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Financial Development and Economic Growth: Evidence from Highly Disaggregated Italian Data

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Financial Development and Economic Growth: Evidence from Highly Disaggregated Italian Data

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Abstract
In this paper we test the nexus between financial development and economic growth upon territorially highly disaggregated data from Italy, paying particular attention to the role of market power of local banks and cooperative banks. Profit efficiency, computed using the so-called "true fixed-effects" model proposed by Greene (J PROD ANAL 2005), is used as qualitative measure of financial development, while its quantitative measure is credit volume divided by gross domestic product. A growth model, similar to Hasan et al. (J BANK FINANC 2009), is specified and tested on panel data over the 2001-2010 period. Our estimates suggest that both indicators of financial development have a positive significant impact on GDP per worker, especially when considering cooperative banks and duopolistic markets. None of the above quoted results seems to be much affected by occurrence of the ongoing recession.

JEL classification: D24, G21, L89

Keywords: Financial development, Economic growth, Profit efficiency, Frontier analysis, Banking efficiency.

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1 Introduction

Over time many economists have focused their attention on the nexus between financial development and economic growth. Most of them are convinced that the financial sector has a key role in driving economic development (Levine 1997). In this paper, we seek to contribute to this literature relying upon territorially disaggregated data (at SLL, *Sistema Locale del Lavoro*, level[1]) from Italy, and considering in some detail how banks' market power and cooperative banks influence growth. We believe that the influence of cooperative banks upon growth has not yet received appropriate attention in the empirical literature. Yet, there is a widespread consensus (see e.g. Fonteyne 2007) to the effect that these banking institutions are geared to support local economic development. Our dataset allows us to shed light upon this issue. A further point is that various papers (see for Italy Angelini and Cetorelli 2000; Bonaccorsi di Patti and Dell'Ariccia 2004) have highlighted the relevance of the local number of banks for bank competition. Our previously unavailable SLL-level data also enable us to provide some novel evidence about the influence of the number of local banks on economic growth. Finally, we pay some attention to the role of the current financial crisis for the finance-growth nexus.

We use profit efficiency scores, computed through a parametric approach, as a qualitative measure of financial development, and bank credit volume granted to non-financial institutions (henceforth "aggregate credits") divided by gross domestic product as its quantitative measure. We build upon the growth model tested in Hasan et al. (2009), but we use data at a much higher level of disaggregation, and unlike in that work, we adopt data disaggregated at the same territorial level for the environmental controls in the efficiency analysis and the variables of the growth model. We thus trust to reduce to a minimum the impact of unobserved heterogeneity on our estimates.

The rest of the paper is organized as follows. Section 2 contains a short survey of the finance-growth nexus. Section 3 describes the methodology used to assess this nexus. Sources and definitions of our variables are detailed in Section 4. The key findings are set out in Section 5, while Section 6 concludes.

2 Finance and Growth: A Short Survey

There are various schools of thought that seek to identify how the financial sector fosters economic growth. Schumpeter (1911) was the first to emphasize the role of banks in facilitating technological innovation and growth. According to him, financial services contribute to growth, not necessarily influencing saving rates, but rather providing an appropriate saving allocation. On the other hand, Goldsmith (1969), McKinnon (1973) and Shaw (1973) stress the impact of the financial sector on capital accumulation.

[1] This is a fairly high level of disaggregation. A *Sistema locale del lavoro* is a group of municipalities akin to the UK's Travel-to-Work-Areas. ISTAT has identified 686 SLL's (ISTAT, 2005), while there are nowadays in Italy 110 *province* (the NUTS3 category) and 20 regions (the NUTS2 category).

The endogenous growth approach, broadly shared by both schools of thought, has also stressed in more recent years (Benhabib and Spiegel 2000) the existence of asymmetric information and uncertainty, which can cause misallocation of the funds, generating an increase of gap financing and equity. Hence, banks' contribution to economic growth also depends on their screening and monitoring functions that allow an easier and more efficient access to external financing to small and medium-sized enterprises and households. This role of banks appears to be particularly relevant when the capital markets are not sufficiently developed (Bencivenga and Smith 1991). Dow and Rodriguez Fuentes (1997) and Rodriguez Fuentes (2006) have highlighted in this respect the ability of banks to extend loans based on higher local knowledge and information. This aspect could imply a key role of cooperative banks, which operate at a strictly local level, in contributing to economic growth. Some literature shows that these banks exhibit less credit rationing in situations of financial stress compared with other financial institutions (see Angelini et al. 1998). They are expected to be more resilient to financial stress being traditionally more prudent in their lending, better capitalized and relying on more stable funding sources. However, not much evidence is available on their impact on local growth (an exception is Berger et al. 2004).

A related issue that has also received relatively little attention is the market power of banks acting in local markets. (Shaffer and Di Salvo 1994). Using a sample of Swiss banks, Shaffer (2002) rejects the hypotheses of static monopoly pricing and perfectly contestable pricing, while the results are consistent with a form of monopolistic competition. For Italy Coccorese (2009) also rejects the hypothesis of pure monopoly pricing. According to his results, local standalone banks only partially exploit their marker power, while the conduct of duopolistic local banks is virtually competitive. The implications of these findings for growth have never been fully explored. Yet it is clear that if banks operate in a less-than-fully competitive environment, they are able to increase their profits by reducing credit quantity and raising its price, with obvious consequences on local growth.

In the past, many studies have deal with the finance-growth nexus empirically. A key problem of this literature is ascertaining the direction of causality (Guiso et al. 2004; Levine 2005): does it run from finance to growth, or the other way around? A first strand of research, mostly relying on some structural kind of estimation, often concludes that economic growth determines financial development (Gurley and Shaw 1967; Goldsmith 1969), or that the causal direction is two-way (e.g. Demetriades and Hussein 1996; Blackburn and Huang 1998). A second strand of research, more geared to time series analysis, shows that financial development predicts growth (McKinnon 1973; Demirgüç-Kunt and Maksimovic 1998; Levine and Zervos 1998; Neusser and Kugler 1998; Rousseau and Wachtel 1998; Rajan and Zingales 1998).

