0 \text{ for } s \geq 3 \text{ and } t = 4, \dots, T \quad (6)$$

$$E [\Delta y_{i,t-s} (\eta_i + \varepsilon_{i,t})] = 0 \text{ for } s \geq 3 \text{ and } t = 4, \dots, T \quad (7)$$

where Δ is the first difference operator. In other words they considered the system of equations in first differences and in levels and instrumented the variables in the first differenced equations by using their past levels and those in the equations in levels by using their past first differences.

It is worth noting that for (5) to hold, $\varepsilon_{i,t}$ should not display serial correlation, therefore Arellano and Bond (1991) proposed a test statistics for the hypothesis of no second order correlation in the differenced residuals. To avoid obtaining residuals with second order serial correlation it is customary to insert time dummies when estimating (4).

In this contribution I provide not only panel data estimates for the dynamic model (3) but also for a model that more directly resembles (1) regressing the three years average of the percentage growth rate of the real per head value added on its level at the beginning of the three years period, the financial indicators and all the controls used in the cross-sectional estimates with the exception of OPPUBVA due to the data constrained discussed above. In this way it will be possible to offer a closer comparison between panel and cross-sectional estimates. To overcome the possible endogeneity of financial indicators I relied again on the System GMM estimator. In the panel estimates I only used data deflated by the CPI in the provinces' main city given that the problems of sample size were less binding. Both for the static and the dynamic models I used the Windmeijer

(2005) small sample correction to have reliable standard errors and estimation was performed relying on Roodman (2005). When testing for spatial correlation in the residuals of GMM estimators I relied again on Anselin and Kelejian (1997).

Tables 4 and 5 contain the cross-sectional results respectively about the ratio of total short term credit over value added (CREDY) and the ratio of long-term credit over value added (LTCREDY). Three general patterns clearly emerge. Financial variables are generally positively and significantly correlated with future real growth, their endogeneity is rejected when comparing 2SLS and the fixed effect estimator which also appears to fit the data better than the random effect ones. It is worth noting that instruments pass the F-test for correlation with the instrumented variables at the 5% level for all the specifications and over-identifying restrictions could not be rejected. Furthermore, comparing different Random Effect estimators, it is possible to notice that significant coefficient estimates are pretty stable signalling the absence of major specification problems that might arise from the exclusion of important regressors such as indicators of physical capital accumulation. Finally, once moving from OLS to the Fixed Effect estimator, differently than in Driffil (2003) and Manning (2003), the coefficients of the financial indicators remain positive and significant and their point estimates do not change much. Deflating the per capita value added by the local inflation rate before computing the real growth rate between 1986 and 2003 does not change the results of the Fixed Effect estimator as showed in the last columns of Tables 4 and 5 labelled DEFL II FE. Both considering CREDY and LTCREDY, the dummies for three Southern regions – Campania, Puglia and Sicilia – appeared to have a negative and very significant sign. Remarkably Campania and Sicilia are the two of the Italian regions where organised crime is stronger.

A picture supporting the finance – growth nexus emerges also considering static and dynamic panel estimates (Tables 6 and 7). In order to make sure that the possible endogeneity of financial indicators do not bias the results, I excluded their lags and the lags of their differences from the instrument sets, relying only on the lags of the levels and first differences of the other regressors.

Specification tests support the model and no spatial correlation was detected, so no time dummy was inserted for love of parsimony. Furthermore, in Table 6 I show a Wald test of equality between two estimators respectively obtained using 3 and 6 years averages: the null of equality between the two estimators could not be rejected at the 5% level supporting the view that different data frequencies do not affect the results. No evidence of spatial correlation was found. When performing dynamic estimates two regional dummies resulted to be significant at the 5% level respectively for Puglia, with a negative sign, and Emilia Romagna, with a positive sign, mirroring cross-sectional results.

Regarding the finance time structure, with the exception of the estimates showed in Table 7, it is not enough to compare the coefficient of LTCREDY with that of CREDY, because they are not elasticities. I first examine cross-sectional results. To understand if either short term or long term credit had a greater impact on growth, it may be useful to consider the provinces that had the minimum value of LTCREDY and CREDY in 1986 and to compute by how much their growth rate would have increased if they had the average value of the financial indicators under analysis.

