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Mutual Spatial Proximity, Organized Crime, and the Profitability of High-Growth Startups: The Case of Italian Gazelle Enterprises

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Abstract

This study applies a spatial regression model to panel data to investigate the impact of spatial proximity between Italian high-growth startups, termed Gazelles, on their Return on Assets (ROA). The model incorporates a spatially lagged dependent variable to capture the influence of neighboring firms' performance. Furthermore, we examine the association between perceived crime levels in the provinces where these startups operate and their profitability. Our results show that operating profitability is positively associated with mutual geographic proximity among Gazelles, whereas it is negatively affected by elevated perceptions of local crime. These findings are relevant for entrepreneurs, incubators, and accelerators seeking to identify contextual factors that may enhance or impede firm performance. They also have significant implications for policymakers aiming to design strategies that foster positive externalities and mitigate detrimental externalities in entrepreneurial ecosystems.

Keywords: Organized crime; Spatial proximity of enterprises; Performance of high-growth startups; Gazelle enterprises. Startups.

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1. Introduction

This paper presents the preliminary results of an ongoing broader research project conducted by the University of Messina, the University "Mediterranea" of Reggio Calabria, and the University "Dante Alighieri" of Reggio Calabria as part of the PRIN-PNRR 2022 project titled "The effect of organized crime on firm technical efficiency and R&D investments".

This paper examines the effects of organized crime conditioning on a specific type of enterprise: high-growth startups, known as gazelle enterprises. Since the performance of these firms relies on innovation and R&D investment to sustain high growth, this study also addresses another objective of the broader research. It is part of exploring the negative impact of organized crime on firms' willingness to invest in R&D. This work contributes to various fields of literature, including those focused on startups, the advantages firms gain from spillovers arising from close business proximity, and the dynamics between organized crime and firm profitability.

To address the literature gaps, this study aims to answer the following research questions:

RQ1) Is there a spatial dependence between the performance of gazelle firms regarding profitability, measured by return on assets (ROA), thus demonstrating a) that the context has a similar positive or negative impact on the financial performance of these high-growth startups, and b) that Gazelles located near each other benefit from their mutual interaction?

RQ2) Does a contextual factor such as crime adversely affect the profitability of Gazelles?

The topic interests startup founders and incubators or accelerators as they seek to understand the contextual factors that foster or threaten their performance. It also holds significant implications for policymakers focused on designing and implementing policies to promote positive externalities and mitigate negative ones.

This work has significant theoretical implications, providing insights into designing and implementing information systems for performance control and management. It primarily emphasizes the integration of risk management systems – explicitly addressing criminal infiltration and default risk – within corporate information systems aimed at performance control and management. This topic is particularly relevant for Gazelle startups, which experience rapid growth rates.

Whether in their startup phase or subsequent life cycle, fast-growing companies are susceptible to significant risks, including infiltration by organized crime, mainly due to their urgent need for financing arising from rapid

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growth. This accelerated growth heightens the financial demands on these startups, potentially leading to high levels of indebtedness and worsening economic and insolvency risks.

While this work does not explore these noteworthy implications in depth, it recognizes the need for further research to comprehensively examine the design and implementation of management control systems, including performance monitoring and risk assessment, particularly risks associated with criminal infiltration and default.

2. Literature review

The context presents companies with both advantages and threats. One advantage is proximity to other enterprises, while organized crime poses a source of negative externalities. This paper emphasizes these externalities, explicitly focusing on high-growth startups, thereby addressing a gap in the literature. High-growth enterprises (HGEs) and high-growth startups (Daunfeldt and Halvarsson, 2015) play a crucial role in generating new net jobs (Acs and Mueller, 2008; Van Praag and Versloot, 2008) and fostering innovation and growth in the economy (McKelvie et al., 2018; Daunfeldt et al., 2015). Despite their significance, research on HGEs is limited, with few articles addressing Gazelle startups. In Italy, studies examining Gazelles are scarce, especially those that analyze these companies within the Italian context (Cattafi et al., 2024; Cattafi et al., 2023; Nicolò and Valenza, 2019). In addition to the lack of specific studies, we chose to examine Gazelle companies because they are more sensitive to the context in which they operate than other startups. First, high-growth companies require substantial resources to sustain their growth (Fritsch, 2013; Audretsch and Dohse, 2007; Garnsey and Smith, 1998). Furthermore, their rapid expansion makes Gazelle startups more vulnerable to attracting the interest of organized crime than other young companies, which typically face challenges in their early stages.

