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Regional Evidence on Financial Development, Finance Term Structure and Growth

by

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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. Thanks to this research strategy, I can avoid pooling developed and developing countries in the same sample. By using both cross-section and panel data estimators I show that finance leads growth, I do not find sizeable endogeneity biases and I show that the finance-growth nexus is robust to spatial unobserved heterogeneity. Spatial correlation in the residuals is rejected by the data. Economic growth appears to be favoured by credit to private firms and more by short-term credit than by long-term credit.

Jel codes: O18, O16, C31.

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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 financial innovations 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 received considerable attention in recent years too. 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 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 by Usai and Vannini (2005) and showed by Schiavo and Vaona (2006). 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 substantial variability within the sample. Moreover, Italian regional data have

recently attracted considerable attention in studies about different aspects of financial development (Guiso, Sapienza and Zingales, 2004a, 2004b and 2006; Usai and Vannini, 2005).

Driffil (2003) claims that growth theories relying on agglomeration economies and falling transport costs may offer more valuable insights than the theories of the link between finance and growth. As a consequence, a regional dataset may offer valid tests to assess the robustness of the finance-growth nexus, as it represents a limit condition of economic integration as compared to cross-country datasets (Guiso, Sapienza and Zingales, 2004a). If agglomeration forces and the dynamics of transport costs are the dominant factors explaining economic growth, the finance growth nexus should disappear within countries.

Unlike Guiso, Sapienza and Zingales (2004a), I do not consider indicators of financial development deriving from micro data, rather I consider aggregate ones, directly concerning the size of the banking sector relative to the local economy as a measure of their degree of financial intermediation. In the first place, this makes the results here achieved more directly comparable with those of the cross-country literature. Secondly, it makes possible to introduce within a regional setting the methodological advances made by the cross-country literature during the last fifteen years, considering not only cross-sectional but also dynamic panel data estimators. In both the cases, I provide estimates robust to unobserved heterogeneity, which is important given the sensitivity of growth studies to model misspecification and the omission of technological progress (Levine and Renelt, 1992; Islam, 1995; in the finance-growth literature Driffil, 2003 and Manning, 2003). Considering a panel dataset will also make it possible to test for the poolability of the regions involved in the present study after Schiavo and Vaona (2006).

Finally, I also show that my result are not affected by spatial correlation in the residuals. The importance of testing for spatial correlation when studying the impact of local financial development on growth has been overlooked so far. Guiso, Sapienza and Zingales (2004a) rightly point out that distance is very important in the credit market as it may produce geographic segmentation. If this is the case, local financial variables will have a statistically significant impact

on real variables. However, suppose that the estimated model does not fully capture the links between different provinces within the credit market: the residuals will display spatial correlation producing biased standard errors and unreliable statistical inference.

I also descend to a finer level of geographical disaggregation than Usai and Vannini (2005). While they analyse NUTS2 regions, this contribution is concerned with NUTS3 ones[2] 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[3]. Furthermore, while they assess the impact of different kinds of banks 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 term structures on the local 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). In an economy particularly relying on small firms as the Italian one, short-term credit may offer the possibility to fund long-term projects given that small firms usually have less collateral than large ones and they may be rationed when applying for long-term credit. Moreover, this might particularly true in lagging regions where opportunistic behaviour is more common and monitoring costs are greater, causing different access to credit for firms based in different regions.

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.

[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 datasets of the present contribution have a very similar cross-sectional dimension to those used in the cross-country studies reviewed in Levine (2004).

[3] Guiso, Sapienza and Zingales (2004a) argue that for both the Italian Antitrust Authority and the Bank of Italy provinces are the "relevant market" for banking.

Afterwards, I will illustrate the collected data. Finally, I will consider both a cross-sectional and a panel data analysis trying to understand if the level of financial development (meant as financial intermediation) 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 instrumental variables estimators.

Literature Review

The literature review that follows deals mainly with cross-country studies considering financial development as improvements in the working of banks, however there exist 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).
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, capital accumulation and productivity growth.
In particular four measures of the level of financial development are proposed:

- DEPTH: liquid liabilities of financial intermediaries over GDP;
- BANK: the ratio of private bank credit over the sum of private bank credit and central bank credit;
- PRIVATE: the ratio of the credit allocated to private enterprises over total domestic credit;
- PRIVY: the ratio of the credit to private enterprises over GDP.