The province that had the smallest value of LTCREDY in 1986 was that of Benevento, if it had the average value of LTCREDY the model presented in Table 5 would imply an overall faster growth by 1.3% over the period from 1986 to 2003. On the other hand the province with the smallest value of CREDY in 1986 was that of Isernia, if it had the average value of CREDY the model presented in Table 4 would imply an overall faster growth by 7.8% over the period under analysis. To the same conclusions leads comparing the effect of CREDY and LTCREDY considering static panel estimates. Moving the province with the smallest value of CREDY to its average sample value would increase the growth rate of per capita real value added from 2.5% to 9.9% over a three year period, while performing the same exercise with LTCREDY the economic growth rate would change from 6.9% to 10.1%. The coefficient estimates in the dynamic panel specification are close to one another but still the point estimates of the coefficient of CREDY is greater than that of LTCREDY.

The greater impact of short term credit on growth is hardly surprising given that it is known that in Italy long term credit was mainly destined to large firms, whereas small firms, driving economic development in Italy during the last two decades, had to rely on the renewal of short term credit and therefore on a good relationship with their banks. Therefore, the abundance of short term credit in a given province may signal not only a larger availability of capital, but also a better relationship between banks and firms entailing less monitoring costs and a better working of the credit market.

Moving to consider credit according to the kind of borrower, Figure 2 shows that the measures of credit to private firms, with difference to those of credit to the public sector or to households, are positively and significantly correlated with future growth⁴. Given that the coefficients significant at the 5% level have markedly different sizes, Table 5 shows the virtual increase in the economic growth rate between 1986 and 2003 obtained by moving the provinces with the minimum values of the financial indicators under analysis to their average values. As it is possible to see the larger increase in real growth is associated to the share of credit to private enterprises over total credit, followed by the credit to non financial enterprises over value added. The least value is obtained considering the credit to financial and insurance companies, a signal that it is the relationship of banks with firms outside the financial sector that is most important to enhance growth.

Conclusions

In this contribution I tested on a regional dataset the hypothesis that the level of financial development, meant as size of the banking sector, can be considered as a good predictor for future growth. This step was desirable because:

- it can help to understand if the finance growth nexus holds even at the regional level, where its main theoretical competitor (the New Economic Geography approach) finds its most natural context;

⁴ For sake of brevity the coefficients of the control variables are not included in Figure 2. However, they are available from the author upon request.

- it allows to avoid pooling developed and developing countries, that have widely different experiences;
- it allows to check if the finance-growth nexus holds even in highly integrated financial markets, as those of a 146 years old monetary union;
- it allows to test if long term credit has a greater impact on growth than the short term one;
- it makes possible to distinguish the kind of credit according to the sector of destination that most enhance real economic growth.

The results here achieved regarding the size of the banking sector can shed new light on the impact of the functions of the financial sector on economic growth. Levine (2004) points out that the functions of financial systems are to:

- "produce information ex ante about possible investments and allocate capital;
- monitor investments and exert corporate governance after providing finance;
- facilitate the trading, diversification and management of risk;
- mobilize and pool savings;
- ease the exchange of goods and services".

The evidence produced in this contribution cannot offer a direct test for the hypotheses whether the production of information regarding investment opportunities or the monitoring role of banks or their risk management function can have an impact on economic growth. However, the size of the banking sector relative to the size of the economy is definitely an indicator of its ability to allocate capital, to mobilize and pool savings and to ease the exchange of goods and services. The evidence showed in this paper would lead to conclude that the more the financial system is able to provide these functions, especially to firms belonging to non-financial sectors of the economy, and the more the economy will benefit from it in terms of enhanced growth. Tests for endogeneity of financial

development indicators were rejected and the omission of relevant variables (unobserved spatial heterogeneity) does not have major effects on its estimated coefficient.

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Table 1 – Descriptive statistics of the growth rate of real value added per capita (G) and of the main financial indicators used in the cross-sectional and panel estimates (three years variables).

	Variable	Obs	Mean	Std. Dev.	Min	Max
	G	94	35.2	14.1	-.5	79.7
Cross-section	LTCREDY	94	1.4	.5	.7	3.1
	CREDY	94	2.6	.9	1.0	5.7
	G	401	2.0	3.3	-14.4	34.6
Panel	LTCREDY	401	2.5	1.3	.8	8.4
	CREDY	401	1.5	1.2	.1	8.7

Note: for cross-section variables, G is the percentage growth rate of per capita value added between 1986 and 2003, CREDY is the ratio of total short term credit over value added in 1986 and LTCREDY is the ratio of long-term credit over value added in 1986. For panel variables, G is the percentage growth rate of per capita value added, CREDY is the ratio of total short term credit over value added and LTCREDY is the ratio of long-term credit over value added. The financial indicators are measured in millions of lire over ten millions of lire. To have percentage numbers for financial indicators it is enough to multiply the figures in the table by 10.