However, evidence that finance *predicts* growth cannot be used to conclude that it *determines* growth because of: (i) the role of expectations and (ii) the possibility that important factors have been omitted. Generally speaking, growth determines finance but follows it if expectations of future economic development induce current financial development (Rajan and Zingales 1998). Furthermore, the causality between growth and finance is undetermined if relevant factors are omitted from the analysis. For instance, a younger population will tend to save more relative to GDP than an older population, and its economy is likely both to be more financially developed and to experience a higher growth. In this case, both finance and growth are driven by the demographic structure.

It should be noted that the effect of financial development on growth is investigated by most researchers in a cross-country set-up, which obviously heightens the risk of omitting potentially relevant factors (demography, legal institutions, etc.). Only relatively few works analyse this phenomenon within the same country (see, e.g., Jayaratne and Strahan 1996; Lucchetti et al. 2001; Guiso et al. 2004; Thangavelu et al. 2004; Vaona 2008).

Different proxies have been associated with financial development in investigating the finance-growth nexus. Nevertheless, the indicators commonly used rely on some measure of credit volume (Goldsmith 1969; McKinnon 1973; King and Levine 1993). Yet, we have already pointed out that the role of financial intermediaries is not simply to mediate savings, but also to identify the quality of borrowers, so as to prevent the spread of harmful risks for the entire banking system. Hence banks can promote the growth of a country not only by placing more credit in the system, but also by achieving a better performance as intermediaries. Indeed, Cameron et al. (1967) already had forcefully stressed the key role of bank efficiency in the finance-growth nexus. It is in this sense interesting to consider the approach adopted by Hasan et al. (2009) to test the direction between financial sector and economic growth in eleven European countries. They use banking (profit) efficiency and the aggregate credits relative to GDP as qualitative and quantitative proxies, respectively, of financial development, and find that both aggregate credits and efficiency have a strong effect upon local development. There is however a problem with their empirical set-up. Hasan et al., building upon Dietsch and Lozano-Vivas (2000), use various factors (macroeconomic, bank structure and regulation variables) to model the impact of the economic environment on bank efficiency[2] (and thus on the qualitative side of financial development). However, their environmental proxies are computed at the country level. They do this because of data availability problems within their European sample. But proceeding to assess the impact of the efficiency scores obtained in this manner on local (NUTS2) growth, estimates of the finance-growth nexus are likely to be distorted by residual unobserved heterogeneity.

Accordingly, in this paper we build upon Hasan et al. (2009) by using a dataset from a single country, Italy, territorially disaggregated at the SLL level. Using single-country data should, by itself, thwart various sources of unobserved heterogeneity. Moreover our bank efficiency measures rely on banking environment proxies computed at SLL level that characterises the growth estimates. In this manner we deal with a potential source of unobserved heterogeneity remaining in the equations estimated by Hasan et al. (2009). The rich territorial information from our dataset, and our focus on local banks, also allow us to shed some

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[2] It is well known that differences in the environment, risk and regulation conditions have an important impact upon the banking industry (Ferrier and Lovell 1990; Berger and Mester 1997). The study of Dietsch and Lozano-Vivas (2000) has been particularly influential. Taking into account France and Spain they investigate the factors that could explain cross-country differences in measured efficiency scores, isolating three groups of environmental variables.

novel light on the role of cooperative banks and banks' market power on growth. Finally, as our data cover the 2001-2010 period, we will be able to some extent to ascertain how the current crisis affects the finance-growth nexus. Assessing the stability of our estimates vis-à-vis the crisis can also be seen as an informal way to apply Hoover's (1991) approach to the issue of direction of causality between finance and growth.

3 The Empirical Methodology

3.1 Assessing the Finance-Growth Nexus

In order to test the nexus between financial development and economic growth (in SLL-level GDP per worker) we rely on the following dynamic panel model:

$$\ln Y_{i,t} = a_1 \ln Y_{i,t-1} + b_1 \ln FV_{i,t} + b_2 \ln FQ_{i,t} + b_3 \ln FV_{i,t} * \ln FQ_{i,t} + b_4 N_{i,t} + b_5 TP_{i,t} + \eta_i + \tau_t + \varepsilon_{i,t} \quad (1)$$

where Y represents the rate of growth in GDP per worker explained by its lagged value, by FV (finance volume), i.e. aggregate credits relative to GDP, by FQ (finance quality), i.e. profit efficiency, by the interaction between FV and FQ, by N, the rate of growth in employment (controlling for various local influences), by TP, a technology proxy controlling for local state of technology, by η, an unobserved area-specific effect, and finally by τ, year dummies controlling for time-specific effects; ε are the disturbance terms. Subscripts i and t respectively refer to SLL areas and time periods (years). The dynamic panel specification suggests the use of the two-step system Generalized Method Moment (sys-GMM) estimator developed by Arellano and Bover (1995) and Blundell and Bond (1998). Moreover, given the well-known endogeneity problems between financial development and economic growth, we include lagged levels and differences as instruments for FV and FQ (see also Levine et al., 2000). As usual, the correctness of the model is checked with the Sargan-Hansen test of overidentifying restrictions for validity of instruments, while the Arellano-Bond test is used for testing autocorrelation between error terms over time.

We stressed already several times that a distinctive feature of our analysis is that we rely on banking efficiency as a qualitative measure of financial development. Since we intend to improve upon Hasan et al. (2009) in computing this proxy, it is of some importance to explain in detail how we measure efficiency.

