Asymmetric Real Effects of Banking Market Structure: Evidence from Spatial Analysis Using Local Level Data*

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Abstract

This paper attempts to extend a recent cross-country evidence on the asymmetric effects of banking development on real economy performance, distinguishing periods of economic expansion from declines. Using industry-level data for Italian provinces for the period 1998-2005, this works examines the issue at local level and shows that more developed local credit markets are associated with lower declines in firm net entry rates, while there is not a clearly significant relationship between local credit markets and firm net entry during periods of expansion. These results hold even after controlling for outliers influence and spatial dependence.

Keywords: finance and growth, local banking developoment, entry and exit of firms, italian local economy, spatial regression

JEL: c21, g2, l1, r1

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Contents

1 Introduction

Using Italian NUTS III level data for banking market and real sector, this paper exploits the large differences between Northern and Southern economic systems and tests whether the theoretical conjectures and empirical evidence about the asymmetric effects of financial development on real economy performance hold at the local level. In particular, this work tests the hypothesis that more developed local banking systems are associated with shallower periods of economic decline at the local level.

This application is closely related to Coricelli and Roland (2008) [12] who show that during recessions the banking system development significantly contribute to reduce output losses. Using a cross-industry panel of 115 countries for the period 1960-2003, when no distinction is made between recession and expansion, instead, they show that the relationship between financial development and economic growth seems to be affected by the sample composition and estimation methodology.

In this paper, the terms decline and expansion refer to negative and positive firm net entry rates. In particular, we define a period of decline as a period during which an industry (in a given province) shows a negative trend in terms of net entry rate, and a period of expansion as one characterized by an industry (in a given province) negative trend in terms of net entry.

Our analysis differs from Coricelli and Roland (2008) [12] not only because it focuses on local level real sector performance, but also because it looks at the effect of the financial system on the real sectors business demography rather than on value added or production growth. This choice is in part imposed by data availability for value added and production (i.e. they are not available at a detailed industry level for NUTS III regions). It allows, though, to analyze the asymmetric real effects of financial development from a different perspective: we look at the effects of finance as a barrier to firm entry and a determinant to exit.

The effects of the development of a local banking system on the real economy have been widely analyzed in the economic literature. Most of the empirical results confirm the cross-country findings of a causal and positive relationship between financial development and economic growth, suggesting that local financial systems positively affects real economy performance.[1] However, to our knowledge, a possible asymmet-

[1]Some of the studies focus on the US: see, among others, Petersen and Rajan (1995) [19], Jayaratne and Strahan (2002) [16], Black and Strahan (2002) [7], Clarke (2004) [11], Cetorelli and Strahan (2006) [10]. However, it should be noted that studies focusing on the US and taking the state as territorial unity reflect something different than regional studies within the EU. There are also studies focusing

ric impact of local financial development in periods of decline and expansion in terms of net entry has not been analyzed at local level yet.

This works is closely related to a strand of the literature on finance and growth, which focused on the relationship between the banking market development and firm demography of real sectors. The main findings show that better financial systems are casually correlated with higher firm entry even at the local level. For example, Bonaccorsi di Patti and DellAriccia (2004) [13], using data for Italian provinces, find a bell-shaped relationship between bank concentration and firm creation, with a range where bank market power is beneficial. They also find that bank concentration is more beneficial for more opaque industries, and that, the development of local credit market has a positive effect on entry rates. Guiso et al. (2004a) [14], using data for Italian provinces, find that financial development at local level is causally associated with higher rates of firms creation. Cetorelli and Strahan (2006) [10], using data on US local markets, find that higher degrees of banking competition are associated with bigger firm population and smaller average firm size.

We use cross-industry data at NUTS III level for real sector firm demography taken from the UnionCamere-Movimprese database and banking sector data from Bank of Italy, for the period 1999-2005. We employ the Rajan and Zingales (1998) [20] methodology to capture the differential effects across industries and provinces. We estimate the model specification using OLS, iteratively reweighted least squares (IRLS) to control for the influence of outliers, and maximum likelihood estimation of regression controlling for the spatial interaction between observations.

Our results show that during phases of decline those provinces having a more developed banking sector experience a shallower decline in net entry. These results hold after also after controlling for outliers influence and industry and regional trends.

When interpreting the importance of local banking development and competition for softening the periods of economic decline, large differences between local economies (both in terms of economic and financial development) should be kept in mind; this holds true even in a well and long-time integrated market as Italy. Our findings may be relevant for the policy debate regarding regional disparities and financial integration within the EU.

on Italian regions and provinces: see, among others, Lucchetti et al. (2001) [18], Bonaccorsi di Patti and DellAriccia (2004) [13], Guiso et al. (2004a [14], 2004b [15]), Usai and Vannini (2005) [22], Vaona (2008) [25], Benfratello et al. (2008) [5]. For studies at regional level focusing on other EU countries, see, for example, Valverde, Humphrey and Fernández (2003) [23] and Valverde, Del Paso and Fernández (2007) [24] for Spain.

The rest of the paper is structured as follows. In the next section, we outline our hypothesis through summary statistics and reviewing the findings of the real effect of local financial development. In section 3, we describe our dataset. In section 4, we discuss the estimation methodologies. In section 5, we report and comment our estimation results. Section 6 concludes.

