

# Organized Crime and Firms: Evidence from Italy

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## Abstract

We employ staggered municipality-level anti-mafia enforcement actions over the 1995-2015 period in Italy to study the effect of organized crime on firms. At the municipality level, we find that as the influence of organized crime weakens, competition among firms, innovation activity, and competition for public procurement contracts increase. At the firm level, firms that do not exit in response to anti-mafia enforcement actions shrink in size and experience a decline in employee productivity, as well as a slight reduction in profitability. These results are more pronounced for firms that are treated by multiple anti-mafia enforcement actions, firms founded during the height of mafia activity, and firms that operate in the non-tradable sector. Our findings are consistent with accounts of organized crime members acting as cartel enforcers and using legitimate firms to launder money.

**Keywords:** Organized Crime, Corruption, Competition, Cartel enforcement, Collusion, Money laundering.

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## I. INTRODUCTION

Organized crime affects societies and economic activities across the globe. In Italy, organized crime in the form of the mafia has affected the lives of millions of people across most if not all of the Southern municipalities since the nineteenth century. Mafia-based activities include extortion, racketeering, gambling, prostitution, drug and people trafficking, money laundering, murder, and political influence, among other under-takings (Bandiera 2003; Acemoglu, De Feo, and De Luca 2017; Alesina, Piccolo, and Pinotti 2018).<sup>1</sup> Other organized crime groups influence economic activity in Japan (Yakuza), Hong Kong (Triads), Russia (Russian mafia), South and Latin America (various drug cartels), the United States, and low-income areas within São Paulo, Rio de Janeiro, Soweto, and Durban (Skaperdas 2001). The revenues generated from organized crime activities in 2009 are estimated at \$870 billion, or 1.5% of global GDP (UN Office on Drugs and Crime 2012), and former U.S. Secretary of State John Kerry assessed the five most influential organized crime organizations to represent the third largest business in the world (Kerry 1998).

Organized crime also affects firms. Narratives reveal its role in protecting incumbent firms from new market entrants, using legitimate businesses as a front for laundering money, and allocating public contracts to firms under its protection (Gambetta 1993; Konrad and Skaperdas 2012). At the same time, survey evidence has highlighted the perceived costs of organized crime to firms: Managers in 122 out of 137 countries surveyed perceive organized crime to impose some cost.<sup>2</sup> But despite such narrative and survey evidence, little is known about the net benefits (or

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<sup>1</sup> In this paper, we use the term “mafia” to describe organized crime in Italy in general, irrespective of geographic origin. This term is often used to refer to the Sicilian Mafia in Sicily. Other influential Italian mafia groups include the Camorra in Campania, the “Ndrangheta” in Calabria, and the Sacra Corona Unita in Apulia.

<sup>2</sup> Based on the World Economic Forum’s *Global Competitiveness Report (2017-2018)*. Managers are asked “To what extent does organized crime (mafia-oriented racketeering, extortion) impose costs on businesses?” where 1 indicates huge costs and 7 indicates no costs; 122 out of 137 countries scored below 6, and 27 countries scored below 4. Managers in one out of five countries consider organized crime to impose medium to huge costs.

costs) to firms associated with organized crime.

In this paper, we study how organized crime affects firms. An important empirical challenge in understanding the impact of organized crime on firms is that organized crime is largely unobserved. In order to address this observability problem, we employ a quasi-experimental design that provides us with plausibly exogenous shocks to the power of the mafia. Specifically, we exploit anti-mafia enforcement actions in Italy over the 1995-2015 period to study municipality and firm-level outcomes. These enforcement actions, in which mafia assets are confiscated by the government, reduce the mafia's influence by taking away its economic resources and weakening its reputation.<sup>3</sup>

We derive major hypotheses on the influence of organized crime on firms from the seminal work by Gambetta (1993), Fiorentini and Peltzman (1997), and Dickie (2004). We hypothesize that anti-mafia enforcement actions unwind some of organized crime's effects on firms. First, organized crime enforces cartels, which includes protecting incumbent firms from new entrants and allocating customers to existing firms. For protected firms, this comes at the cost of protection payments and the indirect costs associated with being forced to use potentially inefficient or expensive mafia-protected suppliers. In this function, organized crime is likely associated with reduced competition, which may result in large and potentially inefficient firms (Gambetta 1993). Reduced competition in turn may affect a firm's innovation activities. Since firms that are protected by the mafia do not compete primarily on price or quality, and since organized crime might siphon off the upside to innovation activity, the presence of organized crime might reduce a firm's incentives to innovate (Vives 2008).

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<sup>3</sup> For example, the government seized assets worth € 1.6 billion from a Sicilian family in Palermo on July 8, 2015. (Source: Reuters <https://www.reuters.com/article/uk-italy-mafia/italian-police-seize-1-6-billion-euros-of-assets-in-mafia-bust-idUKKCN0PI0Q820150708>, accessed on January 24, 2019)

A second way in which organized crime affects firms is through its substantial stake in illegal activities, such as drug trafficking, gambling, and prostitution (Ruffolo et al. 2010; Calderoni 2014).<sup>4</sup> In an effort to launder the proceeds from such activities, organized crime may funnel the proceeds through legitimate stores. Money laundering thus inflates firms' revenues and profits, and may help some inefficient firms to survive. Lastly, partly with the help of public officials (Fenizia 2018), organized crime interferes in the allocation of public procurement contracts, which may have effects similar to the ones described under imperfect competition above.

To test empirically how organized crime affects firms, we use difference-in-difference techniques around asset confiscations in Italy over the 1995-2015 period. Importantly, we are able to match asset confiscations to Italian municipalities and therefore to distinct local mafia families. We rely on the fact that in Italy, mafia cells tend to operate within no more than one municipality, and, with the exception of large cities, no more than one mafia cell exerts power over a given municipality (Gambetta 1993, Gambetta and Reuter 1995; Polo 1995). We consider *municipalities* as treated when they first experience an asset confiscation, and firms as *treated* when their headquarter municipality is first treated. The majority of our 834,016 sample firms obtained from Orbis are small private firms<sup>5</sup> that typically operate at the municipality level, and therefore come under the jurisdiction of a single mafia family. Approximately 80,000 firms (9.6 percent of all sample firms) were treated gradually over the sample period, through staggered confiscations affecting 414 municipalities (10.3 percent of municipalities containing at least one sample firm).

We focus on the impact of anti-mafia enforcement actions on measures of competition and

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<sup>4</sup> Official estimates of mafia revenue from illegal activity range from 6.6 percent to 8 percent of Italy's GDP; estimates of mafia revenue from legitimate businesses with mafia ties are estimated at 12 percent of Italy's GDP (Ruffolo et al. 2010; Calderoni 2014).

<sup>5</sup> The median annual revenue for these firms is approximately USD576,000.

innovation at the municipality level, as well as measures of firm size and employee productivity at the firm level. Since these measures might change in response to other, non-mafia related developments at the municipality level, a large part of our analysis is aimed at mitigating concerns about potential endogeneity or omitted variables. Two key characteristics specific to the anti-mafia enforcement process in Italy mitigate endogeneity concerns. First, the process is often initiated by non-local authorities such as the *Agenzia delle Entrate* (national revenue and tax agency) or the *L'Agenzia delle Dogane e dei Monopoli* (customs authority) (Transparency International 2013). Second, in the Italian judiciary system, whether or not the process results in an enforcement action such as an asset confiscation is determined by courts at the provincial level.<sup>6</sup> Importantly, since there are many municipalities per province (74 on average), we can control for common time series shocks at the provincial level when studying the effects of confiscations on municipality- and firm-level outcomes.<sup>7</sup> Additionally, in some of our firm-level cross sectional tests, we can control for time series shocks at the municipality level.

We start by examining whether anti-mafia enforcement actions affect competition among firms. We find that in treated municipalities, the turnover rate, defined as the sum of the number of firms that enter and exit scaled by the number of active firms in the previous year, increases by 1.15 percentage points after anti-mafia enforcement actions, which constitutes a 11.86% increase over its baseline level. The increased turnover rate is driven by both increased exit of incumbents and increased entry of new firms, and is more pronounced when a municipality is repeatedly affected by asset confiscations. We also find municipality-level evidence consistent with the notion that organized crime hinders innovation activity and competition for procurement contracts.

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<sup>6</sup> We discuss these characteristics in more detail in Section I.

<sup>7</sup> The Italian judiciary system is divided into tribunals, or law courts, each with power over a circuit that in most instances coincides with a province. Italy has three administrative divisions. There are 20 regions, which are divided into 107 provinces. Each province consists of municipalities (7,926 as of January 2019).

Overall, organized crime appears to act as a barrier to market entry.

We also find that treated firms that do not exit after an asset confiscation experience a 4.2 percent decline in revenue. Economically, this constitutes an USD 355,824 (USD 24,192) decline in revenue for the mean (median) firm. Moreover, firms' asset base declines by 1.4 percent and firms' employee productivity—measured as revenue per employee—declines by 1.6 percent. These effects are more pronounced when firms are treated repeatedly and for such firms, profitability also declines. These results suggest that incumbent firms benefit from the presence of organized crime. Anti-mafia enforcement actions likely lead to increased competition among firms and a reduction in rents, as well as a decline in the protected customer base enjoyed by incumbent firms. Thus, enforcement actions likely also make it harder for the mafia to continue to use their existing money laundering firms.

We also examine firm-level cross-sectional characteristics, since certain sectors likely benefit more from the presence of organized crime than others. Firms in the non-tradable sector, for instance, may be forced to pay protection money but benefit from the enforcement of cartels, since they are able to charge oligopolistic prices. In contrast, the prices for firms in the tradable sector are not set locally, thus these firms likely benefit less from the presence of organized crime. Thus, the effect of the crackdown on mafia should be more pronounced across firms in the non-tradable sector. We find this to be the case. In fact, we find that firms in the tradeable sector appear to benefit from anti-mafia enforcement actions, suggesting that the presence of organized crime is costly to these firms.

Lastly, the findings suggest that firms with stronger ties to the mafia benefit more from their presence, and hence suffer more from a crackdown on organized crime. While we cannot directly observe the strength of the ties between firms and organized crime, we use historical

homicide data to proxy for the strength of organized crime at the time of firms' incorporation (Pinotti 2015a,b). We find that our results are more pronounced among firms incorporated during the peak period of organized crime.

We also examine whether municipalities affected by anti-mafia enforcement actions are different from those that are not affected. Using Italian census data from 1991<sup>8</sup>, we find that the municipalities later affected by anti-mafia enforcement actions differ from unaffected ones only in that they have a larger population and a higher density of tourism-related businesses but not in measures of economic development. Our results are robust to matching municipalities on these characteristics. Further mitigating concerns about endogeneity or omitted variables, we also show that confiscations are unrelated to other municipality-level developments, such as election cycles. Moreover, when we conduct our firm-level cross-sectional tests using municipality-year fixed effects, the results remain robust.

