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KEYWORDS

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Discussion Paper Series

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Discussion paper n. 34/2025

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The Mafia Influence in the Business Context: Infiltration of Criminal Firms in the Public Procurement Market

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Abstract

This study sheds light on the complex dynamics surrounding Mafia-related firms in the context of public procurements. We focus on the Italian setting as it explicitly addresses Mafia-related crimes within the penal code. We find that criminal firms are more likely to win public procurement auctions than their non-criminal counterparts. We run a battery of tests and find that winning criminal firms exhibit distinctions from their peers, particularly in size and investment patterns. Winner criminal firms tend to participate in auctions with lower value than their non-winner counterparts. Also, we implement a propensity score matching technique to analyze Mafia and non-Mafia related firms, and the results hold. Lastly, we consider the geographical location of the public buyer, and we find that Mafia-related firms are more likely to be awarded with procurement contracts in those regions highly infiltrated by criminal organizations. Our study contributes to the literature on the impact of criminal characteristics in the allocation of public funds.

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1. Introduction

Powerful and well-organized criminal networks constitute a global challenge, exerting negative effects on community well-being (Riccardi and Maggioni, 2024). Empirical research has shown that these organizations restrict economic growth (Eboli et al., 2021), disrupt the competitive dynamics of economic markets (Bianchi et al., 2022; Chircop et al., 2023), and intensify political corruption (Buscaglia & van Dijk, 2003; Gounev & Bezlov, 2010). These detrimental effects are particularly pronounced in regions where criminality is deeply established within local systems, often operating by corruption, favoritism, and conflicts of interest (Ravenda et al., 2020). Such dynamics prevail in regions with a long-standing historical presence of criminal organizations, such as the Mafia in southern Italy (Fontana & d'Agostino, 2024). Therefore, this study seeks to investigate the extent to which Mafia-related firms infiltrate public financial resources.

Italian Mafia organizations infiltrate the legal economy and are no longer a hidden phenomenon (Dagnes et al., 2020; Sciarrone & Storti, 2014). To do so, Mafia organizations use legitimate companies (Chircop et al., 2023; Riccardi & Maggioni, 2024) to control markets and establish collusive relationships with relevant people, such as politicians and entrepreneurs (Dagnes et al., 2020). Recently, an European investigation of Mafia activities and tax evasion led to the seizure of 520 million euros, while the Italian financial police (e.g., Guardia di Finanza) uncovered 1.3 billion euros in false invoices issued by Mafia-related firms between 2020 and 2023 (Reuters, 2024). In fact, mafia-related companies can acquire goods and services at prices below market value, and through intimidation and violence, they also attract more customers and generate higher sales revenues (Bianchi et al., 2022; Ravenda et al., 2020). Furthermore, the effect of Mafia-related firms also extend to their competitors (Chircop et al., 2023). The authors

find that Mafia-related firms delay economic development in their operating regions and provide evidence that tax avoidance among non-criminal peers within the same industry is diminished after removing a Mafia-related firm from the market. Furthermore, the study of Bianchi et al. (2022) shows that Mafia-related firms have access to a lower cost of debt and shorter operating cycles, which might be consistent with their use of intimidation to gain market power. However, the limited scholarly attention to Mafia-related firm often overlooks the mechanisms through which these firms acquire the financial resources to do their business. We attempt to fill this gap in the literature by drawing on legitimacy theory to examine how Mafia-affiliated firms manage to secure financial resources through the public procurement system.

Public procurements represent a critical financial resource that governments use to support businesses (Baltrunaite et al., 2021). For example, in the OECD-EU countries, public procurement spending increased from 13.7% of GDP in 2019 to 14.9% in 2020 in response to the Covid-19 pandemic (OECD, 2023). In addition to their economic role, local governments use public procurements to pursue long-term objectives such as sustainability and innovation.

However, the public procurement system is particularly vulnerable to corruption due to the participation of multiple stakeholders (Ravenda et al., 2020). Considering that one of the long-term objectives of local governments is to support businesses, if corruption occurs, direct social costs are reflected in the misallocation or waste of public financial resources (Ravenda et al., 2020). In this context, public procurements present a significant opportunity for Mafia-related firms not only secure financial stability but also pursue non-financial goals, such as gaining legitimacy to operate within a specific territory. Therefore, we investigate the infiltration of Mafia-related firms into the public procurement system in Italy as a mechanism to acquire financial resources.

The Italian setting is characterized by its unique legal framework, which provides the

definition of Mafia-related association crimes at article 416-bis of its Penal Code (Fontana & d'Agostino, 2024). Furthermore, following a conviction for Mafia-related offenses, an investigation is initiated to determine the nature and extent of the assets of the convicted individual (Fabrizi & Parbonetti, 2021). These measures aim to trace illicit financial gains linked to Mafiosi, highlighting the significance of controlling the flow of financial resources within these criminal networks. Particularly, if an individual with Mafia connections owns a company, that company may be subject to confiscation as part of an investigation into all assets linked to illegal activities associated with Mafia organizations. Consequently, this allows for the identification of Mafia affiliates and their associated companies.