2 Motivation

The financial system may affect the real economy through different channels during periods of decline and expansion. As Coricelli and Roland (2008) [12] point out, during recessions more liquidity may be necessary for mitigating the downturns, while during expansions banks may be crucial to provide an efficient allocation of resources. This means that during recessions those economies that have a more developed financial system would experience less sharp economic declines.

Coricelli and Roland (2008) [12] find empirical support of their hypothesis and develop a theoretical model. During periods of sustained economic growth, especially in developing and emerging countries, the firms finance their activities with alterative sources to the banking credit (i.e. trade credit). However, during periods of decline, such alternative sources of finance may increase the risk of chain failures as firms depend on other firms-customers performance. A better banking system may reduce the risk of chain effects and avoid sharp recessions. Furthermore, as shown by Cerra and Saxena (2008) [9], very sharp recessions can be associated with lower long-run growth rates, so that they can negatively affect the convergence path of a economy.

We extend the Coricelli and Roland (2008) [12] analysis by testing whether these findings hold at local level as well.

Our test has the distinguishing characteristic of looking at firm net entry changes, focusing on the depth of local banking market as barriers to firm access to finance when opening a business and remaining open.

During periods of decline, firms might hardly compete for credit since extra credit might be decisive to stay in or to quit the market. It seems plausible that during periods of declines extra credit is more likely to influence the choice of incumbent firms about staying in the market than during periods of expansion.

At the same time, competition for credit of the incumbents may result in higher barrier to access to financial sources by new entrepreneurs willing to enter the market. As periods of decline become longer and deeper, firms exit rates may increase and

entry rates decrease. The negative net entry may thus result bigger.

More credit availability at local level may reduce these barriers. We therefore test whether the depth of local credit markets are associated with shallower declines in net entry.

We could also consider an alternative conjecture. During periods of expansion, banks can efficiently allocate the credit, which does not necessarily imply higher net entry rates though. This may also be reflected through lower rates of firm exit during the future periods of decline. The shallower declines experienced by industries located in more developed banking market may therefore be the product of both sufficient liquidity availability and the presence of less risky firms (i.e. firms that are more likely to survive even when there is a generalized tendency to exit in the industry).

The analysis of the Italian banking system provides a useful insight. Large differences can be exploited in terms of development of banking system development among the Italian provinces, while there is little risk of incurring in omitted variables since they belong to the same legal and regulatory framework.[2] Differences in terms of financial development still persist across provinces, with Southern provinces displaying a particularly low levels of banking market development.

We start from the observation that about a third of Italian provinces have a GDP per capita lower than 75% of the EU. This may be associated with low rates of efficient and innovative entrepreneurial activity, echoing the Schumpeterian process of creative destruction. In this context the firm net entry may also be a good indicator of innovation and growth.

We observe that the decline in net entry rates is much more pronounced in the South of Italy, where both the level of banking development and the GDP per capita are much lower than the national (and European) average. Descriptive statistics indicate that during the periods of decline there is a clear negative relationship between the decline in net entry and the depth of credit market (1 in Appendix 8). The relationship is instead not clearly defined during expansion periods (2 in 8).

[2]During the period of analysis the Italian banking market was already liberalized, as the reforms and liberalization process culminated with the 1993 "Testo unico in materia bancaria e creditizia". Before reforms started in the 1980s, the Italian banking system was still regulated by the 1936 "Legge bancaria", which was adopted after the early 1930s financial crisis. This law imposed the creation of four categories of credit institutions, each of which had varying degrees of freedom to operate and open new branches in the province of origin. These limits were removed with the 1993 reform (see Guiso et al., 2004a [14], 2004b [15]).

This descriptive evidence supports a more detailed analysis to determine whether a causal relationship exists between banking development and real sector performance during industries periods of decline and expansion.

In sum, we investigate whether industry decline in terms of net entry is shallower in more developed local banking markets. During periods of decline a more developed banking market may be more effective in lending liquidity and thereby supporting efficient firms in remaining in the market, whereas the negative trends may be sharper in less developed markets. On the other hand, during positive trend periods credit markets may not play a primary role, and a deeper banking market may not necessarily be associated with high growth rates.

3 Data

Our final dataset was created by merging two datasets: Data on the stock of active firms in each industry, province and year are from UnionCamere-Movimprese database, while data about loans are from Bank of Italy (used to create a proxy for the depth of local banking markets). Our final dataset covers 37 industries for 103 NUTS III regions from 1999 to 2005.[3]

The data regarding the firm demography at industry level are aggregated according to the Nace 1.1 2-digit code classification. For comparability reasons we dropped some industries that are influenced by natural endowment of provinces (i.e. agriculture, fishing, mining and quarrying, and manufacturing of tobacco - A, B, C, and DA16 codes); we also dropped those industries whose performance is influenced by public financing (re-cycling -DN37-, energy, gas, and water supply E-, education M-, health and social work N-, other community, social and personal service activities -0A90-OA92-, activities of households P-); finally, we dropped financial intermediaries industries (J) as they are part of our right-hand side estimated equation.[4]

As we have said in Section 1, we define the periods of expansion or decline as periods when the net entry is positive or negative, respectively. As a measure of industry expansion (or decline), we take the average percentage change of (the absolute value of) net entry over the period of expansion (or decline). Each period q ends when the

[3] The database Movimprese is publicly available and is based on the collection of information from the local chambers of commerce about firm demography. The NUTS III level GDP (used to compute the proxy for banking development indicator: bank loans to GDP) is comes from Eurostat-Regio database.

