Economics Letters 235 (2024) 111560

Contents lists available at ScienceDirect

Economics Letters

journal homepage: www.elsevier.com/locate/ecolet

Service sector firm death and productivity in urban and rural locations

Sabine D'Costa [a,*], Adelheid Holl [b], Dalila Ribaudo [c]

[a] University of Westminster, 35 Marylebone Road, London NW1 5LS, United Kingdom
[b] CSIC - Spanish National Research Council, Institute of Public Goods and Policies, c. Albasanz 26-28, 28037 Madrid, Spain
[c] Aston University, Aston Business School, Aston Triangle, B4 7ET, Birmingham, United Kingdom

ARTICLE INFO

JEL classification codes:
D22
L25
O18
R12

Keywords:
Firm exit
Survival
Productivity
Urban
Rural
Services

ABSTRACT

While the positive impact of firm productivity on survival is well documented, limited evidence exists on geographic variations of this relationship and on services industries. We show that in knowledge intensive services, this relationship is more strongly moderated in core urban areas compared to suburban and rural areas.

1. Introduction

We explore whether the positive relation between firm productivity and survival varies along the urban-suburban-rural hierarchy. We focus on service sector firms, for which little evidence exists despite concerns about the relatively low productivity in this sector and the fact that services account for nearly three quarters of GDP in Europe. Services are also more spatially concentrated than manufacturing. Moreover, service firms tend to be more dependent on their local environment and face more localised competition.

Theory predicts that firm productivity is a determinant of survival (Jovanovic, 1982; Schumpeter, 1939). There is ample empirical support, including, for example, Frazer (2005) and Fariñas and Ruano (2005). At the same time, urban economics establishes that firms in denser areas tend to be more productive (Combes et al., 2012; Rosenthal and Strange, 2003). This literature focuses on urban environments of varying sizes and densities rather than the urban-rural spectrum.

Another notable finding is that exit rates are higher in urban areas (Varum and Rocha, 2012; Basile et al., 2017). This suggests that their more competitive environment leads to higher firm exit rates but also to surviving firms that are more efficient compared to rural areas where firms have a higher likelihood of survival but are more likely to remain small and less productive. Indeed, theoretical models in Combes et al. (2012) and Behrens and Robert-Nicoud (2014) predict that cities foster more creative destruction than rural areas, leading to stronger productivity growth via firm exit and production reallocation.

This paper provides evidence on this creative destruction process. Distinguishing between high and low knowledge intensity sector firms in Spain between 2010 and 2019, we find that in knowledge intensive sectors only, the positive effect of productivity on survival is moderated in core urban locations. Knowledge intensive sectors not only differ in their rapid growth, but they are particularly geographically concentrated in urban core locations where they benefit from knowledge spillovers and access to highly skilled employees. They in turn enhance local growth through their role as critical inputs for other sectors. Therefore, stronger competition and creative destruction in the urban core for these sectors tends to exacerbate the existing large regional productivity disparities in Spain.

2. Data and methodology

We use firm-level data from the SABI (Iberian Balance Sheet Analysis System) database to calculate firm productivity and track exit. The dataset comprises 301,880 observations from 99,755 firms in cohorts

* Corresponding author.
E-mail address: s.dcosta@westminster.ac.uk (S. D'Costa).

https://doi.org/10.1016/j.econlet.2024.111560
Received 8 December 2023; Received in revised form 19 January 2024; Accepted 19 January 2024
Available online 20 January 2024

born between 2010 and 2019. We focus on cohorts born since the start of our period of analysis to avoid confounding productivity and exit patterns from young and older firms.