The model specification is as follows:

$$G=\alpha+\beta F+\gamma X+\varepsilon \quad (1)$$

where G is either per capita GDP growth, or growth of the capital stock per head or productivity growth; F 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 developments, international trade, fiscal and monetary policy). α, β and γ are coefficients, while ε is the stochastic error. 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 analyse 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. 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. They 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 credit by financial intermediaries to the private sector divided by GDP. While PRIVY includes credit issued by the monetary authority and government agencies, Private Credit includes only credit issued by banks and other financial intermediaries. This measure also isolates credit

issued to the private sector and therefore excludes credit issued to governments, government agencies and public enterprises[4].

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 unobserved country heterogeneity. These two contributions show that, within a cross-sectional setting, 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, relying on agglomeration economies and transport costs, may provide a better story regarding growth and catching up.

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). This method makes it possible to achieve results robust to unobserved heterogeneity. 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 unobserved 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 intermediation and growth, while Beck, Levine and Loayza (2000) examine the

[4] 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 indexes (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*.

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 (2004), 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 importance of using sufficiently low-frequency data to move beyond cyclical effects.

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 term 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 resorting to short-term credit.

Model Specification and Data Issues

In the present study I will consider both a cross-sectional and a panel dataset of respectively 94 and 73 Italian provinces (NUTS3 regions).

When performing 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 (EIY), the number of students enrolled in the secondary school over local resident population (STUDENTSPOP), the value of finished public infrastructures over value added (OPPUBVA), the number of crimes per head (CRIMESH) and the level of provincial value added per head (VA0POP). All the controls are taken at their 1986 value.

Regarding the deflation of value added, I 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 error 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.

Being the present study 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 (CREDY);
- the ratio of long-term credit over value added (LTCREDY).

The measures of financial development here adopted are therefore very similar to PRIVY used by King and Levine (1993a, b, c) and they all concern financial intermediation. In cross-section estimates both CREDY and LTCREDY are taken at their 1986 value.

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.

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 consider both three and six years averages

to check if the frequency of the data affects coefficient estimates[5] and I focus 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 insert 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 regress the log of real per head value added on its first lag, the log of the financial indicators and the usual controls. I use 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 insert the regional dummies that display a strong explanatory power in the cross-sectional regressions to check if their effect carries over also in the dynamic panel model specification.

To sum up, the data involved in this study with their sources are showed in Table 1. To the reader's benefit the labels of the variables are summed up in Table 2. Descriptive statistics regarding both cross-sectional and panel data for the dependent variable and the main indicators of financial development are offered in Table 3 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, in 1986 LTCREDY reached its minimum 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.

[5] Three years averages were also used in de la Fuente (2002).

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 show 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 one[6].

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 at the beginning of the period of observation. 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 by financing long-term projects.

This scenario drastically changed over the period under analysis. Tables 4 and 5 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 period. From an economic point of view, this means that resources were drying up for the backward part of the country to the benefit of regions that were experiencing fast economic growth. From a methodological point of view, it stresses the need to consider also panel data estimators in order to better capture the dynamic changes of financial indicators over the period under analysis.

Methods and Results

In this contribution I adopt the following research strategy for both the indicators of financial development here considered. First I consider cross-section estimators and then panel ones.

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

Regarding cross-section estimators, 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 group the data of the various provinces according to the region they are in and I use the dataset as if it was an unbalanced panel, given that each region has a different number of provinces. This step is important first because cross-sectional studies of economic growth have been criticized given that they cannot account, as panel studies do, for the unobservable level of technology (Islam, 1995; Caselli, Esquivel and Lefort, 1996; de la Fuente, 2002). While one can think that major technological differences exist between regions, it is unlikely that they are a very relevant factor within regions. Secondly, in this way it is possible to overcome the problems highlighted by Driffil (2003) and Manning (2003). Consequently, following Baltagi (2003), I compute 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[7] estimators (MQ0 and MQA). Misspecification errors are usually signalled by the instability of coefficient estimates across different Random Effect estimators. Finally, in order to understand if the Fixed Effect estimator fits the data better than Random Effect ones, I compare them by means of a Hausman test. As it will appear later, the Fixed Effect estimator is the preferred one.

