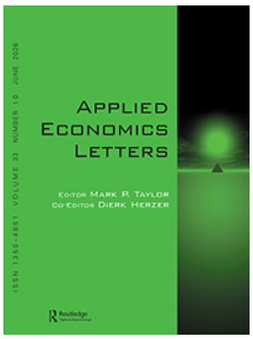

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When the last branch closes: the impact of bank desertification on local firm growth

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ABSTRACT

This paper examines the effects of bank desertification, defined as the closure of the last local branch, on firm growth, drawing on proprietary and publicly available data at the municipal level in Italy. Our robust results show that desertification is associated with a significant decline in firm growth, particularly in areas dominated by smaller and less innovative firms. In contrast, broadband access, used as a proxy for access to digital and alternative financing, does not appear to significantly mitigate these effects. These findings suggest that physical proximity to banking services continues to play an important role in supporting firm growth and local economic development.

KEYWORDS

Bank desertification; bank branches; access to finance; SMEs; firm growth

JEL CLASSIFICATION

G21; D25; O16

I. Introduction

Bank desertification refers to the loss of physical access to brick-and-mortar financial services, typically defined as the absence of a branch within a set distance from the population centre (Amberg and Becker 2024). This reduces face-to-face intermediation and relationship lending by disrupting soft information flows and increasing information asymmetries (Berger and Udell 2006; Liberti and Petersen 2019). While digital technologies and AI may mitigate some frictions, evidence on their ability to substitute for traditional lending relationships remains mixed (Brown and Rocha 2020; Gambacorta, Sabatini, and Schiaffi 2025).

We study the closure of the last remaining bank branch in a municipality, and its effects on local firm growth using Italian municipal data. Italy combines high bank dependence (89% versus an 82% EU average) with a 35% contraction in its branch network between 2015 and 2024, leaving 42.8% of municipalities classified as bank deserts (Bank of Italy 2025; Equita 2025).

Our contribution is threefold. First, rather than examining branch closures broadly, we focus on the 'extreme' case of bank desertification and its effects on local firm performance (Cardamone and Trivieri 2024). Second, by addressing the endogeneity of closures, i.e. banks typically exit areas already in economic decline (Nguyen 2019), we assess whether the complete loss of physical banking services alters local economic dynamics. Third, drawing on evidence on digital finance and AI (Yuan, Li, and Zhang 2023), we test whether this substitution holds in the Italian context.

To our knowledge, this is the first study to analyse bank desertification and its effects on SMEs' growth at municipal level. We employ a difference-in-differences (DiD) methodology that exploits the staggered timing of desertification occurrences complemented by an event-study design showing dynamic leads and lags around desertification. Our robust results show that bank desertification predicts weaker firm growth, consistent with an exogenous shock to local credit conditions, rather than a response to pre-existing decline. Finally, our results suggest that digital channels do not fully substitute for physical banking access.

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II. Data and methodology

We construct a panel dataset of ~7,800 Italian municipalities (2015–2021) using proprietary data on bank branch locations (Federcasse) and municipality-level data on the number of registered firms (InfoCamere), complemented by publicly available socio-economic variables (Table 1).

To address potential selection bias from non-random bank desertification, we employ propensity score matching (PSM) to construct a comparable control group (Heckman, Ichimura, and Todd 1998). The propensity score is the probability that municipality i experiences bank desertification, given pre-treatment characteristics:

$$p(X_i) = Pr(Bank\ desertification_i = 1|X_i) \quad (1)$$

Bank desertification is a dummy equal to one if the municipality loses its last bank branch; the covariates (X_is) include geographic, socio-demographic, economic, and public-service quality characteristics. Matching is done yearly, comparing treated municipalities only with controls that have not yet experienced desertification using a k-nearest-neighbour algorithm (K = 3). Table 2 reports the descriptive statistics for our sample, showing differences between treated and control municipalities.

We then estimate a staggered DiD model that exploits the timing of bank desertification events across municipalities. To examine heterogeneity in the impact of bank desertification, we also interact the treatment effect with time-varying municipal characteristics as follows:

$$Y_{i,t} = \alpha + \beta(Treat_i \times Post_t) + \varphi Z_{it} + \theta(Treat_i \times Post_t \times Z_{it}) + \gamma_i + \delta_t + \varepsilon_{i,t} \quad (2)$$

where $Y_{i,t}$ is the firm growth rate; *Treat* identifies municipalities that experience bank desertification; *Post* indicates post-desertification periods; Z_{it} is three dimensions of local resilience to the loss of

Table 1. List of variables.