[4] We follow Klapper et al. (2006) [17] in excluding those industries.

sign of net entry changes, so that the number of years t belonging to any period q can vary from t0 to tn (since our dataset covers a period of 7 years, the q can vary at maximum from t_0 to t_7).[5] According to this definition, our dependent variable (ΔNE) for each industry showing a trend of n consecutive years looks as follows:

$$\Delta NE_{p,i,q} = [(1 + NE_{p,i,t_0})...(1 + NE_{p,i,t_n})] - 1 \quad (1)$$

where NE is (the absolute value of) the net entry rate in a given industry i, province p, and period t, and it is defined as the percentage change of the number of firms compared to the previous year.[6]

Descriptive statistics show that the distribution of the average percentage change of net entry (ΔNE) over the period of expansion (or decline) is affected by the presence of outlying values (Table 1). In part, this is due to the construction of the (ΔNE) variable as the entry rates may result in very high (low) percentage changes, especially when the number of original stock is characterized by low (high) number of firms. [7] However, we will conduct robustness checks using estimation techniques robust to outliers (IRLS).

The banking system independent variable used is the ratio of loans to GDP (Cr) at NUTS III which indicates the depth of local marking market and is here used as a proxy of local banking development. This measure comes from the Bank of Italy and is closely related to the credit to GDP ratio, which is widely used in the finance and growth literature as a proxy for banking development.[8]

[5] As part of our future research agenda, we intend to use also other definitions, for example, for computing the areas of firm growth and loss during the positive and negative trends.

[6] We have also tried to define the net entry as the number of registered firms minus the number of firms that exit at any time t over the number of firms registered in the previous year. The results are similar and are available upon request. However, we believe that looking at the active firms, rather than registered firms, would allow us to avoid to take in account those firms that are still registered but do not operate in the market for several reasons. In other words, we believe that the change of the stock of active firms better reflects the change in the market performance.

[7] The summary statistics (Table 1) show the presence of extreme outliers. For example, the industry Nace-64 (post and telecommunication) for the province of Mantova shows the highest value of the average percentage change in net entry during the periods of expansion. Looking at the values of the stock of active firms in that province-industry, we can notice that it has had an very high growth in 7 years. However, this is due to the very low presence of firms at the beginning of the period. The post and telecommunication industry show also other outliers (even if not so extremes) for some other provinces.

[8] See the World Bank Financial Structure database by Beck et al. (2000) [4].

Descriptive statistics (Table 1 and and Figure 1) show that the Italian province level banking markets are characterized by large differences, indicating the presence of banking market local segmentation.

Variable	Mean	sd	Min	5 perc.	50 perc.	95 perc.	Max
Negative net entry	0.134	0.206	0.000	0.004	0.052	0.486	3.781
Positive net entry	0.318	1.383	0.000	0.005	0.096	1.000	75.000
Sh	0.023	0.045	0.000	0.000	0.005	0.116	0.355
Cr	0.554	0.249	0.152	0.236	0.52	0.952	2.000

Table 1: Descriptive statistics.Negative and positive net entry rates are defined according to equation (1). Sh is the share of number of firms of industry i on the total number of firms of province p at the beginning of any period of decline (expansion). Cr is the loans to GDP ratio of province p at the beginning of any period of decline (expansion).

4 Methodology and model specification

To exploit the cross-industry structure of the dataset we apply the Rajan and Zingales (1998) [20] methodology that has been widely used in the finance and growth literature. This methodology control for fixed effects and reduce reverse causality and endogeneity problems.

In their seminal work Rajan and Zingales (1998) [20] assume that firms within a given industry do not differ much in terms of external finance dependence. The need of external finance is assumed to be mainly due to technological reasons, so that there is much more difference between industries than within them. Using firm level data Rajan and Zingales (1998) [20] develop an industry-specific indicator of external finance dependence, which is defined as the industry-level median of the ratio of capital expenditures minus cash flows to capital expenditures. This index measures the portion of capital expenditures not financed by internally generated cash, so indicating the intensity of the relationship between the median firm in each industry and the financial markets.

The original indicator is computed for US quoted firms since they assume that US financial markets are the most advanced and the firms optimal choice of external finance is based merely (or, at least, to the possible extend) on technological reasons. Where

computed for other countries, this indicator of external finance would reflect differences between supply and demand of credit. They used this indicator as measure of technological dependence on external finance for a sample of 42 countries, assuming that the value of external finance dependence for a given industry is likely to be the same across countries in relative terms, i.e. if compared to the other industries of the same country.

Furthermore, including the indicator in a sample that excludes the US the indicator enters as exogenous and it may alleviates endogeneity problems which may affect the relationship between financial system and real economy performance.