We define active firms as those with filled financial statements, those in business that have not filled their financial statements, or that have started provisional deregistration. A firm is defined as exiting when it is in bankruptcy, dissolved, in process of winding up or with official deregistration. We restrict our dataset to single-establishment firms as accounts are provided at the firm level and cannot be assigned to the different establishments of multi-plant firms. We also exclude firms that have relocated or have been targets of mergers and acquisitions to prevent misclassifying them as firm exits.[1]

Based on the exact geographic location of firms in SABI, we link each firm to the most recent OECD-Eurostat definition of functional urban area (FUA) (Dijkstra et al., 2019). The OECD defines Urban Core areas as all densely populated areas composed of the city and the surrounding urban areas, whereas a Commuting Zone or suburban area refers to all local units with at least 15 % of their employed residents working in an urban core area. The combination of the urban core area with its commuting zone forms the so called Functional Urban Area (FUA).

First, we calculate firm level Total Factor Productivity (TFP), based on the Levinsohn-Petrin (2003) method. Fig. 1 shows average productivity of survivors and exiters since 2010, for knowledge-intensive (KIS) and low knowledge intensity (LKIS) services based on the Eurostat definition. As expected, survivors have higher productivity levels than exiters, although for younger firms the productivity difference is more pronounced in KIS sectors. Fig. 2 shows that core urban firms are on average more productive, followed by suburban and rural firms.

Next, we estimate how location affects the productivity-exit relationship. Our dependent variable is binary, taking value 1 in the year when a firm exits and 0 otherwise. Our analysis spans a period of ten years, and we only know that an exit occurred sometime in a given year; hence we adopt a discrete time approach. Building on previous studies in the literature on firm survival and exit, such as Bandick and Görg (2010) and Guariglia et al. (2016), we model the determinants of the productivity-exit nexus using a complementary log-log model (cloglog), particularly suited when the probability of an event is either very small (as in our case) or very large. The baseline proportional hazard is formulated as:

$$h(j,X) = 1 - \exp\left[\exp\left(\beta' X + y_j\right)\right] \quad (1)$$

where $h(j,X)$ is the interval hazard for the period between the beginning and the end of the j^{th} year after the incorporation date. The parameters show the effects of the explanatory variables X on the hazard rate, and y captures time-specific effects on the hazard. X includes firm size (employment) and its square, firm age and its square, exporter status and dummies for suburban and core urban location. We also include sector and cohort fixed effects as well as geographical controls for the latitude, longitude, terrain ruggedness index and altitude of the firm. Table 1 provides summary statistics of the variables.

3. Empirical results

We estimate our model separately for KIS and LKIS sectors. Table 2 shows our results with the reported coefficients in exponentiated form. In the service sector, higher productivity is linked to better survival rates: One additional log point in lagged TFP (about 1.33 standard deviation) decreases the probability of exit by 37 % in KIS sectors and 44% in LKIS sectors.[2]

Including the urban and suburban dummies leaves the TFP estimates unchanged, both for KIS firms (column 2) and for LKIS firms (column 5). However, everything else equal, for KIS sector firms, being in an urban location does not significantly affect the probability of exit, whereas for LKIS sector firms, operating in a suburban location increases the probability of exit by 43.5% compared to a rural location and operating in the urban core increases the probability of exit by 62.5 %.

In columns 3 and 6, we estimate the differentiated effect of productivity on exit across FUA types by introducing interactions between lagged TFP and urban, suburban and rural dummies. For KIS firms, although productivity significantly decreases the probability of exit in all locations, this effect is smaller in core urban locations than in rural locations (the difference is statistically significant at the 10 % level, see Table A1) and even smaller compared to suburban locations (difference significant at the 1 % level). One standard deviation higher TFP is associated with a 20 % lower probability of exit in the core, compared to 36 % in a rural area. Results in columns 2 and 3 combined suggest that urban location only affects the probability of exit for KIS firms through its impact on the productivity-exit nexus. Column 6 shows that in contrast, in LKIS sectors, the relationship between productivity and exit is of the same magnitude across the urban-rural hierarchy. Estimating the model using random effects cloglog (Table A2) and Probit (Table A3) yields very similar results.

Location therefore plays a role in how productivity affects exit among KIS firms: in core urban areas, exit decreases less with productivity compared to rural areas, or in other words firms exit at higher productivity thresholds compared to rural firms. We hypothesise that this is due to heightened local competition in urban areas in knowledge intensive sectors.

