The Survival of Italian Firms to Local Demand Shocks During the Great Recession*

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Abstract

The Italian economy is characterised by a business sector that is composed by a large number of micro and small firms that are often clustered in specific territories and by the well-known gap between North and South Italy. Hence, global shocks – such as the Great Recession – have had a heterogeneous impact at the local level: the collapse in private demand was unequally distributed across different products, services and regions (according to their productive specialization).

The aim of this paper is therefore to evaluate the impact of the Great Recession on firm's survival for universe of Italian firms in the light of two relevant indicators, i.e. local exposure to crisis and local demand shocks. These indicators capture the heterogeneity in the propagation of a shock because of, respectively, regional and sector-specific differences. The local exposure indicator proxies the local exposure of the Local Labour Market in relation to the sector mix prior to the shock and the aggregate sector-specific shock, while the local demand shock proxies the local differences in the expected reduction of the demand because of the crisis. Our main contribution consists in providing a picture of the firms' exit hazard. Results suggest a strong negative impact of local demand shocks on the survival of firms, with some degree of heterogeneity across different firms' features, while the degree of exposure to the crisis has generally weak and heterogeneous effect across firms.

Keywords: Resilience, Micro-firms, Survival, Great Recession

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1 Introduction

The Great Recession – originated from the collapse of the financial market in the US in Fall 2007 – has prompted investigation on the way in which a global shock may have heterogeneous impacts across firms, sectors, cities, regions and even countries. Indeed, as denoted by Cainelli et al. (2019), different European regions reacted differently to the same external shock. Many determinants have been identified as responsible of this heterogeneity. However, a rather general consensus emerged on the fact that one of the most important drivers appears to be the region's current industrial structure (Boschma, 2015; Cainelli et al., 2019). For instance, Martin et al. (2016) show that region-specific characteristics – particularly, the industry structure – are key determinants of the capacity of a system to positively react to the crisis. Similar results are also underlined by Palaskas et al. (2015) focusing on industrial specialization.

This line of research raises some interesting questions. In our paper we want to evaluate whether the heterogeneity mentioned above might have a robust effect on the hazard of exit of firms. This is especially interesting in a context such as the Italian economy, where the shock caused by the Great Recession was particularly severe in terms of GDP collapse and increase in the unemployment rate as well as in terms of number of firms that left the market (Arico and Stein, 2012; Bozio et al., 2015; Pissarides, 2013). Moreover, because of the peculiar structural features of the Italian economy, that is characterised by a business sector composed prevalently by a large number of micro and small firms, the Italian economy results to be particularly exposed to recession periods, especially so when these periods are prolonged and hit many sectors in the economy (Mason and Brown, 2013; Parisi et al., 2006). More in details, economic downturns and particularly the Great Recession induced a strong negative demand shock, which was not homogeneous (Furlanetto and Groshenny, 2016; Mumtaz and Theodoridis, 2015).[1]

Recessions, therefore, are here considered as complex events that might create direct shocks that could be fostered by a perturbed and hostile business environment (Arrighetti et al., 2018; Cefis and Marsili, 2019; Meyer, 1982), thus experimenting an overall contraction of consumers' expenditure, a deterioration in the industrial and credit relations (Accetturo and Giunta, 2018; Arrighetti et al., 2018; Bloom, 2014), and an overall increase in uncertainty (Ivashina and Scharfstein, 2010), which make firm exit more likely to occur.

Given these premises, the aim of this paper is to evaluate the extent to which heterogeneous effects of a recession – here identified through indicators of local exposure to crisis and local demand shock in the years of the Great Recession – contributed to firm's exit for different categories of firms in Italy. The indicator on local exposure is a standard shift-share variable, calculated at the Local Labour Market (LLM) level. It aims at predicting the output growth of the LLM given

[1] In Italy, small and medium enterprises accounted for 78.6% in the employment generated by the non-financial business sector in 2016. This is a quite relevant value for one of the most advanced EU country. Indeed, the share for France and Germany is around 63% while the EU-28 average is 66.6%. Other EU-28 countries where this value is particularly high are Bulgaria, Cyprus, Estonia, Greece, and Latvia (see Muller et al., 2017).

the LLM sector mix (4-digit NACE) prior to the shock and the sector-specific aggregate shock. The local demand shock indicator is defined as the expected change in output of local final and intermediate consumers of a firm, identified and weighted according to aggregate input-output linkages, computed at the sector and LLM level.

We are able to analyse the impact of the Great Recession on firm's survival for the universe of the Italian firms by using cross sectional data on the demographic and economic information in the years 2007, 2010 and 2012 (ISTAT). We account for both firm-specific factors and external factors as determinants of firms' survival. Results suggest that local negative demand shocks have a strong negative impact on the survival of firms, while the degree of exposure to the crisis has a generally weak and heterogeneous effect across firms.

The paper is organised as follows. Section 2 provides an overview of the relevant literature. Section 3 discusses the details of our empirical the analysis: Section 3.1 describes the main indicators of exposure to crisis and local demand shock while Section 3.2 focuses on the role played by these variable for the survival of Italian firms. Finally, section 4 concludes.

2 Literature review

The Great Recession and the related economic downturns have motivated the publication a number of studies, especially so on European countries, analyzing the impact of the Great Recession over different units of analysis – e.g. individuals, firms, regions – that mainly focus on the (fashionable) concept of resilience. Resilience is usually defined, in these studies, as the capacity of the object of the analyses to cope with shocks. The majority of these works (if not all), when focusing on the capacity of regions to bounce back and to recover at pre-shock regional GDP or employment conditions, found that the effect of the crisis is heterogeneous in both the impact and in the capacity to recover – e.g. output and employment shocks depend on the phase of the business cycle and on some region-specific characteristics such as industry structure, product specialization, human capital (see Cainelli et al., 2019; Cellini and Torrisi, 2014; Cuadrado-Roura and Maroto, 2016; Di Caro, 2014, 2017; Fingleton et al., 2012; Martin et al., 2016) and degree of rurality (see Giannakis and Bruggeman, 2017; Palaskas et al., 2015; Psycharis et al., 2014). In order to explore the capacity to respond to economic shocks of socio-ecological system, several recent studies have assessed and defined the factors that may influence the capacity of the economic system to recover after a shock at the regional level.[2] For instance, Capello et al. (2015) explore the role of financial activities, as well as the quality of production factors, the cooperation networks and the quality of urban infrastructure as factors that may foster or reduce the capacity of European urban systems

[2]Economists have recently started using the concept of resilience. Even if this concept is not at the focus of this work, we provide short insights on it. To the purpose of this work we briefly define resilience, following Martin (2011), as the capacity of an economy to adapt its structure in terms of firms, industries and institutions, as a consequence of a stress (e.g. a financial crisis) in order to maintain a positive and acceptable economic growth path over time. Readers interested in an in-depth discussion on resilience and other related concepts, such as vulnerability and exposure, can refer to Modica et al. (2018).

to resist to economic shocks. Crescenzi et al. (2016), instead, look at the linkage between national macroeconomic conditions and regional factors that affect the regional economic system resistance in the EU27, mainly focusing on the role of human capital as an important positive factor, even though R&D-intensive regions are more exposed to negative shocks, at least in the short term. On the other hand, Cuadrado-Roura and Maroto (2016) stress the positive role of productive specialization. Finally, Xiao et al. (2017) and Cainelli et al. (2018) investigate the relationship between industrial relatedness and economic resilience.

Other works that address the effect of the Great Recession on economic regional systems have investigated the role of the industrial sectors and the impact of the crisis on the probability of surviving of the firms as well as their capacity to enter and exit the market. For instance, Giannakis and Bruggeman (2017) analysed the capacity of industrial sectors to cope with economic shocks in Greek regions. According to their study, the capacity of sectors to respond to crises is region-specific – e.g. the agriculture sector is resilient in almost all regions and overall at national level, while the food industry declined in aggregated terms, even though it was found to positively react to the shock in more than the half of the studied regions. Similarly, Palaskas et al. (2015) provide evidence of heterogeneous responses to the crisis of municipal labour markets asserting that industry specialization and industrial networks can reduce the impact of the shock.

While regional and macroeconomic characteristics have been extensively explored to understand their effects on the impact of the financial crisis on economic growth and welfare of regions, relatively few studies have been conducted on the relationship between firm exit and entry and the capacity to resist to shocks as well as the impact of the Great Recessions on the survival rates of firms. On this line, Clementi and Palazzo (2016) found that aggregate firm exit and entry lead to greater persistence to positive and negative aggregate shocks. Cucculelli and Peruzzi (2018) found instead that firm's survival in the aftermath of the Great Recessions is positively related to pre-crisis improvements in the business model. With similar reasoning, many studies have investigated the role of the firm characteristics for the survival to economic shocks. For instance, Richtnér and Löfsten (2014) focus on the role of soft skills and creative management. Zhu and Ruth (2013), instead, enlarge the focus of the analysis and focus on the resilience in industrial ecosystems. They show that the overall industrial ecosystem is more vulnerable to shocks the higher is the degree of interdependence between firms of the system. Nonetheless, the industrial ecosystem may be more efficient in terms of output potentials and, in the end, this higher efficiency may allow a great capacity to recover. Finally, several studies focus on firm characteristics that may reduce or increase the probability of firm exits after a distress (see for instance Balcaen et al., 2011; Cefis and Marsili, 2019; Coad, 2014, 2018; Ebert et al., 2018).

Given this evidence, starting from the main insights provided by the so-called resilience framework, we want to establish a link between the capacity of a region to avoid the loss of production capacity (tangible and intangible) and capabilities because of a shock (Coad, 2014), to firm's sur-

vival, that could be considered as an important output of resilience. To this aim, we rely on the resilience framework, even though we are aware that resilience is not the final goal of this work. In this context, therefore, the focus shifts from the impact of negative economic shocks on the performance of the firms, to the firms' specific characteristics that overall may increase the resilience of firms and their degree of preparedness captured by the firms' ability to respond and to survive to new scenarios created by the impact of economic crisis (Cefis and Marsili, 2012). For instance, Hosono et al. (2016) and De Mel et al. (2012) stress on the lack of access to capital as the main cause limiting firm's investments that can impact on the strategic behaviour of firms in the aftermath of a stress, reducing in this way the resilience of the firms and their capacity to survive to shocks.