3.2 Assessing Bank Efficiency

There is no general consensus about which method (parametric or non-parametric) is to be adopted to measure banking efficiency. The great advantage that non-parametric methods have in dealing with multi-input multi-output production sets fails if the measurement of cost or profit efficiency allows the use of specifications with a single dependent variable. In our set-up, these are exactly the kind of efficiency measures that we need. We will use profit efficiency as a qualitative proxy of financial sector. This variable, more than cost efficiency, produces an economically and statistically significant effect on regional growth (forceful arguments in favour of the informative power of - alternative - profit efficiency are provided in Berger and Mester 1997). Employing a stochastic frontier enables us to take into account taking the stochastic noise in the data, as well as to estimate the impact of environmental factors on banks in a very flexible manner. Hence, in the present paper we shall rely on stochastic frontier analysis (SFA).

SFA has been widely used over the past two decades. Over the years, its specification has undergone many changes and extensions. We implement the procedure defined by Greene (2005) as "true fixed-effects model", whose main advantage is to allow for both time-varying inefficiency (modelled through the inclusion of environmental variables in the inefficiency term) and unit-specific time invariant unobserved heterogeneity. Omitting this type of heterogeneity may imply a bias in the estimates (see Greene 2005). Formally, the Greene model may be written as follows:

$$y_{it} = \alpha_i + f(x_{it}, \beta)\exp\{v_{it} - u_{it}\} \quad (2)$$

where α_i is time-invariant unobserved heterogeneity of bank i (a fixed effect), y_{it} is the (natural log of) profit of bank i at time t; x_{it} is a kx1 vector of explanatory variables (output quantities, input and output prices; also taken in natural logs) of bank i at time t; β is a vector of unknown parameters; v_{it} are random variables assumed to be i.i.d. $N(0, \sigma_v^2)$ and independent of the u_{it}, while u_{it} are non-negative random variables measuring inefficiency. In our case, they are assumed to be independently but not identically distributed: they obtain from the truncation to zero of the distribution $N(m_{it}, \sigma_u^2)$ where $m_{it} = \mu + z_{it}\delta$, μ denotes the location parameter of the inefficiency distribution, z_{it} being a vector of determinants of (profit) efficiency of bank i at time t, and δ a vector of unknown coefficients. As said before, any unmeasured heterogeneity is captured by bank-specific fixed effects (α_i). Moreover, following the approach pioneered in Kumbhakar et al. (1991) and Battese and Coelli (1995), the mode of the inefficiency error components is assumed to be a function of a vector of time-varying environmental variables.[3]

Following Dietsch and Lozano-Vivas (2000), we include in the so-called z-vector, explaining the mode of the inefficiency term distribution, a time trend that captures shifts in the profit function over time and some environmental variables such as: deposits (of non-financial institutions) density (DD), branch density (BD) and deposits per branch (DB) (for more details on the composition and size of sample, as well as some descriptive statistics of the environmental variables, see Tables 1 and 2; all tables are in the Appendix). Compared to previous works, we have data that enable us to better capture the differences across geographical areas. DD, BD and DB are measured at SLL level (not at the national level as in Hasan et al., 2009).

[3] We rely on the routines provided in Belotti et al. (2012) for the estimation of the "true fixed-effects model".

The profit efficiency[4] of bank at time t is defined by:

$$PE_{it} = \exp\{-u_{it}\} = \exp\{-z_{it}\delta - w_{it}\} \quad (3)$$

where w_{it} is a random variable defined by the truncation of a normal distribution with - $z_{it}\delta$ as the truncation point. Our translog specification is written as follows:

$$\ln Y = \alpha_0 + \sum_{i=1}^{3}\beta_i \ln y_i + \sum_{i=1}^{3}\gamma_i \ln w_i + \tau_1 T + \frac{1}{2}\left[\sum_{i=1}^{3}\sum_{j=1}^{3}\delta_{ij}\ln y_i \ln y_j + \sum_{i=1}^{3}\sum_{j=1}^{3}\theta_{ij}\ln w_i \ln w_j + \tau_{11}T^2\right]$$

$$+\sum_{i=1}^{3}\sum_{j=1}^{3}\rho_{ij}\ln y_i \ln w_j + \varepsilon_{it} \quad (4)$$

where $\ln Y$ is the natural logarithm of total profit, $y_i\ (i = 1,2,3)$ are output quantities, $w_j\ (j = 1,2,3)$ are input prices, T denotes the time trend that captures the influence of technical change leading to shifts in the profit function over time and $\varepsilon_{it} = v_{it} - u_{it}$ represents the error composite term. Finally, α , β , γ , τ , δ , θ , ρ are the coefficients of parameters to be estimated using maximum likelihood estimation (Greene 2005). Formally, we measure profit efficiency as:

$$PE_{it} = \Pi_{it} / \Pi_{it}^{max} \quad (5)$$

in which Π and Π^{max} describe the profit obtained by a bank and the maximum level that could be achieved. As usual, in order to guarantee linear homogeneity in factor prices it is necessary (and sufficient) to apply the following linear restrictions to the translog function, $\sum_{i=1}^{3}\gamma_i = 1$, $\sum_{i=1}^{3}\theta_{ij} = 0$ and $\sum_{j=1}^{3}\rho_{ij} = 0$ and to impose symmetry conditions, i.e. $\delta_{ij} = \delta_{ji}$ and $\theta_{ij} = \theta_{ji}$.