4. Conclusions

Our results unveil a more pronounced process of "cleansing" of less productive knowledge-intensive services firms in core urban locations. Less productive firms are more likely to exit in core urban areas than in rural areas, consistent with the concept of Schumpeterian transformation. In low knowledge intensity services however, the relation between productivity and exit is the same regardless of location in the urban hierarchy. These findings, though they do not account for spatial sorting of productive firms, provide new evidence on a mechanism that can explain the contrasting survival rates of rural and urban firms. Because knowledge intensive services are predominantly located in core urban areas, competition in these locations is intense. This causes reallocation through firm exit that can increase the urban productivity lead over rural areas, making urban environments more resilient.

Declaration of competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence

[1] These three restrictions reduce the sample by 11%.

[2] As a comparison, in Frazier (2005), a one standard deviation increase in productivity decreased the probability of exit by 30% among Ghanaian manufacturing firms. In Harris and Moffat (2016), more productive service firms in the UK are less likely to exit prior to 2008, however this is offset during the beginning of the crisis.

[1] These three restrictions reduce the sample by 11%.

[2] As a comparison, in Frazier (2005), a one standard deviation increase in productivity decreased the probability of exit by 30% among Ghanaian manufacturing firms. In Harris and Moffat (2016), more productive service firms in the UK are less likely to exit prior to 2008, however this is offset during the beginning of the crisis.

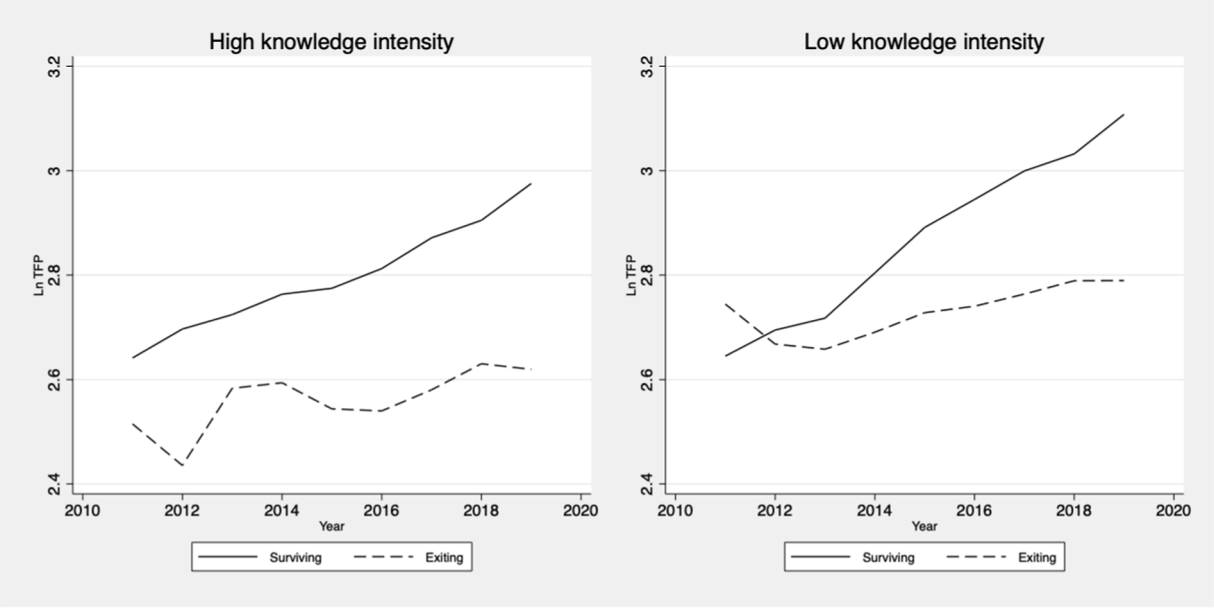

Fig. 1. Average productivity by exiter status.