3 Empirical analysis: local demand shocks, exposure to crisis and firms' survival

3.1 Building the indicators

To evaluate the impact of generalised economic downturns on firms' survival, we develop two original indicators for Italian LLMs.[3] The first indicator, that we label as '*local exposure to the crisis*', is mutated from standard shift-share variables (Bartik, 1991) and it basically returns the expected growth rate in output in the LLM as a weighted average of the national sector growth rates (the 'shifts'), with the weights being the LLM-specific sector shares in the base year (the 'shares').

The second indicator, that we label as '*local demand shock*', is a proxy for expected change in output of local final and intermediate consumers of a firm that belongs to a sector-LLM pair. The indicator is built by combining changes in i) 'local' income as a proxy for reduction of local final demand of households; and ii) demand for intermediate goods of related (through input-output linkages) sectors in the same LLM. The first component is derived according to the change in the net income earned of LLM population, retrieved from municipality-level data on individual income tax statements published by the Ministry of Economics and Finance. The second component is calculated as the growth rate in the derived demand for intermediate goods by using country-level technical coefficients from the Italian input-output tables and local changes in sector-specific output.

[3]LLMs are economically integrated spatial units that, differently from the administrative units such as municipalities, take better into account local and global impact of the crisis, underlying the possible presence of spatial spillovers, agglomeration and more in general a higher propensity to the propagation of the shocks within the area. LLMs are defined as groups of municipality according to the Italian National Institute of Statistics and were defined according to commuting behaviours collected in year 2011.

3.1.1 Local exposure to the crisis

In the analysis of the effect of an economic downturn on the exit rate of firms, we argue that a relevant issue is that different regions might experiment differences in the magnitude of the shock, mainly because of different inherent regional-specific characteristics, resulting in this way in a more pronounced exit rate of firms in given sectors and – whenever it produces agglomeration economies – geographical locations. Therefore, when considering the impact of any crisis on the firms' exit rate, a synthetic indicator that is able to capture the exposure of the area according to its sectoral mix to the crisis is pivotal. A local exposure indicator can be defined as a synthetic value that summarises all the inherent economic characteristics of a region that are able to create the potential for a more or less pronounced production loss. We define an exposure indicator that is based on standard shift-share variable (Bartik, 1991). It aims at predicting the production growth within the LLM given the LLM sector mix prior to the shock and the aggregate sector-specific shock.[4] More specifically, the local exposure indicator for LLM j is computed as:

$$\text{Local exposure to the crisis}_j = -\sum_s \left[\triangle_{2007-2010} Y_s\% \times \frac{Y_{js}^{2007}}{Y_j^{2007}} \right] \tag{1}$$

where $\triangle_{07-10} Y_s$ is the growth rate over 2007-2010 of total sales (as a proxy of output) at the national level of firms in sector s (4-digit NACE rev. 2), Y_{js}^{2007} is total sales of firms in sector s located in LLM j and Y_j^{2007} is total sales of firms in LLM j in all sectors.

In this way, according to the strength of the sectoral shock, we are able to map the (potential) magnitude of the local shock because of the local sectoral composition of the area under analysis: the higher is the local presence of sectors more affected by the aggregate shock, the higher will be the drop in output of the area under analysis. In order to define the local exposure indicator we use the ISTAT data for the universe of the Italian firms aggregated at sector level (4-digit NACE rev. 2) for all LLMs. Figure 1 shows the geographic distribution of the exposure indicator (in deciles) across LLMs (the darker the color, the higher is the drop in the - potential - in output of the LLM given its initial industry mix). All in all, the indicator does not show a clear spatial pattern across macro-region, but shows a large degree of heterogeneity both within and across macro-regions.

[Figure 1 about here]

3.1.2 Local demand shock

In order to build the indicator of local demand shock, we start from the consideration that the propagation of a shock in a local systems with a high degree of common technological and industrial bases is expected to be high because the shock will hit several related firms, in terms of input–output

[4] A very similar indicator, based on employment rather than output, has been used by Vona et al. (2018) and Vona et al. (2018) for US metropolitan and nonmetropolitan areas to account for the resilience to the Great Recession.

linkages. On the contrary, when this is not the case, the propagation of the shock, and therefore changes in local demand, is lower, at least in the short-run (and according to the severity of the recession). Nonetheless, when looking at the recovery phase we could have opposite situations. Indeed, local systems characterised by common technological and industrial bases can experiment re-balancing processes such as reallocation of capabilities and workers from one industry to another related industry, allowing in this way a sort of medium-long run adapting process of the local productive structure to the new conditions brought by the economic downturn (Cainelli et al., 2019; Sedita et al., 2017). In other words, all these contributions suggest that one of the fundamental drivers of short-term shock propagation might be defined by the degree of connectivity among local industries that might exponentially propagate the initial drop in output. This is why we focus on building a local demand shock indicator.

Two main components of local (i.e. same LLM) demand are relevant in this work: i) final demand of households in LLM j for goods and services produced by sector s (FD_{js}); ii) demand of upstream sectors for intermediate goods and services (INT_{js}). In order to estimate the final demand of 'local' households we employ changes in net income earned by population that resides in the municipalities of the LLM (data are retrieved from aggregate personal income tax reports from the Ministry of Economics and Finance) between 2007 and 2010 (FD_j). To attribute final demand to different sectors s, we use information on the macro-level composition (by sector) of final demand expenditure (F) from households, that is available in the official Italian input-output table for 2005 ($\phi_s = F_s / \sum_s F_s$). The proxy for local sector-specific final demand is thus calculated as $FD_{js} = FD_j \times \phi_s$.

To estimate the local demand for intermediate goods and services INT_{js} we calculate the derived demand for intermediate inputs by using aggregate technical coefficients (direct requirements) from the Italian input-output table for 2005 to weight production (proxied by sales) of local (same LLM) firms over 2007-2010 (for more details, see Marin and Modica, 2017). Technical coefficients are calculated as the ratio between the value of intermediate inputs purchased by sector l from sector s and the total gross output (y) of the purchasing sector l ($a_{ls} = z_{ls}/y_s$). In the context of a Leontief production function (i.e. perfect complementarity of input) the matrix of technical coefficients represents the direct requirements of different inputs to produce one euro of output. The local demand for intermediate inputs is thus estimated as:

$$INT_{js} = \sum_{l \neq s} (y_{lj} \times a_{ls}) \tag{2}$$

The final indicator of sector-specific local derived demand LD_{js} is the weighted average of the two demand shocks, weighted with the national sector-specific relative importance of households' final demand over total output at the national level ($\pi_s = FD_s/y_s$), again retrieved from input-

output tables:

$$LD_{js} = FD_{js} \times \pi_s + INT_{js} \times (1 - \pi_s) \tag{3}$$

We compute this indicator for years 2007 and 2010 and estimate the local negative demand shock as the relative change 2007-2010 of the indicator:

$$\text{Local Demand Shock}_{js} = -\frac{\triangle_{2007-2010} LD_{js}}{LD_{js}^{2007}} \tag{4}$$

The indicator is specific for each sector-LLM pair. Figure 2 shows the geography of the local demand shock indicator.[5] As for the exposure indicator, it is not possible to recognise a clear spatial pattern, even if a more pronounced local demand shock seems to appear in the Northern regions (the darker the are the higher the local demand shock).

[Figure 2 about here]

3.1.3 Discussion and descriptive evidence

The two indicators describe two important dimensions that explain the local impacts of the global financial and economic crisis. However, before putting these indicators at work, we need to discuss three issues. First, it is noteworthy to mention that, because the local demand shocks depend on the initial industry mix of a specific area, if we did not account for the exposure to the crisis, our demand shock indicator would also embody information on the structural exposure to the crisis that would influence both the hazard and the demand shock, thus leading to biased estimates. This is also another reason why we control for both exposure of the LLMs to crisis (as predicted by their industrial mix) and local demand shocks.

Second, it is important to check how these indicators are distributed to identify possible outliers and whether or not these measures have multi-modal or skewed distributions. In Figure 3 we report the distributions of our two indicators. Both show uni-modal and almost normal distribution, even though the local demand shock is slightly left-skewed. A particular focus is required regarding the local demand shock indicator. The indicator varies across both LLM and sector. However, it could be the case that, due to the possibility that different LLMs exhibit a very similar sectoral structure, the indicator would not vary much across different sectors if local sector-specific shocks were systematically homogeneous across areas. To evaluate this issue, in Table 1 we report descriptive statistics about the distribution of local demand shocks across LLMs within the same sector. Interestingly, what we observe is a great heterogeneity in average sector-specific shocks across

[5] As the indicator varies across LLMs and sectors, we here compute the weighted average within each LLM using LLM-sector specific sales as weights.

sectors as well as large standard deviation and interquartile range in demand shocks across LLMs within each specific sector: for all sector, the coefficient of variation (ratio between standard deviation and mean) of the local demand shocks is larger than 0.5 and in many cases even larger than 1.

[Figure 3 and Table 1 about here]

Third, we need to validate our indicators by comparing their heterogeneity across areas or area-industry pairs with simple measures of local performance. To this purpose, we estimate conditional correlations of our indicators with simple measures of local labour market performance. As a first step, we evaluate the link between the two indicators and changes (2007-2010 and 2007-2012, to account for the slow adjustment of labour market outcomes in response to shocks) in local total employment and unemployment rate (both retrieved from aggregate LLM-level ISTAT data). Note here that changes in total LLM employment combine two different effects: within-firm changes in employment and entry/exit of firms. OLS regressions, estimated at the LLM level and weighted by labour force in 2007, are reported in Table 2. In the first two columns we consider the change in total LLM log employment (2007-2010 and 2007-2012, respectively) and observe, as expected, negative conditional correlations with our indicators of exposure to the crisis and local demand shock.[6] However, only the latter is statistically significant from zero. In columns 3 and 4 we consider changes in unemployment rates (for 2007-2010 and 2007-2012, respectively), also accounting for the pre-crisis (2007) unemployment rate. Relationships here are much less precise, suggesting that the Great Recessions also influenced local responses in terms of participation rates of the active labour force.

[Table 2 about here]

As a second step, we consider employment changes in 2007-2010 and 2007-2012 at the LLM-by-sector level (based on our microdata from Istat) to have a better understanding of the relevance of the two different sources of variation of the local demand shock indicator. Results, weighted by employment in LLM-sector in 2007, are reported in Table 3. The first two columns suggest a very strong negative relationship between our indicators and the change in the level of total employment. In columns 3 and 4, we estimate a much more demanding specification to assess the validity of the local demand shock indicator by including both LLM and sector dummies.[7] Overall, we observe no significant relationship for the change 2007-2010 and a negative and statistically strong relationship for the change 2007-2012. This suggests that total employment takes time to respond to local demand shocks.