Our paper contributes to several strands of the literature. First, to the literature on barriers to entry and collusion, we contribute by establishing empirically that organized crime serves as an external mechanism to enforce collusion among firms, as argued, among others, by Gambetta (1993). The focus of this literature has been on explicit and tacit collusion agreements as another way to enforce cartels (Dasgupta and Zaldokas 2017; Bourveau, She, and Zaldokas 2018).<sup>9</sup> We show that organized crime is associated with less competition, the presence of potentially inefficient firms, and barriers to entry, which likely have adverse effects on corruption and hence economic growth (Shleifer and Vishny 1993, Mauro 1995, Djankov et al. 2002, Pinotti 2015a,

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<sup>8</sup> We supplement the information with municipality-level data obtained from *Istat*, the Italian National Institute of Statistics. Information on some indicators is not available prior to 1995. In these cases, we use data for the earliest available year.

<sup>9</sup> See Levenstein and Suslow (2012) for a literature review on cartels and collusion.

2015b).

Second, our paper is related to a large body of work on organized crime. Such work has focused on the historical roots of organized crime (Skaperdas 2001; Bandiera 2003; Buonanno and Pazzona 2014; Buonanno et al. 2015; Acemoglu, De Feo, and De Luca 2017; Dimico, Isopi, and Olsson 2017), as well as the effects of organized crime on development, productivity, and economic growth (Daniele and Marani, 2011; Acconcia, Corsetti, and Simonelli 2014; Pinotti 2015a, 2015b; Pinotti and Stanig 2016; Bianchi et al., 2017; Le Moglie and Sorrenti, 2017; Ganau and Rodríguez-Pose, 2018; Scognamiglio 2018).<sup>10</sup> We discuss these and other papers in Section I. Our evidence suggests that organized crime may benefit incumbent firms but result in less competition and innovation. Anti-mafia enforcement actions have the potential to stimulate economic development in affected municipalities.

Our paper proceeds as follows. Section II begins by providing background information laying out the historical features that gave rise to the mafia in Italy, followed by an overview of the economic impact of organized crime, the institutional background on the fight against the mafia in Italy, and the global reach of organized crime. Section III provides a detailed account of how we identify treated municipalities and how we construct municipality- and firm-level variables, followed by an outline of our empirical methodology. Section IV reports the effects of organized crime on municipality-level outcomes such as competition, innovation, and public procurement auctions, and Section V discusses the implications of organized crime for firms. Section VI concludes the study.

## II. BACKGROUND AND INSTITUTIONAL SETTING

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<sup>10</sup> See Ofria and Farinella (2011) for a review.

In this section, we provide an overview of the history and economic impact of the mafia, summarize actions taken to fight the mafia, and describe organized crime's global reach.

### *II.A. Historical background*

The Italian mafia has existed and, at times, thrived for more than a century. Described most simply as a secret organization by Gambetta (1993) and Dickie (2004) in their seminal books, the mafia is traditionally at home in the regions of Campania, Calabria, Puglia, and Sicily, and its origins have been tracked to the time of the unification of Italy during the second half of the nineteenth century (Skaperdas 2001; Lupo 2004).

Early evidence on the Sicilian Mafia dates back to parliamentary inquiries into economic conditions and crime in Sicily in the late nineteenth century (Dimico, Isopi, and Olsson 2017 2017). During that time, the Mafia rose to provide enforcement of property rights and private land protection from predatory attacks, as both services were not provided by an Italian state that was distant, weak, and incapable of enforcing the law (Hess 1973; Arlacchi and Ryle 1986; Gambetta 1993; Bandiera 2003; Acemoglu, De Feo, and De Luca 2017). Moreover, the Italian government relied on the Sicilian Mafia to capture delinquents and enforce the law, in exchange for "looking the other way."

But even within Sicily, the Mafia had a greater presence in some municipalities than in others, raising questions over its origins. Some authors have emphasized the role of the abolition of feudal land relations for the rise of the Mafia in rural areas: landowners, managers, and public administrators used criminal methods to capture land that should have gone to peasants (Romano 1966; Mack Smith 1968; Brancato 1976), and peasants turned to banditry in the face of growing poverty, leading landowners to hire the Mafia to protect properties from predatory attacks (Bandiera 2003). Indeed, land fragmentation has been shown to favor the development of the

Mafia in certain areas of Sicily (Bandiera 2003).

Others have argued that the combination of weak institutions and resource abundance favored the emergence of mafia-type organizations (Gambetta 1993; Konrad and Skaperdas 2012). Researchers have linked the rise of the Sicilian Mafia to the presence of sulphur, a commodity in high demand during the twentieth century (Buonanno et al. 2015), and citrus fruits, a produce in high demand and with high fixed costs of entry (Dimico, Isopi, and Olsson 2017). Yet, others associate the growth of the Mafia with more urban, richer, and export-oriented areas around Palermo (Pezzino 1985, 1987; Catanzaro 1988; Lupo 2004), where the vacuum of law enforcement created demand for private protection.

The evidence on mafia-type groups in other regions is scarcer, partly due to greater secrecy and later discovery. The hierarchically less organized Calabrian ‘Ndrangheta developed as a defense mechanism of impoverished peasants against oppressive landlords (Nicaso and Lamothe 1995), while the Camorra originated in Naples (Skaperdas 2001). This latter organization, just like its Sicilian counterpart, was used to enforce property rights, and by government and local politicians against their political opponents (Mosca 1900; Benigno, 2015; Acemoglu, De Feo, and De Luca 2017).

After the early involvement of the mafia in the enforcement of property rights and support of the government in catching criminals, local mafia families now shape the competitive landscape of their municipalities. Starting in the 1960s, the mafia shifted its focus to providing other types of services, such as enforcing cartels, controlling the entry of firms, intimidating competitors, infiltrating private and public construction works, and supporting particular politicians through voter intimidation. In addition, the mafia entered the highly profitable but illicit drug trafficking business as well as the business of human trafficking and transportation of illegal immigrants

(Acemoglu, De Feo, and De Luca 2017; Alesina, Piccolo, and Pinotti 2018).

From its geographic origins, the mafia established strongholds in the regions of Basilicata and Puglia in the 1970s and 1980s.<sup>11</sup> But mafia outlets have also spread across Italy, partly through *Soggiorno Obbligato*, the policy in the 1960s and 1970s of mandatory resettlements of suspected mafia members to municipalities outside the traditional mafia areas, originally aimed at cutting the links between a mafioso and his network. This policy led to an increased presence of organized crime in host municipalities (Pinotti and Stanig 2016). Some argue that the mafia's power weakened following the Maxi Trial of members of the Sicilian Mafia in the 1980s and after backlash over the assassination of anti-mafia judges Giovanni Falcone and Paolo Borsellino in 1992. However, mafia activities still occur in many municipalities (Gambetta 1993; Pinotti 2015b; Acemoglu, De Feo, and De Luca 2017).<sup>12</sup>

The mafia's reach across Italy may hide the fact that each mafia family tends to be small and operates within local districts, typically in no more than one municipality. Also, no more than one mafia family exerts power in a municipality.<sup>13</sup> Polo (1995) argues that the limited expansion of mafia families is due to severe agency conflicts (members can easily entrench themselves) met by enforcement constraints. Gambetta (1993) adds that the mafia business is labor intensive, since it relies on an intelligence network formed by individuals that gather information that can later be used to enforce power. Thus, a mafioso has a comparative advantage over one territory—generally

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<sup>11</sup> This geographical expansion was the response to two events that turned these formerly mafia-free regions into attractive territories. First, changes in the tobacco smuggling routes during the 1970s put Puglia on the Mafia's radar. Second, an earthquake in Basilicata on November of 1980 resulted in very large public procurement contracts for reconstruction, contracts that in many cases were granted to mafia-related companies (Pinotti 2015b).

<sup>12</sup> More than 250 municipalities, for instance, were put under external administration to combat mafia involvement in local government and contract procurement.

<sup>13</sup> Gambetta and Reuter (1995) estimate the scale of the Sicilian mafia at 3,000 members and over 100 families. This stands in stark contrast to the New York mafia families, where 5 families had an estimated 1,200 members in the 1990s, down from 3,000 in the early 1970s (Reuter 1995).

the one in which he was born—since it is there that he knows most of its residents. As Gambetta (1993, p. 37) points out, a mafioso is better off “protecting *all* transactions over a small territory than *some* over a variety of territories.”

Along these lines, Polo (1995) argues that mafia families act locally due to enforcement constraints rather than for technological reasons. Specifically, the nature of the mafia business is to enforce contracts between principals and agents that are hard to enforce by an external legal authority. Thus, agents for the mafia may act opportunistically when an opportunity arises. Of course, the mafia has a very large set of incentive instruments (including those prohibited by law) but monitoring costs increase substantially—and hence families’ deterrence power decreases—with geographic distance. This creates incentives for mafia families to recruit along blood lines (within families), limiting the availability of “soldiers” and expansion opportunities.

### *II.B. Economic impact*

In the regions of Campania, Calabria, Puglia, and Sicily, the different organized crime organizations operate in 610 towns and affect millions of lives through legal and illegal operations. Though its true economic impact is inherently hard to measure, official estimates of mafia revenues from criminal activity range from 6.6 percent to 8 percent of Italy’s GDP, while revenues from legitimate businesses with mafia ties are estimated to amount to 12 percent of Italy’s GDP (Ruffolo et al. 2010; Calderoni 2014; Dimico, Isopi, and Olsson 2017)

There appears to be wide agreement that organized crime is a major obstacle to economic development (Daniele and Marani, 2011; Pinotti 2015a, 2015b; Scognamiglio, 2018). In our own cross-country analysis, presented in Figure I, we find that Italy stands out as a developed country with a particularly high rate of organized crime compared to other Organisation for Economic Co-operation (OECD) countries (with the exception of Mexico) and is a highly developed country vis-

à-vis other countries infiltrated with organized crime.

-- Figure I about here --

This country-level perspective, however, masks the significant regional variation in economic development across Italy. The traditional mafia regions in Southern Italy are substantially less developed than the regions in the North (see Figure II, Panel A). Although establishing a causal link between economic development and organized crime is difficult, Pinotti (2015b) studies whether this link exists in Puglia and Basilicata, two regions that experienced a surge in organized crime in the 1970s and 1980s. The author estimates that the mafia presence lowered GDP per capita by 16 percent in these regions.

-- Figure II about here --

If the presence of organized crime has a negative impact on economic development, how does its presence affect the outcomes of individual firms? Firms come under mafia control by paying protection money, by buying from mafia-related suppliers, or by having a mafioso as a business partner. In return, the mafia uses its power to enforce cartels, which actively intimidate businesses to keep them out of the market, thereby generating sales for firms under its protection by reducing competition or channeling sales to them, arbitrating disputes, providing reliable material flow, and mediating with locals (Gambetta 1993).