In order to check for endogeneity of financial development indicators, I resort to the 2SLS estimator. I use as instruments the geographical dummies that do not appear to be correlated with future growth in the Fixed Effect regression and that are 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 financial indicators

[7] Minimum Norm Quadratic Unbiased Estimtor.

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 test 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 compute 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 compute the Moran's I statistic in order to check for spatial correlation in the residuals. For 2SLS I rely on Anselin and Kelejian (1997), given that instrumental variables estimators require a specific Moran's I statistic.

To offer results able to further overcome the critiques against cross-sectional estimates discussed above, I also compute 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 financial indicators, η_i is an unobserved province-specific effect and $\varepsilon_{i,t}$ is a stochastic error. Moving 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, one can elide the unobserved province-specific effect:

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

Supposing that the regressors are predetermined it is possible to obtain consistent estimates of coefficients performing a GMM estimator that exploits the following orthogonality conditions:

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

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

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:

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

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

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 serial 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 constrains discussed above. In this way it is possible to offer a closer comparison between panel and cross-sectional estimates. To overcome the possible endogeneity of financial indicators I rely again on the System GMM estimator. In the panel estimates I only use 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 use the Windmeijer (2005) small sample

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

After Baltagi (2003) and Schiavo and Vaona (2006), I also compute for the static panel model a Roy-Zellner test for poolability in order to check that excessive heterogeneity within the sample does not prevent obtaining stable coefficient estimates. The null hypothesis is that the coefficient of financial variable indicators is identical across different provinces, whereas the alternative is that different provinces have different coefficients. Given that we have an unbalanced dataset I estimated the variance covariance matrix of the errors relying on Davis (2001).

Tables 6 and 7 contain the cross-sectional results respectively about CREDY and 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[8]. Deflating per capita value added by the local price index 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

[8] In order to control for the possible effect of the economic specialization of the different provinces, I inserted in the model first the ratio between value added in agriculture and in manufacturing and then the ratio between value added in agriculture and in the service sector. I used a Fixed Effect estimator and the results are stable when compared to those presented in Table 4 and 5. The new variables did not turn out to be significantly different to zero.

dummies for three Southern regions – Campania, Puglia and Sicilia – appeared to have a negative and very significant sign. Remarkably Campania and Sicilia are two of the Italian regions where organised crime is strongest.

A picture supporting the finance – growth nexus emerges also considering static and dynamic panel data estimates (Tables 8 and 9). In order to make sure that the possible endogeneity of financial indicators do not bias the results, I exclude their lags and the lags of their differences from the instrument sets, only including the lags of the levels and first differences of the other regressors. Specification tests support the model and no serial correlation is detected, so no time dummy was inserted for love of parsimony. Furthermore, in Table 8 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 term structure, with the exception of the estimates showed in Table 9, 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 7 would imply an overall faster growth of 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 6 would imply an overall faster growth of 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 years 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 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.

Table 10 compares the results obtained by Schiavo and Vaona (2006) running a Roy-Zellner test for poolability on a cross-country dataset with those obtained in the present application. While poolability is rejected when considering different countries, cross-region estimates displays much more stability.

Moving to consider credit according to the kind of borrower, Figure 2 shows that the measures of credit to private firms, unlike those of credit to the public sector or to households, are positively and significantly correlated with future growth[9]. Given that the coefficients significant at the 5% level have markedly different sizes, Table 11 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 credit to

[9] 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.

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 of future growth. This step was desirable because:

- 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 markets, as those of a 147 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.

Furthermore, the measures of financial development here adopted allow direct comparisons with cross-country studies, making possible the introduction of their recent methodological advances within the cross-region literature.

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 coefficient estimates. Spatial correlation in the residuals does not appear to affect the results here achieved. Unlike in cross-country studies, estimates appear to be robust to underlying coefficient heterogeneity as econometric tests could not reject the hypothesis of poolability across different geographic units.