[Table 3 about here]

[6] Similarly to Figure 3, the local demand shock is aggregated at the LLM level as the weighted average of sector-LLM specific shocks, using as weights sector-LLM specific employment levels in 2007.

[7] The exposure to crisis indicator cannot be identified as it is perfectly collinear with LLM dummies.

Overall, these simple exercises confirm that our indicators is a good predictor of local changes in employment during the Great Recession, especially so the local demand shock indicator.

3.2 Survival analysis: descriptive evidence, data sources and empirical strategy

3.2.1 Exit rates

After having defined the main variables of interest, we are interested in the precise estimation of the effect of the heterogeneous impacts of the crisis, captured by the two selected variables, on the exit rate of firms. Indeed, the Great Recession had an extraordinary impact on firm's exit: overall, about 24 percent of firms that were active in 2007 left the market by 2010 and 35 percent by 2012. Exiting firms (by 2012) represented about 22 percent of employment of 2007 (own elaboration on ISTAT microdata).

[Figure 4 and Table 4 about here]

Figure 4 shows the decile distribution of the average exit rate for 2007-2012, that is the ratio between the number of firms that were active in 2007 and left the market by the end of 2012 and the total number of active firms in 2007, broken down by LLM. In this map, it is clearly recognizable a North-South divide, with a substantially larger exit rate in the South of Italy. On the contrary, the North of Italy (and especially the North-East) has seen a lower exit rate. This might be a result, as mentioned in the Section 3.1, of a higher and 'better' specialization of firms in specific areas of the country. Indeed, as shown in Table 4 when looking at the sectors, we find that the Great Recession had very heterogeneous effects. For instance, the bubble in the housing market and credit rationing resulted in particularly high exit rates in the construction sector and in the whole value chain realted to it. Furthermore, the collapse in private demand was unevenly distributed across different goods and services (e.g. non-business services vs. manufacturing), an evidence that is in line with the results of Giannakis and Bruggeman (2017). Differences appear also in terms of size of firms, where micro firms result to be the more affected by the crises in terms of exit rates.

[Figure 5 about here]

We recall however that our final aim is to estimate the extent to which firms with different features were hit by the recession. For this reason we provide details on the heterogeneity in age-specific hazard across firms with different characteristics. In Figure 5 we report the smoothed hazard functions for firms that belong to different categories: full sample (top-left), size of firms (top-right), industrial macro-sector (bottom-left) and macro-region (bottom-right). Overall, we observe that the average instantaneous hazard of exit is, at first, increasing with firm's age and declines after an age of about 40 years. Formal tests of equality of the hazard curves suggest that

hazard functions are statistically different across all the different considered categories.[8] More specifically, we observe that in all cases the hazard is increasing and then decreasing with firm's age, even though the maximum hazard is reached at different age levels for different categories of firms. As discussed when commenting on Table 4, hazard is decreasing with firm's size and is the largest in Southern regions and smallest in Northern regions. When considering different macro sectors, we observe a steeper than average curve for non-business services, where young firms exhibit relatively low hazard while older firms exhibit relatively high hazard. At the same time, we observe a very large hazard for firms belonging to the construction sector.

3.2.2 Data sources

Our main source of data is the firm-level database provided by the Italian National Institute for Statistics (ISTAT).[9] The database covers the universe of non-agricultural Italian firms and provides information on geographical location, sector (4-digit NACE sector), date of incorporation, date of exit, number of employees (including, when applicable, the entrepreneur in the count) and sales (in 14 intervals). For the purpose of our paper we collect information for the years 2007 and 2012, resulting in this way in a cross-sectional dataset of the universe of firms that were active in 2007. All firm-level variables (except exit, see section 3.2.3) are measured in 2007 while microdata for year 2010 were used to build the indicators of local exposure to the crisis and local demand shock (see section 3.1).

One shortcoming of the data is that sales are categorical rather than continuous variables. To overcome this limitation and obtain a more precise estimate of Y_{js} to be used in the construction of our main indicators, we follow Marin and Modica (2017) and estimate the predicted value of sector-specific interval regressions using firm employment as independent variable. To have more precise estimates, we substitute the categorical variable with the true firm-level sales variable retrieved from balance sheet information provided by the AIDA (Bureau van Dijk) database. This is particularly useful as the coverage of the AIDA database for medium-large firms is very high (see Marin and Modica, 2017, for further details).

3.2.3 Estimation strategy

To evaluate the drivers of individual firm's exit, we consider as empirical framework the one based on hazard duration models (Coad and Guenther, 2013). More specifically, we use the Cox proportional hazard model (Cox, 1972, 1975). In the Cox model the hazard is assumed to be:

[8] We perform log-rank and regression-based Cox tests: for all different types of categories we cannot accept the null hypothesis of equality of the hazard functions.

[9] The database also includes, potentially, self-employed persons. We exclude these entities as they cannot be defined as 'firms', i.e. they do not combine different production inputs to serve the market. Moreover, self-employed persons cannot go bankrupt according to the Italian law. We do include, however, individual firms. In most cases, individual firms have just one employee, i.e. the entrepreneur. The most important distinguishing feature of individual firms, compared to other non-individual firms (e.g. Società per Azioni or Società in Nome Collettivo), is that, in case the firm cannot repay its debts, creditors can count on the entrepreneur's personal private assets.

$$h(t|X) = h_0(t) \times e^{(X'\beta)} \tag{5}$$

where $h(t|X)$ is the instantaneous hazard at time (i.e. firm's age) t given a set of covariates X and is a function of the baseline hazard $h_0(t)$ multiplied by a scale factor $e^{(X'\beta)}$ that is a function of the vector of firm-specific covariates X. Differently from other parametric survival models (e.g. the Weibull parametric model), the baseline hazard h_0 is not directly estimated but is assumed to be an unspecified function of firm's age (t). The main advantage of using the Cox model compared to parametric models (e.g. models with constant hazard o models that allow for duration dependence as models based on the Weibull distribution) is that parametric models provide inconsistent estimates if the model is misspecified, while the Cox model does not require an explicit specification of the baseline hazard.

Our main independent variables are: i. the proxy for local demand shocks (Local demand shock 2007-2010), that measures the predicted change in the local demand of a specific sector in the LLM, and the exposure to the crisis (Exposure to the crisis of LLM). We also account for a number of other control variables that are likely to contribute in determining firm exit and could be correlated with these two indicators. The list of variables, their measurement issues and their source are described in details below.

Dependent variable: survival. Exit here is defined as a binary variable that is equal to one if the firm was active in 2007 and exited in any period between 2007 and 2012, and zero if the firm was active in 2007 and survived up to (at least) 2012. We want to stress that decided to focus structural characteristics of the firm and of the local environment and, for this reason, we exploit the cross-sectional component of our dataset.

Control variables. To limit the bias arising from omitted variables, the vector X includes a number of controls at the firm, sector and LLM level. In relation to the choice of the control variables, we constraint our choices to the ones that are able to prompt or to reduce the resilience of the firms and regions under analysis (see Modica et al., 2018). We account for structural variables, trade variables, public support programs, firms characteristics and flexible regional and sectoral controls.

First, we account for initial (2007) 'structural' characteristics: *population density* (population per square kilometer, in log, from ISTAT) to account for agglomeration effects; the *share of employment in the manufacturing sector* (NACE rev. 2 codes from 10 to 33 - own elaboration on ISTAT data); the concentration of the industrial mix (measured as the *Herfindahl-Hirschman* of 4-digit industry sales shares - own elaboration on ISTAT data) to account for an 'industrial portfolio' effect; *made in Italy LLM* (dummy) and *specialised LLM* (dummy) aimed at taking into account the level of industrial specialization of the LLMs (as defined by ISTAT). Then, the vector X of

control variables includes trade related indicators in order take into consideration the openness to trade of LLMs and therefore the speed of propagation of the shock: *trade openness* (from low to high, 4 categories), *trade balance* (from low to high, 5 categories), *export performance* (from low to high, 4 categories). We also account for shocks in the labour market by including a dummy that is equal to one if employment growth (2007-2012) in the LLM was below average (*shock to employment*). Finally, we control for 2-digit NACE dummies and NUTS1 region dummies to account in a flexible way for sector-specific and region-specific unobserved heterogeneity.[10]

Variables on public support programs are instead aimed at taking into account the role of public funds and investment in capital and infrastructure at LLM level. We focus here on EU cohesion funds outlays received by local government and firms located in each LLM over the period 2007-2012.[11] The variables are the following: *cohesion funds in infrastructure per capita*, *cohesion funds in training per capita*, *cohesion funds in R&D per capita*, *cohesion funds in support to firms per capita*, *cohesion funds in support to public administration per capita*. For each of these variable, we include in our regressions the quartile dummies to account for them in a more flexible way.[12]

We include a series of firm-level information (measured in 2007 - source: ISTAT): a dummy variable for *artisan firms*,[13] the *level of employment* (in log) to proxy for firm size and dummies for *sales* (14 categories) to account for the ability of the firm to generate revenues.

The correlation matrix and a table of descriptive statistics (for the main variables of interest) are reported in Tables 5 Table 6, respectively. We observe relatively weak unconditional correlation coefficients at the micro level across variables: correlation is larger than 0.2 (in absolute terms) only in three cases out of 21. More specifically, some negative correlation is observe between population density and, respectively, industry concentration and exposure to the crisis, while the strongest correlation (positive, 0.43) is found between exposure to the crisis and the share of manufacturing employment.[14]

[Tables 5 and 6 about here]

[10] To make tables readable, we will report estimated coefficients only for 'continuous' structural characteristics: population density, share of manufacturing employment, Herfindal-Hirschman index of industry concentration. Results for the other structural variables (overall, 12 dummy variables for structural variables plus 3 NUTS1 dummies and 74 sector dummies) remain available upon request.

[11] Source: http://www.opencoesione.gov.it.

[12] Also in this case, due to the very large number of variables (15 dummy variables), we do not report estimated coefficients in our table: results remain available upon request.

