Empirical Economics (2008) 34:185–201
DOI 10.1007/s00181-007-0153-2

ORIGINAL PAPER

Regional evidence on financial development, finance term structure and growth

Andrea Vaona

Received: 15 July 2006 / Accepted: 15 June 2007 / Published online: 18 July 2007

Abstract The finance-growth nexus is a classic source of debate among economists. This paper offers regional evidence on this issue in order to determine whether it can fit the data on a 147-year-old economic union, Italy. By means of this approach the pooling of developed and developing countries in the same sample can be avoided. Both cross-sectional and panel data estimates appear to show that more finance generates more growth. Endogeneity does not bias the results to a significant extent, and 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 more by short-term than by long-term credit.

Keywords Finance-growth nexus · Regions · Finance term structure · Cross-section analysis · Panel data analysis

JEL Classification O18 · O16 · C31

1 Introduction

The relationship between financial development and economic growth has long been debated by economists. Various approaches to the issue have been surveyed by Levine (2004), who discusses both theoretical and empirical studies. The latter range among

A. Vaona (✉)
Department of Economics and Quantitative Methods,
University of Pavia, Via S. Felice 5, 27100 Pavia, Italy
e-mail: anvaona@libero.it
URL: http://www.webalice.it/avaona

A. Vaona
Kiel Institute for the World Economy, Kiel, Germany

historical case studies, firm-level studies, time series studies on an individual country or on a limited number of countries, cross-sectional and panel data analyses. These last comprise studies focused on industries, like Rajan and Zingales (1998), and those surveyed below which focus on countries.

The aim of this paper is to offer new perspectives on this long-standing debate by analysing the effect of financial development, defined as enlargement of the banking sector, on growth by using a regional dataset. In this way, it will be possible to avoid pooling developed with developing countries, where the economic mechanisms at work may differ greatly as argued by Usai and Vannini (2005) and shown by Schiavo and Vaona (2007). By focusing on a country like Italy, where regional disparities have been a controversial issue since national unification in 1860, it is possible to maintain substantial variability within the sample. Moreover, regional data on Italy have recently attracted considerable attention in studies on various aspects of financial development (Guiso et al. 2004a,b, 2006; Usai and Vannini 2005).

Driffil (2003) claims that growth theories based on agglomeration economies and falling transport costs may offer more valuable insights than those concerned with the link between finance and growth. As a consequence, a regional dataset may enable valid tests regarding the robustness of the finance-growth nexus because such a dataset represents a limit condition of economic integration as compared to cross-country datasets (Guiso et al. 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.

Contrary to Guiso et al. (2004a), this study does not consider indicators of financial development derived from micro data; rather, it considers aggregate ones directly concerning the size of the banking sector relative to the local economy as a measure of its degree of financial intermediation. As a consequence, the results of this study are more directly comparable with those set out in the cross-country literature. Moreover, it is possible to introduce within a regional setting the methodological advances achieved by the cross-country literature in the last 15 years. This study consequently considers not only cross-sectional estimators but panel data ones as well. In both cases, estimates robust to unobserved heterogeneity are reported, which is important given the sensitivity of growth studies to model misspecification and to the omission of technological progress (Levine and Renelt 1992; Islam 1995; in the finance-growth literature Driffil 2003 and Manning 2003). Consideration of a panel dataset also makes it possible to test for the poolability of the regions involved in the present study, following Schiavo and Vaona (2007). Finally, providing both cross-section and panel data estimators is important because it enables to compare the results obtained here with those of the cross-country literature and of other regional studies using different financial development indicators.

In this study spatial correlation does not affect the models estimated. The importance of testing for spatial correlation when analysing the impact of local financial development on growth has to date been overlooked. Guiso et al. (2004a) rightly point out that distance is very important in the credit market because it may produce geographic segmentation. If this is the case, local financial variables will have a statistically significant impact on real variables. However, if the model estimated does not fully capture the links among different regions within the credit market, the residuals

will display spatial correlation that produces biased standard errors and unreliable statistical inferences.

The paper considers a finer level of geographical disaggregation than that examined by Usai and Vannini (2005). The latter analyse NUTS2 regions, whereas this study is concerned with NUTS3 regions,[1] the purpose being to offer results comparable to those of cross-country studies, and to consider small open economies in light of the analogy with a hypothetical, fully-integrated world economy proposed in the literature.[2] This approach also makes it possible to adopt dynamic panel data estimators, so that the problems of endogeneity and unobserved heterogeneity can be addressed more satisfactorily.