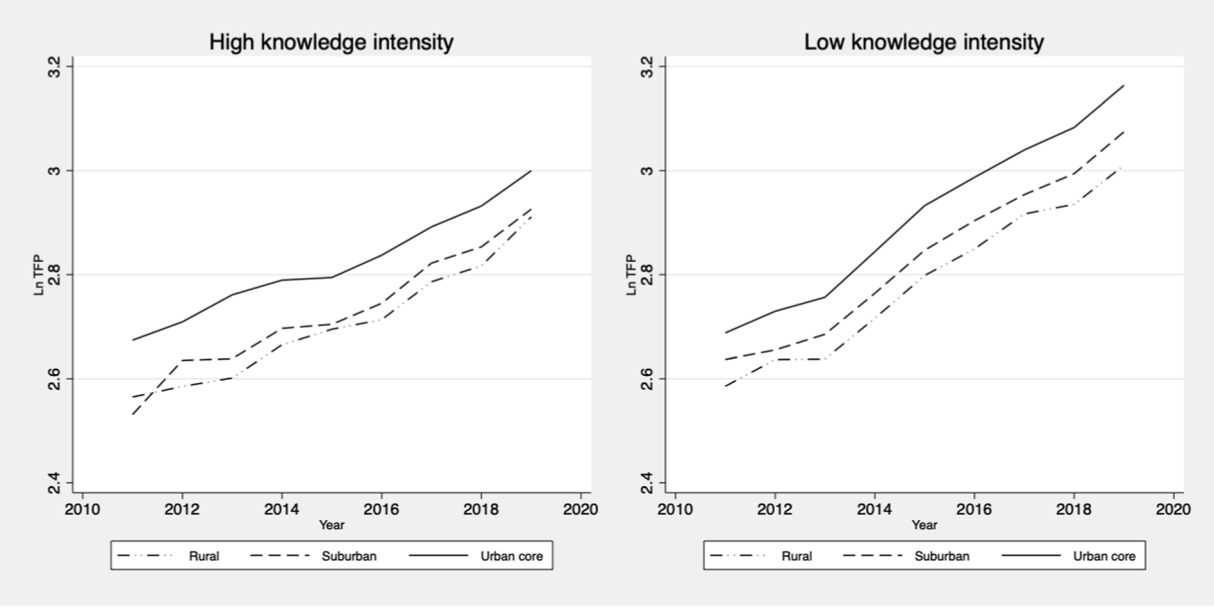

Fig. 2. Average productivity by FUA type.

Table 1
Summary statistics of the variables.

	KIS				LKIS				All firms			
	Mean	Std. dev.	Min	Max	Mean	Std. dev.	Min	Max	Mean	Std. dev.	Min	Max
Ln TFP	2.92	0.75	−3.24	7.56	3.05	0.77	−3.58	9.57	3.02	0.77	−3.58	9.57
Age	4.21	2.01	1	9	3.86	2	1	9	3.94	2	1	9
Size	8.06	120.59	1	15,061	6.54	20.16	1	1891	6.87	59.13	1	15,061
Exporter	0.03	0.17	0	1	0.08	0.28	0	1	0.07	0.26	0	1

Source: authors' own calculations from SABI. $N = 301{,}880$. TFP measured using the Levinsohn-Petrin method. Firm Size is the number of employees. Exporter is a binary variable taking value 1 if the firms export at least in one foreign market.

Table 2
Estimation results (exit hazard ratios).