Literature has highlighted for decades how companies tend to cluster near others in the same sector or in interdependent sectors to capitalize on:

- Specialization economies, also known as Marshall-Arrow-Romer externalities, arise from the scale of activity in specific industries within regions or geographical areas (Arrow, 1962; Romer, 1986).
- Transactions within the same supply chain swiftly engage skilled and knowledgeable personnel while diminishing transaction costs, including distance-dependent expenses like transport and logistics costs (Langlois, 1992).

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- The availability of non-traded inputs, information, and knowledge flows (Krugman, 1991), including knowledge and R&D spillovers (Audretsch, 1995; Acs et al., 1992), as well as learning-by-interacting (Bathelt, 2010), contributes to innovation. These factors drive the emergence of high-tech business clusters in a particular region (Crevoiser, 2004; Camagni, 1993).

Studies show that companies located within clusters tend to outperform their peers in growth, innovation (Gilbert et al., 2008), and profitability, particularly smaller businesses that rely on external sources of knowledge (Caseiro and Coelho, 2019). While scholars have analyzed the effects of geographic proximity to other firms and agglomeration (clusters and industrial districts) on firm performance, no study has examined this relationship concerning startups and high-growth startups.

Startups also gain from being close to other startups. For instance, the closeness of startups within clusters produces the following advantages:

- The greater availability of resources (Delgado et al., 2010; Gilbert et al., 2006; Porter, 2000), such as skilled technicians (Gerlach et al., 2009; Fallick et al., 2006; Chandler and Hanks, 1994), financial resources (Saxenian, 1994), venture capital (Marullo et al., 2018; Baum and Silverman, 2004), as well as relationships (Becattini, 2004), and partnerships with other companies (Lechner and Dowling, 2003).
- Knowledge (Barboza and Capocchi, 2020) and technology spillovers (Kerr and Kominers, 2015; Cavallo et al., 2020) facilitate knowledge pooling and cross-fertilization, resulting in new patents (Li et al., 2019). Distance affects the cost of knowledge transfer (Harhoff, 2000).
- The reputation of the business cluster enhances the development of corporate reputation and, indirectly, the survival and growth of startups located within the cluster that operate in its specialization or in interdependent sectors (Bruna and Nicolò, 2020; Brush et al., 2001).

While spatial proximity between firms is a contextual factor that positively impacts their performance, organized crime negatively affects firms' performance. Before reviewing the literature on the influence of organized crime on legitimate firms, we recall some definitions of organized crime that clarify the characteristics of the phenomenon we studied, the illegal activities it carries out, and the effects it produces on the economy and businesses.

United Nations (2004) defines an organized criminal group as: “A structured group of three or more persons, existing for a period of time and acting in concert with the aim of committing one or more serious crimes or offences established in accordance with this Convention, to obtain, directly or indirectly, financial or other material benefits.” Various definitions of organized crime have been provided in the literature. The definitions show that these

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criminal groups carry out illegal activities to obtain material gains through extreme violence and corruption of public officials, including law enforcement and judicial officers. Literature indicates that companies involved in organized crime gain a competitive advantage over legal businesses by distorting market rules and competition. This advantage is achieved through various means: paying lower wages, evading taxes (Albanese and Marinelli, 2013), and disregarding environmental and security regulations (La Spina and Lo Forte, 2006). Other practices include extortion (Detotto and Otranto, 2010; Konrad and Skaperdas, 1997), money laundering, and corruption, which help control markets and territories, secure public contracts, and shield established companies from new competitors (Calamunci, 2022; Mirenda et al., 2022; Ganau and Rodríguez-Pose, 2018; Savona and Berlusconi, 2015; Chircop et al., 2023; Bandiera, 2003). Organized crime protects infiltrated firms from competition posed by legal firms and enables them to obtain public contracts (Ravenda et al., 2020; Calamunci, 2022; Di Cataldo and Mastrorocco, 2022; Fenizia, 2018; Gambetta, 1993). Legal firms are often compelled to source inputs from suppliers collaborating with criminal organizations (Albanese and Marinelli, 2013) or to pay criminal organizations to continue their operations (Ganau and Rodriguez-Pose, 2017; Daniele and Marani, 2011). Scholars have proposed multiple definitions of organized crime to capture the multidimensional aspects of this complex phenomenon resulting from the multiplicity of activities carried out and the administrative and governance structures (Von Lampe, 2016; Kleemans, 2014; Porteous, 1998).