By enforcing cartels, the mafia essentially also acts as a barrier to market entry, protects monopolistic or oligopolistic rents, directly affects individuals' choices and efficient resource allocation, and, more generally, makes collusion more likely, elaborate, and enduring (Gambetta 1993, Gambetta and Reuter 1995; Bandiera 2003). This results in less efficient production, higher prices, lack of incentives to reduce production costs, the presence and survival of inefficient firms,

and slower growth among efficient firms (Reuter 1987).

Typically, firms under the protection of the same mafia family operate in different industries. The mafia harmonizes activities between these firms by putting all connections in touch, and more specifically, generating sales between firms. For some firms, this may generate additional sales while for others this may mean having to resort to less efficient suppliers (Bonanno and Lalli 1983). In addition to channeling firms' purchases through protected suppliers in which a mafioso is a partner, direct cash payments constitute another form of protection payment. Evidence on the size of protection payments is scarce, but Gambetta and Reuter (1995) estimate that in Sicily, these payments are around 5 percent of contract value in the construction industry. Ultimately, firms forced to make protection payments incur higher operational costs. And since they may have to share the upside with the mafia, they may avoid investing in equipment that can be easily destroyed (Konrad and Skaperdas 1998). Overall, these opposing effects make it hard to anticipate the effect of organized crime on firms' outcomes.

Besides actively managing competition, the mafia is oftentimes directly involved in the allocation of public procurement contracts and public investment funds, controlling concessions, and granting authorizations. This may lead to contracts that are allocated to less efficient firms (Schelling 1971; Barone and Narciso, 2015; Alesina, Piccolo, and Pinotti 2018). In addition, the effect of the mafia is also seen in the labor market. Sanchez-Jankowski (1991) argues that the long-term effects can be even higher as the more able entrepreneurial youth may choose to join the mafia. Even after the dissolution of organized crime, it can take a generation to reverse these effects. Lastly, there are the costs of violence, extortion, destruction of property, illegal drug trafficking, and death (Skaperdas 2001; Collier and Hoeffler 2002; Skaperdas 2002; Bandiera 2003).

While racketeering and the protection provision have always been part of the mafia's business activities, it also exploits other market opportunities. In the 1950s, the mafia penetrated the construction and cement industries, and in the 1970s the mafia reorganized its operations around cigarette smuggling. In addition, drug trafficking has been one of the mafia's most profitable businesses, and legal businesses may act as a tax cover for the illegal activities the mafia is involved in (Anderson 1995).

### *II.C. Fight against the mafia*

Accounts of the mafia were scarce for many decades due to the secrecy associated with it. The early 1980s saw new legislation reflecting the Italian government's willingness to combat the mafia, and accounts of the mafia increased in number from those individuals charged under these regulations.<sup>14</sup> Specifically, Article 416-bis of the Rognoni-La Torre Law (Law #646), introduced into the Italian Penal Code in 1982, defines organized crime as a "stable association that exploits the power of intimidation granted by the membership in the organization, and the condition of subjugation and omertà that descends from it, to commit crimes and acquire the control of economic activities, concessions, authorizations, and public contracts."

Most important for the government's effort against the mafia, Law #646 introduced a crucial procedure by which authorities can seize assets belonging to individuals suspected of mafia ties, with the intention of weakening the mafia's power. The evidence needed to seize an asset under this law is relatively weak, amounting to proving that an individual's lifestyle does not match

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<sup>14</sup> The first legal attempts at anti-mafia regulation date back to at least 1965. Under Law #431, the Italian government banned individuals suspected or convicted of having ties with mafia-type organizations from entering public contracts. However, this law was considered ineffective since the concept of a mafia-type association was undefined, creating a legal loophole. Attempts at closing this loophole gained backing only after Sicilian Mafia assassinated General Carlo Alberto Dalla Chiesa, prefect of Palermo, in 1982.

their reported income.<sup>15</sup> In 1983 alone, there were 207 asset confiscations, compared to 46 confiscations over the 1965-1982 period. The government's actions against the mafia heated up substantially after the killing of anti-mafia judges Giovanni Falcone and Paolo Borsellino in 1992. As of 2013, 5,470 people have been charged with this crime, 4,148 in Calabria, Campania, and Sicily (Alesina, Piccolo, and Pinotti 2018).

One of the most relevant characteristics of this Italian law for our study is the legal structure surrounding a confiscation, which mitigates concerns about the potential confounding effects. Article 23-bis of the law specifies that a confiscation is initiated by the public prosecutor's office, headed by the prosecutor general. This office then gives notice to the chief prosecutor of the regional office where the suspect lives, where the case is assigned to a prosecutor on a random basis and proceedings for the imposition of preventive measures are initiated. In addition to the public prosecutor's office, the anti-mafia task force and the head of the local police can also initiate a case.

As of January 2019, the Italian government had seized more than 30,000 mafia-owned properties and more than 3,500 companies. Panel B of Figure II shows the number of confiscations by province. As expected, given the abundance of organized crime, Southern Italy had experienced the largest number of confiscations, although confiscations take place in almost every province. This may partly reflect the mafia's active outreach throughout Italy, but also policies enforced in the 1960s and 1970s to send suspected mafia members to small towns outside of the typical mafia regions, a policy that backfired and resulted in the geographical expansion of the mafia.<sup>16</sup> The

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<sup>15</sup> Similar procedures have been used elsewhere. Donald Trump's former campaign chairman Paul Manafort, for instance, faces questions over his luxurious lifestyle (clothing, real estate, and vehicles) supported using undisclosed foreign bank accounts.

<sup>16</sup> For instance, 2,360 people were resettled between 1961 and 1972 (Scognamiglio 2018), and such resettlements have been found to have helped organized crime infiltrate firms in distress in the center and north of Italy (Mirenda, Mocetti, and Rizzica 2017).

1994 Italian Parliamentary Anti-mafia Commission stated that “[f]orced resettlement, largely used without careful choices and without appropriate guarantees of control, has practically dispersed in many areas in Italy several individuals belonging to the mafia and has implanted them in areas that would have probably been otherwise immune” (Scognamiglio 2018, p. 4).<sup>17</sup>

In Appendix A, we map the number of confiscations scaled by GDP (Panel A) and population (Panel B), respectively, to show that the prevalence of anti-mafia enforcement actions in the Southern regions is not just an artefact of larger population or economic activity.

#### *II.D. Global reach*

Although we focus on the effects of organized crime on Italian firms’ outcomes, our analysis is also relevant to other settings for several reasons. First, organized crime is present world-wide. There are numerous criminal syndicates, such as the Yakuza in Japan, the Hong Kong-based Chinese Triads, the Russian mafia, MS-13 in North America, and South and Latin American drug cartels, among others. Additionally, organized crime is just one of the many available mechanisms to enforce collusion. Other mechanisms frequently used include price-fixing agreements, political collusion, or market divisions.

In addition, the Italian mafia has, over the last century, acquired strong economic interests throughout the world, particularly in the U.S. Indeed, the American Mafia traces its origin to immigrants associated with the Sicilian Mafia. Its expansion was accelerated by Prohibition (1920-1933) via the large profits from the illegal production and trafficking of the then banned alcohol. By the time prohibition was repealed, the mafia had control over labor unions, allowing them to

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<sup>17</sup> Translated from *Italian Parliamentary Antimafia Commission* (1994): Relazione sulle risultanze dell'attività del gruppo di lavoro incaricato di svolgere accertamenti su insediamenti e infiltrazioni di soggetti ed organizzazioni di tipo mafioso in aree nontradizionali, vol. doc. n. 11.

get into different types of businesses (Schelling 1984; Worsnop 1992; Reuter 1995; Alexander 1997; Skaperdas 2001). Other examples of the reach of the Italian mafia include Germany, Slovenia, Canada, and Australia, among others.<sup>18</sup>

There are also many commonalities between the Italian mafia and other organized crime groups. For instance, the Yakuza arose from the need to enforce property rights in post-feudal Japan as early as in the 17<sup>th</sup> century and is today mainly involved in real estate, although less visibly so since 1992, when regulations made it more difficult for syndicates to operate openly and legally (Milhaupt and West 2000; Skaperdas 2001; Bandiera 2003). The Chinese Triads, whose origin goes back to the traditional 18<sup>th</sup> and 19<sup>th</sup> century Chinese secret societies and their political and war involvement, have their main base in Hong Kong. They mainly engage in heroin trafficking, prostitution, gambling, passport foraging, and pirating software (Martin 1996; Skaperdas 2001). In Russia, the mafia evolved from ex-KGB and unemployed soldiers satisfying the demand for protection during the transition to capitalism (Frye and Zhuravskaya 2000; Bandiera 2003). In addition, youth gangs provide protection in many low-income areas in the U.S. and elsewhere (Sao Paolo, Rio, Soweto, and Durban; Skaperdas, 2001). And the fragmentation of Colombian drug cartels, once the most dynamic and violent organized crime gangs in the world, has led to the development of powerful drug-trafficking groups in other countries, particularly in Mexico (Skaperdas 2001).

### III. DATA AND METHODOLOGY

In order to study the effect of organized crime on firms, we use multiple data sources to

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<sup>18</sup> Giuseppe Governale, an anti-mafia investigator, warned in June 2018 during a meeting with the foreign press in Rome that Italian organized crime was becoming a global phenomenon. According to him, while the Sicilian mafia has been present in countries such as the U.S., Canada, and Australia for a long time, it has expanded to many European countries. (Source: Sky News, <https://news.sky.com/story/italian-mafia-going-global-as-influence-spreads-warns-countrys-anti-mafia-chief-11396031>, accessed on January 18<sup>th</sup> 2019)

characterize anti-mafia enforcement actions, competition, firms, innovation activity, and procurement contract auctions. In this section we describe the data sources used and the methodology employed, and in Appendix B we provide detailed variables definitions.

### *III.A. Data*

For our study we merge multiple dataset that include information on anti-mafia enforcement actions, firms' characteristics and financial statements, applications for patents, and macroeconomic variables for municipalities in Italy.

*Measures of anti-mafia enforcement actions.* Measuring the strength of the mafia directly is intrinsically difficult. Thus, we exploit anti-mafia enforcement actions to proxy for the weakening of mafia families. More specifically, we use staggered anti-mafia enforcement actions across municipalities in Italy in the form of asset confiscations. As Gambetta (1993) and Reuter (1995) point out, the organizational reputation and its name are the most valuable assets a criminal organization has. Thus, these actions weaken those organizations where it hurts the most, regardless of the value of the assets confiscated. We collect data provided by the ANBSC (the national Italian agency responsible for the administration and destination of assets seized and confiscated from organized crime) on the date, location (municipality), and number of assets confiscated from the mafia. The more than 34,000 confiscations that occurred between 1968 and 2018 are spread across every region, although most occurred in the original mafia strongholds in the south (see Table I). Provinces in Campania, Calabria, and Sicily saw large numbers of confiscations, but so did some northern provinces (Figure II, Panel B).