Table 2 - Geographical Evolution of LTCREDY between 1986 and 2003

	1986			2003		
	Number of provinces:					
	below the 33 rd percentile	between the 33 rd and the 66 th percentile	above the 66 th percentile	below the 33 rd percentile	between the 33 rd and the 66 th percentile	above the 66 th percentile
North–West	5	7	3	1	7	7
North-East	9	6	5	0	8	12
Centre	6	8	5	4	6	9
South and Islands	9	8	16	24	8	1
Total	29	29	29	29	29	29

Table 3 - Geographical Evolution of CREDY between 1986 and 2003

	1986			2003		
	Number of provinces:					
	below the 33 rd percentile	between the 33 rd and the 66 th percentile	above the 66 th percentile	below the 33 rd percentile	between the 33 rd and the 66 th percentile	above the 66 th percentile
North–West	1	4	10	3	4	8
North-East	2	7	11	0	8	12
Centre	6	9	4	6	9	4
South and Islands	20	9	4	20	8	5
Total	29	29	29	29	29	29

Figure 1 – Geographical evidence regarding the growth rate of per capita value added between 1986 and 2003 (G), the ratio of total short term credit over value added in 1986 (CREDY) and the ratio of long-term credit over value added in 1986 (LTCREDY), and the Italian macro-regions.