Cincimino et al. (2024) provide a comprehensive and updated literature review on the relationship between crime and firm performance.

Startups struggle in regions with weak legal protections (Luo et al., 2021). Organized crime adversely affects firms' willingness to invest in innovation and R&D (Forgione and Migliardo, 2023). Therefore, it is reasonable to conclude that Gazelles, whose growth and performance heavily rely on investments in innovation and R&D, are significantly harmed by the presence of organized crime in their operations area.

To estimate the impact of organized crime on the profitability of Gazelle, we examine the moderation of a composite index known as the "rule of law," proposed by Nifo and Vecchione (2014). This indicator summarizes provincial-level data related to property crimes, reported crimes, trial durations, magistrate productivity, the underground economy, and tax evasion. It is part of the composite indicator of institutional quality (IQI) at the provincial level. The "rule of law" is widely used in scientific research and practice to capture the intensity of organized crime in any context arising from the bal-

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ance of power between state institutions to uphold the rule of law and criminal entities. All else being equal, the more effective the state's response in ensuring compliance with the law, the lesser the impact of crime on the community, businesses, and public administration, and vice versa.

We propose the following two hypotheses:

HP1) Proximity to other Gazelles enhances the operating profitability of these high-growth startups, as mutual proximity generates spillovers.

HP2) A high perception of crime in the areas where Gazelles are situated negatively impacts their operating profitability.

The literature does not unanimously agree that organized crime always negatively affects business profitability and survival. Few studies have explored the potential positive effects of organized crime on enterprises, as most research considers it a significant source of harm to the economy, markets, businesses (Cincimino et al., 2024), and society. Crime in a territory can sometimes offer certain "advantages" to some companies, particularly in the startup phase. These advantages may include easier access to financing, expedited bureaucratic processes, and reduced competition. This phenomenon is called "proximity propagandistic criminal welfare" (La Rosa and Bernini, 2023). Le Moglie and Sorrenti (2017) identified positive "in sign" economic effects stemming from organized crime. Specifically, they found that mafia investments in the legal economy act as an economic stabilizer and a form of social insurance, helping alleviate impacts of economic downturns. Their research examined labor market spillovers induced by the presence of criminal organizations and revealed a significant effect on employment rates. However, this effect varies considerably depending on the size of the local informal labor market. Additionally, some studies suggest that regions with a high prevalence of organized crime have weathered financial crises more effectively, even in new business formation. This evidence from the literature challenges the assumption in Hypothesis 2 of this study, which suggests that the effects on the profitability of Gazelles startups are primarily adverse.

3. Sampling techniques, data collection, research method

We analyzed a sample of new Italian firms founded in 2014 that achieved gazelle status in either 2018 or 2019, representing a five-year cohort from 2014 to 2019. To collect the necessary data, we relied on the Aida Bureau Van Dijk database, which contains the financial statements of Italian companies. We considered the 2014-19 cohort of gazelles because their results were not negatively affected by the effects of COVID-19 on the economy.

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Therefore, if we had chosen a later cohort, we would have inevitably distorted the measurement of the impact on operating profitability of high-growth startups' mutual spatial proximity and the intensity of organized crime's presence in the context in which they are located. At least three balance sheets would have fallen within the period of the most significant impact of COVID-19, i.e., 2020, 2021, and 2022.