Variables	Description	Data Source
Banking system		
Bank desertification	Dummy equal to 1 if the municipality experienced bank desertification; 0 otherwise.	Federcasse
Access to Broadband	Dummy equal to 1 if VDSL subscriptions per household in the province are at or above the 75th percentile; 0 otherwise.	ISTAT
Firm characteristics		
Firm size	Ratio of total employees to the number of firms in the municipality.	InfoCamere
Δ Local Firms	Growth rate of firms operating in the municipality.	InfoCamere
Innovative firm share	Ratio of innovative firms to the number of firms in the municipality	Eurostat-OECD
Structural municipalities characteristics		
Small town	Dummy variable equal to 1 if the municipality has fewer than 5,000 inhabitants; 0 otherwise.	ISTAT
Altitude	Natural logarithm of the municipality's altitude above sea level (in metres).	ISTAT
Education	University graduates per 1,000 inhabitants at municipality level.	MUR / ISTAT
Income	Natural logarithm of the average municipal income.	MEF
Area	Land area per capita (km^2).	ISTAT
Δ Population[#]	Population growth rate of the municipality.	ISTAT
Waste collection	Percentage of waste separately collected for recycling within the municipality.	ISPRA
*Crime**	Natural logarithm of the number of muggings and robberies.	ISTAT
*GDP**	Natural logarithm of real GDP per capita.	ISTAT

Notes: [#] Percentage value; * At the province level.

Table 2. Descriptive statistics.

	Full sample			Treated			Control		
Variable	N	Mean	SD	N	Mean	SD	N	Mean	SD
Bank desertification	46,800	0.017	0.130	4,854	0.167	0.373	41,946	0.000	0.000
Small town	46,800	0.637	0.481	4,854	0.774	0.418	41,946	0.621	0.485
Altitude	46,800	5.324	1.316	4,854	5.608	1.001	41,946	5.291	1.345
Education	46,800	4.375	2.400	4,854	4.431	2.419	41,946	4.368	2.399
Income	46,800	9.786	0.233	4,854	9.766	0.229	41,946	9.788	0.233
Area	46,800	20.382	31.027	4,854	19.409	24.754	41,946	20.495	31.672
Δ Population	46,800	−0.695	1.506	4,854	−0.838	1.475	41,946	−0.679	1.509
Waste collection	46,800	0.594	0.213	4,854	0.586	0.209	41,946	0.595	0.213
Crime	46,800	3.192	0.794	4,854	3.208	0.805	41,946	3.190	0.793
GDP	46,800	10.064	0.286	4,854	10.034	0.270	41,946	10.067	0.287

Notes: See notes to Table 1.

physical banking: average firm size, innovative firm share, and broadband access; γ_i and δ_t are municipality and year fixed effects, respectively, and $\varepsilon_{i,t}$ is the error term. To address staggered treatment timing and imbalanced treatment and control groups, we also implement an event-study design and employ DiD estimators robust to heterogenous treatment effects and imbalanced treated and control groups (Callaway and Sant'anna 2021). Further details are provided Online Appendix 1.

III. Empirical results

To assess covariate balance, we first carried out a matching procedure. Table 3 shows that it achieves good balance, supporting the comparability of treated and control municipalities in the DiD analysis.

Our main estimates are reported in Table 4, which includes interaction terms capturing heterogeneity in the impact of bank desertification across different local contexts. The DiD approach yields robust estimates under the par-

Table 3. Balance test.

		Mean			Balance Test	Significance
Covariates	Match	Treated	Control	% Avg Bias	% Reduction Avg Bias	(*p*-value)
Small town	U	0.773	0.621	33.8		0.000
	M	0.774	0.780	−1.4	95.9	0.966
Altitude	U	5.609	5.291	26.8		0.058
	M	5.611	5.609	0.2	99.3	0.390
Education	U	4.538	4.457	2.6		0.000
	M	4.522	4.434	3.5	−34.6	0.626
Income	U	9.776	9.798	−9.6		0.014
	M	9.768	9.764	2.0	79.2	0.558
Area	U	19.625	20.603	−3.8		0.000
	M	19.501	20.082	−2.4	36.8	0.094
Δ Population	U	−0.841	−0.679	−10.7		0.011
	M	−1.000	−0.884	−7.4	30.8	0.525
Waste collection	U	0.598	0.605	−3.6		0.191
	M	0.597	0.591	2.6	27.8	0.982
Crime	U	3.161	3.145	1.8		0.000
	M	3.123	3.122	0.1	94.4	0.844
GDP	U	10.045	10.077	−11.9		0.000
	M	10.036	10.034	0.8	93.3	0.966

Notes: Means are shown for Treated and Control municipalities before (U) and after (M) matching. % Avg Bias is the standardized difference; % Reduction Avg Bias is the percentage reduction in bias.