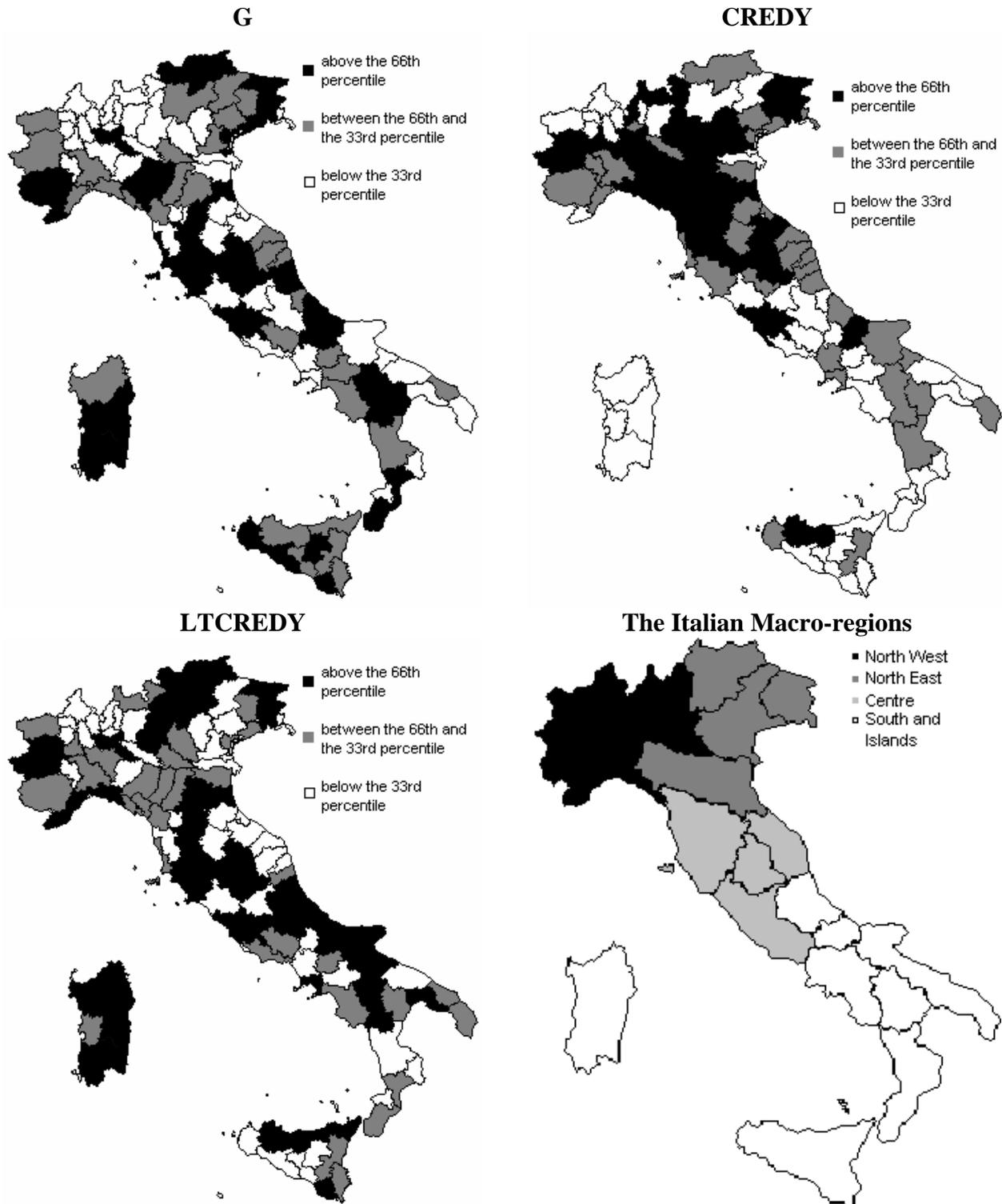


Table 4 – The effect of financial development on real economic growth (CREDY) – Dependent variable: real growth rate of per head value added

	OLS	Fixed Effects	2SLS	WH	SA	HFB	MQ0	MQA	DEFL II FE
CREDY	6.52*	5.74*	8.71*	5.82*	5.81*	5.53*	6.05*	5.67*	7.44*
t-stat.	(3.88)	(4.00)	(2.90)	(3.54)	(3.81)	(3.55)	(3.60)	(3.46)	(4.44)
EIY	-2.01	0.02	-0.01	-1.66	-1.65	-1.36	-1.83	-1.51	0.79
t-stat.	(-1.10)	(0.02)	(-0.01)	(-0.95)	(-1.02)	(-0.82)	(-1.02)	(-0.87)	(0.43)
STUDENTSTOP	0.76	-3.06	-3.52	-0.09	-0.12	-0.70	0.28	-0.40	-0.77
t-stat.	(0.29)	(-1.26)	(-1.39)	(-0.03)	(-0.05)	(-0.27)	(0.11)	(-0.15)	(-0.25)
OPPUBVA	0.26*	0.11	0.16	0.21*	0.21*	0.18*	0.23*	0.20*	0.14
t-stat.	(2.57)	(1.29)	(1.63)	(2.13)	(2.29)	(1.95)	(2.28)	(2.00)	(1.38)
VAOPOP	-22.71*	-45.34*	-48.41*	-26.22*	-26.36*	-29.14*	-24.60*	-27.63*	-41.10
t-stat.	(-4.48)	(-7.41)	(-7.08)	(-4.37)	(-4.72)	(-4.63)	(-4.30)	(-4.40)	(-5.61)
CRIMESH	-1.12	2.04	1.49	-0.01	0.02	0.54	-0.40	0.28	1.81
t-stat.	(-1.03)	(1.87)	(1.23)	(-0.01)	(0.03)	(0.50)	(-0.35)	(0.25)	(1.38)
CONSTANT	47.21*	94.93*	93.94*	56.06*	56.39*	63.79*	52.11*	59.37*	71.51
t-stat.	(3.17)	(5.75)	(5.55)	(3.42)	(3.70)	(3.84)	(3.24)	(3.54)	(3.49)
CAMPANIA	-	-21.36*	-19.78*	-	-	-	-	-	-28.55
t-stat.	-	(-4.08)	(-3.56)	-	-	-	-	-	(-2.59)
PUGLIA	-	-31.44*	-30.07*	-	-	-	-	-	-34.02
t-stat.	-	(-5.25)	(-4.81)	-	-	-	-	-	(-4.12)
SICILIA	-	-14.45*	-13.83*	-	-	-	-	-	-23.47
t-stat.	-	(-3.00)	(-2.78)	-	-	-	-	-	(-3.05)
TRENTINO-A.A.	-	20.21*	21.95*	-	-	-	-	-	24.77
t-stat.	-	(2.78)	(2.89)	-	-	-	-	-	(3.33)
R ²	0.35	0.56	0.54	-	-	-	-	-	0.58
MORAN'S I ¹	-0.25	-0.46	-1.18	0.48	0.49	0.67	0.38	0.58	-
HAUSMAN (p) ²	-	-	0.99	0.00	0.00	0.01	0.00	0.00	-
IV F-test (p) ³	-	-	0.02	-	-	-	-	-	-
IV nR ² (p) ⁴	-	-	0.20	-	-	-	-	-	-
Observations	94	94	94	94	94	94	94	94	67