The sample was selected using the size and growth thresholds outlined in the following definition of Gazelle enterprises from the Eurostat-OECD Manual on Business Demography Statistics (Eurostat-OECD, 2008), which defines Gazelles as: "*All enterprises up to 5 years with an average annualized growth of more than 20% per annum over a three-year period… Growth can be measured by the number of employees or by turnover."* The Eurostat-OECD Manual recommends a minimum size threshold of 10 employees at the start of the three-year growth period to prevent the growth of small businesses from distorting the results. This threshold excludes marginal firms. By adopting this definition, our study's findings are comparable to the existing literature, as it is the commonly accepted definition among scholars (Daunfeldt et al., 2015; Coad et al., 2014; Audretsch, 2012).

We classified our sample according to the two-digit NACE Rev2 classification. We excluded companies classified as "K" Financial and Insurance Activities (64-66) and "O" Public Administration and Defense, and Mandatory Social Security (84). These categories' unique balance sheet patterns made meaningful comparisons with companies in other industries impossible. Finally, cooperatives and consortia were excluded from the sample because they are non-profit organizations. This choice was made to ensure significance in analyzing Gazelle's profitability. The final dataset contained 1,144 companies and 6,864 observations for the sample period.

This study applies a spatial panel data regression model to investigate the effect of spatial proximity on Return on Assets (ROA), operating profit or loss before taxes, and extraordinary items as a measure of Gazelle's operating profitability. This model is widely used by the scientific literature on PMI (Fitzsimmons et al., 2005) and HGE (Steffens et al., 2009; Audretsch, 1995).

The model incorporates a spatially lagged dependent variable that accounts for the influence of neighboring entities' performance on each firm's ROA. Spatial relationships were represented using an Inverse Distance Matrix with row normalization.

Model Specification:

The general form of the spatial panel regression model is as follows:

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$$ROA_{it} = \alpha + \beta' X_{it} + \rho WROA_{it} + u_i + \varepsilon_{it}$$

Where:

X_{it} is the vector of independent variables, including firm-specific characteristics such as size, leverage, and the presence of organized crime, among others.

W is the spatial weights matrix that captures the influence of neighboring firms' ROA on the ROA of firm ii.

W Spatial weights matrix (effect of neighboring firms' ROA

Our methodology employs an inverse distance matrix with row normalization to model the spatial relationships among entities based on the geographical distance (d_{ij}). In this matrix, spatial weights are assigned inversely proportional to the distance between entities, ensuring closer entities exert a more significant influence on one another than those farther away. Specifically, the elements of the matrix are computed as follows:

$$W_{ij} = \begin{cases} \frac{1}{d_{ij}} if\ d_{ij} \leq\ 10\ km \\ 0\ \ if\ d_{ij} >\ 10\ km \end{cases}$$

This specification permits the modeling of the diminishing influence of firms as the distance between them increases, with interactions beyond 10 km deemed negligible. Spatial econometric methods to capture these local spatial interactions adhere to standard practices outlined in the literature (Anselin, 2024; LeSage and Pace, 2009).

ρ is the spatial autoregressive coefficient. The parameter ρ quantifies the extent of spatial dependence in the Regional Output Approach, offering insight into how a firm's performance is impacted by its neighboring entities. A positive and statistically significant value of ρ suggests that spatial spillovers are present, as high-performing firms tend to be close to others.

ε_{it} is the error term.

The error term ϵ captures the unobserved time-varying disturbances in the model.

u_i is the Random effect specific to firm *i*

The random effects u_i are firm-specific and account for unobserved heterogeneity, which might bias the results if left unaddressed. This allows for a more accurate estimation of the spatial and non-spatial effects (Baltagi et al., 2005).

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The spatial panel data model, which considers both random effects and spatial lags, presents a comprehensive approach to examining the impact of geographical proximity on firms' financial performance. This model can provide robust insights into the spatial dynamics of firm behavior by controlling for firm-specific heterogeneity and spatial dependence, as demonstrated by Elhorst (2014).

The determinants of Gazelle's profitability

This study focuses on the relationship between operating profitability in terms of ROA and spatial proximity of Gazelles (agglomeration).