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Table 1 – Data and sources

Data	Sources
Value added	Tagliacarne Institute
Exports	ISTAT
Imports	ISTAT
Inflation measured in the region and in the province main city in CPI	ISTAT
Number of student enrolled in secondary schools	ISTAT
Value of finished public infrastructures	ISTAT
Value of short-term bank credit	Bank of Italy
Value of long-term bank credit	Bank of Italy
Value of short-term credit to financial and insurance companies	Bank of Italy
Value of short-term credit to the public administration	Bank of Italy
Value of short-term credit to non financial enterprises with a public structure	Bank of Italy
Value of short-term credit to private firms	Bank of Italy
Value of short-term credit to non financial private enterprises	Bank of Italy
Value of short-term credit to households and non profit organisations	Bank of Italy
Resident population	ISTAT

ISTAT is the Italian National Statistical Office.

Table 2 – Labels of regressors

Label	Variable
LTCREDY	Long-term credit over value added.
CREDY	Short-term credit over value added.
EIY	Sum of imports and exports over value added.
STUDENTSPOP	Number of students in secondary schools over resident population.
OPPUBVA	Value of finished public infrastructures over value added.
CRIMESH	Number of crimes per head.
VA0POP	Cross-section models: Value added per head in 1986. Panel models: Value added at the beginning of the three years period.

Table 3 – 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 averages).

	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 *total* 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 *average* 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 4 - Geographical evolution of LTCREDY between 1986 and 2003

	1986 Number of provinces:			2003 Number of provinces:		
	below the 33rd percentile	**between the 33rd and the 66th percentile**	**above the 66th percentile**	**below the 33rd percentile**	**between the 33rd and the 66th percentile**	**above the 66th 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 5 - Geographical evolution of CREDY between 1986 and 2003

	1986 Number of provinces:			2003 Number of provinces:		
	below the 33rd percentile	**between the 33rd and the 66th percentile**	**above the 66th percentile**	**below the 33rd percentile**	**between the 33rd and the 66th percentile**	**above the 66th 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), the ratio of long-term credit over value added in 1986 (LTCREDY), and the Italian macro-regions.