By estimating an interaction term between the financial variable of interest and this indicator of external finance, we estimate the differential effect across industries. Assuming that firms external finance dependence is a channel through which financial development impacts firms performance, this allows to differentiate the effect across industries.[9]

The indicator used in this paper is at Nace 1.1 industry-level of aggregation and comes from Klapper et al. (2006) [17]. Precisely, it is calculated following Rajan and Zingales (1998) [20] for US quoted firms during the 1990s. This indicator has the advantage to fit with the industry aggregation of our dataset.[10]

Our baseline estimated model looks as follows:

$$\Delta NE_{p,i,q} = \alpha + \theta Sh_{p,i,t_0} + \beta(Cr_{p,t_0} * Ext_i) + \sigma_p + \gamma_i + \delta_q + \epsilon_{p,i,q} \tag{2}$$

where $\Delta NE_{p,i,q}$ is the average percentage change of (the absolute value of) net entry during the decline or expansion period q, in province p and industry i. Sh_{p,i,t_0} is the ratio of active firms of industry i to the total number of active firms in province p taken at the beginning of the decline or expansion period; this allows to control for the relative importance of any industry on the whole economy and its growth and convergence potential. Ext_i is the index of external finance dependence, while Cr_{p,t_0} is the indicator of bank development expressed as the ratio of loans to GDP in each province p taken at the beginning of the period. σ_p , γ_i and δ_q are the province, industry, and year fixed effects, respectively. The fixed effects allow to identify an independent effect of banking system development on real sector performance, so that our results

[9]For the sake of comparison, Benfratello et al. (2008) [5], studying the impact of banking development on firm innovation and using cross-industry for a cross-section of Italian provinces during the 1990s, use the original indicator of external finance dependence for only manufacturing industry calculated for US firms during the 1980s.

[10] We thank Luc Laeven for sharing this indicator.

are not merely a product of structural characteristics of the provinces and industries.[11] Furthermore, calendar year dummies allow to control for business cycle and for the shocks that might occur during the period.

When the $\Delta NE_{p,i,q}$ refers to the periods of decline (expressed in terms of absolute value), a negative sign of the estimated coefficient means that industries that need more external finance have shallower decline in net entry in provinces with a more developed banking system. For any given industry, the decline in net entry is shallower in those provinces with more developed banking markets.

When the $\Delta NE_{p,i,q}$ refers to the periods of expansion, a negative sign of β means that industries that need more external finance have lower growth in net entry in provinces with a more developed banking system. For any given industry, the net entry is less important in those provinces with more developed banking markets.

5 OLS estimation results

We are interested in understanding whether the depth of credit market has different effects on the net entry rates in periods of decline and expansion. Based on our specification the Chow test statistics (F(148,10217)=12.76; p-value:0.000) shows that there is a structural break for the periods of decline and periods of expansion. We then estimate the models for the sub-samples of decline and expansion periods.

We estimate the model specifications using both OLS and iteratively reweighed least squares (IRLS) regressions, to control for possible outliers. As discussed in Section 3, controlling for outliers is necessary since our dependent variable is expressed in terms of percentage changes of the stock of active firms which may result. For this reason, we also estimate the model specification using OLS after that the sample has been restricted to within the 5th and the 95th percentile of the distributions of the dependent variables.[12]

Overall the baseline OLS results (see Table 2) show that higher levels of bank loans

[11] For instance, the effect EU structural funds contributions, which are particularly relevant for firm demography, especially in Southern provinces, is capture by province dummies. We also tried to include a dummy variable for all the Southern regions: the estimation results are similar. Results available under request. In Section II.6 we discuss the estimation results for model specifications that includes industry and regional trends: we obtain similar results. The single term for external finance dependence (Ext) is not included in the estimated equation as it is perfectly collinear to the industry dummies

[12] As part of future research agenda it is our intention to estimate the models using also truncated regression estimators.

to GDP is causally and significantly associated with shallower industry decline in net entry, whereas during the periods of expansion the relationship is not statistically significant.

These results confirm our hypothesis that a more developed local banking market helps mitigating negative trends in net entry.

	Negative net entry	Positive net entry
Sh	0.076	-1.507***
	(0.084)	(0.285)
Cr*Ext	-0.043**	0.124
	(0.020)	(0.084)
Intercept	0.051	-0.051
	(0.038)	(0.020)
Province dummies	Yes	Yes
Industry dummies	Yes	Yes
Year dummies	Yes	Yes
Obs.	4893	5616
R-Sq.	0.679	0.186

Table 2: OLS estimation results.White standard errors between brackets.
* significant at 10 %; ** significant at 5%; *** significant at 1%.
Negative and positive net entry rates are defined according to equation (1). Sh is the share of number of firms of industry i on the total number of firms of province p at the beginning of any period of decline (expansion). Cr is the loans to GDP ratio of province p at the beginning of any period of decline (expansion). Ext is the external finance dependence indicator of industry i.

During periods of decline instead firms are more likely to need access to bank credit as their own financial resources and trade credit may be scarce, especially when long and deep downturns occur. In this case, firms located in provinces with more developed local credit markets would have a relatively easier access to credit. Therefore, a higher number of firms would obtain liquidity that may allow them to remain in the market.

During periods of expansion, the depth of credit market does not seem to have a

significant role in increasing the firm net entry.