-- Table I about here --

Once Mafia assets are confiscated, the government's goal is to guarantee their effective

social reuse.<sup>19</sup> The ANBSC manages confiscated assets until they are redeployed. As of 2019, 14,000 assets had been redeployed, while 20,000 are still under the management of the agency. Our analysis focuses on assets that have been redeployed since, for undisposed assets, confiscation dates are unavailable. However, the geographical distribution of the deployed assets and assets confiscated but not yet redeployed is highly correlated ( $\rho=0.96$ ), which alleviates concerns that our confiscation measure might be biased by redeployment rates.

Using the confiscation data, we define two measures to capture the weakening of local mafia families. First, *Confiscation Dummy* is a dummy set equal to one following the first confiscation at the municipality level. Second, *#Confiscations* is the natural logarithm of one plus the accumulated number of asset confiscations at the municipality level at any point in time. A potential concern is that the value of the confiscated asset is in general economically small compared to the value of the assets owned by the mafia. However, as stated before, asset confiscations challenge mafia families' most valuable asset, their reputation as a guarantor of protection and effective intimidator (Gambetta 1993; Reuter 1995).<sup>20</sup>

We next examine whether there is an alternative explanation as to what else may change the political environment of a municipality. We begin by obtaining the registry of elected officials for local offices from the Ministry of the Interior. This database includes time-series information

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<sup>19</sup> In most cases where real estate is seized, redeployed assets are used by the municipality and new police stations are opened, but in other cases these properties are assigned to civil associations and social centers. One example is Café de Paris, a bar on the Via Veneto in Rome. This café was glorified by the Italian filmmaker Federico Fellini in the movie “La Dolce Vita.” In 2009, the property was seized by the ANBSC and reopened two years later, selling products produced by Libera, an anti-mafia group that runs cooperative farms on land confiscated from the mafia.

<sup>20</sup> It could be argued that seizures vary in size and that the damage made to the reputation of the mafia depends on the value of the confiscated assets. Unfortunately, there are two empirical problems with this approach. First, the value of the confiscated assets is only available for auctioned assets auctioned. Since most of the assets are redeployed for social uses, the information on the value of the assets' is very limited. Second, the auction value does not accurately reflect the value of the asset at the time of confiscation. In many cases, a number of years pass between the confiscation and the auction, and the value of the asset diminishes rapidly due to deterioration and lack of maintenance. (“The Italian experience in the management, use and disposal of frozen, seized and confiscated assets,” Open-ended Intergovernmental Working Group on Asset Recovery, Vienna, September 11-12, 2014).

on the identity of the mayor for each municipality, which allows us to study whether confiscations are driven by political changes.

In Figure III, we plot the average number of confiscations per year following the election of a mayor (Panel A) and average number of confiscations per year before a mayor leaves office (Panel B). The patterns in Figure III suggest that confiscations are not associated with political cycles.

--- Figure III about here ---

*Competition and firm-level data.* We obtain financial information for all Italian public and private firms reported in Bureau Van Dijk's Orbis database. As is standard in the literature, we download and combine information from multiple vintage DVD editions of the database for the 2005-2015 period to address survivorship bias concerns over that period. Each DVD provides financial statements for the current year and the previous ten years, allowing us to study the 1995-2015 period. Using the firm identifier provided by Orbis, we restrict our sample to firms with at least four yearly observations.<sup>21</sup> A key advantage of Italian data is that all limited liability companies are obliged to disclose financial information including major income statement and balance sheet items, therefore when we restrict our sample to firms with non-missing assets, sample attrition is small. Overall, we start with an initial sample of 834,016 firms, 9,340,460 firm-year observations, and 4,031 municipalities with at least one firm over the 1995-2015 sample period.

Using incorporation years and information on firms' disappearance (by declaring bankruptcy or being dissolved), we construct three measures of competition at the municipality-year level, specifically, *Turnover Rate*, *Entry Rate*, and *Exit Rate*. Our first measure is *Turnover*

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<sup>21</sup> Our results are robust to alternative specifications.

*Rate*, defined as the number of new firms that enter plus the number of firms that cease to exist scaled by the number of active firms at the beginning of a given year. Entry rate and exit rate are defined as the number of new firms created and the number of firms that cease to exist over a given year, respectively, each scaled by the number of active firms at the beginning of the year. The mean turnover rate at the municipality-year level is 9.7 percent, composed of an entry rate of 9.3 percent and an exit rate of 0.4 percent (Table II, Panel A).

-- Table II about here --

At the firm level, we use *Revenues* and *Assets* to capture size. Employees' productivity is measured by *Revenue per employee* (revenues divided by number of employees), and profitability by *Return on assets* (after-tax profit divided by assets). We winsorize these variables at the 1 percent and 99 percent levels, although this choice does not affect our results. The mean (median) firm in our sample has revenue of USD 8.472 (0.576) million and assets of USD 23.765 (0.870) million, reflecting the fact that Orbis contains many small firms (Table II, Panel B). Revenue per employee is USD 364,000 on average. Unsurprisingly, since our sample period includes the recent financial crisis and many small firms did particularly poorly, the mean return on assets (ROA) is negative (-2.0 percent); however, the median ROA is positive (0.3 percent).<sup>22</sup>

In addition, using the Orbis industry classifier, we determine the sector in which each firm operates. A large number of Italian firms in the database (52 percent) operate in the secondary sector, followed by the tertiary sector (45.8 percent; Table II, Panel C).

**Other data sources.** We gather information from various sources to run additional tests. In particular, we exploit time series variation in the strength of the mafia at the time firms were

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<sup>22</sup> To further confirm that the negative mean sample ROA is not an artefact of poor data, we calculate asset-weighted ROA, which is positive (0.5%). Also, mean ROA for the full sample is negative predominantly during the crisis.

incorporated. To this end, we proxy the intensity of mafia activity by looking at homicide rates, following Pinotti (2015b), who finds a very strong correlation between homicide rates and organized crime across regions in Italy. The data on homicide rates are from the Eurostat database.

In order to measure innovation, we use patent data from the European Patent Office (EPO). EPO provides information on all patent applications made in Italy between 1995 and 2015, a total of 137,936 applications.<sup>23</sup> For each patent, we obtain a list of inventors and their domiciles. To create a measure of innovation at the municipality-year level, we aggregate the number of inventors domiciled in each municipality that apply for a patent in a certain year. To avoid overweighting innovation due to the existence of multiple inventors on a patent, we assign each inventor a weight of  $1/N$  for that patent, where  $N$  is the total number of inventors on a patent. Thus, our final measure of innovation is:

$$I_{m,t} = \sum_{p=1}^{P_{m,t}} \frac{1}{N_{p,m,t}},$$

where  $I_{m,t}$  is the level of innovation in municipality  $m$  at time  $t$ ;  $P_{m,t}$  is the number of applications for patents made at time  $t$  that include inventors domiciled in municipality  $m$ ; and  $N_{p,m,t}$  is the total number of inventors on the application for patent  $p$  made in municipality  $m$  at time  $t$ .<sup>24</sup> The results are in Panel D in Table II. In total, we have information on 23,866 municipality-years, with a mean (median) of 10 (4) inventors.

We obtain data on public procurement contracts from the Italian Ministry of Infrastructure and Transportation which, starting in 2006, publishes detailed information on public contracts,

<sup>23</sup> A patent application can be made simultaneously in different countries. Thus, to avoid double counting, we focus on applications made in Italy.

<sup>24</sup> For example, consider a municipality  $y$  that in year 2010 had 3 inventors applying for patents. Inventor A filed for one patent that is solo authored (weight=1), Inventor B filed for one patent that has one additional co-author (weight=0.5), and Inventor C filed for one patent that has three additional co-authors (weight=0.25). Then, municipality  $y$  in year 2010 would have a measure of innovation of  $1 + 0.5 + 0.25 = 1.75$ .

their calls for proposals, bids, and outcomes. The information for 2006-2008 is incomplete, so we restrict our sample to 2009-2015. Where data on the municipality contracting a service are missing, we manually extract the municipality from the contract description. The results are in Panel D in Table II.

### *III.B. Empirical strategy*

We use anti-mafia enforcement actions to proxy for the weakening of mafia families in a difference-in-difference setting, in order to study the effect of anti-mafia enforcement actions on entry and exit rates at the municipality-year level, and on firm-level outcomes at the firm-year level. Municipalities are defined as treated when they first experience an asset confiscation, and firms are defined as treated by an asset confiscation when headquartered in a municipality that has been affected. This choice of assigning asset seizures to municipalities is consistent with accounts of mafia families operating locally (Polo 1995) and not competing directly within the same territory (Gambetta and Reuter 1995).

Figure IV shows that the number of anti-mafia enforcement actions varied significantly over the two decades studied, but there was a substantial number of confiscations during each year (Panel A). Importantly, the number of municipalities and firms treated for the first time varies considerably each year over the 1995-2015 period (Panels B-C). At the end of our sample period, about 80,000 firms (9.6 percent of all sample firms) and 414 municipalities (5.2 percent of all Italian municipalities and 10.3 percent of all municipalities with at least one sample firm) are treated. No more than 3 percent of sample firms and 1.25 percent of sample municipalities are treated for the first time in any given year. This time series variation in the number of affected firms and municipalities is important for our identification strategy, as it helps us to rule out that one specific year drives our results.

--- Figure IV about here ---

We estimate the effect of anti-mafia enforcement actions on municipality-level outcome variables using a difference-in-difference approach, as in Bertrand and Mullainathan (2003). Specifically, we estimate:

$$(1) \quad y_{m,p,t} = \alpha_m + \alpha_{p,t} + \beta TREATED_{m,p,t-1} + \varepsilon_{m,p,t},$$

where  $y_{m,p,t}$  is one of several outcome variables of interest (*turnover*, *entry*, and *exit* rates) for municipality  $m$  in province  $p$  in year  $t$ . The data are aggregated at the municipality-year level using data on firms headquartered in that municipality.  $TREATED_{m,p,t-1}$  identifies treated municipalities and in a variation of (1), we additionally control for *#Confiscations* to measure the effect of the intensity of asset confiscations. We include municipality fixed effect ( $\alpha_m$ ) to account for the time-invariant characteristics of each municipality and province-year fixed effects ( $\alpha_{p,t}$ ) to control for provincial economic and other types of shocks that might coincide with treatment of a municipality.  $\varepsilon_{m,p,t}$  is the error term. Standard errors are clustered at the municipality level, though the results are robust to alternative clustering specifications. In variations of equation (1), we examine innovation and contract allocation data.