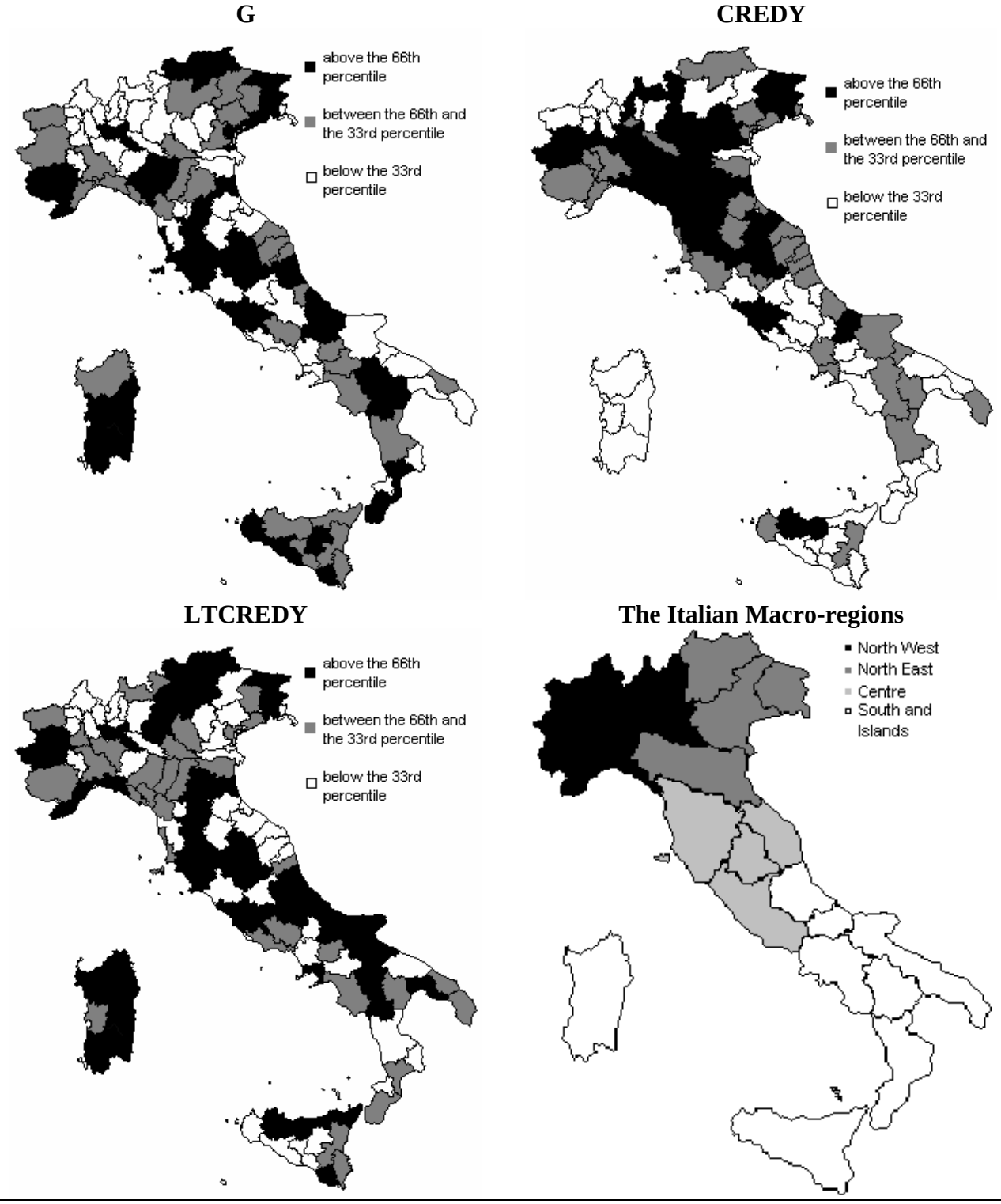


Table 6 – The effect of financial development on real economic growth in cross-section models (CREDY) – Dependent variable: real growth rate of per head value added (The dark border marks the preferred estimator).

	Fixed Effects	2SLS	WH	SA	HFB	MQ0	MQA	DEFL II FE
CREDY	5.74*	8.71*	5.82*	5.81*	5.53*	6.05*	5.67*	7.44*
t-stat.	(4.00)	(2.90)	(3.54)	(3.81)	(3.55)	(3.60)	(3.46)	(4.44)
EIY	0.02	-0.01	-1.66	-1.65	-1.36	-1.83	-1.51	0.79
t-stat.	(0.02)	(-0.01)	(-0.95)	(-1.02)	(-0.82)	(-1.02)	(-0.87)	(0.43)
STUDENTSPOP	-3.06	-3.52	-0.09	-0.12	-0.70	0.28	-0.40	-0.77
t-stat.	(-1.26)	(-1.39)	(-0.03)	(-0.05)	(-0.27)	(0.11)	(-0.15)	(-0.25)
OPPUBVA	0.11	0.16	0.21*	0.21*	0.18*	0.23*	0.20*	0.14
t-stat.	(1.29)	(1.63)	(2.13)	(2.29)	(1.95)	(2.28)	(2.00)	(1.38)
VA0POP	-45.34*	-48.41*	-26.22*	-26.36*	-29.14*	-24.60*	-27.63*	-41.10
t-stat.	(-7.41)	(-7.08)	(-4.37)	(-4.72)	(-4.63)	(-4.30)	(-4.40)	(-5.61)
CRIMESH	2.04	1.49	-0.01	0.02	0.54	-0.40	0.28	1.81
t-stat.	(1.87)	(1.23)	(-0.01)	(0.03)	(0.50)	(-0.35)	(0.25)	(1.38)
CONSTANT	94.93*	93.94*	56.06*	56.39*	63.79*	52.11*	59.37*	71.51
t-stat.	(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	0.56	0.54	-	-	-	-	-	0.58
MORAN'S I[1]	-0.46	-1.18	0.48	0.49	0.67	0.38	0.58	-
HAUSMAN (p-value)[2]	-	0.99	0.00	0.00	0.01	0.00	0.00	-
IV F-test (p-value)[3]	-	0.02	-	-	-	-	-	-
IV Overid. (p-value)[4]	-	0.20	-	-	-	-	-	-
Observations	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 Effects estimator once deflating 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. For the meaning of labels see Table 2. Labels of the Random Effect estimators: Wallace and Hussain (WH), Swamy and Arora (SA), Henderson, Fuller and Batese (HFB), minimum norm quadratic unbiased estimators (MQ0 and MQA).

Table 7 – The effect of financial development on real economic growth in cross-section models (LTCREDY) – Dependent variable: real growth rate of per head value added (The dark border marks the preferred estimator).