A simple calculation makes it easier to interpret our results related to the fact that we are estimating the differential effect between industries. For example, the significant and negative coefficient of ($Cr * Ext$) during periods of decline means that a switch from the province at 25^{th} percentile of the loans to GDP distribution (Teramo in 1998) to the province at the 75^{th} percentile (Torino in 2005) would reduce more the net entry on the industry that has an external finance dependence at the 75^{th} percentile of the distribution of external finance dependence (70: real estate activities) compared to an industry at the 25^{th} percentile of the same distribution (31: manufacture of electrical machinery). Given a coefficient of -0.043 (Table 2 column 1), the differential effect would be -0.005 on the average percentage change in firm (absolute) net entry during the decline periods.[13] Considering that the median value of the average percentage change of absolute values of net entry rates during the decline periods is 0.052, it means that this change would reduce the decline of around 9.6% respect to the median decline.[14]

[13] Mathematically: $\beta(Cr75 - Cr25) * (Ext75 - Ext25)$, where β is the estimated coefficient, $Ext75$ and $Ext25$ are the values of the external finance dependence variable at the 75^{th} and 25^{th} percentile of its distribution, respectively, while $Cr75$ and $Cr25$ are the values of the banking market development variable at the 75^{th} and 25^{th} percentile of its province-year distribution, respectively.

[14] We also control for the province time trends in order to capture those effects that vary during the year and may influence a province's performance. It might be the case that the inclusions of simple province dummy variables do not provide fully control for other determinant of firm net entry. This tends to vary also during the time dimension, even if our period of analysis is relatively short. The inclusion of these trend dummies may be particularly useful to control for specific shocks to provinces. The estimation of these models drastically increases the number of dummies included and reduces the degree of freedom. We have therefore decided to include dummies for the higher level of territorial aggregation (NUTS II) so controlling for regions-time trends. Italy is disaggregated in 20 NUTS II regions and 103 NUTS III provinces. The inclusion of NUTS II dummies interacted with the 7 year dummies thus increases degrees of freedom. It seems plausible to consider that provinces within a region are affected by the same aggregate shocks in a given year. Also, that is likely that aggregate time varying omitted variables do not differ much across provinces within a region. The estimation results (available upon request) confirm that the local credit development helps in mitigating strong decline in net entry, while does not spur net entry during expansion periods, even after controlling for regional trends.

6 Robustness checks

6.1 IRLS estimation results

In Table 3 we report the estimation results using IRLS (iteratively re-weighted least squared). The magnitude of the loans on GDP (Cr*Ext) coefficient is smaller than with OLS (because of the presence of outliers), however, the sign and significance of the coefficient of the variable is consistent with the results of the other estimates for the decline periods sub-sample, while for the expansion periods sub-sample is not statistically significant like the other estimates.

	Negative net entry	Positive net entry
Sh	-0.077	-0.411***
	(0.050)	(0.090)
Cr*Ext	-0.020***	0.001
	(0.006)	(0.009)
Intercept	0.000	0.960***
	(0.021)	(0.020)
Province dummies	Yes	Yes
Industry dummies	Yes	Yes
Year dummies	Yes	Yes
Obs.	4893	5616
R-Sq.	0.694	0.90

Table 3: Iteratively re-weighted least squared (IRLS) estimation results.* significant at 10 %; ** significant at 5%; *** significant at 1%.
Negative and positive net entry rates are defined according to equation (1). Sh is the share of number of firms of industry i on the total number of firms of province p at the beginning of any period of decline (expansion). Cr is the loans to GDP ratio of province p at the beginning of any period of decline (expansion). Ext is the external finance dependence indicator of industry i.

6.2 Spatial dependence

Spatial dependence across provinces can be caused by a variety of factors among which the arbitrary delineation of spatial units of observations, spatial aggregation and, most

importantly, the presence of spatial externalities and spillover effects. As pointed out by many authors (e.g., Boldrin and Canova, 2001 [8]) the NUTS3 level of territorial aggregation refers to administrative units which do not necessarily reflect homogeneous economic characteristics.

According to Anselin (1988) [1] there are typical approaches to deal with the spatial autocorrelation: *spatial lag dependence* (i.e. spatial correlation in the dependent variable), and *spatial error dependence* (i.e. spatial correlation in the error term). Spatial lag models assume that the outcome in a given area (e.g. a region) depends also on the outcome of its neighbors. In our specification this means that the intensity of negative or positive net entry changes are influenced by the change in net entry of the neighboring NUTS III regions. In spatial error models, instead, the spatial autocorrelation affects the covariance structure of the random disturbance terms. The standard explanation for this type of spatial dependence is that not-modeled effects may spill over across units of observation resulting in spatially correlated errors. In our specification it means that both not-modeled spatial lags of independent variables or spatial lags of other not-model determinants influence the region net entry performance (see, Vaona, 2008, for a contribution about the finance-growth nexus in a spatial econometrics framework).

To detect the possible presence of spatial dependence, a set of maximum likelihood tests has been performed. In particular: (i) the *LMerr* test, which is a Lagrange Multiplier test with a null hypothesis of no spatial dependence and has as alternative hypothesis the spatial error model; (ii) the *LMlag* test, which has the same null hypothesis and as has as alternative hypothesis the spatial lag model (for more details see Anselin, 2001 [2]). A robust version of these two tests is provided by Bera and Yoon (1993) [6] and Anselin et al. (1996) [3], denoted as *RLMerr* and *RLMlag* tests respectively. Finally, the *SARMA* test has the same null hypothesis of the other tests, but has as alternative hypothesis a model with both spatial error dependence and spatial lag dependence.