A potential anomaly with the use of SFA in estimating profit efficiency concerns the presence of negative values that correspond to the losses (negative profits) incurred by banks. Since the log of negative numbers associated to profit of banks is not defined, this leaves us with a potential problem. The main approaches used in the literature to deal with it are: (i) truncation, by eliminating observations with negative profits; (ii) rescaling, by adding the sample minimum plus one to the negative value of profits and (iii) censoring, that is assigning negative profits to 1 and specifying an additional dummy variable that takes value 1 if profits are positive and value 0 if profits are zero or negative, before taking logs. Bos and Koetter (2011), who propose

[4] We rely on the notion of "alternative profit efficiency" (Berger and Mester 1997). This approach is a closer representation of reality whenever the assumption of perfect competition is questionable or there are differences of quality/specialisation among the firms of the sample. Alternatively, "standard profit efficiency" assumes perfect competition in the markets for inputs and outputs. So, banks try to maximize the profits by adjusting the vector of outputs and inputs, given the vector of output and input prices.

censoring, stress that it improves the precision of profit efficiency scores, making them less likely to be biased. Accordingly, censoring shall be the method employed in our analysis to deal with negative profits.

4 Variables: Definitions and Sources

According to Berger and Humphrey (1997), the intermediation approach (Sealey and Lindley 1997) is the most appropriate in evaluating the activities carried out by financial intermediaries, and this is the approach that we shall follow here. Following this approach, the output vector (**y**) is composed by: customer loans (y_1), services (administrative) or non – traditional activities (y_2), i.e. commission income and other operating income, and securities (y_3), i.e. bank loans, Treasury bills and similar securities, bonds and other debt less bonds and debt securities held by banks and other financial institutions.

The cost vector (**w**) incurred by the credit institutions is composed by: labour cost (w_1), the ratio of personnel expenses (wages and salaries, social charges, etc.) over number of employees; cost of physical capital (w_2), the ratio of other administrative expenses, value adjustments to tangible and intangible assets and other operating expenses over number of branches; cost of financial capital (w_3), the interest expenses and similar charges and commission expenses over total liabilities (descriptive statistics of variables composing our production set are given in Table 3).

Total profit is the difference between revenue and cost, where revenue is composed by: interest and similar income on loans to costumers, interest and similar income on debt securities and services (administrative) or non – traditional activities, i.e. commission income and other operating income, and services, while total cost is composed by: personnel expenses, other administrative expenses, value adjustments to tangible and intangible assets and other operating expenses and interest expenses and similar charges and commission expenses.

In comparison to previous works, we have data that enable us to better capture the differences across geographical areas. The SLL is a group of municipalities (akin to the UK's Travel-to-Work-Areas) adjacent to each other geographically and statistically comparable, characterised by common commuting flows of the working population. SLL's are an analytical tool appropriate to the investigation of socio-economic structure at a fairly disaggregated territorial level. The identification of 686 SLL's made by ISTAT (the Italian Statistical Office) in some recent research (ISTAT 2005) has highlighted remarkable differences in economic performance across the Italian territory.

Bank efficiency is measured over a large sample of Italian banks classified by the Bank of Italy as small (average funds intermediated between 1.3 and 9 billion euro) and minor (average funds intermediated less than 1.3 billion euro). We exclude larger banks both because their technology is likely to be very different from that of smaller banks, and because their nexus with local development is likely to be much flimsier. On the other hand, it should be stressed that our estimates include both cooperative and for-profit (Other, in our parlance) banks. Cooperative, or mutual, banks can be, at least to some extent, considered along with other banks as far as cost minimisation is concerned, but differ widely from them in their profit maximisation process.[5] This means that we shall consider these two bank types separately in measuring profit efficiency.

The bank data were taken from the BilBank 2000 database distributed by ABI (Associazione Bancaria Italiana) because it has a large time extension and wealth of information on bank balance sheets. Employment is from the ISTAT SLL data-set. Also the technology proxy (the ratio between service workers and the sum of industry plus service workers) comes from that dataset GDP per worker is constructed by updating the SLL value added data from ISTAT through the 2006-2010 period with data from the Bureau Van Dijck's AIDA dataset. SLL-level data for branches, deposits and loans are from the Bank of Italy dataset (*Bollettino Statistico*). All monetary aggregates are in thousands of deflated 2005 Euros. Our sample begins in 2001, because the SLL-level data are not available before that year. All the regression analysis (GMM and SFA alike) is carried out with STATA 12.

5 The Empirical Evidence

To repeat, in order to test at SLL level the nexus between financial development (FV and FQ) and economic growth (GDP per worker) we estimate a growth model in a panel data context. The bank efficiency scores (proxies of FQ) are calculated following Greene (2005) methodology and including in the profit frontier some environmental variables. Some basic results for the efficiency analysis are given in Table 2, while the panel evidence is detailed in Tables 4 and 5.

A very important feature of our analysis is that, like Hasan et al. (2009), we allocate banks to geographic areas on the basis of head-office location. This has several consequences. First of all, as highlighted in Tables 1 and 2, the sample upon which we carry out our panel estimation is not the whole SLL universe. In particular, SLL's from the North-west and the South are under-represented in the estimation sample. This may have been a drawback had we wanted to assess the impact of financial development on Italian economic dualism. As, on the other hand, our aim is to bring new, highly disaggregated, evidence to bear upon the finance-local growth debate in general, we feel that our estimation sample contains valuable information, potentially very relevant for other countries. Compare our descriptive statistics with those in Tables 1 and 2 of Hasan et al. (2009): the range of variation of our GDP per capita and environmental variables is pretty extensive. Only DB has relatively little variation, but so it would have throughout the whole SLL universe.

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[5] Italian CB's must apply the so-called principle of prevalence, requiring that more than 50% of assets are either loans to co-operative members or risk-free assets, according to the criteria established by the Financial Regulator. Furthermore, as far as profit distribution is concerned, the 1993 law, *Testo Unico Bancario*, requires that CB's must: a) devote at least 70% of annual net profits to legal reserve; b) pay a share of annual net profits to mutual funds for the promotion and development of cooperation in an amount equal to 3%; c) devote the remaining share of profits to purposes of charity or mutual aid.

Allocating banks to geographic areas on the basis of head-offices also means that our FQ measure does not allow for the efficiency of the branches of larger banks and of other banks that do not have their head office in a given SLL. It is not clear a priori how this should systematically affect the link between FQ and GDP growth. At any rate this is one more reason to instrument FQ (as we do in our estimates). On the other hand, our FV proxy includes the credit offered by all bank branches of a SLL to non-financial institutions.