We estimate the effect of asset seizures on firm-level outcome variables using a similar approach. Specifically, we estimate:

$$(2) \quad y_{i,m,p,t} = \alpha_i + \alpha_{p,t} + \beta TREATED_{i,p,t-1} + \varepsilon_{i,m,p,t},$$

where  $y_{i,p,t}$  is one of several dependent variables of interest for firm  $i$  in municipality  $m$ , province  $p$ , at time  $t$ .  $TREATED_{i,p,t-1}$  identifies treated firms and as before, in a variation of equation (2), we additionally control for the number of confiscations. We include firm ( $\alpha_i$ ) and province-time ( $\alpha_{p,t}$ ) fixed effects, thereby comparing treated firms within a province in a given year to other firms in

that region in that year.<sup>25</sup>  $\varepsilon_{i,p,t}$  is the error term. Standard errors are clustered at the municipality level and again, all results are robust to alternative clustering specifications.

We also use equation (2) to examine how the anti-mafia enforcement actions affect firms in different industries. To this end, we run a variation of specification (2) where we interact  $TREATED_{i,p,t-1}$  with *Tradable*, an indicator variable for firms in the tradable sector. Along similar lines, we identify firms that were founded in years with a high level of mafia activity and interact  $TREATED_{i,p,t-1}$  with that measure.<sup>26</sup> In Appendix C, we provide the results of specification (2) on different industry subsamples.

It might be argued that our specification is subject to omitted variable bias. For instance, asset confiscations could be driven by geography-specific developments or prospects, such as a greater push for economic development. Thus, our results could be driven by the push for economic development—unobservable to the econometrician—and not by the anti-mafia enforcement action itself. However, the structure of the judiciary system in Italy is such that it mitigates this concern. As described in the introduction, the system is divided into *tribunali*, or law courts, each one with power over a territory that in most instances coincides with a province. Thus, the inclusion of province-year fixed effects mitigates this concern, allowing us to identify from variation in treatment within provinces.

In addition to the above argument, we mitigate the concern about omitted variable bias in two ways. First, in Panel A of Table III, we compare the initial conditions of municipalities that were later affected by anti-mafia enforcement actions with those of municipalities that were not. The results show that, at least on a series of observable dimensions, these municipalities are

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<sup>25</sup> We estimate equations (1) and (2) using a Stata package for high-dimensional fixed effects (Guimaraes and Portugal 2010).

<sup>26</sup> We follow Pinotti (2015b), who shows a strong correlation between homicide rates and organized crime activity.

similar. The municipalities do not differ on proxies for economic and social development, such as water usage per capita, social expenditure per capita, or number of tourism-related businesses per capita. However, they do differ on their size, as measured by population, and the number of firms per capita.

Second, we test whether observable municipality-level data measured in or prior to 1995 can predict subsequent enforcement actions. We use observable municipality-level variables including population, water usage, and measures of tourism, and also aggregate data on firms' activity obtained from Orbis at the municipality level to capture municipality-level economic development. We then run a probit model where the dependent variable is an indicator on whether the municipality experiences an enforcement action between 1995 and 2015 and all controls are measured in 1995 or before. In addition, due to the institutional setting and the nature of the judiciary system in Italy, we include province fixed effects. In Panel B of Table III, we present the marginal effects based on the probit model.<sup>27</sup> Our results show that larger cities in terms of population and cities with more tourism are more likely to experience an anti-mafia enforcement action, but that proxies for economic development such as water usage and firms per capita or social indicators such as the percentage of foreign-born residents do not predict anti-mafia enforcement actions.

--- Table III about here ---

In additional unreported robustness tests, we also use various matching approaches. For instance, we repeat our analysis on the subset of (i) treated municipalities and same-province municipalities matched by population, and (ii) treated firms and firms matched by same industry,

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<sup>27</sup> Fernández-Val (2009) shows that estimates of marginal effects based on a probit fixed effects model exhibit no bias or negligible bias.

nearby municipality, and closest in revenues. Our results are robust to using these approaches.

#### IV. MUNICIPALITY-LEVEL EVIDENCE

We next investigate the municipality-level implications of anti-mafia enforcement actions. We provide evidence for firm *turnover*, *entry*, and *exit*, and examine innovative activities and competition for public procurement contracts at the municipality level.

##### *IV.A. Turnover, entry, and exit*

We study whether the mafia in a municipality acts as a barrier to entry for new firms and protects existing firms. More specifically, we test whether anti-mafia enforcement actions lead to an increase in competition. We estimate equation (1) for firms' *turnover*, *entry*, and *exit rates* (Table IV) and find this to be the case. After a municipality experiences its first anti-mafia enforcement action, the *turnover rate* of firms' increases by 1.15 percentage points, or 11.86 percent of the mean *turnover rate* (Panel A, column (1)). This change in *turnover rate* is due to both increased *entry* (1.09 percentage points, or 11.77 percent of the mean, column (2)) and, to an economically smaller extent, increased *exit* (0.06 percentage points, or 14.95 percent of the mean, column (3)). These results are economically and statistically similar when we focus on municipalities with at least 10 firms, which alleviates the concern that our results are driven by municipalities with very few firms (columns (4)-(6)).

--- Table IV about here ---

We next include a measure of the intensity of the anti-mafia enforcement actions. The results in Panel B of Table IV show that for an increase of 1 percent in the number of confiscated assets, there is an increase in the *turnover rate* of 0.65 percent. This result can be decomposed into *entry* and *exit* rates. The coefficients in Table IV show that most of the effect comes from *entry*.

For robustness, we repeat our analysis by randomly reallocating confiscations that occurred in one municipality to another. We repeat this placebo test multiple times and the results we obtain allow us to rule out spurious correlations between measures of competition and anti-mafia enforcement actions (Appendix D).

Next, we consider two alternative explanations for our *turnover* rate results. First, that the mafia “recycles” confiscated firms. That is, once the assets of a mafia-related firm are confiscated and the firm closes down, the mafia opens a new firm under a different name, causing an apparent increase in entry and exit rates. Second, that shadow firms become legitimate subsequent to the weakening of organized crime. In both cases, we should observe that firms that enter the market following anti-mafia enforcement actions are larger and grow faster than firms that are established in the absence of anti-mafia enforcement actions. To test this idea, we compare the revenues of newly incorporated firms over the first five years of their existence. We find that on average, the revenues for firms established within five years of anti-mafia enforcement actions are no different from those established under regular circumstances (Figure V, Panel A). Firms in both categories exhibit similar growth patterns, indicating that our results are not driven by firms that were set up to replace firms whose assets were confiscated during anti-mafia enforcement actions.

--- Figure V about here ---

We also examine firms that exit following anti-mafia enforcement actions and those that exit under regular circumstance. We find that firms that exit following anti-mafia enforcement actions were larger prior to these actions, although the pre-exit trends for these both types of firms are similar.

Overall, the results in this subsection support the idea that organized crime acts as a barrier to entry that protects firms from entry by new firms. Anti-mafia enforcement actions, which reduce

the strength of organized crime, result in increased competition.

#### *IV.B. Innovation*

In addition to the change in the competitive landscape documented so far, our study setting also allows us to examine the impact of organized crime on innovation. This is important since innovation is typically tied to economic growth. In particular, organized crime, by limiting entry, may reduce the incentives for firms to innovate. Firms do not compete primarily on quality or price, but by enlisting mafia protection (Gambetta 1993). Thus, we should expect an increase in innovation activity after anti-mafia enforcement actions.

Using the regression specified in equation (1) but using our measure of innovation for the 1995-2015 period as the dependent variable, we find that firms in a municipality where anti-mafia enforcement actions take place for the first time experience an increase in innovation activities of approximately 6 percent. The results in Table V show that once anti-mafia enforcement actions take place in a municipality, our measure of innovation activities increases by 5.71%. We find that this result is not driven by small municipalities with less than 10 firms (columns (1) and (2)). In columns (3) and (4), we find that once we include the log of the number of confiscations in the specification, only the coefficient for the indicator variable for whether a municipality was affected is significant.

--- Table V about here ---

#### *IV.C. Competition for public procurement contracts*

The mafia has also been accused of manipulating the allocation of public procurement contracts. To further understand the effect of anti-mafia enforcement actions on competitiveness, we examine whether these actions make the allocation of public contracts more competitive. The

results in Table VI provide evidence that they do. In particular, we find that in a municipality where anti-mafia enforcement actions take place for the first time, there is a 28 percent increase in the number of public procurement contracts (column (1)), a 12 percent increase in the number of applications to bid on each contract (column (2)), a 36 percent increase in the number of firms invited to bid (column (3)), a 31 percent increase in the number of offers per contract (column (4)), a 34 percent increase in the number of offers submitted (column (5)), a 140 percent increase in the value of the work (column (6)), and an almost 400 percent increase in the price reduction obtained by the municipality over the estimated contract value (column (7)). Overall, the evidence suggests that a weakening of organized crime results in increased firm turnover, innovation activity, and competition for public procurement contracts. These results are in line with the notion that the mafia acts as a barrier to market entry and limits competition.

--- Table VI about here ---

## V. FIRM-LEVEL EVIDENCE

We next investigate the implications of anti-mafia enforcement actions for firms. We implement a difference-in-difference specification as outlined in equation (2). Importantly, due to firm fixed effects, identification stems from firms that exist prior to and after anti-mafia enforcement actions. Our results are therefore interpreted with respect to incumbent firms that survive the weakening of organized crime.

### *V.A. Main results*

We examine whether organized crime benefits firms under its protection. In particular, we test whether anti-mafia enforcement actions negatively impact incumbent firms. Using the *Confiscation Dummy* to indicate the anti-mafia enforcement actions, we find this to be the case.

Firms affected by anti-mafia enforcement actions experience a 4.2 percent decline in revenue (Table VII, Panel A). Economically, this reflects a USD 355,824 (4.2 percent x 8.472 million) decline in annual revenue for the average firm and a USD 24,192 (4.2 percent x 576 thousand) decline in revenue for the median firm. The assets of affected firms decline by 1.4 percent on average.

--- Table VII about here ---

Next, we examine whether anti-mafia enforcement actions affect employee productivity, as measured by revenue per employee. In line with the idea that firms under mafia protection may charge oligopolistic prices, and supporting the idea that the costs of protection outweigh its benefits, we find that employee productivity declines. Specifically, revenue per employee declines by 1.6 percent; ROA declines by 0.1 percent, but is statistically insignificant (columns (3)-(4) in Table VII).

These results also hold when we match firms in affected municipalities to same-industry similar-size firms in neighboring municipalities that were unaffected by anti-mafia enforcement actions.<sup>28</sup> In Figure VI, we also show that the firm effects due to anti-mafia enforcement actions documented in Panel A of Table VII are relatively instantaneous. They do not seem to be the result of a violation of the parallel trend assumption.

--- Figure VI about here ---

Having shown that firms located in municipalities affected by anti-mafia enforcement actions for the first time experience a decline in revenues, assets, and revenue per employee, we next examine whether additional anti-mafia enforcement actions also impact these variables. Using

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<sup>28</sup> Results not reported for brevity and available upon request.

the (logged) number of accumulated asset confiscations, we find in Panel B of Table VII that the intensity of anti-mafia enforcement actions leads to additional declines in size, revenue per employee, and employee profitability.