The tests of spatial dependence have been performed considering two different spatial weight matrices. In the first spatial matrix (W1) we define the weights according to the inverse distance across all provinces, but we consider that each observation can be affected by the others only if they belong to the same industry. Thus, given i and j units of observation, W1 is defined as:

$$w^*_{i,j} = \begin{cases} 0 & \text{if } i = j \\ 1/d_{i,j} & \text{if } i \text{ and } j \text{ belong to the same industry} \end{cases} \tag{3}$$

$w^1_{i,j} = w^*_{i,j} / \sum_j (w^*_{i,j})$, where $d_{i,j}$ is the great circle distance between centroids of regions i and j.

The second spatial matrix W2 is constructed according to:

$$w^\circ_{i,j} = \begin{cases} 0 & \text{if } i = j \\ 1/d_{i,j} & \text{if } d_{i,j} < d_{min} \text{ and } i, j \text{ belong to the same industry} \\ 0 & \text{if } d_{i,j} > d_{min} \end{cases} \quad (4)$$

$w^2_{i,j} = w^\circ_{i,j} / \sum_j (w^\circ_{i,j})$, where d_{min} is equal to the distance which allows each region to have at lest one neighbor. The second matrix might be more appropriate for the analysis of the relationship between firm net entry and local banking market. In fact, the cluster effects that might influence the dependent variables are more likely to be capture when considering as neighbors those regions sharing a border instead than all the regions (even with different weights) as in the case of W1. Furthermore, the possible effects of neighboring banking market might be better captured when considering only the markets sharing borders, as the evidence of very segmented local Italian banking markets would suggest.

Results of tests are reported in Table 4.

Neagtive net entry					Positive net entry				
Lmerr	Lmlag	RLMerr	RLMlag	SARMA	Lmerr	Lmlag	RLMerr	RLMlag	SARMA
24.33	24.15	1.04	0.85	25.18	14.86	12.44	2.89	0.48	15.34
(0.00)	(0.00)	(0.31)	(0.36)	(0.00)	(0.00)	(0.00)	(0.09)	(0.49)	(0.00)
2.23	1.25	7.99	7.00	9.23	4.45	3.93	1.00	0.49	4.94
(0.14)	(0.26)	(0.00)	(0.01)	(0.01)	(0.03)	(0.05)	(0.32)	(0.49)	(0.08)

Table 4: Maximum likelihood spatial dependent tests.Negative and positive net entry rates are defined according to equation (1).

According to results of Lagrange multiplier tests both models show strong evidence of spatial misspecification. In particular, considering either the sample of negative or positive net entry and using the two different definition of spatial matrix, we always can reject the null hypothesis of spatial autocorrelation in favour of the presence of both spatial lag and spatial error dependence.

Therefore we decide to incorporate in our model both substantive (spatial lag) and nuisance (spatial error) spatial autocorrelation.

Following Roberts 2006 [21] we consider a spatial hybrid model, which is defined as a spatial cross-regressive model with an error term that follows a autoregressive structure. The model looks as follows:

$$y = X\beta + WX\theta + \epsilon$$
$$\epsilon = \lambda W\epsilon + \mu \tag{5}$$

where y is the dependent variable of dimension (n*1) (where n is the number of the province.industry-year observation) and k the number of regressors; X is a (n*k) regressors matrix; β is a (k*1) vector of coefficients; W is the spatial weight matrix defined as described above; θ is a ((k-z)*1) vector of spatially lagged independent variables.[15] This provides a model that incorporate both sources of spatial autocorrelation. Moreover, it allows to use the same spatial matrix in the treatment of both kind of autocorrelation and it can be estimated as an extension of the spatial error term.

Estimation results are reported in Table 5 and Table 6 for W1 and W2 respectively. Using W1 as weight matrix we find that no coefficient is significant both for the period of declines and expansions.

Differently, using W2 as definition not only we can confirm our OLS results but we also find that the coefficient of spatially lagged Cr*Ext is negative and strongly significant. This means that both the change on industrial composition and specialization as well as the banking development of neighboring regions have a significant effect on the firm net entry performance. In particular, more developed neighboring banking market have an effects in reducing the decline in net entry.[16]

[15] Clearly, we do not include the spatial lags of dummy variables.

[16] We obtain similar results using as spatial matrix a matrix that considers two observation as neighbors only if they share borders and they belong to the same industry.

	Negative net entry	Positive net entry
Sh	0.152	-2.011
	(0.190)	(2.459)
Sp.Lag Sh	3.548	-43.181
	(5.638)	(184.78)
Cr*Ext	-0.038	0.325
	(0.035)	(0.238)
Sp.Lag Cr*Ext	0.382	20.179
	(5.633)	(20.62)
Intercept	-0.553	-3.986
	(23.234)	(112.22)
Province dummies	Yes	Yes
Industry dummies	Yes	Yes
Year dummies	Yes	Yes
Obs.	4893	5616
ML residual var. (Sigma sq.):	0.026	1.61
AIC for lm:	-3675.2	18862

Table 5: Maximum likelihood estimation considering spatial dependence (W1).* significant at 10 %; ** significant at 5%; *** significant at 1%.
Negative and positive net entry rates are defined according to equation (1). Sh is the share of number of firms of industry i on the total number of firms of province p at the beginning of any period of decline (expansion). Cr is the loans to GDP ratio of province p at the beginning of any period of decline (expansion). Ext is the external finance dependence indicator of industry i. The weight matrix (W1) is defined according to equation (3).