[13] According to the Italian legislation, 'artisan' firms are defined as those in which the entrepreneur himself is directly involved in the production activities of the firm. In addition to this requisite, the firm should remain below certain size thresholds (e.g. 8 employees for firms in the transport sector). The main advantage of the 'artisan' firm compared to other firms is that its credits towards other firms are 'privileged': if the debtor of an 'artisan' firm goes bankrupt, the debts towards 'artisan' firms have a priority compared to debts towards other firms. This advantage is particularly important in a situation of financial distress as the one occurred as a consequence of the financial crisis of 2008-2009.

[14] These low correlation coefficients across our main variables suggest that we should not face issues of multicollinearity. To further investigate this issue, we calculate the Variance Inflation Factor (VIF) for the full set of independent variables: the mean VIF is 4.55, below the rule of the thumb of 5, suggesting only moderate correlation across independent variables.

3.3 Results

3.3.1 Baseline results

Baseline results are reported in Table 7: in the first column we show results for the whole sample while in columns 2-4 results refer firms belonging to different size classes. For the full sample, we observe a strong positive coefficient for the local demand shock indicator: a large negative local demand shocks increases the hazard of exit for the average Italian firm. When we consider firms of different size, we observe a very strong effect of the local demand shock on the hazard of exit for micro and small firms, while the effect on medium-large firms is very small in magnitude and not statistically significant from zero. To illustrate, the hazard ratio of the local demand shock in the full sample is 1.147, which is very similar to the sample of micro firms (1.146), while it is much larger for the sample of small firms (1.347) and much smaller (and not statistically significant) for the sample of medium-big firms (1.073).[15]

[Table 7 about here]

These results suggest that, on average, micro and small firms appear to be more sensitive to local demand shocks than medium-big firms. This result should be interpreted as a greater reliance of small and micro firms on local markets, compared to medium-big firms, whose markets of reference go beyond the borders of the LLM. This means that the same negative demand shock hits firms in different size classes differently, as long as demand shocks are not perfectly spatially correlated.

When considering exposure, results appear to be less clear. On the one hand, the hazard for firms in highly-exposed LLMs is expected to be higher in the full sample (p-value=0.073, hazard ratio 1.359) and in the sample of micro firms (hazard ratio 1.401). On the other hand, conditional on the local demand shock, LLM exposure is negatively related to the hazard for small and medium-big firms, even though the coefficients are not precisely estimated (p-value=0.232 for the former and p-value=0.094 for the latter).

Combining the results for our two variables of interest, we can affirm that, conditional on the pre-crisis industry structure (and the corresponding exposure to crisis), asymmetric (across sectors and LLM) local demand shocks play a role in explaining exit rates, especially so for micro and small firms.

For what concerns our main control variables, we observe that agglomeration forces (population density) are positively correlated with hazard, while the role played by the prevalence of manufacturing sector in the LLM and the diversity of the industry mix is generally not significant. 'Artisan' firms (see Footnote 3.2.3) always have a systematically lower hazard, while larger firms (in terms of employment) are less likely to exit than small firms.[16] Conditional on size, the capacity

[15]The hazard ratio should be interpreted as the ratio between the hazard for firms with a value of the considered variable equal to one and the hazard for firms with the value of the same considered variable equal to zero.

[16]This is true for the full sample. However, within each size-based sub-sample (e.g. within small firms) we find

to generate revenues is negatively related with the hazard, with an almost monotonic relationship between the level of firm's sales and hazard.

3.3.2 Results by sub-samples

To dig deeper into the heterogeneity of the link between local demand shocks and the survival of of firms, we estimate our specification for different sub-samples (Table 8).

[Table 8 about here]

First, we focus on the heterogeneity across sectors. In the first panel we consider a rather coarse sectoral breakdown (manufacturing, construction, business services, non-business services), while in the second panel we further decompose the manufacturing (medium-high technology - NACE rev. 2: 20-21; 26-30 - and medium-low technology) and business services (knowledge intensive business services - KIBS, NACE rev. 2: 50-51; 59-66; 69-74; 78; 80 - and other business services).[17] We observe that local demand shocks are much more strongly correlated with hazard in the manufacturing (especially so medium-high technology manufacturing) and the construction sectors, while their impact on services is not significant (very small in magnitude for business services, either knowledge intensive or not, and larger though not precisely estimated - p-value=0.105 - for non-business services). The large sensitivity to local demand shocks of manufacturing sectors is likely to be related to the greater degree of competition in these sectors compared to the service sectors. Fiercer competition (both local and global) implies that firms have limited possibilities of passing-through the shock to downstream actors by, for example, increasing mark-ups. This means that manufacturing firms that face demand shocks, including the local ones, could be forced to exit the market. The strong effect for the construction sector should be interpreted in a different way. For this sector, markets are mostly local. Moreover, the construction sector was among the most badly hit by the Great Recession, on average, but with very heterogeneous effects across different areas. For what concerns our indicator of exposure to the crisis, we observe a generally positive, small and not statistically significant effect across all sectors with the notable exception of the construction sector, for which exposure to crisis has a positive effect which is large (hazard ratio 1.902) and strongly significant.

Second, we estimate heterogeneous effects across macro-regions (North, Centre and South).[18] Results suggest that local demand shocks play a much stronger role in the South than in the Centre (only weakly significant) and in the North (not statistically significant). This result suggests that

a positive link between size and hazard. It should be noted, however, that within rather homogeneous groups of firms (in terms of size), what seems to matter the most is the size in terms of 'creation of gross economic value' (i.e. sales).

[17] For sake of brevity, we just report estimated coefficients for our two main indicators. Results for other variables remain available upon request.

[18] North includes the following NUTS2 regions: Valle d'Aosta, Piemonte, Liguria, Lombardia, Emilia-Romagna, Veneto, Trentino, Alto Adige, Friuli Venezia Giulia; Centre includes: Toscana, Umbria, Marche, Lazio; South includes: Abruzzo, Campania, Basilicata, Molise, Puglia, Calabria, Sicilia, Sardegna.

firms in the North of Italy, due to their stronger links with international value chains, were not very much affected by 'local' demand shocks.

3.3.3 Results for individual firms

Individual firms are a particular category of firms in the Italian context. These firms constitute an important component of the Italian economy: they accounted in 2007 for the 53 percent of firms in the private sector, covering 20 percent of total employment in the private sector. Furthermore, 60.9 percent of individual firms only employ one worker (i.e. the entrepreneur). Due to their small average size (1.8 employees compared to 8.1 employees for non-individual firms in 2007), these firms are expected to be relying mostly on local markets. Moreover, individual firms are of particular interest also for their performance after the Great Recession: their exit rate (38.3%) was substantially larger than the exit rate (30.4%) of non-individual firms.

Interestingly, for the sub-sample of individual firms we can also consider the characteristics of the individual entrepreneur by retrieving additional information from the fiscal code of the entrepreneur (place of birth, age of the entrepreneur, gender).[19] This possibility allows to further characterise the impact of local demand shocks and exposure to crisis in terms of individual characteristics of the entrepreneur. Descriptive evidence already suggests systematic differences in average exit rates across individual firms with entrepreneurs with different characteristics. Exit rates in our period of reference were larger for individual firms with female (40.6% vs 37.5% for male), foreign-born (57.6% vs 36.5% for Italian-born) and under-35 (44.8% vs 36.4% for over-35) entrepreneurs.

[Table 9 about here]

We estimate our main specification, augmented for three entrepreneur-specific variables (age of the entrepreneur, dummy for foreign born entrepreneurs, dummy for male entrepreneurs), for the sub-sample of Italian individual entrepreneurs and we try to understand whether observable characteristics of the entrepreneur are related to heterogeneous responses to local demand shocks and to different levels of exposure to the crisis. Results are reported in 9. In the first column, we show results for the baseline specification estimated on the sub-sample of individual entrepreneurs. Results for the local demand shock variable and the exposure to crisis variable substantially overlap the results found for the sub-sample of micro firms (column 2 of Table 7), with both variables being positively and strongly correlated with the hazard. For what concerns entrepreneur-specific variables, we observe systematically different (conditional) hazards for different entrepreneurs, that confirm our preliminary descriptive evidence: the hazard is lower for male entrepreneurs (hazard ratio 0.712) and older entrepreneurs (hazard ratio 0.933) and larger for foreign-born entrepreneurs (hazard ratio 2.404).

[19] This is possible as the fiscal code of firms with the legal status of individual entrepreneurs coincides with the fiscal code of the entrepreneur himself.

As a first step forward, we evaluate the extent to which the age of the entrepreneur (using the threshold of 35 years to identify young entrepreneurs) influences firm's response to local demand shocks and to exposure to crisis (column 2 of Table 9). We estimate a positive and significant differential effect of exposure to crisis for young compared to old entrepreneurs (for which the net effect turns out to be negative and significant). However, the survival of young individual entrepreneurs is not affected by local demand shocks, that remains significant for old individual entrepreneurs only. One possible explanation for these results is that old entrepreneurs are more tightly connected to the local economic environment and therefore this increases their sensitivity to local demand shocks. At the same time, younger entrepreneurs are less linked to local demand shocks because their attitude is to open more innovative start-ups that compete mainly on more geographically dispersed markets, but also because, as reported by (Boyer and Blazy, 2014, p. 676), '*older individuals tend to have a less entrepreneurial attitude than younger ones*' and this may impact the choice of market penetration strategies.

When considering the role played by gender (column 3 of Table 9), even though we observe systematically heterogeneous hazard in favour of male entrepreneurs, the response to the exposure and to local demand shocks does not differ significantly with gender. The literature attributes a relatively worse performance of female-led ventures to larger opportunity costs of remaining into business due to family-related commitments (Justo et al., 2015), a higher risk aversion of female entrepreneurs compared to male entrepreneurs (Fossen, 2012) and a systematically lower work experience compared to their male peers (Rosti and Chelli, 2005). However, these gender differences do not seem to be reflected in a difference in the response to exposure and local demand shocks.

Finally, in column 4 we consider the possible differential response of foreign-born individual entrepreneurs. While the effect of local exposure to crisis is not statistically different between foreign-born and Italian-born individual entrepreneurs, we do observe that foreign-born individual entrepreneurs are particularly sensitive to local demand shocks (hazard ratio 1.675, compared to an hazard ratio 1.188 for Italian-born individual entrepreneurs). As denoted by previous studies (e.g. Boyer and Blazy, 2014; Cooper et al., 1994; Dadzie and Cho, 1989; Ahn, 2011), if the entrepreneur belongs to a minority, this reduces the survival probability of firms. On the one hand, foreign-born entrepreneurs have the unique opportunity of relying on international networks. At the same time, '*the opportunity for foreign entrepreneurs to prosper depends on their ability to establish linkages with the local firm networks*' (p. 1953 Canello, 2016). However, this local linking becomes a risk in case of collapse of the local markets, which makes successful foreign-born entrepreneurs more sensitive to local demand shocks than Italian-born entrepreneurs.