The baseline estimates include all SLL's in which there is the head office of at least one bank for which we measure profit efficiency. If there is more than one of such banks in the SLL, FQ is measured as their mean profit efficiency. With a view to consider in some detail how banks' market power and cooperative banks influence growth, we bring our model to several sub-samples. Given the relevance of the local number of banks for bank competition (see for Italy Angelini and Cetorelli 2000; Bonaccorsi di Patti and Dell'Ariccia 2004) we split our sample in SLL's where there is only one bank head-office, and SLL's where there are two bank head-offices in a SLL. For want of a better label, we dub these cases as monopolistic and duopolistic. Indeed, while these categories cannot apply to our case in any rigorous sense (there are almost invariably branches of other banks in any SLL), the gist of the literature is that SLL with just one head-office should have less bank competition. Both monopolistic and duopolistic sub-samples are divided in further groupings. We take monopolistic SLL's with a cooperative bank, a bank of the other kind, and the union of the above samples (meaning all SLL's with a standalone head office regardless of whether it is cooperative or other). For duopolistic SLL's, we distinguish SLL's with two cooperative banks, SLL's with two other banks, and SLL's with a cooperative and another bank.

Finally, in order to gain some insight on the relevance of the crisis for banks' behaviour, all estimates are carried out our both on the full 2001-2010 sample and on a 2001-2007 sub-sample excluding the recession period.

Examination of Table 2 shows that cooperative banks generally obtain higher profit efficiency than other banks in 2001-2010 period. This is customary for the literature on Italian banks (see, e.g., Girardone et al. 2004), as is customary the evidence that Southern banks are less efficient than Northern banks. Moreover, the efficiency scores are, on average, close to those obtained by Hasan et al. (2009) for Italy. Note however that our bank samples differ to some extent (theirs also including large banks).

The GMM estimates of the growth model are detailed in Tables 4 and 5. The Arellano-Bond test results vouch for the appropriateness of the 1st-order autoregressive specification. Also the Sargan tests (and Hansen) are always insignificant, validating the robustness of our evidence. On the whole, this evidence strongly suggests that financial development has indeed a (positive) significant impact on GDP per worker. FV turns up almost invariably with a positive and significant coefficient. This is also true, by and large, of FQ. While on the whole our results support those from Hasan et al. (2009), there is an important, quantitative, difference. Hasan et al. find that FQ promotes five times more regional growth than an identical increase in FV. Our evidence says otherwise: we find contributions of FV and FQ roughly similar in size.

More specifically, we find that the FV impact coefficient is often above 0.02, while FQ is often just below 0.02. In the most general specification (columns A, B, C and D of Table 4), our results definitely suggest a stronger and more significant role for FV than for FQ. Finally, the interaction between qualitative and quantitative proxies of financial development is seldom significant in our estimates (never for the baseline sample).

We expected that, due to their choice of a cross-country framework and their modelling of bank efficiency, the FQ estimates obtained by Hasan et al. (2009) may have been upwardly biased by unobserved heterogeneity. In the end, we find rather similar FQ estimates to their ones. Our FV estimates are, on the other hand, much larger and more significant than theirs. Hasan et al. argue that their results are in line with studies for developed countries in recent years. Yet, evidence at the local level, especially for Italy, has repeatedly found a significant role for quantitative proxies of financial development (Jayaratne and Strahan 1996; Lucchetti et al. 2001; Guiso et al. 2004; Thangavelu et al. 2004; Vaona 2008). All in all, rather than emphasising these quantitative differences, we would like to stress that bank efficiency comes out as an important component of financial development both in Hasan et al.'s and in our estimates, characterised by a similar model, but fairly different samples.

Let us now focus on the specific role of cooperative banks (CB's). When we consider the CB's sample (see columns E, F, G and H of Table 4) we find that financial development has a very significant impact on growth, both through FV and FQ. The same cannot be said for the Others sample, for which we almost never see a significant impact of financial development on growth, except for FV (see columns I and K of Table 4). This is strong and rather novel evidence validating the prior that, following their mission, CB's are more involved than other banks in the local economy, and use their efficiency to boost its growth. Our results corroborate the few existing papers on this issue, coming from widely different set-ups and samples (Angelini et al. 1998; Berger et al. 2004). However, not even for CB's there is any significant evidence for the interaction term between qualitative and quantitative proxies of financial development.

Turning to the role of bank competition, our evidence suggests that in monopolistic SLL's, financial development contributes less to growth than in duopolistic SLL's (compare columns A1, B1, C1 and D1; and A2, B2, C2 and D2, of Table 4). We rationalise this results on the grounds that banks with more market power are able to increase their profits by reducing credit quantity and raising its price, with obvious consequences on local growth. Specifically, FQ is less significant for monopolistic SLL's, while FV is statistically significant for their sample only when it enters alone in the regression. The interaction term is never significant. However, even in monopolistic SLL's, CB's promote growth more significantly than Other banks (compare columns E1, F1, G1 and H1; and I1, J1, K1 and L1). The fact that CB's contribute positively to growth, albeit weakly, also in monopolistic SLL's suggests that they only partially exploit their market power. This is in accordance with some previous evidence on the behaviour of CB's (see Shaffer, 2002).

Finally we find that the impact of financial development on growth is very strong in duopolistic SLL's, especially when considering CB's (see columns E2, F2, G2 and H2 of Table 4). This suggests that duopolistic SLL's may indeed be characterised by less rent-seeking banks (in a different set-up Coccorese, 2009, finds that duopolistic banks behave very competitively). The credit supply and efficiency of these banks is then more closely related to local growth. Only for this sub-sample we find that also the interaction term between FV and FQ is statistically significant.