	Negative net entry	Positive net entry
Sh	0.047	-1.577
	(0.174)	(1.247)
(Sp.Lag) Sh	0.906	-1.068
	(1.153)	(4.499)
Cr*Ext	-0.037*	0.129
	(0.021)	(0.124)
(Sp.Lag) Cr*Ext	-0.350**	-0.778
	(0.143)	(0.751)
Intercept	-3.202	-6.518
	(23.738)	(112.85)
Province dummies	Yes	Yes
Industry dummies	Yes	Yes
Year dummies	Yes	Yes
Obs.	4893	5616
ML residual var. (Sigma sq.):	0.03	1.62
AIC for lm:	-3676.8	18861

Table 6: Maximum likelihood estimation considering spatial dependence (W2).* significant at 10 %; ** significant at 5%; *** significant at 1%.
Negative and positive net entry rates are defined according to equation (1). Sh is the share of number of firms of industry i on the total number of firms of province p at the beginning of any period of decline (expansion). Cr is the loans to GDP ratio of province p at the beginning of any period of decline (expansion). Ext is the external finance dependence indicator of industry i. The weight matrix (W2) is defined according to equation (4).

7 Concluding Remarks

This paper tested the hypothesis that the depth local credit market has an asymmetric effect on the performance of real sector during periods of decline and expansion in term of net entry. To our knowledge this paper is the first testing this hypothesis by using local data. We used data NUTS III data for Italy, which has large differences both in terms of local financial system development and real sector performance and growth.

We find that during downturns in net entry, a more developed local credit markets tends to smooth the trend of the real economy.

During periods of decline, firms rising need of liquidity to stay in the market (even for more efficient firms) can be better met by more developed banking markets, so that the probability of their exit is reduced.

Our results hold even after controlling for the possible spatial dependence that might influence local level data. In particular, we find that higher levels of spatially lagged bank loans to GDP are significantly and negatively associated with shallower declines in terms of net entry. This result indicates the influence of neighboring banking markets on real economy performance, and their important role in softening downturns rather than in spurring further expansions of economic activities.

Similarly to most of the previous literature our findings show that local finance matters and, in particular, that local differences in terms of depth (size) of credit market are important to mitigate real economy decline, even within a long-time integrated area such as Italy. These results support the view that within financially and economically integrated areas regional disparities in terms of real sector performance may be in part explained by differences in development and competition of local banking markets.