Overall, the results in this subsection highlight the role played by local mafia families in protecting firms. Typically, to these firms, the economic benefits more than outweigh the potential costs associated with being under mafia protection. However, anti-mafia enforcement actions destroy some of the benefits enjoyed by incumbent firms.

### *V.B. Cross-sectional results*

A potential concern is that an omitted variable at the municipality-year level might drive both asset confiscations and firm-level outcomes. To this end, our setting allows us to make certain cross-sectional predictions about industry and firm characteristics, which we then test by including *municipality x year* fixed effects in the specification. In this section, we describe these tests and the results obtained, which alleviate concerns about omitted variables at the municipality-year level.

*Tradable and non-tradable sectors.* We first analyze the differential effect of asset confiscations on firms in the tradable and non-tradable sectors. While firms in the non-tradable sector can charge oligopolistic prices when protected from competition, firms in the tradable sector cannot. Thus, firms in the non-tradable sector should benefit more from the presence of organized crime, and anti-mafia enforcement actions should be detrimental for these firms.

We examine this idea by identifying firms that operate in the tradable sector following the categories in Mano and Castillo (2015). We find that firms in the non-tradable sector experience a decline in revenue, assets, revenue per employee, and ROA when experiencing anti-mafia

enforcement actions (Table VIII, Panel A). In contrast, firms in the tradable sector typically benefit from anti-mafia enforcement actions. This finding is consistent with the idea that firms in the tradable sector are less competitive prior to anti-mafia enforcement actions, since the costs associated with the presence of organized crime are not offset by some of the potential benefits. For robustness, we confirm our results with *municipality x year* fixed effects in Panel B.

--- Table VIII about here ---

*Mafia strength.* We next examine whether firms that have plausibly stronger ties to the mafia are more adversely affected by anti-mafia enforcement actions. To this end, we employ one additional dimension, the strength of organized crime in the year a firm is incorporated. Arguably, a firm that enters a market at a time when the mafia is stronger is more likely to require mafia permission to open for business. Since the level of organized crime activity is hard to measure, we proxy it with homicide rates, as suggested by Pinotti (2015a).

Consistent with the idea that firms founded during the height of the mafia activity benefit more from mafia protection, we find that firms that were incorporated in times of above-median homicide rates experience a larger decline in revenue, assets, and revenue per employee after anti-mafia enforcement actions, while we find no effect on profitability (Table IX, Panel A). These results are robust to additionally controlling for *municipality x year* fixed effects (Panel B) and in the subset of firms incorporated prior to 1992 (i.e., prior to the onset of anti-mafia enforcement actions).

--- Table IX about here ---

## VI. CONCLUSION

Organized crime in the form of the mafia is pervasive in Italy and has plagued the regions of

Calabria, Campania, and Sicily for well over a century. In this study, we examine the effects of organized crime on Italian firms. We find that as organized crime activities declined due to the anti-mafia enforcement actions, new firms enter the market and firms that were presumably under mafia protection become more likely to exit. Firms that do not exit shrink in size and experience reduced employee productivity. Our results are more pronounced for firms that operate in the non-tradable sector and among firms founded during the height of mafia power. Further, the gradual decline of the mafia leads to increased innovation activity and competition for public procurement contracts.

Our identification relies on difference-in-difference estimations based on staggered municipality-level confiscations of mafia assets across Italy over the 1995-2015 period. These confiscations weaken the actual and, perhaps more importantly, the perceived power and reputation of local mafia families.

Overall, our results suggest that organized crime hinders competition among existing firms, which benefits inefficient incumbents but hinders entry of new firms. In other words, anti-mafia enforcement actions affect the competitive landscape in affected municipalities and industries. To the best of our knowledge, ours is the first attempt to illuminate the effect of organized crime on the outcomes of individual firms.

While our setting is specific to Italy, organized crime is pervasive across the globe. Testing whether or not our findings can be generalized to other countries will require additional data sources on organized crime, but provides promising avenues for future research.

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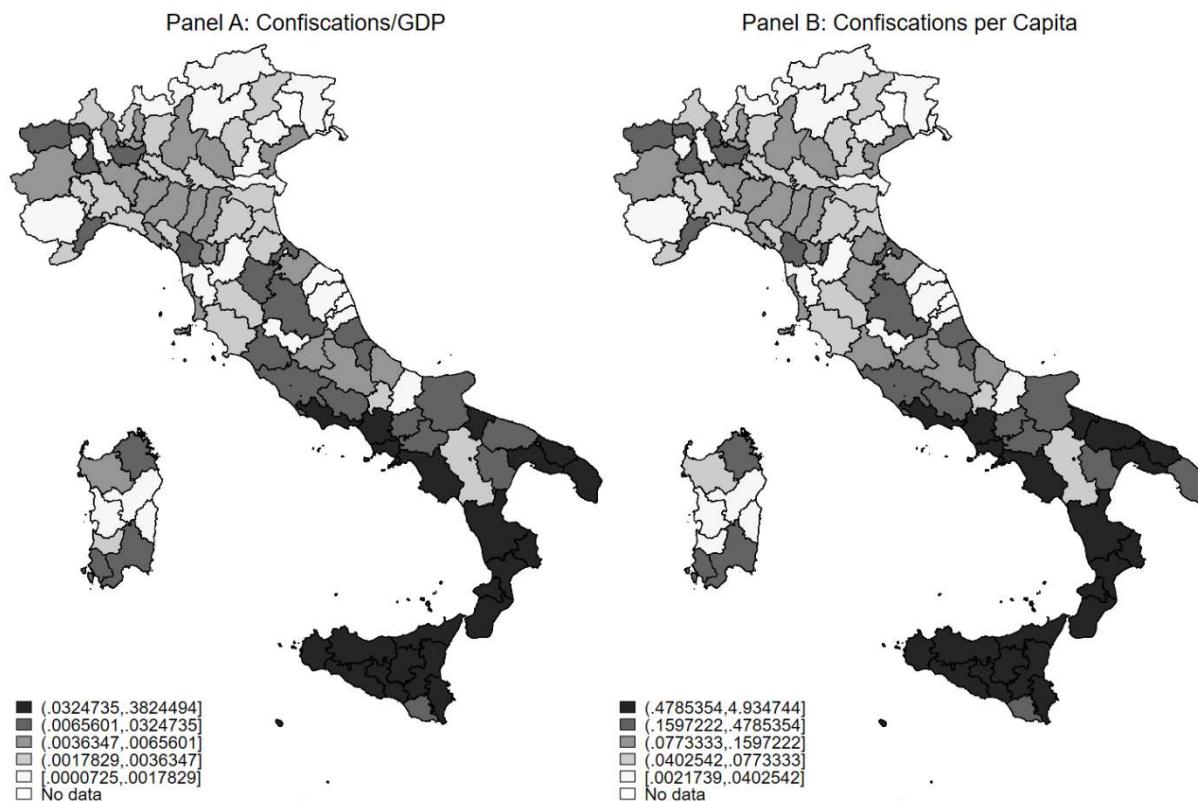
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## Appendix A: Asset confiscations scaled by Province Characteristics

This figure shows the number of confiscations of mafia assets scaled by GDP (Panel A) and by population, in thousands (Panel B) by Italian province. The data on asset confiscations are from the Italian National Agency for the administration and destination of assets seized and confiscated from organized crime (*ANBSC*), and the data on GDP and Population are from the Italian National Institute of Statistics (*Istat*).



## Appendix B: Variable definitions

Variable	Definition	Source
<b>Anti-mafia enforcement</b>		
Confiscation (Dummy)	A dummy variable set equal to one if a municipality experiences or has experienced an asset confiscations at any point in time.	ANBSC
#Confiscations	The number of asset confiscations that have occurred in a municipality at a point in time (logged).	ANBSC
<b>Competition</b>		
Turnover Rate	(Number of new firms that enter + Number of old firms that cease to exist) / Number of firms at the beginning of the period	Orbis
Entry Rate	Number of new firms / Number of firms at the beginning of the period	Orbis
Exit Rate	Number of firms that cease to exist / Number of firms at the beginning of the period	Orbis
<b>Firm characteristics</b>		
Revenue	Revenue (USD, logged in regressions).	Orbis
Assets	Total Assets (USD, logged in regressions).	Orbis
Revenue per Employee	Revenues/Number of Employees (USD, logged in regressions).	Orbis
ROA	Profit/Total Assets.	Orbis
<b>Innovation</b>		
#Inventors	Number of inventors that contribute to a patent in a municipality-year.	European Patent Office (EPO)
<b>Procurement contracts</b>		
<i>N</i> Contracts	Number of tendered contracts.	IMIT (Ministry of Infrastructure and Transportation.)
<i>N</i> Applicants	Number of auction applicants.	IMIT
<i>N</i> Invitations	Number of companies invited to bid	IMIT
<i>N</i> Offers	Number of offers submitted to an auction.	IMIT
<i>N</i> Admitted	Number of admitted offers.	IMIT
Value	Value of contract.	IMIT
% Reduction	Percentage reduction of the winning bidder's bid.	IMIT
<b>Other variables</b>		
Agriculture (dummy)	A dummy variable set equal to 1 if a firm operates in the primary sector, defined as Industry Code 13.	Orbis
Manufacturing (dummy)	A dummy variable set equal to 1 if a firm operates in the primary sector, defined as Industry Codes 2, 3, 5, 9, 10, 16, 18, and 19.	Orbis
Service (dummy)	A dummy variable set equal to 1 if a firm operates in the primary sector, defined as Industry Codes 7, 11, 15, 17.	Orbis

## Appendix C: Competition results by industry

Table C.1 provides the results of the analysis of the relation between the confiscations of assets and measures of competition by industry. The sample period is 1995-2015 and the unit of analysis is the municipality-year level. See Table III for detailed definitions. *Turnover Rate* is the number of new firms that enter + the number of old firms that cease to exist/number of firms. *Entry Rate* is the number of new firms/number of firms. *Exit Rate* is the number of firms that cease to exist/number of firms. In Tables C.2 and C.3, the control of interest is *Confiscation Dummy*, a dummy set equal to one the year of the first confiscation at the municipality level and the years thereafter (Table C.2) and *#Confiscations*, the natural logarithm of one plus the number of asset confiscations at the municipality level at any point in time (Table C.3). The first three columns report all municipalities and the remaining columns report municipalities with at least 10 firms in the year analyzed. The *Finance* industry and *Other* industries are omitted from this analysis for lack of observations. All regressions include municipality and province x year fixed effects. All dependent variables are winsorized at the 1 percent and 99 percent levels. *t*-statistics are in parentheses; standard errors are clustered at the municipality level; \*, \*\*, and \*\*\* denote significance at the 10 percent, 5 percent, and 1 percent levels, respectively.