The sample selection process involves data collection from multiple sources. We begin by using the database provided by Chircop et al. (2023) to identify Mafia-related firms, based on judicial documents that specify convicted individuals. We then obtain procurement and participant data from the National Anti-Corruption Authority (ANAC). By matching the fiscal code across both datasets, we identify Mafia-related firms involved in public procurement auctions. Finally, we gather financial and accounting data for both Mafia-related and non-Mafia-related firms from Aida, provided by Bureau van Dijk (BvD). Our final sample covers from 2012 to 2020 and includes 3,374,192 participant-procurement-year observations.

Our findings reveal that Mafia-related firms are more likely to succeed in public procurement competitions than their non-criminal counterparts. To mitigate concerns regarding endogeneity, we employ a propensity score matching (PSM) technique, and the results remain robust. Additionally, Mafia-related winners tend to be larger, invest more in intangible assets, and maintain higher cash reserves compared to their non-winning counterparts. We also find that this difference is more pronounced in regions with historically higher levels of criminal infiltration (e.g., Calabria, Campania, and Sicily).

These findings suggest that Mafia-related firms not only have a greater likelihood of securing public contracts, but also exhibit distinctive financial characteristics that may provide them with a strategic advantage in procurement markets. According to legitimacy theory, these results might indicate that in regions with deeper criminal networks, Mafia-related firms may gain social acceptance and credibility, allowing them to exploit the procurement system more effectively and secure resources that would otherwise be difficult to obtain.

This study offers several contributions. First, it advances the understanding of criminal networks in economic contexts (Bianchi et al., 2022; Chircop et al., 2023; Ravenda et al., 2020) by providing evidence that Mafia-related companies secure financial resources. Our findings show that these companies are more likely to win public procurement contracts compared to their non-criminal counterparts. In this respect, Chircop et al. (2023) highlight that the participation of criminal firms in the market increases costs for non-criminal competitors. Our study expands on this by demonstrating that the involvement of Mafia-related firms in public procurement processes intro- duces significant inefficiencies that, in turn, lead to a misallocation of public financial resources.

Second, we contribute to this literature by comparing winning and non-winning Mafia-related firms. Our findings highlight significant differences between these two groups in terms of size, investment in intangible assets, and cash reserves. Moreover, these differences are more pronounced in regions historically characterized by higher levels of criminal infiltration. Identifying these disparities provides deeper insights into the financial and strategic behaviors of Mafia-related firms in public procurement markets and their ability to secure resources to sustain their operations.

Finally, this study has important implications for local governments and policy-makers, as it underscores the risks associated with Mafia-related firms securing public procurement

contracts. The ability of these firms to obtain public funds represents not only an economic distortion but also a broader social cost. Beyond financial gains, Mafia-related firms leverage public contracts to consolidate their influence and establish a facade of legitimacy within the public sector. This, in turn, can erode trust in government institutions and compromise the fairness and efficiency of procurement systems. Addressing these challenges requires stronger oversight mechanisms and targeted policy interventions to mitigate the risks posed by criminal infiltration in public procurement.

The paper is structured as follows. Section 2 reviews the relevant literature and outlines the development of hypotheses. Section 3 presents the research design, while Section 4 reports the empirical results. Section 5 discusses the additional analyses, and Section 6 provides the concluding remarks.

2. Literature review and hypotheses development

2.1. Mafia-related firms

Building on existing research in this field (Champeyrache, 2004; Chircop et al., 2023; Gambetta, 1993), we define criminal firms as Mafia-related entities that function within a legal framework despite their illicit activities (Chircop et al., 2023; Gambetta, 1993). These firms formally participate in the market, yet their financial resources often originate from illegal activities. More precisely, they are legally registered companies under the direct control of at least one Mafioso (Chircop et al., 2023; Champeyrache, 2004). This dual nature allows criminal and non-criminal firms to co-exist within the same eco- nomic environment. However, infiltration of Mafia-related companies and the broader presence of illicit financial flows distort market competition (Chircop et al., 2023) and hinder economic development, contributing to an

estimated 16% decline in per capita GDP over the past three decades (Pinotti, 2015).

According to institutional theory (Signor et al., 2020), normative monitoring is reduced when organizations align with societal expectations and gain the necessary support consensus to operate. In the case of Mafia-related organizations, they can achieve this alignment by strategically distributing both financial and non-financial resources, thereby offering jobs and opportunities to local communities in regions that are characterized by significant socio-economic underdevelopment. This approach allows Mafia-related organizations to build social relationships within the city, particularly with political figures and local communities, further enhancing their legitimacy and influence (Sciarrone, 1998; Signor et al., 2020).

Yahagi (2018) provide evidence that criminal firms often leverage violence and intimidation to negotiate favorable terms, attract more clients, and report higher operating revenues compared to their non-criminal counterparts. Despite the initial increase in sales revenues achieved through these illicit channels, the cumulative effect on their overall performance remains negative, as their operating efficiency tends to be lower than that of non-criminal firms. Therefore, Mafia-related firms seem to experience short-term financial gains, but their long-term operational effectiveness seem to be undermined by their reliance on criminal activities.