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8 APPENDIX

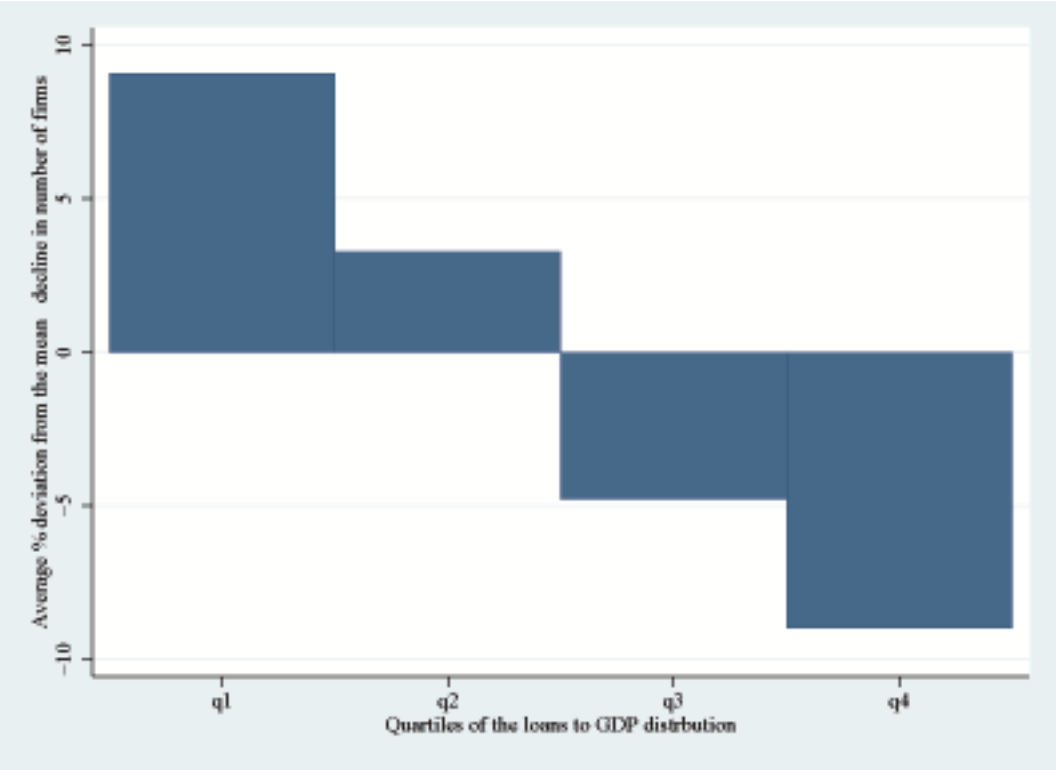

Figure 1

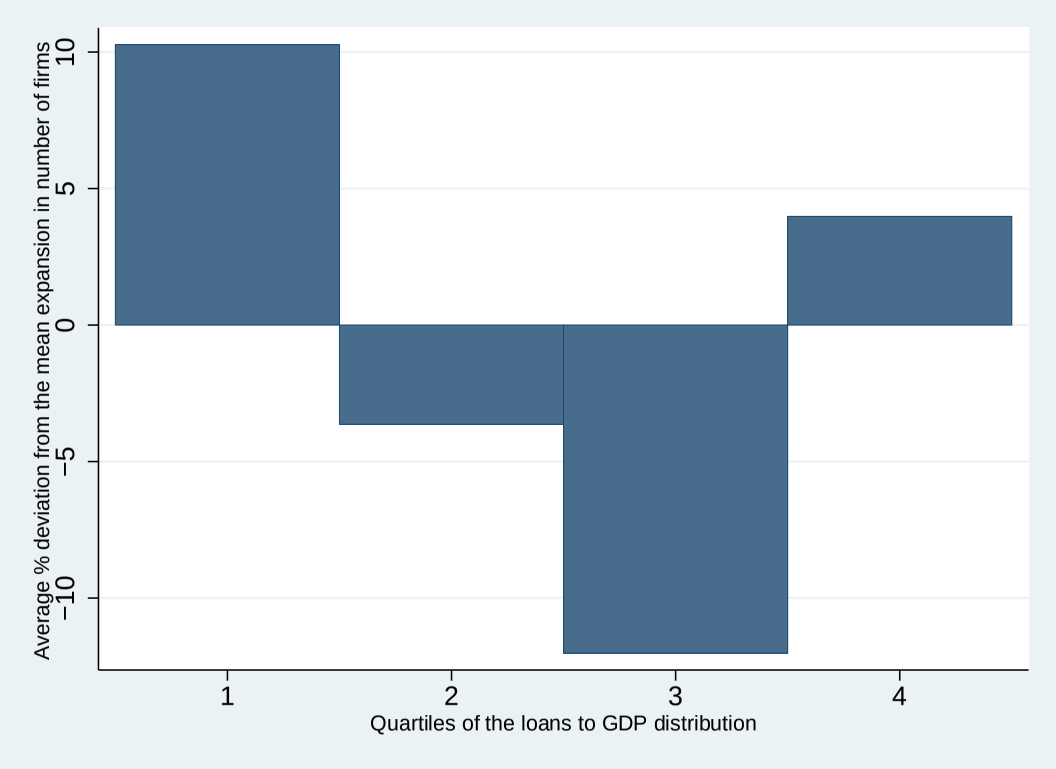
Average % deviation from the mean expansion in number of firms
10
5
0
−5
−10
1
2
3
4
Quartiles of the loans to GDP distribution

Figure 2

8.1 Summary statistics by industry

NACE 1.1 code	Negative net entry	Positive Net entry	Sh	Ext
DA15	0.013	0.177	0.028	0.181
DB17	0.116	0.112	0.008	0.262
DB18	0.160	0.056	0.012	0.174
DC19	0.193	0.121	0.005	0.098
DD20	0.114	0.025	0.018	0.156
DE21	0.137	0.164	0.001	0.123
DE22	0.041	0.100	0.007	0.096
DF23	0.491	0.626	0.000	-0.044
DG24	0.153	0.095	0.002	0.791
DH25	0.083	0.119	0.003	0.300
DI26	0.040	0.062	0.009	-0.121
DJ27	0.234	0.166	0.001	0.147
DJ28	0.021	0.089	0.030	0.166
DK29	0.037	0.086	0.012	0.077
DL30	0.156	0.873	0.001	0.502
DL31	0.105	0.105	0.005	0.137
DL32	0.344	0.106	0.002	0.328
DL33	0.035	0.074	0.007	0.643
DM34	0.172	0.410	0.001	0.394
DM35	0.129	0.369	0.002	0.124
DN36	0.038	0.132	0.017	0.376
F	0.006	0.311	0.172	0.470
G 50	0.027	0.023	0.049	0.743
G 51	0.016	0.072	0.108	0.598
G 52	0.018	0.048	0.215	0.304
H	0.013	0.123	0.075	0.425
I 60	0.045	0.024	0.041	0.233
I 61	0.318	0.538	0.001	-0.053
I 62	0.604	0.885	0.000	0.100
I 63	0.040	0.415	0.006	0.241
I 64	0.179	2.905	0.001	0.856
K 70	0.032	0.867	0.032	0.489
K 71	0.051	0.330	0.004	0.466
K 72	0.015	0.383	0.016	1.239
K 73	0.243	0.480	0.000	2.859
K 74	0.023	0.240	0.041	0.501
O 93	0.015	0.031	0.045	0.259

Negative and positive net entry rates are defined according to equation (1). Sh is the share of number of firms of industry i on the total number of firms of province p at the beginning of any period of decline (expansion). Ext is the external finance dependence indicator of industry i.