Finally, given that the Bank of Italy collects financial data distinguished between long and short-term credit, it is possible to assess the impact of different financial term structures on local growth rates. This is particularly interesting because studies on financial structure usually focus more on its effect on firm size or on the opportunities for firm growth than, as here, on its aggregate effect on economic growth (Caprio and Demirgüç-Kunt 1997). In an economy especially reliant on small firms like Italy's, short-term credit may enable the funding of long-term projects, given that small firms usually have less collateral than large ones and may be rationed when applying for long-term credit. Moreover, this may be particularly the case in lagging regions, where opportunistic behaviour is more common and monitoring costs are greater, so that firms operating in different regions have different access to credit.

The rest of this paper is structured as follows. First, a brief survey is conducted on studies regarding both the link between finance and growth across countries and firm debt structure, the purpose being to show the main econometric issues tackled by the relevant literature. Next, the model specification, the data collected and the econometric methods of the paper are described. Finally, estimation results are illustrated, while the last section concludes.

2 Literature survey

The literature survey which follows deals mainly with cross-country studies that define financial development as improvement in the working of banks. However, there exist other studies which consider financial development in terms of institutional changes or a deepening of the stock market (see for instance Levine and Zervos 1998 or Beck and Levine 2004, and others surveyed by Levine 2004). Previous research has been mainly concerned with the following econometric issues: model specification, the endogeneity of financial indicators, unobserved heterogeneity, and the frequency of the data.

[1] 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, while NUTS3 is the label for smaller spatial units more similar to counties in the US. To be noted is that the datasets used by the present study have a cross-sectional dimension very similar to those used in the cross-country studies reviewed by Levine (2004).

[2] Guiso et al. (2004a) argue that both the Italian Antitrust Authority and the Bank of Italy regard provinces as the "relevant market" for banking.

Since the seminal contributions by King and Levine (1993a,b), attention has focused on whether financial development is a precondition for or a consequence of economic growth. Various studies have been conducted with different 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 determine whether financial development can be considered a predictor of future long-run growth, capital accumulation and productivity growth.

They propose four measures of the level of financial development:

- 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:

$$G = \alpha + \beta F + \gamma X + \varepsilon \tag{1}$$

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. King and Levine (1993a,b,c) 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 and Zervos (1998); Levine (1999) and Levine et al. (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 enforcement of national credit laws, yielding different results in the protection of external investors and promoting financial development to different extents.

Levine et al. (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 1960–1995 period. Measures of financial development are instrumented with legal origin indicators. The variables included in X, the conditioning set, are treated as exogenous. They also cover a longer time span than King and Levine (1993a,b), including the years from 1989 to 1995. Levine et al. (2000) add a new measure of overall financial development called Private Credit, which is defined as 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.[3]

The above studies conclude that financial development plays a first-order role in explaining economic growth. However, both Manning (2003) and Driffil (2003) have recently argued that these studies may not have properly considered the role of unobserved country heterogeneity. They show that, within a cross-sectional setting, the effect of financial development on growth disappears once dummies for some subsets of countries are inserted, either according to the continent in which they are situated or because they have achieved outstanding growth performance (the "Asian tigers", for instance). These results induce Driffil (2003) to conclude that New Economic Geography, which relies on agglomeration economies and transport costs, may provide a better account of growth and catching up.

Levine et al. (2000) is an important contribution not only for its instrumenting of financial development indicators in a cross-sectional analysis, but also for its use of dynamic panel data estimation, as in Beck et al. (2000). This method yields results robust to unobserved heterogeneity. In order to exploit both time series and cross-section variation, Levine et al. (2000) employ data averaged over 5-year-periods, avoiding the use of data at annual frequency in an attempt to capture long run relationships. If dynamic panel data estimators are used, one can deal with unobserved heterogeneity and instrument not only financial development variables but also the variables belonging to the conditioning set.

Levine et al. (2000) examine the relationship between financial intermediation and growth, while Beck et al. (2000) analyse the relationship between financial development and the sources of growth, i.e., productivity growth, physical capital accumulation, and savings.

With regard to the frequency of the data, Beck and Levine (2004) check whether the annual frequency of the data affects the results in comparison to those obtained by studies which rely on 5 year averages. They find that the relationship between Bank Credit and growth disappears when annual data are used. 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 in order to move beyond cyclical effects.