4 Conclusions

In this paper we develop a novel indicator of local demand shock that considers the expected drop in the derived demand for intermediate and final products and services for local firms by using detailed microdata and LLM-level information combined with input output tables. This indicator appears to be particularly effective in explaining firm's exit. Indeed, the main aim of this paper was to assess the extent to which heterogeneous local demand shocks in the aftermath of the Great Recession contributed to firm's exit for different categories of firms in Italy.

Overall, Italian firms were particularly badly hit by local demand shocks in the aftermath of the Great Recession. Local demand shocks contribute to explaining hazard, also when accounting for the exposure of the LLM to the crisis given its pre-crisis industry mix. The effect is not homogeneous across different categories of firms. More specifically, the estimated effect is larger for micro and small firms, for firms located in the South of Italy and for firms in the manufacturing and construction sectors. Moreover, when focusing on individual firms, for which we have access to detailed demographic information on the entrepreneur, we observe that old and foreign-born entrepreneurs appear to be more sensitive to local demand shocks compared to, respectively, young and Italian-born entrepreneurs.

Local demand shocks contribute to exit of Italian firms. However, the impact of firm's exit on local and aggregate overall economic outcomes, that is the ultimate goals of economic policies, is ambiguous. On the one hand, exit of low-performance firms is seen as a positive selection effect that allows the re-allocation of inputs towards more productive activities (e.g. Baden-Fuller, 1989). At the same time, however, exit also destroys tangible and intangible assets that cannot be easily transferred, leading to persistent losses of economic valuable inputs (e.g. Coad, 2014). This ambiguity calls for novel research aimed at disentangling 'positive' exit from 'negative' exit and at identifying specific drivers of the two different types of exit.

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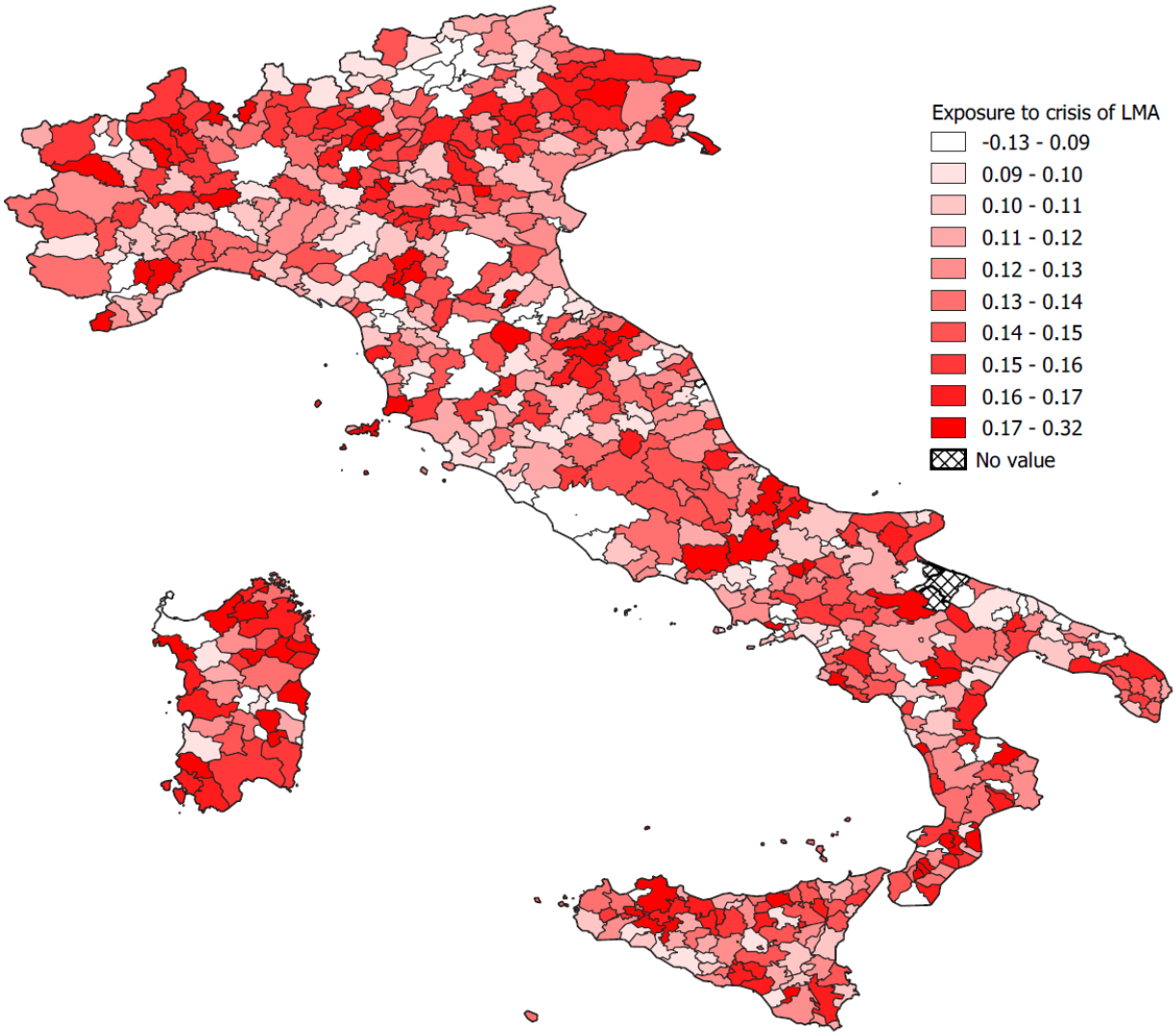
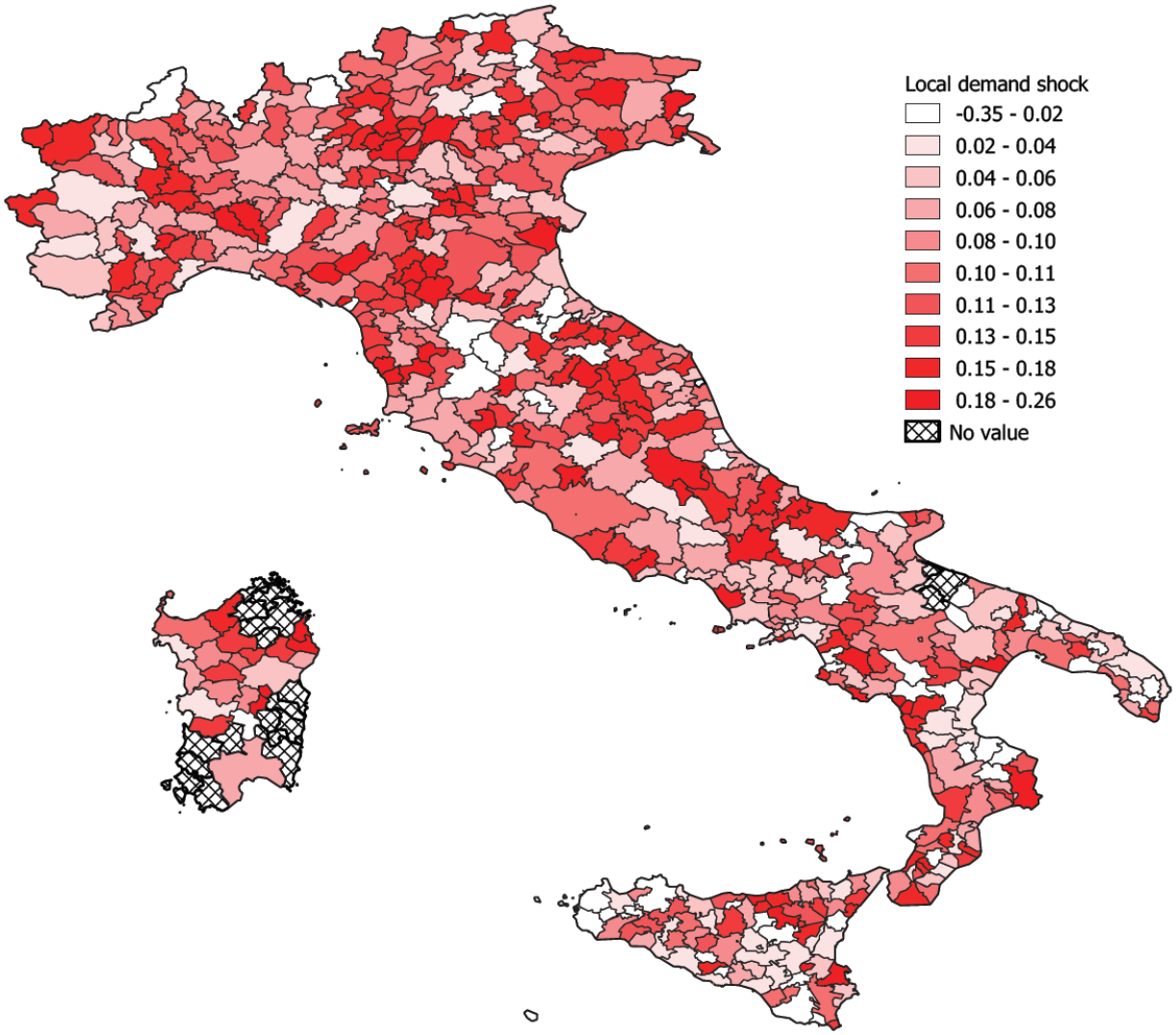
Tables and figures