	KIS			LKIS		
	(1)	(2)	(3)	(4)	(5)	(6)
ln TFP(t-1)	0.630***	0.627***		0.559***	0.558***	
	(0.057)	(0.056)		(0.021)	(0.021)	
Suburban		0.840	1.274		1.435***	1.464
		(0.256)	(0.690)		(0.189)	(0.480)
Core urban		1.265	0.527		1.625***	1.872***
		(0.302)	(0.285)		(0.178)	(0.450)
Rural x ln TFP(t-1)			0.515***			0.580***
			(0.083)			(0.042)
Suburban x ln TFP(t-1)			0.422***			0.576***
			(0.057)			(0.052)
Core urban x ln TFP(t-1)			0.726***			0.550***
			(0.087)			(0.024)
Age	1.740***	1.729***	1.748***	1.718***	1.717***	1.718***
	(0.350)	(0.347)	(0.350)	(0.171)	(0.171)	(0.171)
Age2	0.951**	0.951**	0.950**	0.956***	0.956***	0.956***
	(0.020)	(0.020)	(0.019)	(0.010)	(0.010)	(0.010)
Size	1.015***	1.014***	1.014***	0.997	0.996	0.996
	(0.006)	(0.006)	(0.005)	(0.006)	(0.007)	(0.006)
Size2	1.000*	1.000*	1.000**	1.000	1.000	1.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Exporter	0.827	0.826	0.818	0.989	0.955	0.953
	(0.413)	(0.413)	(0.407)	(0.153)	(0.148)	(0.148)
Observations	63,868	63,868	63,868	238,012	238,012	238,012

***, **, *: significant at the 1%, 5% and 10% level respectively. Robust standard errors in parentheses. All estimations include year, two-digit sector and cohort fixed effects and geography controls. Binary dependent variable equal to 1 if firm exits in year t. TFP measured using the Levinsohn-Petrin method. Rural, Suburban and Core urban are binary variables based on the OCED classification. Firm Size is the number of employees. Exporter is a binary variable taking value 1 if the firms export at least in one foreign market.

the work reported in this paper.

Data availability

The authors do not have permission to share data.

Appendix

Table A1
Wald Test of equality of coefficients.

	Rural	Suburban	Core Urban	Rural	Suburban	Core Urban
Rural	–	0.97	3.1	–	0.010	0.45
		[0.32]	[0.078]		[0.94]	[0.503]
Suburban			9.85			0.23
			[0.0017]			[0.63]

Table A2
Random effects complementary log-log estimations.

	High knowledge intensity			Low knowledge intensity		
	(1)	(2)	(3)	(4)	(5)	(6)
ln TFP (t-1)	0.629***	0.627***		0.559***	0.558***	
	(0.057)	(0.056)		(0.021)	(0.021)	
Suburban		0.840	1.274		1.435***	1.464
		(0.257)	(0.692)		(0.189)	(0.481)
Core urban		1.265	0.527		1.625***	1.872***
		(0.303)	(0.285)		(0.178)	(0.451)
Rural x ln TFP(t-1)			0.515***			0.580***
			(0.082)			(0.043)
Suburban x ln TFP(t-1)			0.422***			0.576***
			(0.057)			(0.052)
Core urban x ln TFP(t-1)			0.726***			0.550***
			(0.088)			(0.024)
Age	1.740***	1.729***	1.748***	1.718***	1.717***	1.718***
	(0.353)	(0.351)	(0.355)	(0.171)	(0.171)	(0.171)
Age 2	0.951**	0.951**	0.950**	0.956***	0.956***	0.956***
	(0.020)	(0.020)	(0.020)	(0.010)	(0.010)	(0.010)

(*continued on next page*)

Table A2 (*continued*)

	High knowledge intensity			Low knowledge intensity		
	(1)	(2)	(3)	(4)	(5)	(6)
Size	1.015***	1.014**	1.014**	0.997	0.996	0.996
	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)	(0.006)
Size 2	1.000*	1.000*	1.000*	1.000	1.000	1.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Exporter	0.827	0.826	0.818	0.989	0.955	0.953
	(0.413)	(0.412)	(0.406)	(0.154)	(0.148)	(0.148)
Observations	63,868	63,868	63,868	238,012	238,012	238,012

***$p<0.01$, **$p<0.05$, *$p<0.1$. Robust standard errors in parentheses. All estimations include year, two-digit sector and cohort fixed effects and geography controls. Rural, Suburban and Core urban are binary variables based on the OCED classification. Firm Size is the number of employees. Exporter is a binary variable taking value 1 if the firms export at least in one foreign market.

Table A3
Pooled Probit estimations.