Turning to the literature on the finance term structure, this has mainly dealt with firm level data of developing countries. It is difficult to tell a priori whether either short-term or long-term credit is more effective in supporting economic development. On the one hand, pervasive market imperfections may prevent firms in developing countries from establishing long-term relationships with banks and from financing

[3] In regard to deflation of the financial development indicators, while the balance sheet items of financial intermediaries are measured at the end of the year, GDP is measured over the year. Levine et al. (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. They then compute the average of the real financial balance sheet items in year t and $t-1$ and divide this average by real GDP measured in year t.

far-reaching projects that may generate economic growth. On the other hand, short-term credit may induce banks to exercise closer control over borrowers and projects. Moreover, public banks focusing on long-term credit are faced by the same accounting and monitoring problems as private ones. Finally, short-term credit may reflect new information better, but long-term credit may protect firms against creditors' imperfect information and opportunistic behaviour, as well as against temporary shocks (Caprio and Demirgüç-Kunt 1997; Diamond 1991).

The dataset analysed here provides a particular standpoint from which to assess the effect of finance term structure on growth. Italy is well-known for the economic importance of small firms, and for the social ties that often connect various firms together, and firms to banks, which induces the formation of industrial districts (Observatory of European SMEs 2003a,b; Becattini et al. 1992). These are two countervailing forces: small firms are usually discriminated against 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, so that the latter can fund long-term projects by resorting to short-term credit.

3 Model specification and data issues

Cross-section data were first analysed. For this purpose, we adopted a model specification similar to (1) which regressed 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, taken at their 1986 values.[4]

Controls (X) were the sum of exports and imports over value added, the number of students enrolled at secondary school over local resident population, the value of finished public infrastructures over value added, the number of crimes per head, and the level of provincial value added per head.

In order to deflate value added, we used the consumer price index (CPI), which in Italy is measured in the main cities of NUTS2-regions and NUTS3-provinces. Cross-sectional estimates relied on the CPI of the main cities of NUTS2-regions, because using the CPI of those of NUTS3-provinces entailed losing about one third of the observations.[5] This choice may have introduced some measurement error into the dependent variable, but this kind of measurement error does not affect coefficient estimates and standard errors (Wooldridge 2001). The level of provincial value added per head was not affected by measurement error because 1986 was taken as the base year.

Given that the analysis was concerned with provinces, exports and imports only included international trade, not trade with other Italian provinces, which is of course not registered at custom offices. However, more internationalised regions may achieve faster growth by exploiting international comparative advantages, so that it appeared advisable to include this control as well.

[4] Cross-sectional estimates cannot be interpreted as resulting from a pooled OLS panel estimator as the dependent variable is the future growth rate, while regressors are taken at their value at the beginning of the period of observation.

[5] Vaona (2006) sets out results obtained deflating value added not only by the regional CPI but also by the provincial one. Estimates are stable.

As regards indicators of financial development (F), two possibilities were available:

- the ratio of short-term credit over value added;
- the ratio of long-term credit over value added.

Therefore, the measures of financial development adopted were very similar to PRIVY used by King and Levine (1993a,b,c) and they both concerned financial intermediation.

When the panel dataset was analysed, estimates for both a static and a dynamic model were implemented. In the former case, a model specification similar to (1) was adopted, regressing a three (six) year average of the percentage growth rate of real per head value added on the financial indicators (short-term or long-term credit over value added). We included all the controls used in the cross-sectional estimates except the value of finished public infrastructures over value added, which is not available after the year 2000. To capture convergence forces, the model also considered the real value added per head at the beginning of each of the three (six) year time periods, as in Kahn and Senhadji (2001) and in the literature surveyed in Vaona and Schiavo (2007). Regressors were thus selected so that comparison between the panel and cross-sectional estimates would be made straightforward. Both three and six-year averages were considered in order to check whether the frequency of the data affected the coefficient estimates.[6]

When a dynamic model was used, the log of real per head value added was regressed on its first lag, the log of the financial indicators and the usual controls. The log of the financial indicators was used to capture possible non-linearities in the relationship between finance and growth, as in Levine et al. (2000). Summing up, the model specification was as follows

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

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.

Regional dummies displaying strong explanatory power in the cross-sectional regressions were also inserted in order to check whether their effect carried over to the dynamic panel model. In the panel estimates, data deflated by the CPI in the provinces' main cities were used, given that the problems of sample size were less binding in this case.

The data involved in this study and their sources are shown in Table 1. Descriptive statistics regarding both cross-sectional and panel data for the dependent variable and the main indicators of financial development are set out in Table 2. They show that there was substantial variability in the sample. The minimum growth rate between 1986 and 2003 was exhibited by the province of Rieti (−0.5%), and the maximum one by the province of Potenza (+79.7%). Also financial indicators display marked variability. For instance, in 1986 long term credit over value added reached its minimum value in the province of Benevento (7%) and its maximum one in the province of Rome (31%). Similarly, in 1986, short-term credit over value added varied from 10 to 57%, while for

[6] Three year averages were also used in de la Fuente (2002).