### C.1: Summary statistics

	Turnover Rate	Entry Rate	Exit Rate
Agriculture	9.74	9.52	0.18
Finance	3.15	2.76	0.09
Manufacture	9.43	8.90	0.49
Others	11.84	11.22	0.27
Service	9.81	9.35	0.41
Total	9.64	9.19	0.33

## C.2: Confiscation dummy

### Agriculture

	(1) Turnover Rate	(2) Entry Rate	(3) Exit Rate	(4) Turnover Rate	(5) Entry Rate	(6) Exit Rate
Confiscation Dummy	0.568*	0.536*	0.0499***	0.461**	0.429**	0.0296
	(1.94)	(1.82)	(2.73)	(2.16)	(2.03)	(1.50)
N	81,157	81,157	81,157	62,173	62,173	62,173
R <sup>2</sup>	0.786	0.792	0.449	0.927	0.929	0.521
Sample	All	All	All	>10 firms	>10 firms	>10 firms
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
Province x Year FE	Yes	Yes	Yes	Yes	Yes	Yes

### Manufacturing

	(1) Turnover Rate	(2) Entry Rate	(3) Exit Rate	(4) Turnover Rate	(5) Entry Rate	(6) Exit Rate
Confiscation Dummy	0.373***	0.365***	0.0379**	0.309***	0.300***	0.0234
	(3.28)	(3.29)	(2.20)	(3.01)	(3.00)	(1.39)
N	84,451	84,451	84,451	77,097	77,097	77,097
R <sup>2</sup>	0.235	0.228	0.616	0.342	0.330	0.650
Sample	All	All	All	>10 firms	>10 firms	>10 firms
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
Province x Year FE	Yes	Yes	Yes	Yes	Yes	Yes

### Service

	(1) Turnover Rate	(2) Entry Rate	(3) Exit Rate	(4) Turnover Rate	(5) Entry Rate	(6) Exit Rate
Confiscation Dummy	0.319**	0.251	0.0869***	0.129	0.101	0.0421**
	(2.00)	(1.62)	(4.87)	(1.04)	(0.83)	(2.56)
N	83,554	83,554	83,554	68,938	68,938	68,938
R <sup>2</sup>	0.192	0.181	0.543	0.302	0.278	0.592
Sample	All	All	All	>10 firms	>10 firms	>10 firms
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
Province x Year FE	Yes	Yes	Yes	Yes	Yes	Yes

### C.3: Number of confiscations

#### Agriculture

	(1) Turnover Rate	(2) Entry Rate	(3) Exit Rate	(4) Turnover Rate	(5) Entry Rate	(6) Exit Rate
Confiscation	-0.0998	-0.0848	-0.00627	-0.135	-0.118	-0.0181
Dummy	(-0.27)	(-0.23)	(-0.29)	(-0.49)	(-0.43)	(-0.79)
#Confiscations	0.196 (0.93)	0.158 (0.75)	0.0470*** (3.86)	0.466*** (2.79)	0.424** (2.56)	0.0404*** (3.17)
N	77,305	77,305	77,305	61,392	61,392	61,392
R <sup>2</sup>	0.810	0.817	0.450	0.925	0.928	0.521
Sample	All	All	All	>10 firms	>10 firms	>10 firms
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
Province x Year FE	Yes	Yes	Yes	Yes	Yes	Yes

#### Manufacturing

	(1) Turnover Rate	(2) Entry Rate	(3) Exit Rate	(4) Turnover Rate	(5) Entry Rate	(6) Exit Rate
Confiscation	0.0456	0.0802	-0.00679	0.116	0.145	-0.0167
Dummy	(0.31)	(0.56)	(-0.34)	(0.85)	(1.08)	(-0.85)
#Confiscations	0.135* (1.74)	0.103 (1.36)	0.0361*** (3.55)	0.125* (1.73)	0.0946 (1.35)	0.0327*** (3.25)
N	80,406	80,406	80,406	73,799	73,799	73,799
R <sup>2</sup>	0.254	0.248	0.615	0.348	0.339	0.648
Sample	All	All	All	>10 firms	>10 firms	>10 firms
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
Province x Year FE	Yes	Yes	Yes	Yes	Yes	Yes

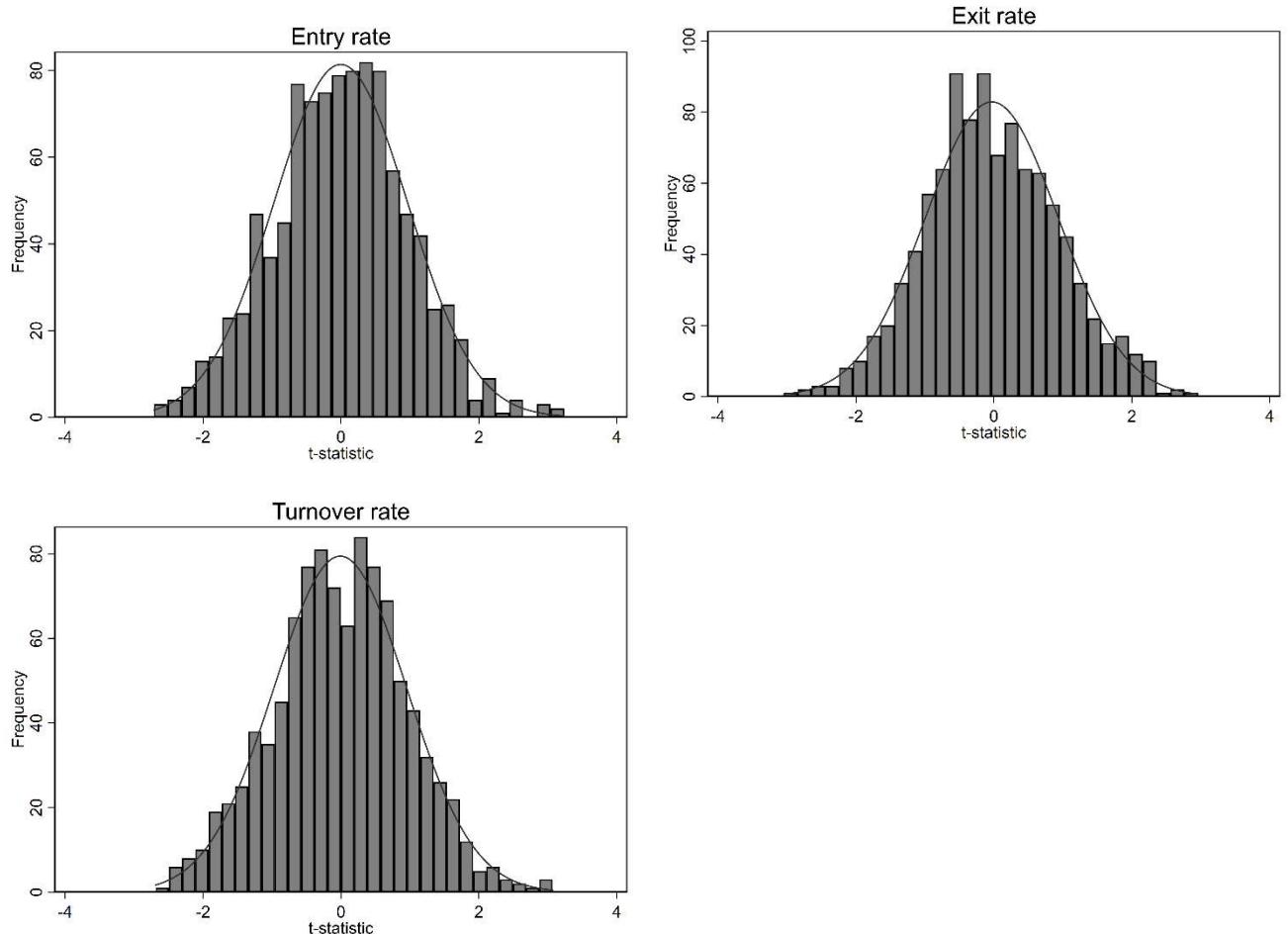
#### Service

	(1) Turnover Rate	(2) Entry Rate	(3) Exit Rate	(4) Turnover Rate	(5) Entry Rate	(6) Exit Rate
Confiscation	0.283	0.272	0.0216	0.145	0.170	-0.0155
Dummy	(1.56)	(1.54)	(0.98)	(0.94)	(1.11)	(-0.76)
#Confiscations	-0.0808 (-0.90)	-0.129 (-1.42)	0.0549*** (4.36)	-0.0282 (-0.35)	-0.0709 (-0.89)	0.0480*** (3.87)
N	79,537	79,537	79,537	66,248	66,248	66,248
R <sup>2</sup>	0.195	0.182	0.542	0.304	0.282	0.590
Sample	All	All	All	>10 firms	>10 firms	>10 firms
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
Province x Year FE	Yes	Yes	Yes	Yes	Yes	Yes

## Appendix D

### Robustness tests

This figure provides the  $t$ -stats obtained in our placebo test aimed at ruling out spurious correlation. In those tests, we randomize shocks to municipalities and run our baseline regression (Equation (1)) 1,000 times for each one of the variables of interest: Turnover Rate, Entry Rate, and Exit Rate. Each time we collect the  $t$ -stats of the main coefficients of interest.



**Table I: Confiscations by region**

This table shows the number of confiscations of mafia properties and other characteristics by region. *Number of Confiscations* denotes assets seized by the government and *Redeployed Confiscations* denotes assets that were seized and consequently transformed for social purposes. The data on asset confiscations are from the Italian National Agency for the administration and destination of assets seized and confiscated from organized crime (*ANBSC*). The data on Gross Regional Product and Population are from the Italian National Institute of Statistics (*Istat*).

Region	Number of Confiscations	Redeployed Confiscations	GRP (EUR mn)	Population (000s)
Abruzzo	346	64	28,867	1,262
Basilicata	57	12	11,147	598
Calabria	4,857	2,349	32,419	2,011
Campania	5,177	1,997	101,682	5,702
Emilia-Romagna	650	135	134,164	3,983
Friuli Venezia Giulia	52	15	34,679	1,184
Lazio	2,236	590	177,058	5,112
Liguria	270	77	45,695	1,572
Lombardia	3,104	1,154	319,728	9,033
Marche	53	19	39,467	1,471
Molise	10	3	6,643	321
Piemonte	918	178	124,739	4,215
Puglia	2,471	1,557	69,479	4,021
Sardegna	283	102	31,950	1,632
Sicilia	12,558	5,433	88,154	4,969
Toscana	499	71	100,696	3,498
Trentino-Alto Adige	21	16	33,584	940
Umbria	111	44	21,858	826
Valle D'aosta	31	0	4,227	120
Veneto	372	102	141,078	4,528
<b>Total</b>	<b>34,076</b>	<b>13,918</b>	<b>1,547,314</b>	<b>56,996</b>

**Table II: Summary statistics**

This table shows summary statistics for the variables in our analysis. Detailed variable definitions are in Appendix B. Panel A presents summary statistics at the municipality-year level, Panel B at the firm-year level, Panel C at the firm level in 2010, and Panel D at the municipality-year level.