Figure 1: Exposure to crisis of LLM



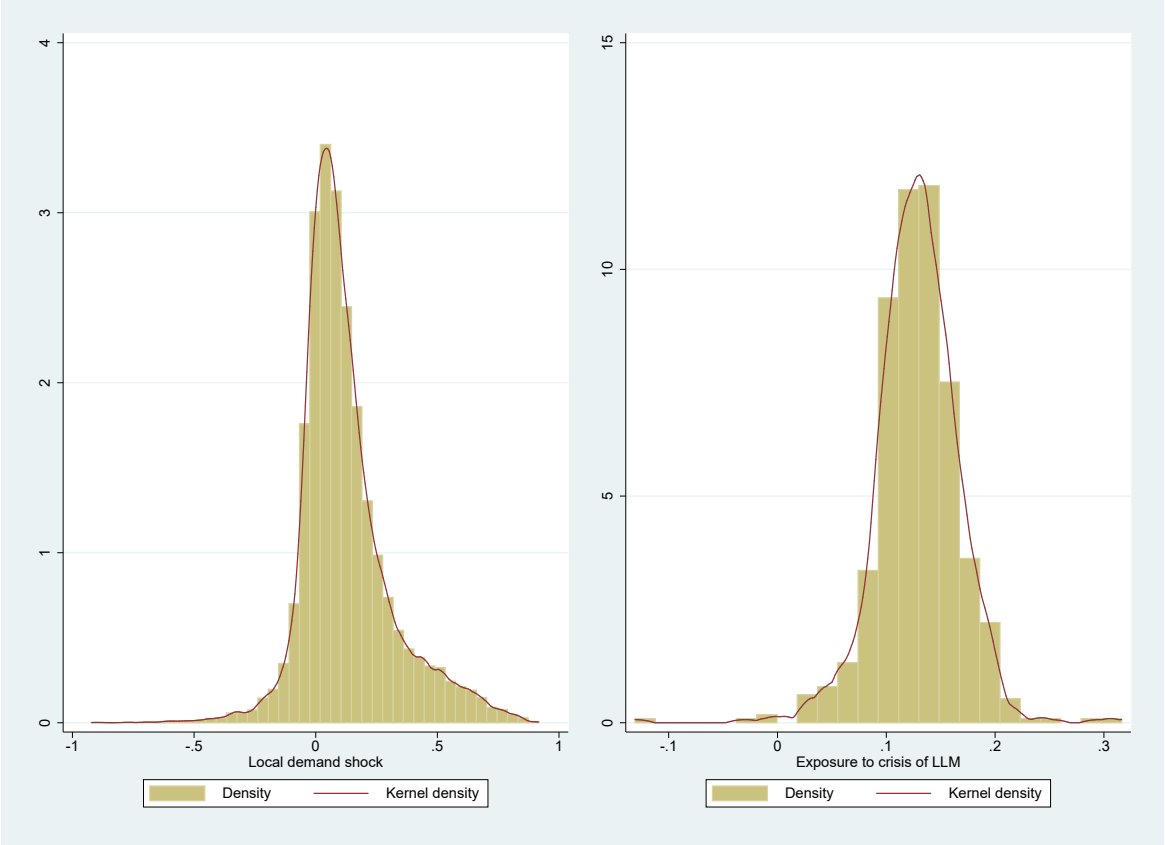
Source: own elaboration on data from ISTAT.

Figure 2: Local demand shock



Source: own elaboration on data from ISTAT.

Figure 3: Distribution of local demand shocks and exposure to crisis of LLM



Source: own elaboration on data from ISTAT.

Table 1: Average local demand shock by sector

Sector (NACE rev. 2)	Mean	SD	Min	Q1	Median	Q3	Max
C10-12 Food products; beverages and tobacco products	0.06	0.06	-0.22	0.04	0.05	0.09	0.30
C13-15 Textiles, wearing apparel, leather and related products	0.06	0.05	-0.35	0.04	0.06	0.08	0.33
C16 Wood and of products of wood and cork, except furniture;	0.17	0.12	-0.45	0.10	0.16	0.23	0.68
C17 Paper and paper products	0.09	0.11	-0.62	0.04	0.08	0.11	0.64
C18 Printing and reproduction of recorded media	0.15	0.18	-0.92	0.07	0.14	0.19	0.92
C19 Coke and refined petroleum products	0.05	0.12	-0.33	-0.02	0.03	0.10	0.43
C20 Chemicals and chemical products	0.11	0.07	-0.35	0.07	0.10	0.15	0.50
C21 Basic pharmaceutical products and pharmaceutical preparations	0.03	0.05	-0.19	0.00	0.04	0.04	0.24
C22 Rubber and plastic products	0.11	0.10	-0.53	0.05	0.10	0.15	0.57
C23 Other non-metallic mineral products	0.18	0.12	-0.63	0.12	0.16	0.25	0.69
C24 Basic metals	0.13	0.09	-0.28	0.08	0.12	0.18	0.53
C25 Fabricated metal products, except machinery and equipment	0.15	0.10	-0.57	0.11	0.15	0.20	0.62
C26 Computer, electronic and optical products	0.05	0.07	-0.35	0.03	0.05	0.07	0.31
C27 Electrical equipment	0.07	0.05	-0.35	0.05	0.08	0.09	0.33
C28 Machinery and equipment n.e.c.	0.06	0.03	-0.18	0.04	0.06	0.07	0.23
C29 Motor vehicles, trailers and semi-trailers	0.05	0.04	-0.14	0.03	0.06	0.07	0.25
C30 Other transport equipment	0.07	0.08	-0.30	0.02	0.05	0.11	0.36
C31_32 Furniture; other manufacturing	0.06	0.04	-0.18	0.04	0.06	0.08	0.24
C33 Repair and installation of machinery and equipment	0.07	0.06	-0.31	0.05	0.08	0.10	0.41
D Electricity, gas, steam and air conditioning supply	0.18	0.22	-0.68	0.05	0.12	0.26	0.72
E36 Water collection, treatment and supply	0.03	0.08	-0.28	-0.03	0.02	0.07	0.34
E37-39 Sewerage, waste management, remediation activities	0.09	0.13	-0.65	0.03	0.08	0.16	0.65
F Construction	0.09	0.05	-0.11	0.06	0.08	0.11	0.30
G45 Wholesale and retail trade and repair of motor vehicles and motorcycles	0.06	0.05	-0.10	0.04	0.05	0.09	0.26
G46 Wholesale trade, except of motor vehicles and motorcycles	0.12	0.08	-0.28	0.07	0.10	0.16	0.56
G47 Retail trade, except of motor vehicles and motorcycles	0.03	0.04	-0.17	0.01	0.03	0.06	0.21
H49 Land transport and transport via pipelines	0.17	0.14	-0.48	0.09	0.15	0.23	0.65
H50 Water transport	0.06	0.06	-0.37	0.04	0.05	0.05	0.35
H51 Air transport	0.09	0.19	-0.39	0.02	0.05	0.14	0.62
H52 Warehousing and support activities for transportation	0.19	0.14	-0.60	0.11	0.15	0.23	0.73
H53 Postal and courier activities	0.40	0.17	-0.11	0.29	0.36	0.48	0.82
I Accommodation and food service activities	0.03	0.04	-0.13	0.01	0.02	0.05	0.19
J58 Publishing activities	0.09	0.07	-0.14	0.04	0.10	0.11	0.45
J59_60 Publishing, motion picture, video, television programme production	0.03	0.09	-0.48	-0.02	-0.01	0.08	0.55
J61 Telecommunications	0.19	0.10	-0.14	0.13	0.16	0.23	0.57
J62_63 Computer programming, consultancy, and information service activities	0.09	0.08	-0.33	0.05	0.08	0.12	0.59
K64 Financial service activities, except insurance and pension funding	0.02	0.20	-0.65	-0.08	0.05	0.13	0.72
K65 Insurance, reinsurance and pension funding, except compulsory social security	-0.01	0.04	-0.12	-0.03	0.01	0.02	0.11
K66 Activities auxiliary to financial services and insurance activities	-0.04	0.20	-0.64	-0.14	-0.06	0.04	0.80
L68 Real estate activities excluding imputed rents	0.04	0.06	-0.27	0.01	0.04	0.07	0.25
M69_70 Legal and accounting activities; management consultancy activities	0.20	0.15	-0.17	0.13	0.14	0.24	0.86
M71 Architectural and engineering activities; technical testing and analysis	0.20	0.14	-0.41	0.12	0.17	0.23	0.89
M72 Scientific research and development	0.10	0.12	-0.50	0.05	0.09	0.14	0.56
M73 Advertising and market research	0.11	0.17	-0.90	0.02	0.10	0.20	0.91
M74_75 Other professional, scientific and technical activities;	0.17	0.14	-0.13	0.10	0.12	0.19	0.73
N77 Rental and leasing activities	0.21	0.16	-0.20	0.11	0.15	0.27	0.77
N78 Employment activities	0.09	0.11	-0.21	0.04	0.04	0.12	0.70
N79 Travel agency, tour operator reservation service and related activities	0.20	0.17	-0.68	0.11	0.18	0.26	0.70
N80-82 Security and investigation, service and landscape, office activities	0.24	0.17	-0.12	0.14	0.19	0.28	0.86
P Education	0.00	0.03	-0.18	-0.01	0.00	0.02	0.11
Q86 Human health activities	-0.01	0.02	-0.22	-0.02	-0.01	0.01	0.09
Q87_88 Residential care activities and social work activities	-0.01	0.03	-0.20	-0.02	-0.01	0.01	0.09
R90-92 Creative, arts and entertainment activities; libraries, cultural activities	0.02	0.06	-0.23	-0.02	0.01	0.05	0.31
R93 Sports activities and amusement and recreation activities	0.03	0.07	-0.31	-0.01	0.02	0.07	0.35
S95 Repair of computers and personal and household goods	0.06	0.04	-0.14	0.04	0.06	0.08	0.27
S96 Other personal service activities	-0.02	0.03	-0.23	-0.04	-0.02	0.00	0.07
Total	0.08	0.10	-0.92	0.02	0.06	0.11	0.92

Source: own elaboration on data from ISTAT.