The independent variables

- Size: the natural logarithm of the number of employees and the natural logarithm of the total assets and their squares (Eklund, 2020; Audretsch et al., 1999).
- The intangibles to total assets ratio is the proportion of a company's intangibles on total assets.
- Human capital (Becker and Huselid, 2006; Colombo and Grilli, 2005; Cooper et al., 1994) is measured using the following two ratios: value-added/total employee cost and total labor costs/number of employees (Cattafi et al., 2023; Garcìa-Ayuso et al., 2000; Pulic, 2000).
- Geographical areas populated by Gazelles: we used the ratio of Gazelles born in 2014 per 1,000 inhabitants residing in each province and its square since location determines firm growth (Audretsch and Dohse, 2007).
- Liquidity: the liquidity ratio (current assets divided by short-term liabilities) and its square are proxies for slack in available financial resources (Carnes et al., 2019; Bradley et al., 2011; George, 2005). We also consider the potential slack of financial resources using the leverage (debt/equity) ratio (George, 2005).
- Financial risk: the long-term debt/ to total assets ratio has also been used.
- Industry (from A to S).
- Rule of law, as a proxy for crimes against the person and property, tax evasion, the spread of undeclared work, and the efficiency of the judiciary in each province where the Gazelles are located (Nifo and Vecchione, 2014).
- Citizens' spending capacity is assessed by calculating the logarithm of the per capita income tax (Audretsch and Dohse, 2007).
- Year dummies.

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4. Results

Table 1 highlights how Gazelles' operating profitability is positively affected by mutual proximity and negatively affected by their perception of crime in the context in which they are located.

This study is ongoing and part of a larger research project. In the following steps, we will analyze how Gazelles' proximity and perception of crime in their location affect their technical efficiency and growth.

We are interested in studying these effects on Gazelle firms' performance because these high-growth startups' success in terms of profitability, growth, and efficiency largely relies on their investments in research and development (R&D) and innovation. Once this research is finished, the findings will contribute to a larger research project examining the impact of organized crime on firms' performance and their proclivity to invest in R&D and innovation.

Table 1 - Spatial Model for ROA

	(1)	(2)	(3)	(4)
log employees	1.3998***	1.3999***	1.4015***	1.4009***
	(0.177)	(0.177)	(0.177)	(0.177)
intangibles/total asset	-11.6657***	-11.6652***	-11.6420***	-11.6231***
	(2.390)	(2.390)	(2.389)	(2.389)
intangibles/total asset^2	13.8692***	13.9037***	13.8558***	13.8300***
	(3.679)	(3.679)	(3.678)	(3.677)
leverage	-0.0514***	-0.0515***	-0.0514***	-0.0515***
	(0.008)	(0.008)	(0.008)	(0.008)
unit labor cost	0.0204***	0.0204***	0.0205***	0.0205***
	(0.005)	(0.005)	(0.005)	(0.005)
current ratio	7.6272***	7.6330***	7.6273***	7.6319***
	(0.374)	(0.374)	(0.374)	(0.374)
current ratio^2	-0.8589***	-0.8592***	-0.8592***	-0.8599***
	(0.054)	(0.054)	(0.054)	(0.054)
log total asset	4.1221***	4.1288***	4.1254***	4.1207***
	(0.380)	(0.380)	(0.380)	(0.380)
Log tot asset^2	-0.3625***	-0.3630***	-0.3627***	-0.3624***
	(0.028)	(0.028)	(0.028)	(0.028)
log labor productivity	3.5150***	3.5163***	3.5177***	3.5161***
	(0.160)	(0.160)	(0.160)	(0.160)
Log added value	7.5557***	7.5509***	7.5502***	7.5466***
	(2.067)	(2.068)	(2.068)	(2.067)