Furthermore, prior research shows that Mafia-related firms tend to infiltrate specific industries (Barone & Narciso, 2015), particularly those characterized by high cash reserves, labor-intensive operations, minimal technological requirements, and a predominance of small and medium-sized enterprises (SMEs), which play a crucial role for the economy of most countries of the European Union (Arlacchi, 2010; Signor et al., 2020). In addition, Mafia infiltration is found to be more common in regions with weak governance structures, where Mafiosi can exert influence over political actors to secure favorable conditions and strengthen their market position

(Gambetta, 1993; Sciarrone & Storti, 2014). In this context, a typical example is represented by the Southern Italy (Chircop et al., 2023).

Moreover, criminal firms exhibit a heightened propensity for tax avoidance behaviors, such as manipulating operating profit and evading legally mandated employee payments as evidence of criminal firms' non-compliancy with government regulations (Chircop et al., 2023; Yahagi, 2018). As Chircop et al. (2023) demonstrate, the removal of a Mafia-related firm from a given industry leads to a significant shift in the behavior of non-criminal firms within the same sector. Specifically, these firms are observed to reduce their tax avoidance practices, indicating that the presence of Mafia-related firms has a significant impact on shaping the financial conduct of legitimate firms. In this context, the presence of Mafia-related firms in the market distorts the economic environment and makes it harder for legitimate firms to operate.

2.2.Mafia-related firms and public procurements market

Public procurement system represents approximately 13% of the GDP of OECD countries, with individual countries typically allocating around one third of their total expenditure to it (Baltrunaite et al., 2021). Beyond its economic significance, public procurements serve two key functions. First, it supports corporate growth by providing firms with financial resources. Second, it operates as a policy instrument to advance long-term objectives, such as fostering innovation and promoting sustainability (Ravenda et al., 2018). From the perspective of legitimacy theory (Gabbioneta et al., 2013; Signor et al., 2020), public procurement auctions create an opportunity for Mafia-affiliated firms to gain access to legal financial resources, which in turn sustain their operations. By securing government contracts, these firms not only increase their revenues but also acquire a degree of legal recognition, reinforcing their ability to operate within the formal economy. This process enables criminal enterprises to expand their influence,

accumulate wealth, and strengthen their social and territorial control (Sciarrone, 1998; Sciarrone & Storti, 2014; Signor et al., 2020).

The existing literature shows that firms infiltrated by Mafia members engage in money laundering through mechanisms such as illicit trafficking and earnings management (Ravenda et al., 2018). However, these firms also leverage legitimate financial resources to sustain their operations. For instance, Barone and Narciso (2015) document a positive association between Mafia-related firms and public funding, providing evidence that government efforts to support local economies may benefit these firms in underdeveloped regions. As a result, public procurement contracts may represent a significant source of revenue for Mafia-affiliated firms. Therefore, by integrating illicit funds into legitimate business operations, these firms can obscure the origins of their wealth while maintaining financial stability. Despite the potential incentives for Mafia-related firms to secure public procurement contracts, legal safeguards are in place to deter their participation. Under the Italian Code of Public Contracts (ex art. 91 D. Lgs. 159/2011 and ex art. 84 co. 2 D. Lgs. 159/2011), firms undergo preliminary screening to identify links to criminal organizations. Additionally, multiple government bodies oversee the procurement process to ensure transparency and prevent Mafia infiltration. Empirical evidence suggests that such regulatory measures contribute to the integrity of local economies by restricting the allocation of public resources to Mafia-related firms (Baraldi, 2004; Daniele & Dipoppa, 2017; Fontana & d'Agostino, 2024; Slutzky & Zeume, 2024). Consequently, the ability of criminal firms to infiltrate certain sectors may be constrained, allowing more financially stable and solvent non-Mafia-related firms to participate and secure public procurement contracts. This, in turn, implies that Mafia-related firms may not necessarily be the most competitive bidders in public procurement auctions.

Given the above discussion, if monitoring government actions are effective, we should

observe that Mafia-related firms are less likely to secure public procurement contracts. Otherwise, if Mafia-related firms may still hold competitive advantages compared to their non-Mafia counterparts, enabling them to submit more competitive bids in procurement auctions (Bianchi et al., 2022; Chircop et al., 2023; Yahagi, 2018). Mafia-related firms may also resort to coercion, including violence and intimidation, to secure contracts (Bianchi et al., 2022; Ravenda et al., 2020). Therefore, if competitive advantages or illicit practices prevail over regulatory enforcement, we should observe that Mafia-related firms are more likely to win public procurement contracts. Based on this premise, we propose the following non-directional hypothesis:

H_{1a}: If government monitoring actions are effective, Mafia-related firms are less likely to win public procurement contracts.

H_{1b}: If Mafia-related firms hold competitive advantages over their non-Mafia counterparts or engage in illicit practices such as coercion and intimidation, they are more likely to win public procurement contracts.