Table 1 Data and sources

Data	Sources
Value added	Tagliacarne Institute
Exports	ISTAT
Imports	ISTAT
Inflation measured in the region's and in the province's main city in CPI	ISTAT
Number of students enrolled at 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
Resident population	ISTAT

ISTAT is the Italian National Statistical Office

Table 2 Descriptive statistics of the growth rate of real value added per capita and of the main financial indicators used in the cross-sectional and panel estimates (three year averages)

	Variable	Observations	Mean	SD	Minimum	Maximum
Cross-section	Total percentage growth rate of real per capita value added between 1986 and 2003	94	35.2	14.1	−0.5	79.7
	Short-term credit over value added in 1986	94	1.4	0.5	0.7	3.1
	Long-term credit over value added in 1986	94	2.6	0.9	1.0	5.7
Panel	Average percentage growth rate of real per capita value added between 1986 and 2003	401	2.0	3.3	−14.4	34.6
	Short-term credit over value added	401	2.5	1.3	0.8	8.4
	Long-term credit over value added	401	1.5	1.2	0.1	8.7

The financial indicators are measured in millions of lire over ten millions of lire. Percentage numbers for financial indicators can be obtained by multiplying the figures in the table by 10

instance PRIVATE CREDIT in Levine et al. (2000) varied from 4% in Zaire to 141% in Switzerland, which is indicative that pooling underdeveloped and developed countries may not be thoroughly informative. Also the panel data show a good variability, though it is less marked than in cross-country studies.

Figure 1 provides geographical evidence on the percentage growth rate of real per capita value added in the Italian provinces between 1986 and 2003 (G), short and long-term credit over value added. It also shows the four macro-regions into which Italy is usually divided: the North-west, the North-east, the Centre and the South and Islands. Historically, the North-west has been the most developed part of the country, while the South and Islands has been the most backward one.[7]