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Longdebt /total asset	-14.8981***	-14.9195***	-14.9046***	-14.9192***
	(1.107)	(1.107)	(1.107)	(1.107)
Longdebt /total asset^2	3.9655***	3.9711***	3.9682***	3.9698***
	(0.825)	(0.825)	(0.825)	(0.825)
Rule of law	-1.8565*	-1.8709*	-1.9223*	-1.9152*
	(1.085)	(1.084)	(1.082)	(1.082)
Log irpef per capita	-0.0905	-0.0686	-0.0146	0.0094
	(1.003)	(1.002)	(1.001)	(1.002)
density of Gazelles	646.4102**	649.0430**	646.9811**	645.8993**
	(313.386)	(313.218)	(313.145)	(313.273)
density of Gazelles^2	-22416.5301**	-22468.0863**	-22405.7756**	-22354.0831**
	(9974.164)	(9969.309)	(9966.926)	(9971.177)
Value added to total employed cost	0.0299***	0.0299***	0.0297***	0.0298***
	(0.007)	(0.007)	(0.007)	(0.007)
Value added to total employed cost^2	-0.0000***	-0.0000***	-0.0000***	-0.0000***
	(0.000)	(0.000)	(0.000)	(0.000)
A	4.3433***	4.3371***	4.3418***	4.3427***
	(1.599)	(1.598)	(1.597)	(1.598)
B	-2.8164	-2.7889	-2.7903	-2.9172
	(3.478)	(3.477)	(3.476)	(3.478)
D	-6.0818**	-6.0698**	-6.0565**	-6.0633**
	(2.725)	(2.724)	(2.724)	(2.725)
E	1.0956	1.1092	1.1110	1.1020
	(2.039)	(2.039)	(2.038)	(2.039)
F	0.8352	0.8231	0.8360	0.8334
	(0.610)	(0.609)	(0.609)	(0.609)
G	-2.3435***	-2.3336***	-2.3378***	-2.3532***
	(0.615)	(0.615)	(0.615)	(0.615)
H	0.5416	0.5475	0.5529	0.5408
	(0.745)	(0.745)	(0.745)	(0.745)
I	1.4084**	1.4078**	1.4214**	1.4091**
	(0.631)	(0.631)	(0.631)	(0.631)
J	-0.7210	-0.7208	-0.7160	-0.7274
	(0.969)	(0.968)	(0.968)	(0.969)
L	-1.4305	-1.4035	-1.3948	-1.3986
	(2.296)	(2.295)	(2.294)	(2.295)
M	0.2917	0.2973	0.3109	0.3115
	(0.922)	(0.922)	(0.922)	(0.922)

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N	1.4600*	1.4585*	1.4688*	1.4609*
	(0.769)	(0.769)	(0.768)	(0.769)
P	-2.6794	-2.6584	-2.6680	-2.6695
	(1.943)	(1.942)	(1.942)	(1.943)
Q	-1.2592	-1.2591	-1.2450	-1.2412
	(1.515)	(1.515)	(1.514)	(1.515)
R	1.4622	1.4535	1.4742	1.4651
	(1.470)	(1.470)	(1.469)	(1.470)
S	2.3679	2.3855	2.4239	2.4334
	(1.847)	(1.847)	(1.847)	(1.847)
yeard2	1.7202***	1.7041***	1.6817***	1.6611***
	(0.386)	(0.387)	(0.388)	(0.388)
yeard3	2.3069***	2.2863***	2.2559***	2.2308***
	(0.415)	(0.416)	(0.417)	(0.418)
yeard4	2.1582***	2.1348***	2.1043***	2.0769***
	(0.433)	(0.434)	(0.435)	(0.436)
yeard5	2.2814***	2.2566***	2.2276***	2.1996***
	(0.447)	(0.449)	(0.450)	(0.451)
yeard6	1.1052**	1.0843**	1.0597**	1.0362**
	(0.454)	(0.455)	(0.456)	(0.457)
Constant	-87.6083***	-87.8439***	-88.3388***	-88.5315***
	(20.257)	(20.254)	(20.251)	(20.252)
ρ				
ROA	0.0232*	0.0247*	0.0279*	0.0330**
	(0.014)	(0.014)	(0.014)	(0.015)
sigma_u				
_cons	5.0346***	5.0319***	5.0300***	5.0336***
	(0.153)	(0.152)	(0.152)	(0.152)
sigma_e				
_cons	7.8670***	7.8672***	7.8670***	7.8653***
	(0.074)	(0.074)	(0.074)	(0.074)
r2	0.2954	0.2952	0.2954	0.2952

*Standard errors in parentheses, * p < 0.1, ** p < 0.05, *** p < 0.01. N° of firms 1144, N of obs. 6864. (1) five Km, (2) ten Km, (3) fifteen Km, (4) twenty Km.*

The empirical findings of this study provide significant insights into the interaction between spatial dynamics, organized crime, and the operational