Criminal organizations do not necessarily infiltrate legitimate companies solely to secure public procurement contracts. Prior research indicates that only firms with specific characteristics are more likely to be targeted for infiltration (Barone & Narciso, 2015; Gambetta, 1993; Ravenda et al., 2020). If the primary motivation for infiltration were to obtain public resources, we would expect Mafia-related firms to consistently win procurement contracts by targeting companies with a higher probability of success. This would imply that Mafia-related firms always possess an economic advantage, enabling them to submit the most competitive bids. However, if criminal organizations infiltrate firms for reasons beyond winning public contracts - such as money laundering, territorial control, or access to other strategic resources - not all Mafia-related firms would necessarily be well-positioned to secure these contracts. Consequently, we should expect

to observe systematic differences between Mafia-related firms that win public procurement contracts and those that do not. Therefore, we hypothesize that:

H_2: Winning Mafia-related firms exhibit distinct characteristics compared to their non-winning counterparts in public procurement contracts.

3. Research design

3.1. Data and sample selection

We collected public procurement data from the Italian National Anti-Corruption Agency (ANAC) database. Each procurement contract is uniquely identified with a number named Codice identificativo di gara (CIG). Based on this identifier, we collect information on each participant, therefore including winning and non-winning firms. Given that firms can participate in multiple public procurement auctions within a single year, we set the sample at the participant-public procurement-year level.

Then, we rely on the updated database of Chircop et al. (2023) to identify Mafia-related firms and we merge the two datasets. Finally, we obtain financial data from AIDA database which is provided by Bureau van Dijk (BvD) that covers only Italian firms.

The sample selection process starts from 4,950,237 participant-public procurement-year observations and includes 869,496 individual CIGs. We exclude those CIG with no winner (1,508,450) and those with duplicate data (49,388). We also discard observations with missing information related to the registered office region (650) and procurement information (6). We also exclude participant-procurement-year observations with missing accounting and financial data (17,550). Therefore, the final sample consists of 3,374,192 participant-procurement-year observations from 2012 to 2020 and includes 737,934 unique procurement competitions.

[Insert Table 1 about here]

3.2. Regression model and variable definitions

We use a probit regression model to test our hypothesis (H_1), as reported below:

$$Win_{k,i,t} = \beta_0 + \beta_1 Criminal_i + \beta_2 Size_{i,t-1} + \beta_3 Fix_{i,t-1} + \beta_4 Intfix_{i,t-1} + \beta_5 Lev_{i,t-1} + \beta_6 Cash_{i,t-1} + \beta_7 Roa_{i,t-1} + \beta_8 Value_{i,t} + \beta_9 N\_Wini_{,t} + \beta_{10} Industry\ FE + \beta_{11} Year\ FE + \beta_{12} Region\ FE + \varepsilon_t \quad (1)$$

The dependent variable *Win* is a dummy variable equal to 1 if a contract (k) at time (t) is awarded to a company (i), and 0 otherwise. The independent variable of interest, *Criminal*, is a dummy variable equal to 1 if the company is classified as Mafia-related, and 0 otherwise. We also include a set of control variables at both company and procurement levels. Accounting variables are recorded for the fiscal year preceding participation in public procurement auctions, as firms must meet accounting requirements from prior years to be eligible for the awarding procedures. *Size* is measured as the logarithm of total assets, and *ROA* is the ratio between operating profit and total assets. We also control for the investment level of tangible (*Fix*) and intangible (*Intfix*) assets. Specifically, *Fix* is the ratio between tangible and total assets, while *Intfix* is the ratio between intangible and total assets. *Lev* represents leverage, calculated as the ratio of total debts to total assets, and *Cash* is the ratio of cash and cash equivalents to total assets. We include the total number of public procurements won (*N_win*) by each company per year, and *Value* is the natural logarithm of the value of each procurement contract. Finally, we controlled for industry, year, and region-fixed effects.

4. Results

4.1. Univariate results and correlation matrix

Table 2 shows descriptive statistics of the variables used in the main analyses. The sample includes 3,374,192 participant-procurement-year observations, representing 105,063 unique firms that participated in 737,934 different procurement competitions. Of the participating companies, 23.40% secured a public procurement contract and 6,686 firms were identified as connected to the Mafia.

[Insert Table 2 about here]

The average values for tangible and intangible investments are 0.115 and 0.038, respectively, indicating that firms in our sample allocate 11.50% of their total assets to tangible investments, while only 3.80% is invested in intangible assets. The average firm size (*Size*) and average leverage ratio (*Lev*) are 9.171 and 0.693, respectively. On average, firms in our sample hold 9.90% of their total assets in cash and cash equivalents. Finally, the average winning company in our sample has a natural logarithm value of 4.935 for the maximum number of public procurement contracts won each year (*N win*), with an average contract value of 11.542.