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

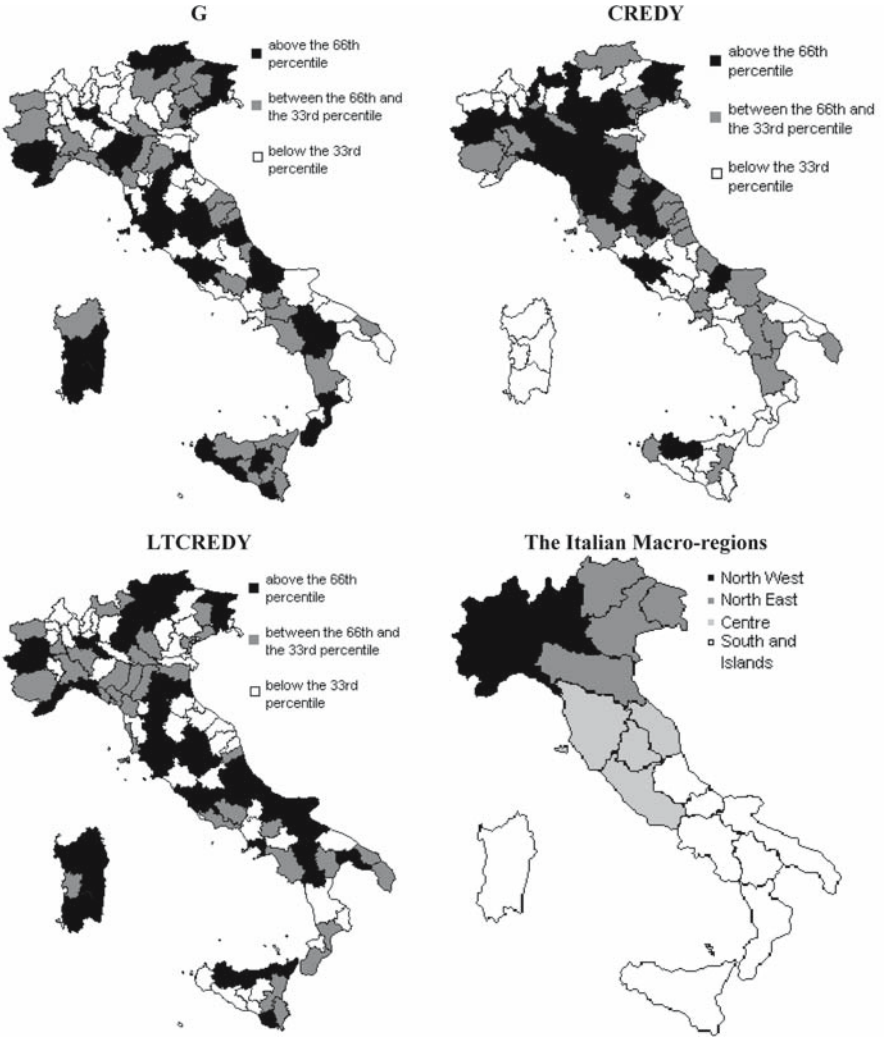

Fig. 1 Geographical evidence regarding the growth rate of per capita value added between 1986 and 2003 (G), the ratio of total short-term credit over value added in 1986 (CREDY), the ratio of long-term credit over value added in 1986 (LTCREDY), and the Italian macro-regions

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 did the North-west. This is a sign of convergence within Italy, given the leading position of the North-west with respect to the country's other macro-regions at the beginning of the observation period. Inspection of the financial indicators shows 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 evident that in 1986 the banking sector was transferring resources from the North to the South in order to boost the catching-up process by financing long-term projects.

This scenario drastically changed over the period analysed. Vaona (2006) shows that while short-term credit was mainly channelled to northern provinces in both 1986 and 2003, long-term credit was redirected from southern provinces to those in the North-east during the same period. From an economic point of view, this means that resources were diminishing in the backward part of the country, to the benefit of regions experiencing fast economic growth. From a methodological point of view, this highlights the need to consider panel data estimators in order to capture dynamic changes in financial indicators over the period under analysis.

4 Econometric methods

Let us first consider the cross-section estimates. Model (1) did 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, the data of the various NUTS3-provinces were grouped according to the NUTS2-region in which they are situated, and the dataset was used as if it were an unbalanced panel, since each NUTS2-region has a different number of NUTS3-provinces.[8] This step is important primarily because cross-sectional studies of economic growth have been criticized for being unable to account, as panel studies can, for the unobservable level of technology (Islam 1995; Caselli et al. 1996; de la Fuente 2002). Although there are presumably major technological differences among NUTS2-regions, they are less likely to be a highly significant factor within those regions. Secondly, it is thus possible to deal with the problems highlighted by Driffil (2003) and Manning (2003).

The analysis presented relied on the Fixed Effects estimator.[9] In order to check for endogeneity of financial development indicators, the 2 stage least squares dummy variables estimator (2SLSDV) was adopted. We used as instruments the geographical dummies that did not appear to be correlated with future growth in the Fixed Effects regression and which passed at the 5% level an F-test on their correlation with the instrumented variables (Wooldridge 2001). Using as instruments the geographical dummies not correlated with future growth was important in order to extract the exogenous part of the finance-growth nexus, excluding the dummies of regions where credit flowed because of their good economic prospects. On the other hand, the regional dummies not correlated with future growth, but instead with financial indicators, may play a role similar to that of the indicators of legal origin in the cross-country literature. In fact, whilst the letter of the law is the same within a country, the manner, efficacy and efficiency with which it is applied may vary from region to region, especially in the presence of markedly different local practices in a country like Italy, which achieved national unity much later than many of the other European countries.

[8] There were 21 groups (one for each of the Italian NUTS2 regions) which ranged from a minimum of one observation (Valle d'Aosta) to a maximum of nine observations (Tuscany and Sicily).

[9] Following Baltagi (2003), Vaona (2006) computes not only the Fixed Effects but also five different Random Effects estimators: the Wallace and Hussain one, the Swamy and Arora one, the Henderson, Fuller and Batese one and two minimum norm quadratic unbiased estimators. Results are stable across different Random Effects estimators, signalling the absence of major misspecification errors. A Hausman test favours the Fixed Effects estimator over the Random Effects ones.

We tested for endogeneity of the financial indicators by means of a Durbin-Wu-Hausman test which compared the 2SLSDV estimator with the Fixed Effects one. In order to assess the validity of overidentifying restrictions, we 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 2SLSDV estimator on the control variables and the instruments (Wooldridge 2001).

Finally, in order to check for spatial correlation in the residuals, we followed Anselin (1988) and we computed the Moran's I statistic for all the estimators except 2SLSDV. For 2SLSDV the key reference is Anselin and Kelejian (1997), given that instrumental variables estimators require a specific Moran's I statistic.