Table 2: Relationship between indicators and labour market outcomes at the LLM level

	(1) $\log\left(\frac{Empl2010}{Empl2007}\right)$	(2) $\log\left(\frac{Empl2012}{Empl2007}\right)$	(3) △ Unemployment rate 2007-2010	(4) △ Unemployment rate 2007-2012
Local demand shock 2007-2010	-0.0559**	-0.0793***	0.00229	-0.00585
	(0.0216)	(0.0275)	(0.00673)	(0.0105)
Exposure to crisis of LLM	-0.0407	-0.0527	0.0203*	0.0110
	(0.0382)	(0.0485)	(0.0117)	(0.0181)
Unemployment rate 2007			0.0153	0.243***
			(0.0115)	(0.0179)
N	590	590	590	590

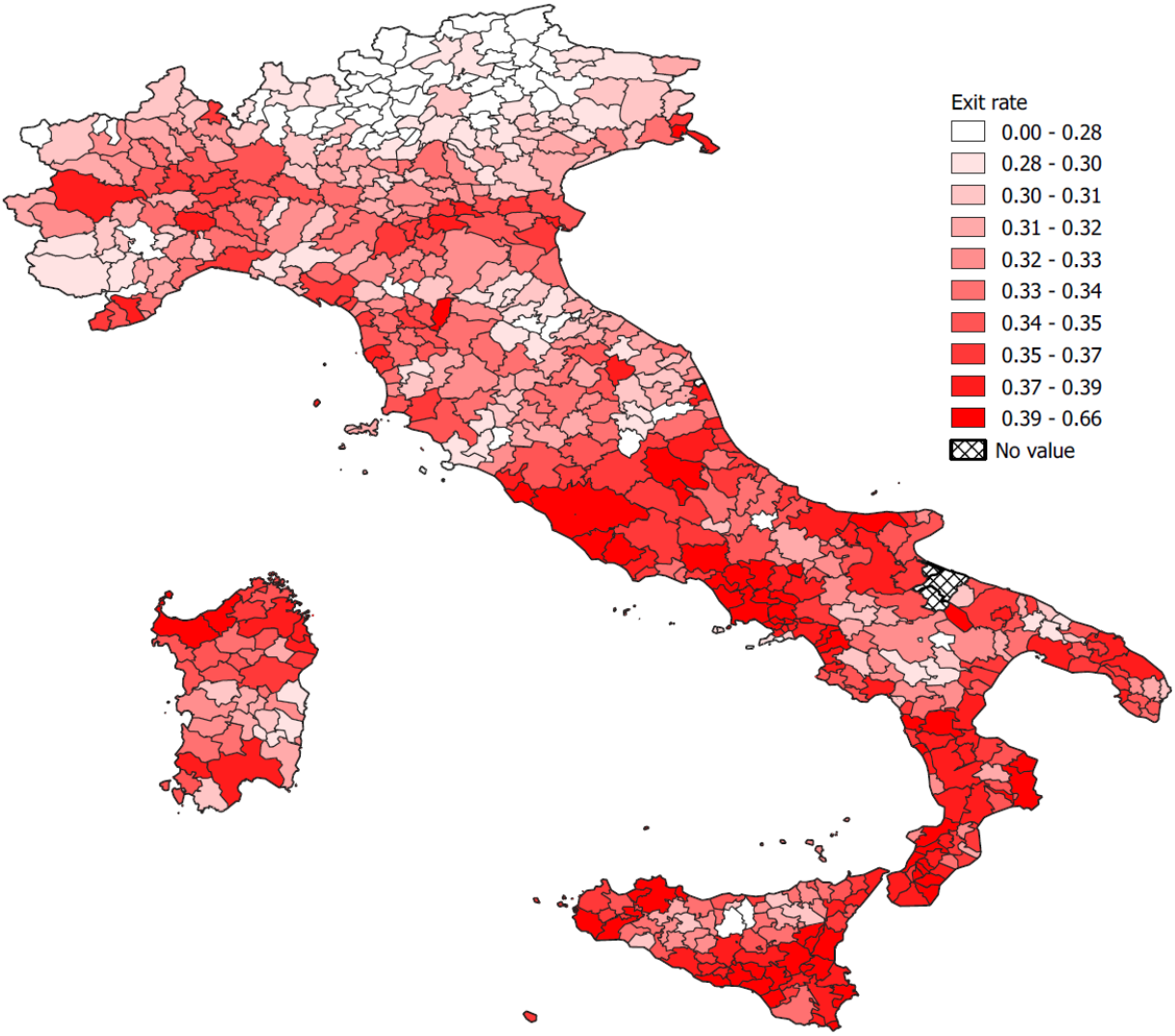
OLS estimates weighted by labour force in LLM. Robust standard errors in parenthesis. * p<0.1, ** p<0.05, *** p< 0.01.

Table 3: Relationship between indicators and labour market outcomes at the LLM-by-sector level

	(1) $\log\left(\frac{Empl2010}{Empl2007}\right)$	(2) $\log\left(\frac{Empl2012}{Empl2007}\right)$	(3) $\log\left(\frac{Empl2010}{Empl2007}\right)$	(4) $\log\left(\frac{Empl2012}{Empl2007}\right)$
Local demand shock 2007-2010	-0.130***	-0.226***	0.0210	-0.170***
	(0.0290)	(0.0389)	(0.0429)	(0.0608)
Exposure to crisis of LLM	-0.540***	-1.589***		
	(0.110)	(0.147)		
Sector dummies	-	-	Yes	Yes
LLM dummies	-	-	Yes	Yes
N	23761	23761	23761	23761

Unit of analysis: LLM by sector pairs with strictly positive employment in 2007, 2010 and 2012. OLS estimates weighted by labour force in LLM. Robust standard errors in parenthesis. * p<0.1, ** p<0.05, *** p< 0.01.

Figure 4: Exit rate (share of firms that were active in 2007 and left the market in 2012 or earlier)



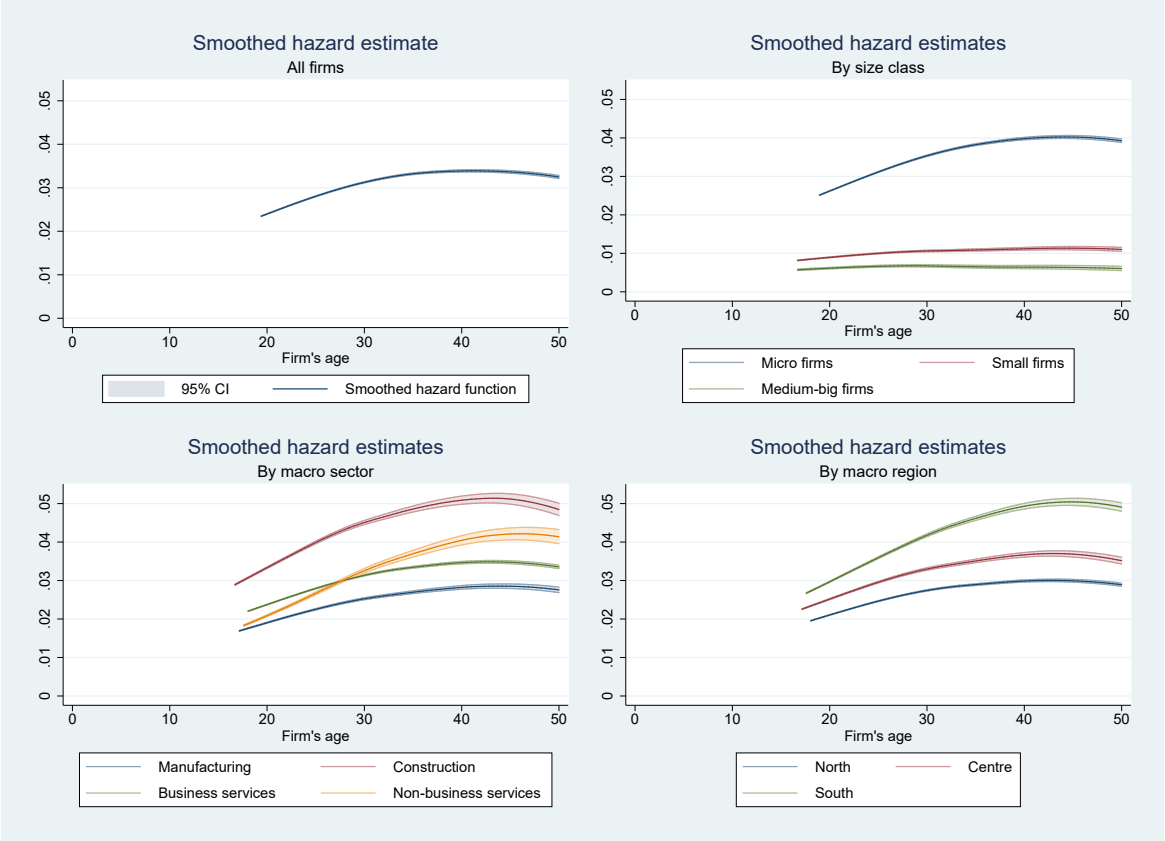
Source: own elaboration on data from ISTAT.

Table 4: Descriptive statistics on exit rate, local demand shock and exposure to crisis of LLM

	Exit rate	Local demand shock	Exposure to crisis of LLM
Panel A - Macro sector			
Manufacturing	0.317	0.099	0.12
Construction	0.404	0.087	0.118
Business services	0.343	0.077	0.113
Non-business services	0.286	-0.002	0.114
Panel B - Macro region			
North	0.324	0.086	0.117
Centre	0.359	0.076	0.094
South	0.377	0.057	0.128
Panel C - Size class			
Micro (0-9)	0.357	0.075	0.115
Small (10-49)	0.19	0.094	0.115
Medium-big (50+)	0.169	0.097	0.11
Panel D - Quartile of exposure to crisis of LLM			
Q1 - Low exposure	0.354	0.067	0.062
Q2	0.342	0.075	0.109
Q3	0.351	0.072	0.128
Q4 - High exposure	0.337	0.091	0.163
Panel D - Quartile of local demand shock			
Q1 - Low shock	0.335	-0.017	0.113
Q2	0.353	0.042	0.11
Q3	0.352	0.083	0.114
Q4 - High shock	0.345	0.197	0.122
Total	0.346	0.076	0.115

Source: own elaboration on data from ISTAT.

Figure 5: Baseline hazard by firm's characteristics



Source: own elaboration on data from ISTAT.

Table 5: Correlation matrix of selected relevant variables

	1	2	3	4	5	6	7
1 Exit between 2007-2012 (dummy)	1						
2 Firm's employment in 2007 (in log)	-0.160	1					
3 Population density in LLM (2007, in log)	0.034	0.009	1				
4 Share of manuf empl in LLM (2007)	-0.041	0.052	-0.167	1			
5 HH index of industry conc in LLM (2007)	-0.009	0.004	-0.270	0.131	1		
6 'Exposure to crisis of LLM	-0.014	0.004	-0.331	0.430	0.045	1	
7 Local demand shock 2007-2010	0.006	0.050	-0.097	0.159	0.065	0.087	1

N=3,285,982 firms.