	High knowledge intensity			Low knowledge intensity		
	(1)	(2)	(3)	(4)	(5)	(6)
ln TFP (t-1)	0.856***	0.854***		0.817***	0.816***	
	(0.027)	(0.027)		(0.012)	(0.012)	
Suburban		0.955	1.148		1.128***	1.116
		(0.092)	(0.250)		(0.048)	(0.134)
Core urban		1.077	0.790		1.173***	1.238**
		(0.082)	(0.159)		(0.041)	(0.111)
Rural x ln TFP(t-1)			0.797***			0.827***
			(0.052)			(0.022)
Suburban x ln TFP(t-1)			0.734***			0.830***
			(0.041)			(0.027)
Core urban x ln TFP(t-1)			0.898***			0.810***
			(0.036)			(0.014)
Age	1.190***	1.188***	1.195***	1.199***	1.198***	1.198***
	(0.078)	(0.077)	(0.078)	(0.039)	(0.039)	(0.039)
Age 2	0.984**	0.984**	0.984**	0.985***	0.985***	0.985***
	(0.007)	(0.007)	(0.007)	(0.003)	(0.003)	(0.003)
Size	1.005**	1.005**	1.005**	0.999	0.999	0.999
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Size 2	1.000**	1.000*	1.000**	1.000	1.000	1.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Exporter	0.918	0.919	0.910	0.997	0.984	0.983
	(0.144)	(0.144)	(0.143)	(0.051)	(0.050)	(0.050)
Observations	63,868	63,868	63,868	238,012	238,012	238,012

***$p<0.01$, **$p<0.05$, *$p<0.1$. Robust standard errors in parentheses. All estimations include year, two-digit sector and cohort fixed effects and geography controls. Rural, Suburban and Core urban are binary variables based on the OCED classification. Firm Size is the number of employees. Exporter is a binary variable taking value 1 if the firms export at least in one foreign market.

References

Bandick, R., Görg, H., 2010. Foreign acquisition, plant survival, and employment growth. Can. J. Econ. 43, 547–573.

Basile, R., Pittiglio, R., Reganati, F., 2017. Do agglomeration externalities affect firm survival? Reg. Stud. 51 (4), 548–562.

Behrens, K., Robert-Nicoud, F., 2014. Survival of the fittest in cities: urbanisation and inequality. Econ J. 124 (581), 1371–1400.

Combes, P.-P., Duranton, G., Gobillon, L., Puga, D., Roux, S., 2012. The productivity advantages of large cities: distinguishing agglomeration from firm selection. Econometrica 80, 2543–2594.

Dijkstra, L., Poelman, H., and Veneri, P. 2019. The EU-OECD definition of a functional urban area.

Fariñas, J.C., Ruano, S., 2005. Firm productivity, heterogeneity, sunk costs and market selection. Int. J. Ind. Org. 3 (7–8), 505–534.

Frazer, Garth., 2005. Which firms die? A look at manufacturing firm exit in Ghana. Econ. Dev. Cult. Change 53 (3), 585–617.

Guariglia, A., Spaliara, M., Tsoukas, S, 2016. To what extent does the interest burden affect firm survival? Evidence from a panel of UK firms during the recent financial crisis. Oxf. Bull. Econ. Stat. 78 (4), 576–594.

Harris, R., Moffat, J., 2016. Plant closure in Britain since the Great Recession. Econ. Lett. 140, 27–30.

Jovanovic, B., 1982. Selection and the evolution of industry. Econometrica 50 (3), 649–670.

Levinsohn, J., Petrin, A., 2003. Estimating production functions using inputs to control for unobservables. Rev. Econ. Stud. 70, 317–341.

Rosenthal, S., Strange, W., 2003. Geography, Industrial Organization, and Agglomeration. Rev. Econ. Stat. 85 (2), 377–393.

Schumpeter, J.A., 1939. Business Cycles: A Theoretical, Historical, and Statistical Analysis of the Capitalist Process. McGraw-Hill, New York.

Varum, C.A., Rocha, V.C., 2012. The effect of crises on firm exit and the moderating effect of firm size. Econ. Lett. 114 (1), 94–97.