Panel data estimators were also implemented in order to obtain further results able to meet the above-discussed criticisms of cross-sectional estimates. One of the estimators most frequently used in the growth literature is the System GMM estimator developed by Blundell and Bond (1998). The validity of this estimator hinges on the absence of second-order serial correlation in the residuals, which can be tested by means of the statistic proposed by Arellano and Bond (1991). It is customary to insert time dummies in the estimated model not to obtain residuals with second-order serial correlation. To deal with the possible endogeneity of financial indicators, the System GMM estimator was also adopted when estimating the static panel model.

We used the Windmeijer (2005) small sample correction for both the static and the dynamic model to have reliable standard errors, and we performed the estimation on the basis of Roodman (2005). When we tested for spatial correlation in the residuals of GMM estimators, we again drew on Anselin and Kelejian (1997).

Following Baltagi (2003) and Schiavo and Vaona (2007), for the static panel model we computed a Roy-Zellner test for poolability in order to check that excessive heterogeneity within the sample did not prevent us from obtaining stable coefficient estimates. The null hypothesis was that the coefficients of the financial indicators would be identical across different provinces, whereas the alternative was that different provinces had different coefficients. Because we had an unbalanced dataset, we estimated the variance covariance matrix of the errors by relying on Davis (2001).

5 Estimation results

Table 3 sets out the cross-sectional results. Financial variables are positively and significantly correlated with future real growth. Their endogeneity is rejected when 2SLSDV and the Fixed Effect estimator are compared. Instruments pass the F-test for correlation with the instrumented variables at a 5% level for all the specifications, and over-identifying restrictions cannot be rejected. Finally, unlike the findings of Driffil (2003) and Manning (2003), the coefficients of the financial indicators remain positive and significant even adopting a Fixed Effects estimator.[10] Considering

[10] In order to control for the possible effect of the economic specialization of provinces, we also inserted into 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. We used a Fixed Effect estimator, and the results were stable when compared with those in Table 3. The new variables did not prove to be significantly different from zero.

Table 3 The effect of financial development on real economic growth in cross-section models—dependent variable: total real growth rate of per head value added between 1986 and 2003

	Fixed Effects	2SLSDV	Fixed Effects	2SLSDV
Short term credit over value added in 1986	5.74*	8.71*	–	–
t-statistics	(4.00)	(2.90)	–	–
Long term credit over value added in 1986	–	–	8.68*	13.17*
t-statistics	–	–	(3.46)	(2.32)
Sum of exports and imports over value added in 1986	0.02	−0.01	0.30	0.20
t-statistics	(0.02)	(−0.01)	(0.18)	(0.12)
Students attending secondary school over resident population in 1986	−3.06	−3.52	−3.93	−4.26
t-statistics	(−1.26)	(−1.39)	(−1.56)	(−1.64)
Value of finished public infrastructures over value added in 1986	0.11	0.16	0.08	0.09
t-statistics	(1.29)	(1.63)	(0.91)	(1.02)
Real value added per head in 1986	−45.34*	−48.41*	−37.86*	−35.71*
t-statistics	(−7.41)	(−7.08)	(−5.86)	(−5.09)
Crimes per head in 1986	2.04	1.49	0.98	−0.15
t-statistics	(1.87)	(1.23)	(0.78)	(−0.08)
Constant	94.93*	93.94*	93.99*	88.76*
t-statistics	(5.75)	(5.55)	(5.36)	(4.72)
Dummy Campania	−21.36*	−19.78*	−20.35*	−18.05*
t-statistics	(−4.08)	(−3.56)	(−3.71)	(−2.93)
Dummy Puglia	−31.44*	−30.07*	−30.32*	−27.98*
t-statistics	(−5.25)	(−4.81)	(−4.84)	(−4.05)
Dummy Sicilia	−14.45*	−13.83*	−13.08*	−11.17*
t-statistics	(−3.00)	(−2.78)	(−2.57)	(−1.99)
Dummy Trentino Alto-Adige	20.21*	21.95*	–	–
t-statistics	(2.78)	(2.89)	–	–
Dummy Emilia Romagna	–	–	9.91*	10.83*
t-statistics	–	–	(2.47)	(2.57)
R^2	0.56	0.54	0.54	0.52
Moran's I[a]	−0.46	−1.18	−0.33	−0.71
Durbin-Wu-Hausman test (*p*-value)[b]	–	0.99	–	0.99
Instrumental variable *F*-test (*p*-value)[c]	–	0.02	–	0.03
Test for overidentifying restrictions(*p*-value)[d]	–	0.20	–	0.19
Observations	94	94	94	94