Our sample period (2001-2010) is characterised by the occurrence of the worldwide financial crisis in late 2007. We are thus in a position to see whether our results are driven or anyhow affected by this important event. This evidence may be rather interesting *per se*. Moreover, Hoover (1991) suggests that testing for stability in the face of structural breaks in the exogenous variables is a way of assessing the soundness of a causal nexus postulated in the data. Although we do not pursue this point formally, we point out that ascertaining the stability of our estimates throughout the crisis provides some information about the issue of direction of causality between finance and growth.

The role of the crisis is gauged by repeating our estimation exercises considering the 2001-2007 sub-sample, i.e. excluding the financial crisis from our sample (see Table 5). The 2001-2007 estimates are by and large similar to the above ones, validating the evidence we commented above. Yet there are some interesting differences. For the baseline sample we find in 2001-2007 a more significant impact of FQ on growth, while very little change is found for the role of FV (see columns A, B, C and D of Table 5). This difference could be easily rationalised on the grounds of a higher relevance of financial quality in an expansionary phase, but is not very robust. In fact we find that FV produces a slightly *higher* contribution on growth in 2001-2007 (than in 2001-2010) for CB's (see columns E, F, G and H; E1, F1, G1 and H1; E2, F2, G2 and H2 of Table 5) and in the monopolistic and duopolistic samples for all banks (see columns A1, B1, C1 and D1; A2, B2, C2 and D2 of Table 5). By and large, bank efficiency is also more relevant in these sub-samples during 2001-2007. Our main conclusion is then that our estimates are not heavily affected by the occurrence of the crisis, validating our specification and the basic thrust of our previous considerations.

6 Concluding Remarks

In this paper we tested the nexus between financial development and economic growth relying upon territorially disaggregated data (SLL, *Sistemi Locali del Lavoro*) from Italy. To the best of our knowledge, our study is the first to explore the finance-growth nexus considering the role of local institutions at a very territorially disaggregated level, and paying particular attention to the role of cooperative banks and market power. Profit efficiency scores, computed using the so-called “true fixed-effects model” proposed by Greene (2005), are used as qualitative measures of financial development, while aggregate credits divided by gross domestic product is its quantitative measure.

Our estimates, that allow for the potentially two-way nature of the finance-growth nexus in various ways, suggest that both qualitative and quantitative proxies of financial development have a positive and significant impact on GDP per worker. More precisely, in line with much previous evidence on local development, especially from Italy (Jayaratne and Strahan 1996; Lucchetti et al. 2001; Guiso et al. 2004; Thangavelu et al. 2004; Vaona 2008), we find a significant role for a quantitative proxy of financial development. On the top of that, bank efficiency comes out from our estimates as an important determinant of growth.

Focusing on cooperative banks, we find that, in accordance with their mission, they seem to have a stronger impact on local growth. In particular, their efficiency is more closely related to the growth of the SLL where they have their head office, suggesting that they indeed share the outcome of their managerial performance with their territory.

Turning to the impact of market power on the conduct of banks acting in local markets, we find, broadly in accordance with some related evidence (Shaffer and Di Salvo 1994; Shaffer 2002; Coccorese 2009) that banks contribute less to growth in SLL's with a lower number of bank head-offices.

Finally our estimates provide fairly similar results for sub-samples including and excluding the recession started by the worldwide financial crisis. This vouches for the robustness of the above described evidence.

7. **Appendix**: Descriptive Statistics and Results

Legend of the Tables

Table 1: in the Duopolistic Sample, the sum of CB's and Others provides a total which is less than All, because the latter also includes SLL's with mixed duopolies (a CB and an Other bank).

Number of banks is the *average* number per year.

Source: own calculations upon data from ABI.

Table 2:

FQ: Financial quality measured as profit efficiency for all banks (All), cooperative banks (CB's) and other banks (Others) [a]

FV: Financial volume measured as ratio of aggregate credits over local GDP [b,c,d]

Y: Gross domestic product per worker [b,c]

TP: Technology proxy; ratio of service workers over the sum of industry plus service workers [b]

DB: Deposit per branch measured as ratio of aggregate deposits over number of branches [d]

DD: Deposit density measured as aggregate deposits per square kilometer [d]

BD: Branch density measured as number of branches per square kilometer [d]

Number of banks in the SLL sample is the average number per year.

Source: (a) own calculations upon data from ABI; (b) ISTAT (2005); (c) ISTAT (2005) and own calculations from Bureau Van Dijck's AIDA; (d) Bank of Italy (*Bollettino Statistico*).

Table 3: customer loans (y_1), non-traditional activities (y_2), securities and other loans (y_3); labour cost (w_1), cost of physical capital (w_2), cost of financial capital (w_3). All variables averaged between 2001 and 2010. All monetary aggregates in thousands of deflated 2005 Euros. SD: Standard Deviation. Source: own calculations upon data from ABI (values on average).

Table 4 , Table 5:

All equations are estimated through system GMM: financial volume (FV), financial quality (FQ) and the interaction term (FV x FQ) are specified as endogenous variables. Lagged levels and differences are used as instruments.

Year dummies included but not reported.

N is the SLL-level rate of growth in employment, included as a further control.

n: Sample size.

Statistics for the Sargan and Arellano-Bond, AR(2), tests are p-values.

*, **, *** stands for significant at 10%, 5% and 1%, respectively.