Table 6: Descriptive statistics of selected relevant variables

	Mean	SD	Q1	Median	Q3
Population density in LLM (2007, in log)	5.8528	1.066	5.1396	5.8221	6.6183
Share of manuf empl in LLM (2007)	0.2480	0.1225	0.1609	0.2306	0.3229
HH index of industry conc in LLM (2007)	0.0199	0.0193	0.0124	0.0157	0.0209
'Artisan' firm (dummy)	0.3736	0.4838	0	0	1
Firm's employment in 2007 (in log)	0.7163	0.8974	0	0.6043	1.0986
Individual firm (dummy)	0.5296	0.5009	0	0	1
Exposure to crisis of LLM	0.1148	0.0403	0.0942	0.1217	0.1364
Local demand shock 2007-2010	0.0761	0.0983	0.0199	0.0624	0.1087

N=3,285,982 firms.

Table 7: Baseline results

	(1) All firms	(2) Micro firms (<10 empl)	(3) Small firms (10-49 empl)	(4) Medium-big firms (50+ empl)
Population density in LLM (2007, in log)	0.0696***	0.0708***	0.0649***	0.0518
	(0.00902)	(0.00898)	(0.0185)	(0.0318)
Share of manuf empl in LLM (2007)	-0.0558	-0.0707	0.507**	0.135
	(0.0974)	(0.0944)	(0.241)	(0.365)
HH index of industry conc in LLM (2007)	-0.223	-0.217	-0.495	-0.538
	(0.348)	(0.342)	(0.727)	(0.863)
'Artisan' firm	-0.475***	-0.470***	-0.585***	-0.305
	(0.0111)	(0.0115)	(0.0226)	(0.208)
Firm's employment in 2007 (in log)	-0.251***	-0.261***	0.253***	0.105***
	(0.00985)	(0.0118)	(0.0240)	(0.0355)
Individual firm	-0.111***	-0.122***	0.440***	0.420***
	(0.0176)	(0.0177)	(0.0314)	(0.126)
Sales in 2007 (0-19 k euro)	[ref category]	[ref category]	[ref category]	[ref category]
Sales in 2007 (20-49 k euro)	-0.370***	-0.370***	-0.219**	-0.646*
	(0.00619)	(0.00623)	(0.106)	(0.372)
Sales in 2007 (50-99 k euro)	-0.582***	-0.583***	0.0257	-1.754***
	(0.00815)	(0.00840)	(0.0922)	(0.437)
Sales in 2007 (100-199 k euro)	-0.729***	-0.733***	0.0873	-0.875***
	(0.0116)	(0.0123)	(0.0821)	(0.294)
Sales in 2007 (200-499 k euro)	-0.833***	-0.854***	-0.151*	-0.319
	(0.0183)	(0.0199)	(0.0801)	(0.210)
Sales in 2007 (500-999 k euro)	-0.936***	-0.944***	-0.650***	-0.216
	(0.0241)	(0.0243)	(0.0909)	(0.172)
Sales in 2007 (1-1.9 mln euro)	-1.065***	-1.002***	-1.055***	-0.330**
	(0.0325)	(0.0292)	(0.0893)	(0.167)
Sales in 2007 (2-3.9 mln euro)	-1.225***	-1.038***	-1.401***	-0.612***
	(0.0432)	(0.0339)	(0.0938)	(0.170)
Sales in 2007 (4-4.9 mln euro)	-1.356***	-1.031***	-1.600***	-0.965***
	(0.0557)	(0.0483)	(0.0968)	(0.170)
Sales in 2007 (5-9.9 mln euro)	-1.434***	-0.980***	-1.713***	-1.392***
	(0.0734)	(0.0585)	(0.0953)	(0.180)
Sales in 2007 (10-19.9 mln euro)	-1.533***	-0.868***	-1.849***	-1.719***
	(0.0850)	(0.0538)	(0.0942)	(0.185)
Sales in 2007 (20-49.9 mln euro)	-1.532***	-0.763***	-1.869***	-1.843***
	(0.0791)	(0.0627)	(0.0921)	(0.176)
Sales in 2007 (50-199.9 mln euro)	-1.449***	-0.612***	-1.649***	-2.061***
	(0.0978)	(0.162)	(0.122)	(0.170)
Sales in 2007 (200+ mln euro)	-1.303***	-0.765**	-1.292***	-2.424***
	(0.104)	(0.373)	(0.280)	(0.201)
Exposure to crisis of LLM	0.307*	0.337**	-0.550	-1.474*
	(0.171)	(0.168)	(0.460)	(0.879)
Local demand shock 2007-2010	0.137***	0.136***	0.298**	0.0705
	(0.0462)	(0.0458)	(0.128)	(0.206)
N	3285982	3075196	185585	25201

Non parametric regression survival-time Cox model. Standard errors clustered by local labour system in parenthesis. * p<0.1, ** p<0.05, *** p<0.01. Additional control variables: region dummies (NUTS2) and sector dummies (2-digit NACE rev. 2), Trade openness category (LLM), Trade balance category (LLM), Specialised LLM (dummy), Labour productivity category (LLM), Shock to employment category (LLM), Export performance category (LLM), Made in Italy LLM (dummy), Quartile of cohesion funds per capita for infrastructure (2007-2010, LLM), Quartile of cohesion funds per capita for training (2007-2010, LLM), Quartile of cohesion funds per capita for R&D (2007-2010, LLM), Quartile of cohesion funds per capita for support to firms (2007-2010, LLM), Quartile of cohesion funds per capita for support to public administration (2007-2010, LLM).

Table 8: Results for sub-samples

	Manufacturing	Construction	Business serv	Non BS
Exposure to crisis of LLM	0.123	0.643**	0.171	0.204
	(0.288)	(0.279)	(0.149)	(0.243)
Local demand shock 2007-2010	0.337***	0.631***	0.0775	0.375
	(0.0634)	(0.189)	(0.0477)	(0.231)
N	457708	617307	1947166	254559
	MH tech manuf	ML tech manuf	KIBS	Other BS
Exposure to crisis of LLM	0.0335	0.124	0.0411	0.185
	(0.577)	(0.293)	(0.181)	(0.152)
Local demand shock 2007-2010	0.773***	0.326***	0.0457	0.0461
	(0.271)	(0.0647)	(0.0353)	(0.0659)
N	49338	408370	255180	1691986
	North	Centre	South	
Exposure to crisis of LLM	0.355	0.915***	0.0252	
	(0.342)	(0.285)	(0.208)	
Local demand shock 2007-2010	0.0615	0.109*	0.185***	
	(0.0660)	(0.0656)	(0.0563)	
N	1682255	698370	905357	

Non parametric regression survival-time Cox model. Standard errors clustered by local labour system in parenthesis. * p<0.1, ** p<0.05, *** p<0.01. Additional control variables: Population density in LLM (2007, in log), Share of manuf empl in LLM (2007), HH index of industry concentration in LLM (2007), Exposure to crisis of LLM, 'Artisan' firm, Firm's employment in 2007 (in log), Individual firm (dummy), Sales in 2007 (dummies), region dummies (NUTS2) and sector dummies (2-digit NACE rev. 2), Trade openness category (LLM), Trade balance category (LLM), Specialised LLM (dummy), Labour productivity category (LLM), Shock to employment category (LLM), Export performance category (LLM), Made in Italy LLM (dummy), Quartile of cohesion funds per capita for infrastructure (2007-2010, LLM), Quartile of cohesion funds per capita for training (2007-2010, LLM), Quartile of cohesion funds per capita for R&D (2007-2010, LLM), Quartile of cohesion funds per capita for support to firms (2007-2010, LLM), Quartile of cohesion funds per capita for support to public administration (2007-2010, LLM).

Table 9: Focus on entrepreneur's characteristics (individual firms only)

	(1)	(2)	(3)	(4)
Exposure to crisis of LLM	0.523***	-0.401**	0.515***	0.464***
	(0.158)	(0.172)	(0.194)	(0.161)
Local demand shock 2007-2010	0.209***	0.269***	0.181***	0.172***
	(0.0450)	(0.0481)	(0.0523)	(0.0458)
Male entrepreneur	-0.339***	-0.337***	-0.342***	-0.338***
	(0.00897)	(0.00879)	(0.0288)	(0.00898)
Age of entrepreneur	-0.0694***	-0.0603***	-0.0694***	-0.0694***
	(0.000631)	(0.000839)	(0.000631)	(0.000631)
Foreign born entrepreneur	0.877***	0.883***	0.877***	0.791***
	(0.0184)	(0.0174)	(0.0184)	(0.0475)
Exposure to crisis of LLM		3.180***		
x Age of entrepreneur <35		(0.189)		
Local demand shock 2007-2010		-0.247***		
x Age of entrepreneur <35		(0.0773)		
Exposure to crisis of LLM			0.0118	
x Male entrepreneur			(0.196)	
Local demand shock 2007-2010			0.0373	
x Male entrepreneur			(0.0418)	
Exposure to crisis of LLM				0.523
x Foreign born entrepreneur				(0.412)
Local demand shock 2007-2010				0.344***
x Foreign born entrepreneur				(0.0995)
Net effect of the exposure to crisis		2.780***	0.527***	0.987**
for dummy=1		(0.248)	(0.177)	(0.401)
Net effect of the demand shock		0.0223	0.218***	0.516***
for dummy=1		(0.0739)	(0.0474)	(0.101)
N	1740128	1740128	1740128	1740128

Non parametric regression survival-time Cox model. Standard errors clustered by local labour system in parenthesis. * p<0.1, ** p<0.05, *** p<0.01. Additional control variables: Population density in LLM (2007, in log), Share of manuf empl in LLM (2007), HH index of industry concentration in LLM (2007), Exposure to crisis of LLM, 'Artisan' firm, Firm's employment in 2007 (in log), Sales in 2007 (dummies), region dummies (NUTS2) and sector dummies (2-digit NACE rev. 2), Trade openness category (LLM), Trade balance category (LLM), Specialised LLM (dummy), Labour productivity category (LLM), Shock to employment category (LLM), Export performance category (LLM), Made in Italy LLM (dummy), Quartile of cohesion funds per capita for infrastructure (2007-2010, LLM), Quartile of cohesion funds per capita for training (2007-2010, LLM), Quartile of cohesion funds per capita for R&D (2007-2010, LLM), Quartile of cohesion funds per capita for support to firms (2007-2010, LLM), Quartile of cohesion funds per capita for support to public administration (2007-2010, LLM).