Asterisks denotes coefficients significant at the 5% level. *t*-Statistics are shown in *parentheses*. Instruments in the 2SLSDV regression in the second column include the dummies for the regions Basilicata, Calabria, Emilia Romagna, Lazio, Marche, Molise, Sardegna, Toscana, Umbria and Valle d'Aosta. Instruments in the 2SLSDV regression in the fourth column include the dummies for the regions Calabria, Friuli-Venezia Giulia, Lazio, Liguria, Lombardia, Marche, Piemonte, Toscana, Veneto

[a] the null is no spatial correlation

[b] the null is no endogeneity in the comparison between the Fixed Effects and the 2SLSDV estimators

[c] the null is that the instruments are not significantly correlated with the instrumented variables

[d] the null is that over-identifying restrictions are not rejected

both short and long-term credit over value added, the dummies for three southern regions—Campania, Puglia and Sicilia—appear to have negative and very significant coefficients. Remarkably Campania and Sicilia are two of the Italian regions with the highest levels of organised crime. In the Fixed Effects estimates, we dropped dummies not significantly different from zero for the sake of parsimony.

Confirmation of the finance-growth nexus is also forthcoming when the static and dynamic panel data estimates are considered (Table 4). In order to ensure that the possible endogeneity of financial indicators did not bias the results, we excluded their lags and the lags of their differences from the instrument sets. Only the lags of the levels and first differences of the other regressors were included. Specification tests supported the model and no serial correlation was detected. Consequently, we did not insert any time dummy for the sake of parsimony. Furthermore, Table 4 shows a Wald test of equality between two estimators respectively obtained using three and six-year averages: the null of equality between the two estimators could not be rejected at a 5% level, which supports the view that different data frequencies do not affect the results. No evidence of spatial correlation was found. When we performed dynamic estimates, two regional dummies were significant at a 5% level, respectively for Puglia with a negative sign, and Emilia Romagna with a positive sign, which mirrors the cross-sectional results.

Unlike in Schiavo and Vaona (2007), who analysed the cross-country dataset used in Levine et al. (2000), a Roy Zellner test could not reject the null of poolability. This showed that cross-region estimates may display much more stability than cross-country ones.

With regard to the finance term structure—with the exception of the estimates for the dynamic panel model—it was not enough to compare the coefficient of long-term credit over value added with that of short-term credit over value added because they are not elasticities. We first examine the cross-sectional results. To determine whether short-term or long-term credit had a greater impact on growth, we considered the provinces with the minimum value of long and short-term credit over value added in 1986 and computed by how much their growth rate would have increased if they had the average value of the financial indicators analysed.

The province with the lowest value of long-term credit in 1986 was Benevento. If it had the average value of long-term credit over value added, the model presented in Table 3 would imply an overall faster growth of 1.3% over the period from 1986 to 2003. On the other hand, the province with the lowest value for short-term credit over value added in 1986 was Isernia: if it had the average value of short-term credit over value added, the model presented in Table 3 would imply an overall faster growth of 7.8% over the period analysed. Comparing the effect of short and long-term credit over value added in the static panel estimates led to the same conclusions. Moving the province with the smallest value of short-term credit over value added to its average sample value would increase the growth rate of per capita real value added from 2.5 to 9.9% over a 3-year-period. Performing the same exercise with long-term credit over value added, 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 the point estimate of the coefficient of short-term credit over value added is still greater than that of long-term credit over value added.

Table 4 The effect of financial development on real economic growth—static and dynamic panel estimates