Table 1 Sample Size for Panel Growth Regressions on SLL's: Various Sub samples by Year and Geographic Area

	Whole Sample			Monopolistic Sample			Duopolistic Sample		
Year\Geo.Loc	**CB's**	**Others**	**All**	**CB's**	**Others**	**All**	**CB's**	**Others**	**All**
2001	229	125	354	79	26	105	42	16	100
2002	224	128	352	77	27	104	40	13	100
2003	222	113	335	76	25	101	42	11	97
2004	218	116	334	74	23	97	42	11	97
2005	217	106	323	73	22	95	40	11	93
2006	220	108	328	74	22	96	41	10	93
2007	227	116	343	82	23	105	40	11	94
2008	223	116	339	77	22	99	39	11	94
2009	221	117	338	80	23	103	37	11	93
2010	215	117	332	75	22	97	37	10	89
Total	2216	1162	3378	767	235	1002	400	115	950
N-E	71	30	101	14	6	20	13	3	17
N-W	30	26	56	8	3	11	8	3	24
Centre	49	32	81	21	8	29	4	2	25
South	72	29	101	33	7	40	15	4	29
Total	222	116	338	77	24	101	40	12	95

Table 2 Financial Development, Growth, Technology Proxy and Environmental Variables from the estimation sample, 2001-2010

	FQ_ All		FQ_ CB's		FQ_ Other		FV		Y		DB		DD		BD		n
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**	
Our SLL Sample																	
N-W	0.709	0.202	0.730	0.197	0.684	0.204	0.909	0.589	50.233	5.640	16.341	10.557	7.746	17.256	0.290	0.337	56
N-E	0.726	0.183	0.748	0.165	0.674	0.210	0.943	0.393	47.549	5.713	13.878	6.904	3.387	6.358	0.186	0.166	101
Centre	0.716	0.208	0.721	0.215	0.708	0.198	0.820	0.563	45.712	6.275	15.402	8.419	2.801	4.321	0.145	0.125	81
South	0.654	0.252	0.654	0.249	0.655	0.260	0.502	0.274	41.060	7.244	16.179	6.848	2.540	4.921	0.122	0.166	101
Italy	0.699	0.216	0.709	0.214	0.681	0.220	0.777	0.485	45.623	7.129	15.332	8.026	3.716	8.730	0.174	0.205	338
Whole SLL Universe																	
N-W							0.594	0.368	51.744	6.921	12.226	7.133	2.865	8.857	0.148	0.196	114
N-E							0.752	0.304	49.825	6.639	11.382	5.571	1.970	2.977	0.125	0.121	119
Centre							0.646	0.449	46.627	7.280	12.558	7.166	1.655	2.751	0.098	0.100	128
South							0.340	0.201	38.831	9.092	12.468	6.661	1.241	2.694	0.063	0.103	325
Italy							0.533	0.360	44.339	9.712	12.228	6.682	1.785	4.677	0.094	0.130	686

Table 3 The production set for "CB's" and "Other" Banks: Some descriptive statistics

Var.	y_1	y_2	y_3	w_1	w_2	w_3
CB's						
Mean	181,670.8	2,827.83	70,658.31	56.87	347.41	0.020
SD	204,891.5	2,823.14	60,895.75	6.87	142.54	0.007
Min	61.821	4.55	3,466.62	18.18	50.30	0.002
Max	2,163,233	26,457.13	574,114.80	150.95	1358.65	0.051
Other						
Mean	1,273,069	36,303.19	459,424.3	57.82	1,681.04	0.022
SD	1,288,343	49,586.01	573,720.2	10.83	13,027.29	0.014
Min	27.40	44	2,823.69	5.47	7.09	0.003
Max	7,435,634	962,951.8	4,988,497	189.45	420,157.70	0.194

Table 4 Finance and Growth, GMM, Whole Sample (2001-2010)

	All				**CB's**				**Others**			
Whole Sample	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**
ln $Y_{i,t-1}$	0.820***	0.770***	0.850***	0.890***	0.780***	0.760***	0.800***	0.840***	0.810***	0.630***	0.820***	0.820***
ln $FV_{i,t}$	0.020***		0.015**	0.018***	0.024***		0.019**	0.025***	0.018*		0.017*	0.020
ln $FQ_{i,t}$		0.018**	0.014	0.033		0.021**	0.015*	0.038		0.005	0.003	0.006
ln $FV_{i,t}$ * ln $FQ_{i,t}$				0.019				0.025				0.008
$N_{i,t}$	-0.016	-0.003	-0.019	-0.022*	0.093	0.099	0.095	0.095	0.032	0.036	0.032	0.032
$PT_{i,t}$	0.027	0.017	0.031*	0.034**	0.013	0.006	0.017	0.020	0.070***	0.062	0.069***	0.068***
n	2594	2594	2594	2594	1790	1791	1789	1789	805	805	805	805
Sargan	0.643	0.655	0.693	0.435	0.462	0.562	0.659	0.247	0.180	0.019	0.019	0.336
AR (2)	0.143	0.154	0.101	0.110	0.322	0.378	0.353	0.364	0.083	0.045	0.045	0.058
Monopolistic Sample	**A1**	**B1**	**C1**	**D1**	**E1**	**F1**	**G1**	**H1**	**I1**	**J1**	**K1**	**L1**
ln $Y_{i,t-1}$	0.900***	1.100***	0.920***	0.89***	0.960***	1.000***	0.970***	0.940***	0.840***	0.930***	0.910***	0.880***
ln $FV_{i,t}$	0.025**		0.016	0.024	0.028**		0.022	0.039*	0.022		0.011	0.029
ln $FQ_{i,t}$		0.016*	0.010	0.013		0.015*	0.007	0.027		0.018	0.011	0.030
ln $FV_{i,t}$ * ln $FQ_{i,t}$				0.009				0.028				0.035
$N_{i,t}$	-0.160*	-0.400*	-0.170*	-0.160*	-0.220*	-0.290	-0.220*	-0.200*	-0.220	-0.270	-0.240	-0.270
$PT_{i,t}$	0.037*	0.074*	0.038*	0.034	0.046*	0.046	0.045*	0.038	0.075*	0.083***	0.080***	0.077**
n	842	844	842	842	653	655	653	653	189	189	189	189
Sargan	0.662	0.672	0.681	0.658	0.067	0.065	0.689	0.656	0.685	0.649	0.650	0.656
AR (2)	0.433	0.255	0.401	0.422	0.279	0.187	0.253	0.276	0.519	0.364	0.415	0.506
Duopolistic Sample	**A2**	**B2**	**C2**	**D2**	**E2**	**F2**	**G2**	**H2**	**I2**	**J2**	**K2**	**L2**
ln $Y_{i,t-1}$	1.000***	0.970***	0.950***	1.000***	1.000***	1.100***	1.000***	1.100***	0.780***	0.950***	0.850***	0.830***
ln $FV_{i,t}$	0.043*		0.016	0.026*	0.041**		0.028	0.028	0.038		0.038	0.046*
ln $FQ_{i,t}$		0.029***	0.024***	0.098**		0.080***	0.072***	0.230*		0.013	0.009	0.022
ln $FV_{i,t}$ * ln $FQ_{i,t}$				0.064*				0.100*				0.028
$N_{i,t}$	-0.100	-0.099	-0.099	-0.110	-0.440*	-0.350*	-0.350*	-0.360*	-0.240	-0.48***	-0.310*	-0.36***
$PT_{i,t}$	0.120*	0.057**	0.074	0.064**	0.120	0.140**	0.120*	0.120*	-0.020	0.052	-0.003	0.031
n	783	782	782	782	323	322	322	322	90	90	90	90
Sargan	0.066	0.676	0.027	0.667	0.066	0.676	0.027	0.650	0.006	0.674	0.671	0.691
AR (2)	0.194	0.222	0.211	0.265	0.194	0.222	0.211	0.497	0.010	0.099	0.112	0.010