Table 3 reports the correlation coefficients between the variables, highlighting the positive influence of specific firm characteristics on the likelihood of winning public procurement contracts. *Winner* shows a positive correlation with *Size* (r=0.098), indicating that larger firms are more likely to secure public procurement contracts. In contrast, *Winner* is negatively correlated with *Value* (r=-0.192), suggesting that firms winning contracts tend to be awarded lower-value contracts. This might suggest that larger firms, which are more likely to win contracts, may focus on smaller contracts for various strategic reasons, such as resource allocation. *Criminal* is also positively correlated with *Lev* (r=0.025) and negatively the number of winning public

procurements (-0.023), suggesting that criminal firms may have higher leverage and lower chances to win several public procurements as it might be suggested that government monitoring mechanism is working effectively. Furthermore, *Intfix* is positively correlated with *N_win* (r=0.086), suggesting that firms with higher investments in intangible assets tend to win more procurement contracts, potentially indicating their focus on innovative or intangible assets that may be valued in public procurement auctions.

In addition, the number of procurement contracts won (*N_win*) is positively correlated with *Winner* (r=0.138), *Size* (r=0.752), and *Roa* (r=0.113), suggesting that firms that win more contracts tend to be larger and more profitable. This might suggest that larger and more financially stable firms are more competitive in the public procurement market. All these coefficients are significant at least at the 5% level. None of the correlation coefficients exceeds 0.80, which aligns with the recommendation of Gujarati and Porter (2009) that bivariate correlations below this threshold generally do not cause multicollinearity issues.

[Insert Table 3 about here]

4.2.Multivariate results

Table 4 presents the probit regression results (Column 1) and the propensity score matching (PSM) technique (Column 2) estimating the likelihood of Mafia-related firms of winning public procurement contracts. The coefficient of the main independent variable, *Criminal*, is positive and statistically significant with the likelihood of winning a public procurement contract (0.153, *p-value* < 0.01), supporting H_1 and suggesting that Mafia-related firms are more likely to infiltrate in public procurement market than their non-Mafia-related counterparts.

The control variables *Size*, *Lev*, *Vaue* and *Intfix* are negatively and statistically significant associated with the likelihood of being awarded public procurements (*p-value* < 0.01). This

suggests that larger firms, firms with higher debt-levels and those with lower investments in intangible assets are less likely to secure public procurement contracts and smaller value public procurement contracts awarded.

In contrast, *Fix*, *Cash*, and *Roa* are positively and significantly associated with public procurements success (*p-value* < 0.01), indicating that Mafia-related firms with greater liquidity, stronger performance and higher investments in tangible assets are more likely to win public procurement contracts.

In addition, we compute the variance inflation factor (VIF) to assess the potential for multicollinearity concerns, and following Gujarati and Porter's (2009) benchmark, the VIF value to be considered is below 10. Therefore, based on these checks, our results are not expected to suffer from multicollinearity problems.

[Insert Table 4 about here]

Furthermore, we implement a Propensity Score Matching (PSM) technique to mitigate concerns related to potential selection bias. This method allows us to create a treated sample of Mafia-related firms and a matched control sample of non-Mafia-related firms. Our unit of analysis is at the participant–procurement level, meaning that the same Mafia-related or non-Mafia-related firm may appear multiple times within a given year, as firms can participate in—and be awarded—multiple procurement contracts. To focus on differences across firms rather than across procurements, we perform the PSM on a reduced dataset containing a single observation per firm-year. We then export the matched sample back to the full procurement-level dataset.

Our results show that *Criminal* is positive and statistically significant at the 1% level,

suggesting that Mafia-related firms seem to be more likely to win public procurements. These findings hold the results presented in Column (1) and provide empirical evidence to support our H_1, limiting the selection bias concerns.

Furthermore, smaller Mafia-related firms tend to obtain public procurement contracts with relatively low economic values. Overall, our findings suggest that a difference among Mafia-related and non-Mafia-related firms exists in securing public procurement market.

Accordingly, we test our second hypothesis to investigate which accounting characteristics are most strongly associated with the success of Mafia-related firms in securing public contracts, relative to non-winning firms. We employ a battery of t-tests to analyse these characteristics, as reported in Table 5.

[Insert Table 5 about here]

Winning Mafia-related firms appear to be larger than their non-winning counterparts, with a statistically significant size difference of -1.36 (p-value < 0.01). This suggests that larger firms may hold a competitive advantage in public procurement markets, potentially due to greater organizational capacity, more experience navigating bureaucratic procedures, or stronger relational networks (Bianchi *et al.*, 2022; Chircop *et al.*, 2023). While investment in tangible assets is similar across the two groups, winning firms allocate significantly more resources to intangible assets. The observed difference of 0.08 is statistically significant, pointing to a potentially distinct strategic orientation in resource allocation. Moreover, winning Mafia-related firms exhibit significantly lower cash reserves and tend to secure smaller public contracts. Finally, no significant differences are observed between winners and non-winners in terms of leverage (*Lev*) or performance (*Roa*). Taken together, these findings highlight meaningful structural and financial differences between winning and non-winning Mafia-related firms that

are associated with success in public procurement markets.