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profitability of high-growth startups, referred to as Gazelles. Thus, the assumption that mutual spatial proximity enhances profitability is supported. The spatial autoregressive coefficient (ρ) exhibited a statistically significant positive effect ($p < 0.05$) across all models, reinforcing the concept that clustering facilitates knowledge spillovers, resource sharing, and collaborative advantages. These results are consistent with agglomeration theory, which posits that geographic concentration reduces transaction costs and enhances access to specialized inputs such as skilled labor and venture capital. However, the quadratic term for Gazelle density reveals a complex relationship: while moderate clustering enhances ROA, excessive density may lead to competitive saturation, resulting in diminishing marginal returns. This highlights the importance of balanced ecosystem development for startups. The influence of organized crime demonstrates a negative correlation with profitability, although the statistical significance of this relationship is relatively weak, which aligns with the existing literature that emphasizes the externalities of crime, such as extortion risks, market distortions, and institutional distrust. However, this marginal significance warrants caution. This may be attributed to the indirect nature of the "rule of law" proxy, which measures institutional efficacy rather than direct criminal activity. For example, the indicator reflects judicial efficiency and tax compliance but does not account for localized mafia infiltration or extortion incidents. Furthermore, the influence of organized crime may operate through latent mechanisms, such as restricted access to legitimate financing or diminished incentives for innovation, which the current model does not fully disentangle. The other variables further contextualize the performance of the Gazelle firms. High leverage ratios determine a significant negative correlation with return on assets (ROA), underscoring the financial vulnerabilities associated with rapid scaling. Liquidity, as measured by the current ratio, exhibits a curvilinear relationship: Moderate liquidity enhances agility, whereas excessive reserves may indicate underutilized assets. Labor productivity is a crucial determinant of profitability, highlighting the importance of human capital in maintaining high-growth trajectories. Collectively, these findings underscore the multifaceted determinants of startup success, wherein both contextual and internal factors play decisive roles.

4. Conclusions, limitations, and future directions for research

This study demonstrates that mutual spatial proximity positively impacts the operational profitability of Gazelle startups, as measured by Return on

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Assets (ROA). In contrast, the perceived level of organized crime in the provinces where these firms operate negatively affects their profitability. These findings address a gap in the existing scientific literature.

To conduct this research, we selected 1,144 Italian firms that were founded in 2014 and achieved Gazelle status in 2018 or 2019, i.e. the 2014-19 cohort whose financial statements were not negatively affected by COVID-19, following the OECD Eurostat definition of Gazelle enterprises, which is widely recognized in academic studies. We employed a spatial regression model on panel data to analyze the relationship between spatial proximity and the ROA of these high-growth startups. The model included a spatially lagged dependent variable to consider the influence of neighboring firms' performance on each firm's ROA. We represented spatial relationships using an inverse distance matrix, which we normalized by row.

To evaluate the influence of perceived organized crime levels on the operational profitability of high-growth startups in these provinces, we utilized the composite indicator "rule of law" as defined by Nifo and Vecchione (2014), which is also commonly referenced in the literature. This indicator indirectly measures the relative intensity of the effects of organized crime in each context as the result of two opposing forces: that of criminal groups and that of the police and the judiciary that operate to prevent and combat the mafia and crime in general, ensuring the rule of law. The impact of crime on the community is indirectly reflected in the effectiveness of the State in applying the rule of law: as the latter increases, the intensity of the presence of organized crime and the effects of its activity decreases. In other words, this indicator indirectly represents the intensity of the actions of the mafia on companies, public administration, and the community. In another study of ours, currently underway, we are estimating the effects on the ROA and technical efficiency of gazelles, we are using a composite indicator that measures the intensity of the presence of organized crime at the municipal level (Forgione and Migliardo, 2025). In detail, this CI is based on eight crimes typically committed by organized crime syndicates: mafia association, mafia attack, arson, extortion, mafia murder, attempted mafia murder, money laundering, and usury. This CI estimate also considers the number of clans in the area, the number of seizures of businesses and properties, and the number of times the city council has been dissolved due to mafia infiltration. One of its main advantages is the comparison of the intensity of mafia presence in different contexts. Overall, this CI was estimated based on 12 elementary indicators, sized for the population of the municipality.