Table 5 Finance and Growth, GMM, Pre-Crisis Sample (2001-2007)

	All				**CB's**				**Others**			
Whole Sample	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**
ln $Y_{i,t-1}$	0.840**	0.890**	0.860**	0.910**	0.770**	0.780**	0.77***	0.86***	0.610**	0.990**	0.660**	0.680**
ln $FV_{i,t}$	0.019*		0.014	0.019*	0.028*		0.025*	0.028**	0.020		0.028	0.010
ln $FQ_{i,t}$		0.02***	0.019**	0.043*		0.02***	0.016**	0.044*		0.001	0.004	0.029*
ln $FV_{i,t}$ * ln $FQ_{i,t}$				0.026				0.029				0.048*
$N_{i,t}$	-0.001	-0.003	-0.0039	-0.004	0.079	0.085	0.081	0.081	0.14***	0.18***	0.14***	0.13***
$PT_{i,t}$	0.025	0.032	0.033*	0.037**	0.005	0.002	0.011	0.021	0.065	0.06***	0.068*	0.069*
n	1716	1716	1716	1716	1193	1193	1193	1193	523	523	523	523
Sargan	0.477	0.661	0.733	0.400	0.159	0.512	0.746	0.658	0.148	0.383	0.194	0.680
AR (2)	0.387	0.475	0.410	0.422	0.754	0.858	0.831	0.872	0.044	0.027	0.029	0.068
Monopolistic Sample	**A1**	**B1**	**C1**	**D1**	**E1**	**F1**	**G1**	**H1**	**I1**	**J1**	**K1**	**L1**
ln $Y_{i,t-1}$	0.900**	0.910**	0.900**	0.890**	0.970**	0.900**	0.960**	0.920**	0.660**	0.910**	0.820**	0.830**
ln $FV_{i,t}$	0.041**		0.036	0.012	0.048**		0.043	0.028	0.047		0.024	0.003
ln $FQ_{i,t}$		0.012	0.003	0.007		0.015*	0.002	0.021		0.005	0.012	0.055
ln $FV_{i,t}$ * ln $FQ_{i,t}$				0.003				0.012				0.062
$N_{i,t}$	-0.150	-0.170	-0.15	-0.150	-0.210	-0.130	-0.210	-0.150	-0.250	-0.310*	-0.260	-0.210
$PT_{i,t}$	0.051	0.034	0.049	0.036	0.070	0.015	0.066	0.035	0.082	0.08***	0.078	0.078*
n	558	558	558	558	432	432	432	432	126	126	126	126
Sargan	0.957	0.980	0.987	0.980	0.982	0.915	0.990	0.912	0.969	0.938	0.934	0.978
AR (2)	0.612	0.643	0.616	0.619	0.833	0.810	0.813	0.825	0.397	0.193	0.292	0.168
Duopolistic Sample	**A2**	**B2**	**C2**	**D2**	**E2**	**F2**	**G2**	**H2**	**I2**	**J2**	**K2**	**L2**
ln $Y_{i,t-1}$	1.100**	1.100**	1.000**	1.200**	0.880**	0.980**	0.950**	0.920**	0.760**	0.870**	0.700**	0.690**
ln $FV_{i,t}$	0.09***		0.024	0.033	0.08***		0.013	0.045**	0.063*		0.073*	0.022
ln $FQ_{i,t}$		0.03***	0.03***	0.130*		0.07***	0.06***	0.190**		0.040*	0.019	0.092
ln $FV_{i,t}$ * ln $FQ_{i,t}$				0.087*				0.088*				0.140
$N_{i,t}$	-0.023	-0.043	-0.038	-0.037	-0.460	-0.230	-0.280	-0.200	-0.340	-0.270	-0.280	-0.350
$PT_{i,t}$	0.230*	0.090**	0.110**	0.130**	0.110	0.078	0.075	0.067	-0.033	-0.035	-0.100	0.011
n	523	523	523	523	217	217	217	217	61	61	61	61
Sargan	0.672	0.734	0.177	0.984	0.873	0.765	0.322	0.824	0.981	0.987	0.997	1,000
AR (2)	0.316	0.301	0.303	0.329	0.280	0.645	0.738	0.563	0.134	0.131	0.094	0.041

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