Table 4. Staggered DiD results.

	Firm growth as dependent variable			
	(1)	(2)	(3)	(4)
Treat × Post	−0.2213**	−0.6687***	−0.6555***	−0.3223**
	(0.108)	(0.240)	(0.235)	(0.136)
Firm size		−0.7561***		
		(0.205)		
Treat × Post ×Firm size		0.2309**		
		(0.107)		
Innovative firm share			0.0711*	
			(0.041)	
Treat × Post ×Innovative firm share			0.0556**	
			(0.027)	
Broadband				−0.0280
				(0.078)
Treat × Post ×Broadband				0.1635
				(0.172)
Constant	−0.1144**	1.3762***	−0.6299**	0.0954*
	(0.050)	(0.408)	(0.299)	(0.050)
Year FE	YES	YES	YES	YES
Municipality FE	YES	YES	YES	YES
Observations	18,612	18,612	18,612	15,510

Notes: Standard errors in parentheses. Robust SEs clustered at municipality level. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

allel trends assumption; the Wald pre-test confirms the validity of this assumption.[1]

Consistent with theory, bank desertification has a negative and statistically significant effect on firm growth. The closure of the last local branch may weaken relationship lending and exacerbate informational frictions, tightening credit constraints, particularly for smaller and more bank-dependent firms (Berger and Udell 2006; Degryse and Ongena 2005). Our findings confirm that municipalities that lose their last bank branch experience lower firm growth than comparable controls, highlighting the continued importance of physical banking infrastructure for local business activity (Nguyen 2019).

In column (1), the *Treat* × *Post* coefficient of −0.2213 implies that branch closures are associated with an average 0.22% point decrease in firm growth post-treatment. This corresponds to approximately 0.07 standard deviations, indicating a modest but non-negligible effect. If sustained annually, it would cumulate to about 1.1 decline over 5 years. Online Appendix 2 offers additional context and pre-treatment statistics (Table A3).

The impact of bank desertification varies with firm size. Municipalities with a greater share of smaller firms – proxied by a lower average number of employees – are more exposed to the loss of local banking services, consistent with their dependence on relationship lending and limited access to alternative finance (Berger & Udell, 1998; Moscalu, Girardone, and Calabrese 2020). In contrast, areas with larger firms are less affected, given their stronger internal resources and diversified funding options (Berger and Udell 2006; Rahaman 2011). Innovation-driven firms appear to be more resilient, potentially relying more on alternative sources of finance – such as self-financing, venture capital, private equity, and innovation grants – and greater managerial sophistication. The positive role of the local share of innovative firms further suggests that innovation-oriented systems support stronger firm dynamics regardless of banking access conditions (e.g. Brown and Rocha 2020).

Conversely, while digital infrastructure may facilitate access to alternative financial channels, the interaction term is not statistically significant, indicating that broadband availability alone is not sufficient to offset the effects of branch closures. Yet, broadband access is an imperfect proxy for the actual use of digital financial services, and we do not directly observe firms' financing sources or credit conditions. Therefore, the absence of a significant effect may reflect measurement limitations rather than a true lack of substitutability More generally, our findings are consistent with the idea that digital channels may not fully replicate all functions of physical bank presence, particularly with respect to the relational dimension that is important for building trust and exchanging information in bank–firm relationships. This interpretation is consistent with evidence showing that digital interaction alone does not fully resolve informational frictions in financing relationships, especially for small and opaque firms (Brown and Rocha 2020).

Given the staggered nature of treatment and the potential endogeneity of branch closures, to further strengthen our analysis, we run an event study specification showing leads and lags around desertification. Results are reported in Tables A1-A2 and Figures A1-A2 of the online supplementary material with detailed explanations. A placebo test is also implemented to further assess the validity of our identification strategy (Table A4 in Appendix 3). Overall, these analyses confirm the robustness of our main results.

IV. Conclusions

This paper investigates how bank desertification affects firm growth in Italian municipalities. It finds that the closure of the last bank branches significantly reduces firm growth, confirming the importance of local banking relationships. The impact is smaller for larger or more innovative firms, reflecting their greater access to alternative financing. Digital lending (proxied by broadband availability) does not offset the loss of physical banking, though this lack of significant effect may reflect measurement issues. This study is limited by municipality-level data that do not separate firm entry, exit and incumbent growth, and by limited availability of detailed

[1]Tests results are available from the authors upon request.

information on credit conditions, financing sources and digital finance use. Future research could combine firm-level longitudinal data, credit registries, and direct indicators of digital financial activity to better identify the underlying mechanisms.