The analysis revealed that the operational profitability of Gazelle startups is positively influenced by their mutual proximity, while negatively impacted

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by the perception of crime in their surrounding environment. This topic is particularly relevant for entrepreneurs, startup incubators, and accelerators who want to understand the contextual factors that can enhance or impede their performance. Additionally, it has significant implications for policymakers focused on developing and implementing strategies to promote positive externalities while addressing negative ones.

This study presents some limitations. First, we focused exclusively on ROA (Return on Assets) as the sole performance-related variable to assess the robustness of our findings. While ROA is a widely recognized metric in studies examining firm performance, particularly for small businesses such as startups and young enterprises, excluding other performance indicators may limit the scope of our analysis. To address this, ongoing research expands the framework by incorporating additional dependent variables, including technical efficiency and growth metrics, such as employee count and revenue.

Another limitation of this study is its reliance on a single, indirect indicator to measure the intensity of the presence of organized crime in the context. We have already mentioned this in another of our ongoing works; to overcome this limitation, we are testing the developed composite indicator of crime perception. This improvement aims to provide a more complete understanding of the impact of crime perception within the model. It is expected that these developments will address the current limitations and improve the results of the study.

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Table A1 - Correlation matrix

	ROA	log em-ployees	intangi-bles/to-tal asset	leverage	unit la-bor cost	current ratio	Log tot asset	log la-bor produc-tivity	Log ad-ded value	Long-debt /total asset	Rule of law _	Log ir-pef per capita	density of Ga-zelles	Value added to total em-ployed cost
ROA	1													
log employees	0.1195	1												
intangi-bles/total asset	-0.2663	-0.093	1											
leverage	-0.1624	0.1221	-0.0008	1										
unit labor cost	0.0577	0.1668	-0.0472	0.0067	1									
current ra-tio	0.1909	-0.103	-0.1828	-0.1865	0.0169	1								
log total asset	0.0215	0.6118	-0.0009	0.1464	0.4127	-0.062	1							
log labor producti-vity	0.1954	-0.0456	-0.1067	0.0324	-0.0196	-0.0898	0.2717	1						
Log added value	0.0868	0.0475	-0.0063	0.0034	0.1565	0.0234	0.0685	0.0728	1					

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Longdebt /total asset	-0.2019	0.0198	0.1827	0.0701	-0.0251	0.126	0.1185	-0.0726	-0.0048	1				
Rule of law	-0.03	0.0756	0.0241	0.0225	0.1439	-0.0154	0.1634	0.0001	0.0018	0.0305	1			
Log irpef per capita	-0.0501	0.0829	0.1836	-0.0195	0.1619	-0.0104	0.1544	0.0011	0.0095	0.0114	0.2785	1		
density of Gazelles	0.0019	0.0084	0.0567	-0.0126	-0.0254	0.0054	-0.018	0.0258	0.0058	-0.0363	-0.4725	0.3113	1	
Value added to total employed cost	0.052	-0.0027	-0.0243	-0.0033	-0.0156	-0.0041	-0.0107	0.139	0.0085	-0.0233	0.0109	-0.0015	-0.0085	1

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Table A2 - Descriptive statistics

Variable	Obs	Mean	Std.	Min	Max
ROA	6864	5.370983	11.1237	-23.55	28.41
log employees	6864	2.798948	1.034648	0	8.104099
intangibles/total asset	6864	0.083709	0.1396071	0	0.9604774
leverage	6864	13.67571	16.69319	-2.35	64.73
unit labor cost	6864	24.12566	26.69838	0	1382.029
current ratio	6864	1.255207	0.8763557	0	9.77
log total asset	6864	6.605443	1.639959	0.0953102	14.19656
log labor productivity	6864	1.567642	0.8578333	0	9.832021
Log added value	6864	8.401595	0.0504389	4.333454	8.768266
Longdebt /total asset	6864	0.0989236	0.1766159	0	2.859772
Rule of law	6864	0.4933222	0.217298	0.0097037	1
Log irpef per capita	6864	9.909989	0.2341325	9.169288	10.5551
density of Gazelles	6864	0.0151527	0.0047113	0.0042765	0.0225104
Value added to total employed cost	6864	1.639011	18.79684	-628.1	1178.375

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