	Fixed Effect	2SLS	WH	SA	HFB	MQ0	MQA	DEFL II FE
LTCREDY	8.68*	13.17*	10.41*	10.34*	9.78*	10.43*	10.09*	8.97*
t-stat.	(3.46)	(2.32)	(3.86)	(4.14)	(3.81)	(3.86)	(3.79)	(2.81)
EIY	0.30	0.20	-1.67	-1.65	-1.39	-1.68	-1.53	0.97
t-stat.	(0.18)	(0.12)	(-0.95)	(-1.01)	(-0.84)	(-0.96)	(-0.89)	(0.47)
STUDENTSPOP	-3.93	-4.26	-0.46	-0.53	-1.09	-0.45	-0.78	-2.01
t-stat.	(-1.56)	(-1.64)	(-0.17)	(-0.21)	(-0.42)	(-0.17)	(-0.29)	(-0.59)
OPPUBVA	0.08	0.09	0.15	0.16	0.13	0.15	0.14	0.10
t-stat.	(0.91)	(1.02)	(1.54)	(1.65)	(1.47)	(1.55)	(1.49)	(0.93)
VA0POP	-37.86*	-35.71*	-18.12*	-18.50*	-21.99*	-18.01*	-20.01*	-32.69*
t-stat.	(-5.86)	(-5.09)	(-3.27)	(-3.55)	(-3.67)	(-3.26)	(-3.42)	(-3.79)
CRIMESH	0.98	-0.15	-1.33	-1.25	-0.63	-1.35	-0.97	0.90
t-stat.	(0.78)	(-0.08)	(-1.09)	(-1.11)	(-0.53)	(-1.11)	(-0.79)	(0.54)
CONSTANT	93.99*	88.76*	51.46*	52.20*	58.89*	51.26*	55.10*	-29.91*
t-stat.	(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	0.54	0.52	-	-	-	-	-	0.48
MORAN'S I[1]	-0.33	-0.71	0.60	0.62	0.80	0.60	0.70	-
HAUSMAN (p-value)[2]	-	0.99	0.00	0.00	0.01	0.00	0.00	-
IV F-test (p-value)[3]	-	0.03	-	-	-	-	-	-
IV Overid. (p-value)[4]	-	0.19	-	-	-	-	-	-
Observations	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 Effects 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. For the meaning of labels see Table 2. Labels of the Random Effect estimators: Wallace and Hussain (WH), Swamy and Arora (SA), Henderson, Fuller and Batese (HFB), minimum norm quadratic unbiased estimators (MQ0 and MQA).

Table 8 - 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)
Test for first order serial correlation (p-value)[1]	0.04	0.06
Test for 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 differenced 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. [4]: the null is no spatial correlation. [5]: the null is equality between the estimators using three and six years averages. For the meaning of labels see Table 2.

Table 9 - 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
Test for first order serial correlation (p-value)[1]	0.03	0.03
Test for 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 differenced 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. For the meaning of labels see Table 2.

Table 10 – Roy-Zellner test for poolability across countries (Schiavo and Vaona, 2006) and across regions for different indicators of financial development