5. Additional analysis

5.1. The territorial distribution of Mafia-related firms

Mafia-related organizations began to emerge in the late 1880s (Paoli, 2004), with some of the most prominent groups including the Sicilian Mafia (Sicily), the Camorra (Campania), and the 'Ndrangheta (Calabria) (Bianchi *et al.*, 2022). As a result, the presence of Mafia-related activity remains significantly more pervasive in Southern Italy than in Central and Northern regions (Chircop *et al.*, 2023). Building on this historical and geographical concentration, we conduct an additional analysis that considers the location of public buyers to examine whether Mafia-related firms are more likely to be awarded public contracts in regions where criminal organizations are more prone to infiltrate public institutions. In particular, we divide the sample into two subsamples: one comprising the historically Mafia-affected regions (i.e., Calabria, Campania, and Sicily), and the other covering regions with no strong historical Mafia presence. The results are summarized in Table 6.

Column (1) reports the results for historically Mafia-affected regions, while Column (2) presents the results for the other Italian regions. Overall, Mafia-related firms remain statistically significant and positively associated with a higher likelihood of infiltrating the public procurement market compared to their non-Mafia counterparts, supporting our main findings. Column (1) shows that the probability of winning a public contract is 39.20% for Mafia-related companies in the historically infiltrated regions, whereas Column (2) reports a probability of 8.90% for firms in the other regions. These findings indicate a substantial difference across regions, suggesting that Mafia-related firms have a significantly greater chance of winning public contracts in historically infiltrated areas compared to others.

[Insert Table 6 about here]

6. Conclusions

This study provides novel evidence on the presence of Mafia-related firms within the public procurement market by analyzing procurement-level data in the Italian context. Using the dataset developed by Chircop *et al.* (2023) to identify Mafia-related firms, we find that such companies are significantly more likely to win public contracts than their non-Mafia-related counterparts.

This study contributes to the literature in three main ways. First, it adds to the body of research examining the infiltration of organized crime on the real economy. The Italian legal framework, which explicitly defines Mafia-related crimes, allows us to specifically isolate the phenomenon of Mafia-related firms, offering a more precise identification strategy. In doing so, we are able to compare Mafia-related firms from their non-Mafia-related counterparts in the specific public procurement contexts. We build on institutional theory (Signor *et al.*, 2020) by showing Mafia-related firms may seek legitimacy through participation in the public procurement market. Our results are consistent with prior studies (Arlacchi, 2010; Bianchi *et al.*, 2022; Signor *et al.*, 2020), which suggest that Mafia-related firms exploit economic opportunities and strategic advantages by leveraging intimidation and violence.

Second, we offer novel insights into the differences between winning and non-winning Mafia-related firms, suggesting that these firms may pursue distinct strategies of infiltration. Specifically, winning Mafia-related firms tend to be larger, invest more heavily in intangible assets, and target smaller procurement contracts. In contrast, no significant differences emerge in terms of tangible asset investment or leverage.

Moreover, we find that Mafia-related firms are significantly more likely to win public

contracts in historically Mafia-infiltrated regions such as Calabria, Campania, and Sicily. This geographic concentration underscores the need for targeted regulatory enforcement and localized anti-crime policies in areas with entrenched criminal presence. Our results highlight the importance of strengthening monitoring systems, particularly in high-risk regions. Enhancing transparency in procurement processes and implementing more rigorous due diligence on participating firms may help mitigate the risk of criminal infiltration.

However, a caveat of this study is that we are unable to establish a causal relationship between Mafia-related firms and success in public procurement market. Our findings document a robust association, but not necessarily a direct causal effect. In addition, due to data limitations, we cannot determine the exact timing of Mafia infiltration, nor can we fully exploit the heterogeneity of procurement contracts in terms of awarding procedures or contract types.

Future research could address these limitations by investigating whether specific procurement designs are more susceptible to criminal infiltration and by conducting longitudinal studies to examine how Mafia influence evolves over time and in response to policy changes.

References

Arlacchi, P. (2010). *La mafia imprenditrice. Dalla Calabria al centro dell'inferno*, Vol- ume 3. Il saggiatore.

Baltrunaite, A., T. Orlando, and G. Rovigatti (2021). The implementation of public works in italy: institutional features and regional characteristics. Technical Report 659, Bank of Italy.

Baraldi, A. L. (2004). An empirical analysis of the causes and consequences of organized crime. *Journal of Economic Behavior & Organization 55* (2), 123–145.

Barone, G. and G. Narciso (2015). Organized crime and business subsidies: Where does the money go? *Journal of Urban Economics 86*, 98–110.

Bianchi, P. A., A. Marra, D. Masciandaro, and N. Pecchiari (2022). Organized crime and firms' financial statements: Evidence from criminal investigations in italy. *The Accounting Review 97* (3), 77–106.

Buscaglia, E. and J. van Dijk (2003, December). Controlling organized crime and corruption in the public sector. *Forum on Crime and Society 3* (1/2).

Champeyrache, C. (2004). Property and accumulation by the mafia: Theoretical and practical stakes of the infiltration of mafiosi within legitimate business. *Economie Appliquee 57* (2), 79–104.