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Author contributions

CRediT: **Carmelo Algeri:** Data curation, Software; **Paola Brighi:** Conceptualization, Formal analysis, Investigation, Methodology, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing; **Claudia Girardone:** Conceptualization, Formal analysis, Investigation, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing; **Valeria Venturelli:** Conceptualization, Formal analysis, Investigation, Methodology, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing.

Disclosure statement

No potential conflict of interest was reported by the author(s).

AI declaration

The content of this article is original and written by the authors. Chatgpt –5mini has been used solely to check grammar and improve readability.

References

Amberg, N., and B. Becker. 2024. "Banking Without Branches (No. 430)." Sveriges Riksbank Working Paper Series.

Bank of Italy. (2025). *Banks and Financial Institutions: Branch Network - Year 2024*. Rome: Bank of Italy.

Berger, A. N., and G. F. Udell. 1998. "The Economics of Small Business Finance: The Roles of Private Equity and Debt Markets in the Financial Growth Cycle." *Journal of Banking and Finance* 22 (6–8): 613–673.

Berger, A. N., and G. F. Udell. 2006. "A More Complete Conceptual Framework for SME Finance." *Journal of Banking and Finance* 30 (11): 2945–2966. https://doi.org/10.1016/j.jbankfin.2006.05.008.

Brown, R., and A. Rocha. 2020. "Entrepreneurial Uncertainty During the COVID-19 Crisis: Mapping the Temporal Dynamics of Entrepreneurial Finance." *Journal of Business Venturing Insights* 14:e00174. https://doi.org/10.1016/j.jbvi.2020.e00174.

Callaway, B., and P. H. Sant'anna. 2021. "Difference-in-Differences with Multiple Time Periods." *Journal of Econometrics* 225 (2): 200–230. https://doi.org/10.1016/j.jeconom.2020.12.001.

Cardamone, P., and F. Trivieri. 2024. "Out of Sight, Out of Mind! Bank Branch Closures and New Firm Creation in Italy." *Regional Studies, Regional Science* 11 (1): 122–152. https://doi.org/10.1080/21681376.2024.2315187.

Degryse, H., and S. Ongena. 2005. "Distance, Lending Relationships, and Competition." *Journal of Finance* 60 (1): 231–266. https://doi.org/10.1111/j.1540-6261.2005.00729.x.

EQUITA. 2025. *Italian Capital Markets Monitor 2024*. Milan: EQUITA. https://www.equita.eu/static/upload/ita/italian-capital-markets-monitor-2024_vf--18022025-.pdf.

Gambacorta, L., F. Sabatini, and S. Schiaffi. 2025. "Artificial Intelligence and Relationship Lending." *Working Papers (Temi di Discussione)*, No 1476. Rome: Bank of Italy. https://doi.org/10.32057/0.TD.2025.1476.

Heckman, J. J., H. Ichimura, and P. Todd. 1998. "Matching as an Econometric Evaluation Estimator." *Review of Economic Studies* 65 (2): 261–294. https://doi.org/10.1111/1467-937X.00044.

Liberti, J. M., and M. A. Petersen. 2019. "Information: Hard and Soft." *The Review of Corporate Finance Studies* 8 (1): 1–41. https://doi.org/10.1093/rcfs/cfy009.

Moscalu, M., C. Girardone, and R. Calabrese. 2020. "SMEs' Growth Under Financing Constraints and Banking Markets Integration in the Euro Area." *Journal of Small Business Management* 58 (4): 707–746. https://doi.org/10.1080/00472778.2019.1668722.

Nguyen, H. L. Q. 2019. "Are Credit Markets Still Local? Evidence from Bank Branch Closings." *American Economic Journal: Applied Economics* 11 (1): 1–32. https://doi.org/10.1257/app.20170543.

Rahaman, M. M. 2011. "Access to Financing and Firm Growth." *Journal of Banking and Finance* 35 (3): 709–723. https://doi.org/10.1016/j.jbankfin.2010.09.005.

Yuan, K., W. Li, and W. Zhang. 2023. "Your Next Bank is Not Necessarily a Bank: FinTech Expansion and Bank Branch Closures." *Economics Letters* 222:110948. https://doi.org/10.1016/j.econlet.2022.110948.