Note: * marks coefficients significant at the 5% level. T-statistics are showed in parentheses. Instruments in the 2SLS regression include the dummies for the regions Basilicata, Calabria, Emilia Romagna, Lazio, Marche, Molise, Sardegna, Toscana, Umbria and Valle d'Aosta. The last column shows estimate for the fixed effect estimator once deflating the per head value added by using the provincial CPI. ¹: the null is no spatial correlation. ²: the null is no endogeneity for the comparison between the Fixed Effects and the 2SLS estimators, whereas for the comparison between the Fixed Effects and the Random Effects estimators the null is that the Random Effects estimator fits the data better than the Fixed Effects one. ³: the null is that the instruments are significantly correlated with the instrumented variables. ⁴: the null is that over-identifying restrictions are not rejected.

Table 5 – The effect of financial development on real economic growth (LTCREDY) – Dependent variable: real growth rate of per head value added

	OLS	Fixed Effect	2SLS	WH	SA	HFB	MQ0	MQA	DEFL II FE
LTCREDY	11.23*	8.68*	13.17*	10.41*	10.34*	9.78*	10.43*	10.09*	8.97*
t-stat.	(4.09)	(3.46)	(2.32)	(3.86)	(4.14)	(3.81)	(3.86)	(3.79)	(2.81)
EIY	-1.93	0.30	0.20	-1.67	-1.65	-1.39	-1.68	-1.53	0.97
t-stat.	(-1.07)	(0.18)	(0.12)	(-0.95)	(-1.01)	(-0.84)	(-0.96)	(-0.89)	(0.47)
STUDENTSDPOP	0.33	-3.93	-4.26	-0.46	-0.53	-1.09	-0.45	-0.78	-2.01
t-stat.	(0.13)	(-1.56)	(-1.64)	(-0.17)	(-0.21)	(-0.42)	(-0.17)	(-0.29)	(-0.59)
OPPUBVA	0.16	0.08	0.09	0.15	0.16	0.13	0.15	0.14	0.10
t-stat.	(1.62)	(0.91)	(1.02)	(1.54)	(1.65)	(1.47)	(1.55)	(1.49)	(0.93)
VAOPOP	-13.45*	-37.86*	-35.71*	-18.12*	-18.50*	-21.99*	-18.01*	-20.01*	-32.69*
t-stat.	(-3.01)	(-5.86)	(-5.09)	(-3.27)	(-3.55)	(-3.67)	(-3.26)	(-3.42)	(-3.79)
CRIMESH	-2.41*	0.98	-0.15	-1.33	-1.25	-0.63	-1.35	-0.97	0.90
t-stat.	(-2.03)	(0.78)	(-0.08)	(-1.09)	(-1.11)	(-0.53)	(-1.11)	(-0.79)	(0.54)
CONSTANT	43.02*	93.99*	88.76*	51.46*	52.20*	58.89*	51.26*	55.10*	-29.91*
t-stat.	(2.92)	(5.36)	(4.72)	(3.18)	(3.46)	(3.62)	(3.17)	(3.34)	(-2.43)
CAMPANIA	-	-20.35*	-18.05*	-	-	-	-	-	10.07*
t-stat.	-	(-3.71)	(-2.93)	-	-	-	-	-	(2.23)
EMILIA-ROMAGNA	-	9.91*	10.83*	-	-	-	-	-	-33.67*
t-stat.	-	(2.47)	(2.57)	-	-	-	-	-	(-3.63)
PUGLIA	-	-30.32*	-27.98*	-	-	-	-	-	-22.69*
t-stat.	-	(-4.84)	(-4.05)	-	-	-	-	-	(-2.59)
SICILIA	-	-13.08*	-11.17*	-	-	-	-	-	75.47*
t-stat.	-	(-2.57)	(-1.99)	-	-	-	-	-	(3.16)
R ²	0.36	0.54	0.52	-	-	-	-	-	0.48
MORAN'S I ¹	-0.04	-0.33	-0.71	0.60	0.62	0.80	0.60	0.70	-
HAUSMAN (p) ²	-	-	0.99	0.00	0.00	0.01	0.00	0.00	-
IV F-test (p) ³	-	-	0.03	-	-	-	-	-	-
IV nR ² (p) ⁴	-	-	0.19	-	-	-	-	-	-
Observations	94	94	94	94	94	94	94	94	67