Chircop, J., M. Fabrizi, P. Malaspina, and A. Parbonetti (2023). Anti-mafia police actions, criminal firms, and peer firm tax avoidance. *Journal of Accounting Re- search 61* (1), 243–277.

Dagnes, J., D. Donatiello, V. Moiso, D. Pellegrino, R. Sciarrone, and L. Storti (2020).

Mafia infiltration, public administration and local institutions: a comparative study in northern italy. *European Journal of Criminology 17* (5), 540–562.

Daniele, V. and G. Dipoppa (2017). Mafia, elections and violence against politicians. *Journal of Public Economics 154*, 10–33.

Eboli, M., A. Toto, and A. Ziruolo (2021). Mafia infiltrations in italian municipalities: two statistical indicators. *Applied Economics 53* (24), 2693–2712.

Fabrizi, M. and A. Parbonetti (2021). The economic consequences of criminal firms. Presented at the 2019 Global Issues in Accounting Conference at Chicago Booth. Available at SSRN: https://ssrn.com/abstract=3444839 or http://dx.doi.org/ 10.2139/ssrn.3444839.

Fontana, S. and G. d'Agostino (2024). Anti-mafia policies and public goods in italy. *Public Choice 198* (3/4), 493–529.

Gabbioneta, C., R. Greenwood, P. Mazzola, and M. Minoja (2013). The influence of the institutional context on corporate illegality. *Accounting, Organizations and Society 38* (6-7), 484–504.

Gambetta, D. (1993). *The Sicilian Mafia*. Cambridge, Mass.

Gounev, P. and T. Bezlov (2010). *Examining the Links Between Organised Crime and Corruption*. European Commission: Centre for the Study of Democracy (Project 1 EOOD).

Gujarati, D. N., & Porter, D. C. (2009). Basic econometrics. McGraw-Hill Irwin.

OECD (2023). Size of public procurement. Available at: https://www. oecd-ilibrary.org/sites/18dc0c2d-n/index.html?itemId=/content/ component/18dc0c2d-en.

Paoli, L. 2004. Italian organized crime: Mafia associations and criminal enterprises. Global Crime 6 (1): 19–31. https://doi.org/10.1080/1744057042000297954.

Pinotti, P. (2015). The economic costs of organised crime: Evidence from southern italy. *The Economic Journal 125* (586), F203–F232.

Ravenda, D., M. G. Giuranno, M. M. Valencia-Silva, J. M. Argiles-Bosch, and J. Garc´ıa-Blando´n (2020). The effects of mafia infiltration on public procurement performance. *European Journal of Political Economy 64*, 101923.

Ravenda, D., M. M. Valencia-Silva, J. M. Argiles-Bosch, and J. Garcia-Blandon (2018). Accrual management as an indication of money laundering through legally registered mafia firms in Italy. *Accounting, Auditing & Accountability Journal 31* (1), 286–317.

Reuters (2024). Police arrest 43, seize 520 million euros in europe-wide probe into mafia and tax evasion. Accessed: 2024-11-14.

Riccardi, M. and M. A. Maggioni (2024). Bricks or cooks? geographical and social determinants of the investment choices of mafia-type organized crime. *Criminology & Criminal Justice*, 1–29.

Sciarrone, R. (1998). Il capitale sociale della mafia. relazioni esterne e controllo del territorio. *Quaderni di sociologia* (18), 51–72.

Sciarrone, R. and L. Storti (2014). The territorial expansion of mafia-type organized crime. the case of the italian mafia in germany. *Crime, Law and Social Change 61*, 37–60.

Signor, R., P. E. Love, and L. A. Ika (2020). White collar crime: Unearthing collusion in the procurement of infrastructure projects. *IEEE Transactions on Engineering Management 69* (5), 1932–1943.

Slutzky, P. and S. Zeume (2024). Organized crime and firms: Evidence from antimafia enforcement actions. *Management Science 70* (10), 6569–6596.

Yahagi, K. (2018). Welfare effects of forming a criminal organization. *European Journal of Law and Economics 46*, 359–375.

Tables

Table 1: Sample Selection

Sample Selection Procedure	*Count*
Participant-procurement-year observations, as provided by ANAC	4,950,237
Public procurements with no winner firm	(1,508,450)
Public procurements duplicate data	(49,389)
Missing accounting data	(17,550)
Missing data of registered office region	(650)
Missing procurement data	(6)
Final sample [t = 2012, 2020] [737,934 procurements]	3,374,192

The table summarizes the sample selection process. The first column describes the steps taken to refine the dataset, and the second column provides the corresponding number of observations removed.