Static Panel			Dynamic Panel		
Long term credit over value added	–	1.92*	Log (Long term credit over value added)	0.0474*	–
t-statistics	–	(2.58)	*t*-statistics	(3.33)	–
Short term credit over value added	5.30*	–	Log (Short term credit over value added)	–	0.0481*
t-statistics	(2.03)	–	*t*-statistics	–	(2.18)
Real value added per head at the beginning of the 3-year-period	−5.98*	−11.56*	Log(real per head value added)$_{t-1}$	0.7745*	0.7365*
t-statistics	(−3.62)	(−4.75)	*t*-statistics	(17.49)	(11.41)
Students attending secondary school over resident population	−1.03	0.66	Students attending secondary school over resident population	−0.0001	−0.0001
t-statistics	(−0.58)	(0.37)	*t*-statistics	(−0.47)	(−1.68)
Sum of exports and imports over value added	−2.11	−0.98	Sum of exports and imports over value added	−0.0004	−0.0024
t-statistics	(−1.63)	(−1.24)	*t*-statistics	(−0.37)	(−1.78)
Crimes per head	0.24	0.26	Crimes per head	0.0006	0.0003
t-statistics	(0.84)	(0.86)	*t*-statistics	(1.16)	(0.75)
Constant	15.41	16.56	Dummy Puglia	−0.1996*	−0.1429*
t-statistics	(1.48)	(1.68)	*t*-statistics	(−2.10)	(−2.75)
Test for first order serial correlation (*p*-value)[a]	0.04	0.06	Dummy Emilia Romagna	0.1174*	0.1036*
Test for second order serial correlation (*p*-value)[b]	0.08	0.12	*t*-statistics	(2.33)	(2.02)
Test for overident. restrictions (*p*-value)[c]	0.11	0.16	Test for first order serial correlation (*p*-value)[a]	0.03	0.03
MORAN'S I (*p*-value)[d]	0.07	0.08	Test for second order serial correlation (*p*-value)[b]	0.29	0.31
Frequency Wald test (*p*-value)[e]	0.93	0.84	Test for overident. restrictions (*p*-value)[c]	0.33	0.35
Roy-Zellner test (*p*-value)[f]	0.99	0.99	Moran's I (*p*-value)[d]	0.09	0.11
Number of provinces	73	73	Number of provinces	72	72
Number of instruments	46	46	Number of instruments	72	72
Number of observations	401	401	Number of observations	330	330

Dependent variable. Static Panel: real growth rate of per head value added (three year averages). Dynamic Panel: log of real per head value added
Method: System-GMM
For the static Panel estimates the instrument set comprises the past lags of the levels of real value added per head, crimes per head and sum of imports and exports over value added; for the Dynamic Panel estimates, the instruments are past first differences and past levels of Log (real value added per head)$_{t-1}$, students attending secondary school over resident population, exports and imports over value added, crimes per head. *Asterisks* denotes coefficients significant at the 5% level. *t*-Statistics are shown in parentheses
[a] 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
[b] the null is absence of second order serial correlation in the differenced residuals
[c] the null is that over-identifying restrictions are not rejected
[d] the null is no spatial correlation
[e] the null is equality between the estimators using three and six year averages
[f] the null is that the coefficient of the financial indicators is the same across different provinces

The greater impact of short-term credit on growth is hardly surprising, given that in Italy long-term credit is mainly granted to large firms. By contrast, small firms, which have driven the country's economic development over the past two decades, have had to rely on the renewal of short-term credit, and therefore on good relationships 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 which entails less monitoring costs and a better working of the credit market.

6 Concluding remarks

This study has used a regional dataset to test the hypothesis that the level of financial development, defined as the size of the banking sector, spurs economic growth.

This approach has first the advantage that it does not require the pooling of developed and developing countries, which have very different features. Secondly, the approach makes it possible to check whether the finance-growth nexus holds even in a highly integrated market like that of a 147-year-old economic union, and to test whether long-term credit has a greater impact on growth than short-term credit. Finally, the measures of financial development adopted here are directly comparable to those of cross-country studies, so that their recent methodological advances can be incorporated into the cross-region literature.

The results obtained on the size of the banking sector shed new light on the impact of the financial sector's functions 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 provided by this contribution does not confirm the growth impact of either the monitoring role of banks or their risk management function, or their ability to produce information on investment opportunities. However, the size of the banking sector relative to the size of the economy is an indicator of its ability to allocate capital, to mobilize and pool savings, and to ease the exchange of goods and services. The evidence of this paper supports the claim that the more a financial system is able to provide these functions, the more the economy will benefit in terms of enhanced growth.

Tests for the endogeneity of financial development indicators have been rejected and the omission of relevant variables (unobserved spatial heterogeneity) has not had a major effect on the coefficient estimates. Spatial correlation in the residuals does not appear to affect the results obtained here. Unlike in cross-country studies, the estimates appear to be robust to underlying coefficient heterogeneity, because econometric tests did not reject the hypothesis of poolability across different geographic units.

Acknowledgments The author would like to thank for their comments Paola Dongili, Angelo Zago, Francesco Aiello, Antonio Accetturo, Söhnke Bertram, Badi Baltagi, an anonymous referee and the attendants at the seminars at the International Workshop on Spatial Econometrics and Statistics in Rome (25–27 May 2006), at IfW in Kiel (13 September 2006) and at the OFCE in Nice (24 November 2006). Adrian

Belton and Kathy Lingo have been very helpful in editing the text. The usual disclaimer applies. Financial support from the Italian Ministry for University and Scientific Research (COFIN 2004—protocol number 2004-132703) is gratefully acknowledged.

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