Note: * marks coefficients significant at the 5% level. T-statistics are showed in parentheses. Instruments in the 2SLS regression include the dummies for the regions Calabria, Friuli-Venezia Giulia, Lazio, Liguria, Lombardia, Marche, Piemonte, Toscana, Veneto. The last column shows estimate for the fixed effect estimator once deflating the per head value added by using the provincial CPI. ¹: the null is no spatial correlation. ²: the null is no endogeneity for the comparison between the Fixed Effects and the 2SLS estimators, whereas for the comparison between the Fixed Effects and the Random Effects estimators the null is that the Random Effects estimator fits the data better than the Fixed Effects one. ³: the null is that the instruments are significantly correlated with the instrumented variables. ⁴: the null is that over-identifying restrictions are not rejected.

Table 6 - The effect of financial development on real economic growth (LTCREDY and CREDY) – Static Panel

Dependent variable: real growth rate of per head value added

Method: System-GMM

LTCREDY	-	1.92*
t-stat.	-	(2.58)
CREDY	5.30*	-
t-stat.	(2.03)	-
VA0POP	-5.98*	-11.56*
t-stat.	(-3.62)	(-4.75)
STUDENTSPOP	-1.03	0.66
t-stat.	(-0.58)	(0.37)
EIY	-2.11	-0.98
t-stat.	(-1.63)	(-1.24)
CRIMESH	0.24	0.26
t-stat.	(0.84)	(0.86)
CONSTANT	15.41	16.56
t-stat.	(1.48)	(1.68)
First order serial correlation (p-value) ¹	0.04	0.06
Second order serial correlation (p-value) ²	0.08	0.12
Test for overident. restrictions (p-value) ³	0.11	0.16
MORAN'S I (p-value) ⁴	0.07	0.08
Frequency Wald Test (p-value) ⁵	0.93	0.84
Number of groups	73	73
Number of instruments	46	46
Number of obs.	401	401

Note: the instrument set includes the past lags of the levels of VA0POP, CRIMESH and EIY; * marks coefficients significant at the 5% level. T-statistics are showed in parentheses. ¹: the null is absence of first order serial correlation in the differenced residuals. Presence of first order serial correlation in the differences residuals does not affect the validity of estimates. ²: the null if absence of second order serial correlation in the differenced residuals. ³: the null is that over-identifying restrictions are not rejected. ⁴: the null is no spatial correlation. ⁵: the null is equality between the estimators using three and the six years averages.

Table 7 - The effect of financial development on real economic growth (LTCREDY and CREDY) – Dynamic Panel