Table 2: Descriptive Statistics

Variable	*N*	*Mean*	*Min*	*Median*	*Max*
Winner	3,374,192	0.234	0.0	0.0	1.0
Criminal	3,374,192	0.002	0.0	0.0	1.0
Size	3,374,192	9.174	4.190	8.934	14.501
Fix	3,374,192	0.115	0.0	0.056	0.619
Intfix	3,374,192	0.038	0.0	0.007	0.484
Lev	3,374,192	0.693	0.107	0.736	1.041
Cash	3,374,192	0.099	0.0	0.043	0.641
Roa	3,374,192	0.029	-0.401	0.020	0.271
Value	3,374,192	11.542	4.102	11.805	16.832
N_win	3,374,192	4.935	0.0	4.407	13.379

This table presents descriptive statistics for the main variables used in the analysis. The columns report the number of observations (*N*), mean (*Mean*), minimum (*Min*), median (*Median*), and maximum (*Max*) values for each variable.

Table 3: Correlation Matrix

	Winner	*Criminal*	*Size*	*Fix*	*Intfix*	*Lev*	*Cash*	*Roa*	*Value*	*N_win*
Winner	1									
Criminal	0.004	1								
Size	0.098***	-0.003	1							
Fix	0.041***	0.011	-0.072***	1						
Intfix	0.020***	-0.010	0.145***	-0.085***	1					
Lev	-0.012	0.025**	-0.242***	-0.031***	-0.056***	1				
Cash	-0.011	-0.004	-0.269***	-0.122***	-0.092***	-0.182***	1			
Roa	0.026**	-0.009	0.138***	-0.025**	-0.086***	-0.350***	0.132***	1		
Value	-0.192***	0.017	-0.097***	0.006	-0.050**	0.103***	0.010	-0.031**	1	
N_win	0.138***	-0.023**	0.752***	-0.155***	0.086***	-0.235***	-0.167***	0.113***	0.218***	1

The table reports the correlation matrix. *p-value < 0.10, **p-value < 0.05, ***p-value < 0.01.

Table 4: Main Analysis.

	(1)	(2)
Variable	*Win*	*Win*
	Probit	PSM
Criminal	0.153***	0.103***
	(0.017)	(0.022)
Size	-0.010***	-0.025***
	(0.001)	(0.007)
Fix	0.386***	0.037
	(0.006)	(0.064)
Intfix	-0.084***	-0.105
	(0.012)	(0.155)
Lev	-0.041***	-0.102
	(0.004)	(0.062)
Cash	0.088***	0.101
	(0.007)	(0.087)
Roa	0.445***	-0.123
	(0.011)	(0.185)
Value	-0.109***	-0.144***
	(0.000)	(0.005)
N_win	0.116***	0.191***
	(0.000)	(0.005)
Constant	0.093	2.126***
	(0.457)	(0.185)
Industry FE	Yes	Yes
Year FE	Yes	Yes
Region FE	Yes	Yes
Observations	3,374,192	35,447
Pseudo R-squared	0.165	0.339

The table describes the association between the probability of being awarded with a procurement contract (*Win*) and the presence of a Mafia-related firm (*Criminal*) participating in the awarding procedure. Robust standard errors in parentheses. For Regression Results, *p-value < 0.10, **p-value < 0.05, ***p-value < 0.01.

Table 5 – Characteristics of winner and non-winner Mafia-related firms.

Variable	*Winner*	*Non-Winner*	*Difference*
Size	9.980	8.620	-1.36***
Fix	0.020	0.020	0.00
Intfix	0.210	0.130	-0.08***
Lev	0.810	0.820	0.01
Cash	0.060	0.100	0.04***
Roa	0.010	0.010	0.00
Value	11.340	12.880	1.54***

Notes: The table reports the characteristics of winner and non-winner Mafia-related firms based on a set of dimensions. The last column shows the difference in means between winners and non-winners. Significance levels: *p-value < 0.10, **p-value < 0.05, ***p-value < 0.01.

Table 6 – Additional Analysis per geographical area.

	(1) Regions historically infiltrated	(2) Other Regions
Criminal	0.392***	0.086***
	(0.044)	(0.019)
Size	-0.008***	-0.011***
	(0.002)	(0.001)
Fix	0.287***	0.388***
	(0.022)	(0.007)
Intfix	-0.145***	-0.031**
	(0.039)	(0.012)
Lev	0.027*	-0.033***
	(0.014)	(0.005)
Cash	0.092***	0.100***
	(0.021)	(0.007)
Roa	0.416***	0.449***
	(0.036)	(0.012)
Value	-0.080***	-0.111***
	(0.001)	(0.000)
N_win	0.131***	0.118***
	(0.002)	(0.000)
Constant	0.384***	0.177
	(0.071)	(0.458)
Industry FE	Yes	Yes
Year FE	Yes	Yes
Region FE	Yes	Yes
Observations	421,967	2,925,634
Pseudo R-squared	0.231	0.167

*Notes:*The table describes the association between the probability of being awarded with a procurement contract (*Win*) and the presence of a Mafia-related firm (*Criminal*) participating in the awarding procedure based on two subsamples. In Column 1, we report the results from PB located regions historically infiltrated by Mafia (Calabria, Campania, and Sicily). In Column 2, we report the results for the rest of the sample. Robust standard errors in parentheses. *p-value < 0.10, **p-value < 0.05, ***p-value < 0.01.