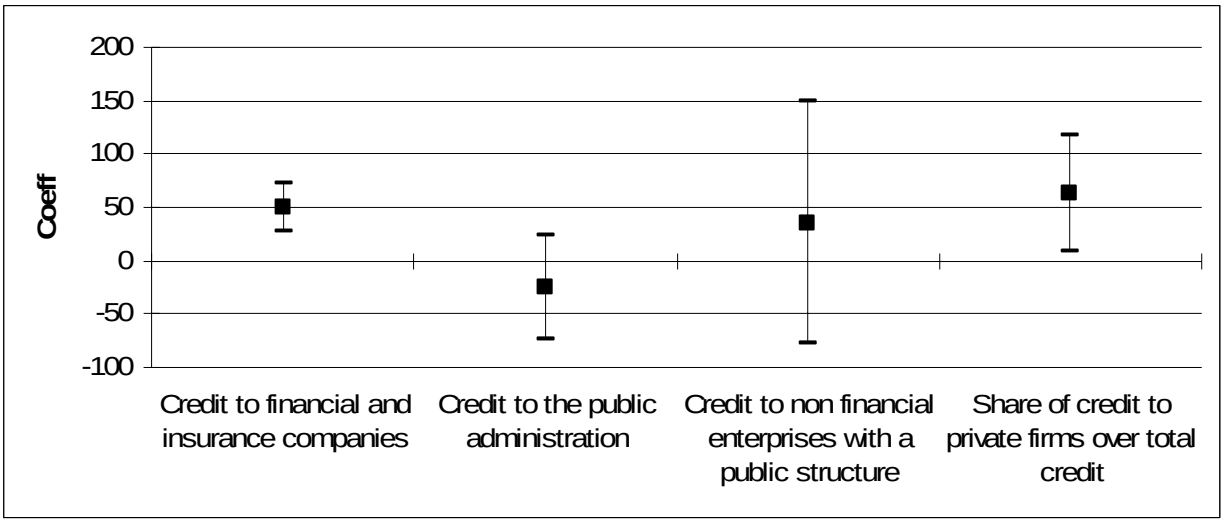
	Results for different financial indicators				
Test	**Log of liquid liabilities over GDP**	**Log of the ratio between commercial banks and central bank assets**	**Log of private credit over GDP**	**Short-term credit over value added**	**Long-term credit over value added**
Cross-country test	2.40 (0.00)	2.24 (0.00)	1.85 (0.00)	-	-
Is poolability better?	No	No	No	-	-
Cross-region test	-	-	-	0.48 (0.99)	0.23 (0.99)
Is poolability better?	-	-	-	Yes	Yes

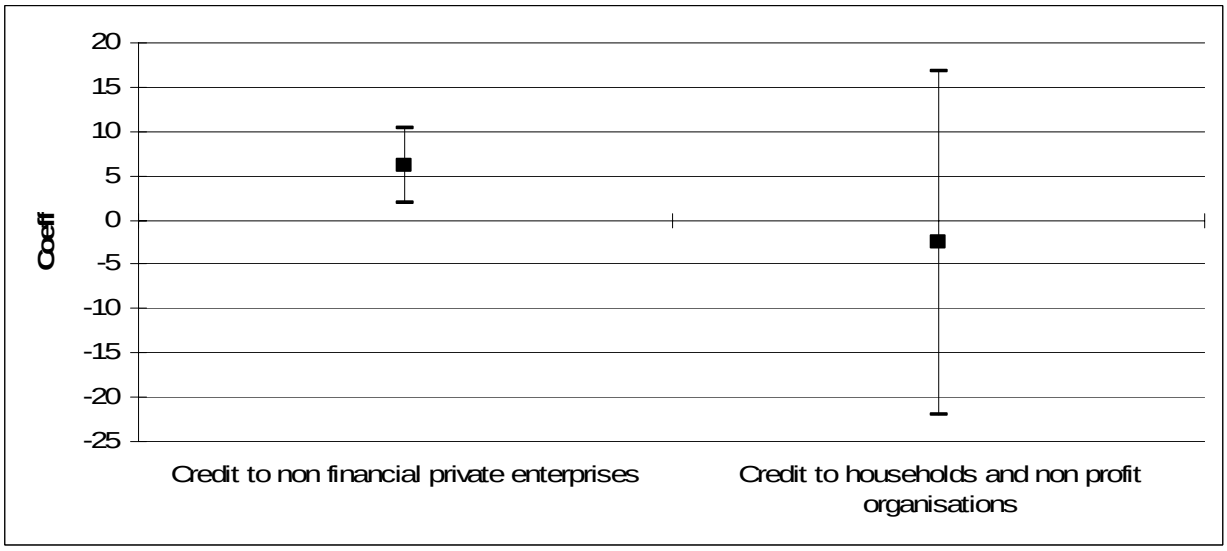
P-value in parentheses. The Roy-Zellner test has an F-distribution with 76 and 363 degrees of freedom for cross-country tests and with 71 and 323 degrees of freedom for cross-region tests. The results contained in the first three columns on the left were obtained by Schiavo and Vaona (2006), they are reproduced here to the reader's benefit.

Table 11 – The impact of private credit on future growth according to the kind of borrower

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%

Figure 2 – The impact of credit on future growth according to the kind of borrower (Fixed Effect estimator – point estimates and 95% confidence intervals of the coefficients of financial indicators). Dependent variable: real growth rate of per head value added.





Note: the coefficient estimates of the control variables are available from the author upon request. The same set of controls as in Tables 6 and 7 was used here.