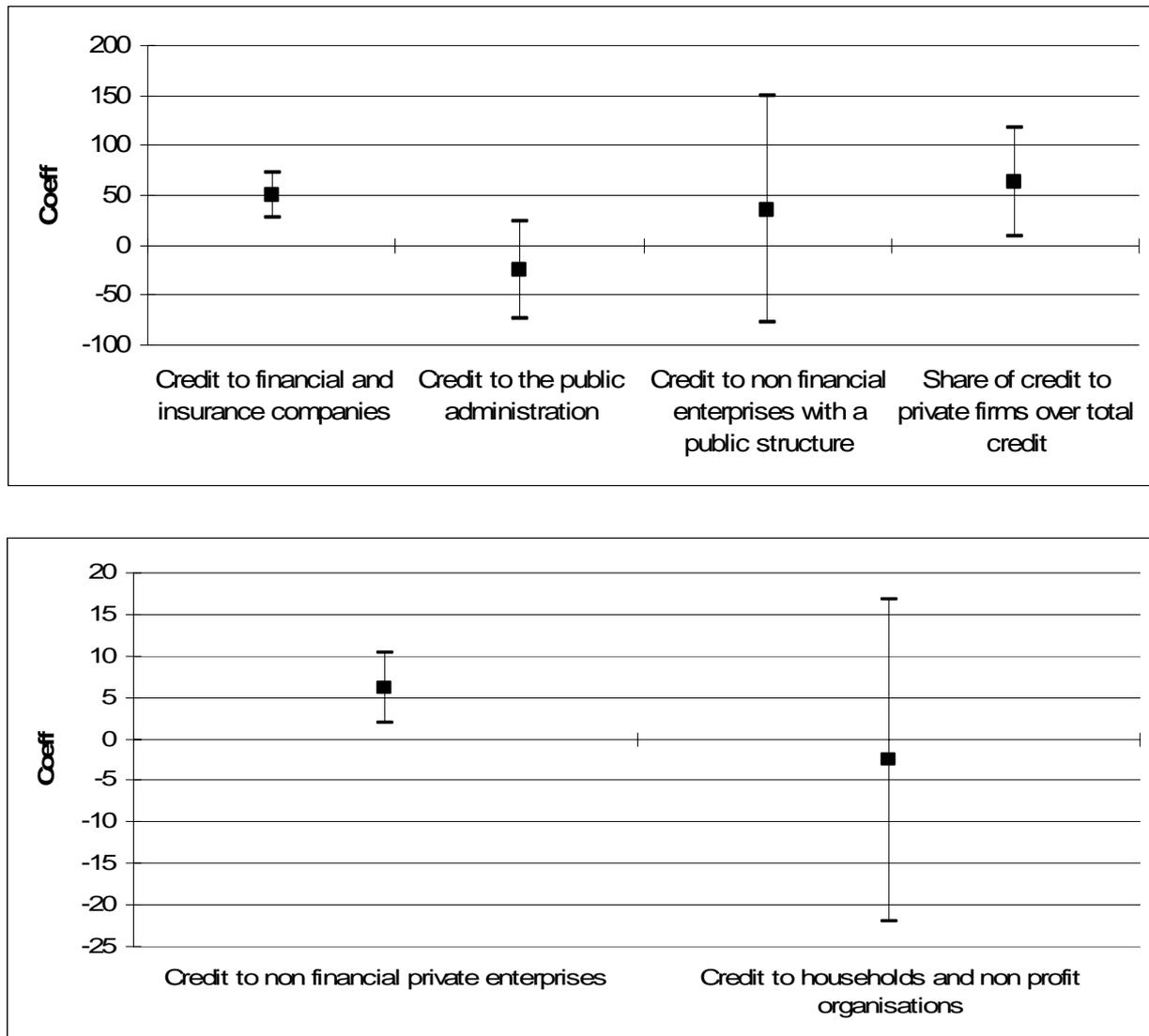
Dependent variable: log of real per head value added

Method: System-GMM

Log(LTCREDY)	0.0474*	-
t-stat.	3.33	-
Log(CREDY)	-	0.0481*
t-stat.	-	2.18
Log(REAL VALUE ADDED PER HEAD) ₋₁	0.7745*	0.7365*
t-stat.	17.49	11.41
STUDENTSPOP	-0.0001	-0.0001
t-stat.	-0.47	-1.68
EIY	-0.0004	-0.0024
t-stat.	-0.37	-1.78
CRIMESH	0.0006	0.0003
t-stat.	1.16	0.75
DUMMY PUGLIA	-0.1996*	-0.1429*
t-stat.	-2.1	-2.75
DUMMY EMILIA-ROMAGNA	0.1174*	0.1036*
t-stat.	2.33	2.02
CONSTANT	-0.6175*	-0.5161*
t-stat.	-4.77	-3.88
First order serial correlation (p-value) ¹	0.03	0.03
Second order serial correlation (p-value) ²	0.29	0.31
Test for overident. restrictions (p-value) ³	0.33	0.35
Number of groups	72	72
Number of instruments	72	72
Number of obs.	330	330

Note: * marks coefficient significant at the 5% level. T-statistics are showed in parentheses. Instruments include past first differences and past levels of Log(REAL VALUE ADDED PER HEAD)₋₁, STUDENTSPOP, EIY, CRIMESH. ¹: the null is absence of first order serial correlation in the differenced residuals. Presence of first order serial correlation in the differences residuals does not affect the validity of estimates. ²: the null is absence of second order serial correlation in the differenced residuals. ³: the null is that over-identifying restrictions are not rejected.

Figure 2 – The impact of credit on future growth according to the kind of borrower (Fixed Effect Estimator)



Note: the coefficient estimates of the controls variables are available from the author upon request. The same set of controls as in Tables 4 and 5 was used here.

Table 8 – The impact of private credit on future growth

Financial Indicator	Percentage increase in the future growth rate obtained by moving the province with the least value of each financial indicator to its average value
Credit to non financial private enterprises over value added	7.8%
Credit to financial and insurance companies over value added	3%
Share of credit to private firms over total credit	14.4%