**Panel A: Entry and exit (municipality-year level)**

Variable	N	Mean	SD	P25	P50	P75
Confiscation Dummy	84,929	0.11	0.31	0.00	0.00	0.00
#Confiscations	84,919	1.33	14.59	0.00	0.00	0.00
#Active firms	84,929	454.25	2366.78	64.00	160.00	388.00
Turnover Rate (%)	84,890	9.72	7.30	6.25	8.68	11.19
Entry Rate (%)	84,890	9.28	7.25	5.97	8.22	10.54
Exit Rate (%)	84,890	0.41	1.03	0.00	0.00	0.26

**Panel B: Firms (firm-year level)**

Variable	N	Mean	SD	P25	P50	P75
Confiscation Dummy	9,340,460	14.5%	35.2%	0.0%	0.0%	0.0%
#Confiscations	9,340,460	58	149	-	-	22
Revenue (000s)	9,291,191	8,472	1,040,392	120	576	2,108
Total Assets (000s)	9,340,327	23,765	2,401,098	273	870	2,670
Revenue per Employee (000s)	4,801,445	364	472	102	199	410
ROA	9,319,787	-2.0%	17.5%	-1.7%	0.3%	2.8%

**Panel C: Industries (firm level in 2010)**

Variable	Agriculture	Manufacturing	Service
#Firms	18,858	432,961	382,197
Confiscation Dummy	17.0	15.5	15.9
#Confiscations	33	52	75
Revenue (000s)	10,251	5,794	3,547
Total Assets (000s)	14,658	6,046	8,204
Revenue per Employee (000s)	412	436	286
ROA	-4.3%	-2.4%	-2.9%

**Panel D: Innovation and Procurement data (municipality-year level)**

Variable	N	Mean	SD	P25	P50	P75
#Inventors	23,866	10.02	39.65	2	4	8
#Contracts	329	4.0	8.6	0.0	1.0	4.0
#Applicants	329	1.3	7.2	0.0	0.0	0.0
#Invitations	329	1.1	3.5	0.0	0.0	0.0
#Offers	329	11.6	26.7	0.0	2.3	10.0
#Admitted	329	10.0	23.8	0.0	2.0	9.0
Value	329	6,285,037	23,100,000	0	406,550	3,419,881
% Reduction	329	16.1	24.0	0.0	0.1	27.4

**Table III: Municipality characteristics**

This table provides results of the comparison between municipalities that experienced an anti-mafia enforcement action and those that did not. Panel A presents the univariate results. Panel B presents the marginal effects from a probit regression where the dependent variable indicates whether a municipality experiences an anti-mafia enforcement action over the sample period or not. All municipality-level controls are as of or prior to 1995 and obtained from the Italian National Institute of Statistics (*Istat*). In the regression for column (2), additional firm-level controls are aggregated at the municipality level using 1995 data. Robust standard errors are reported in parentheses; \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% levels, respectively.

**Panel A: Univariate split**

	Not shocked		Shocked		Difference
	Mean	N	Mean	N	
Population (logged)	7.712	7,196	9.613	414	-1.901***
Water usage per capita (000s cubic meters)	0.089	7,163	0.086	414	0.002
#Firms per capita	0.071	7,163	0.077	414	-0.006***
#Touristic establishments per capita	0.006	7,168	0.007	414	-0.001
#Foreigners per capita	0.067	7,168	0.073	414	-0.005*
Social Expenditure per capita	88.205	211	111.014	7	-22.808
Profit Margin (%)	2.17	2,117	1.29	540	0.87***
Revenue per employee (logged 000s)	5.53	2,105	5.63	537	-0.10***
Revenue (logged 000s)	10.427	2,124	10.865	543	-0.438***
#Active firms (logged)	1.513	2,124	1.851	543	-0.338***

**Panel B: Probit regressions**

	(1)	(2)
Population (logged)	0.107*** (14.29)	0.107*** (11.09)
Water usage per capita	-0.0855 (-0.30)	-0.0614 (-0.22)
#Firms per capita	0.119 (0.24)	0.198 (0.39)
#Touristic establishments per capita	4.398** (2.30)	4.279** (2.19)
#Foreigners per capita	0.316 (1.42)	0.268 (1.21)
Profit Margin (%)		-0.00113 (-0.87)
Revenue per employee (logged 000s)		0.00557 (0.54)
Total Revenue (log)		0.00243 (0.28)
#Active firms (log)		-0.00173 (-0.12)
Province FE	Yes	Yes
Pseudo R-squared	0.4092	0.4167
N	1,908	1,890

**Table IV: Organized crime and competition**

This table provides the results of the analysis of the relation between confiscations of assets and measures of competition. The sample period is 1995-2015 and the unit of analysis is the municipality-year level. The control of interest is *Confiscation Dummy*, a dummy set equal to one the year of the first confiscation at the municipality level and the years thereafter (Panel A) and *#Confiscations*, the natural logarithm of one plus the number of asset confiscations at the municipality level at any point in time (Panel B). Both variables are lagged by one year. The dependent variables are the *Turnover Rate* ((Number of new firms that enter + Number of old firms that cease to exist) / Number of firms at the beginning of the period) in Columns 1 and 4, the *Entry Rate* (=Number of new firms / Number of firms at the beginning of the period) in Columns 2 and 5, and the *Exit Rate* (= Number of firms that cease to exist / Number of firms at the beginning of the period) in Columns 3 and 6. The first three columns consider all municipalities and the remaining columns consider those with at least 10 firms in the year analyzed. All regressions include *municipality* and *province x year* fixed effects. All dependent variables are winsorized at the 1% and 99% level. *t*-statistics are given in parentheses; standard errors are clustered at the municipality level; \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% levels, respectively.

**Panel A: Confiscation dummy**

LHS	(1)	(2)	(3)	(4)	(5)	(6)
	Turnover All	Entry All	Exit All	Turnover >10 firms	Entry >10 firms	Exit >10 firms
Confiscation Dummy	1.153*** (7.16)	1.093*** (6.96)	0.0613*** (4.68)	1.161*** (7.41)	1.116*** (7.28)	0.0528*** (4.07)
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
Province x Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	80,822	80,822	80,822	78,272	78,272	78,272
R-squared	0.591	0.604	0.753	0.647	0.656	0.774

**Panel B: Number of confiscations**

LHS	(1)	(2)	(3)	(4)	(5)	(6)
	Turnover All	Entry All	Exit All	Turnover >10 firms	Entry >10 firms	Exit >10 firms
Confiscation Dummy	0.389* (2.01)	0.395* (2.08)	0.00244 (0.17)	0.412* (2.14)	0.423* (2.24)	-0.00315 (-0.22)
#Confiscations	0.646*** (5.42)	0.590*** (5.08)	0.0498*** (7.08)	0.634*** (5.39)	0.586*** (5.10)	0.0474*** (6.85)
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
Province x Year FE	Yes	Yes	Yes	Yes	Yes	Yes
N	80,822	80,822	80,822	78,272	78,272	78,272
R-squared	0.591	0.605	0.753	0.647	0.657	0.774

**Table V: Organized crime and innovation activity**

This table provides results of the analysis of the relation between confiscations of mafia assets and innovation. The sample period is 1995-2015 and the unit of analysis is the municipality-year level. The control of interest is *Confiscation Dummy*, a dummy set equal to one the year of the first confiscation at the municipality level and the years thereafter (columns (1) and (2)) and *#Confiscations*, the natural logarithm of one plus the number of asset confiscations at the municipality level at any point in time (columns (3) and (4)). Both variables are lagged by one year.. The dependent variable is the natural logarithm of one plus the number of inventors that contributed to a patent in a municipality in a given year. All regressions include *municipality* fixed effects and *province x year* fixed effects. *t*-statistics are provided in parentheses; standard errors are clustered at the municipality level; \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% levels, respectively.

	(1) #Inventors All	(2) #Inventors >10 Firms	(3) #Inventors All	(4) #Inventors >10 Firms
Confiscation Dummy	0.0571*** (2.76)	0.0571*** (2.74)	0.0510** (2.17)	0.0509** (2.15)
#Confiscations			0.00514 (0.41)	0.00521 (0.41)
Municipality FE	Yes	Yes	Yes	Yes
Province x Year FE	Yes	Yes	Yes	Yes
N	80,855	78,272	80,855	78,272
R-Squared	0.726	0.725	0.726	0.725

**Table VI: Organized crime and competition for procurement contracts**

This table provides results of the analysis of the relation between confiscations of mafia assets and the characteristics of procurement auctions. The sample period is 2009-2015 and the unit of analysis is the municipality-year level. The sample consists of all municipalities that experienced a confiscation for the first time in the 2009-2015 period. The control of interest is *Confiscation Dummy*, a dummy set equal to one the year of the first confiscation at the municipality level and the years thereafter, lagged by one year. In the regression for column (1), the dependent variable is the natural logarithm of the number of contracts tendered publicly. In the regression for column (2), the dependent variable is the natural logarithm of the average number of applicants per tendered contract. In the regression for column (3), the dependent variable is the natural logarithm of the average number of invitations per tendered contract. In the regression for column (4), the dependent variable is the natural logarithm of the average number of offers made per tendered contract. In the regression for column (5), the dependent variable is the natural logarithm of the average number of admitted offers made per tendered contract. In the regression for column (6), the dependent variable is the natural logarithm of the work value tendered publicly. In the regression for column (7), the dependent variable is the average reduction from work value to contract value (discount). Procurement auction data are obtained from the Italian Ministry of Infrastructure and Transportation. All regressions include *municipality* fixed effects. *t*-statistics are given in parentheses; standard errors are clustered at the municipality level; \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% levels, respectively.

LHS	(1) #Contracts (logged)	(2) #Applicants (logged)	(3) #Invitations (logged)	(4) #Offers (logged)	(5) #Admitted (logged)	(6) Work Value (logged)	(7) Percentage reduction
Confiscation	0.277*** (3.28)	0.119 (1.32)	0.360*** (4.04)	0.311* (1.95)	0.342** (2.17)	1.405* (1.92)	3.932* (1.99)
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	329	329	329	329	329	329	329
R-Squared	0.729	0.454	0.224	0.323	0.321	0.499	0.265

**Table VII: Organized crime and firms**

This table provides results of the analysis of the relation between confiscations of assets and firm characteristics. The sample period is 1995-2015 and the unit of analysis is the firm-year level. Firms are included if they have at least four observations over the sample period. The control of interest is *Confiscation Dummy*, a dummy set equal to one the year of the first confiscation at the municipality level and the years thereafter (Panel A) and *#Confiscations*, the natural logarithm of one plus the number of asset confiscations at the municipality level at any point in time (Panel B). Both variables are lagged by one year. . The dependent variables are the natural logarithm of revenues in the regression for column (1), the natural logarithm of assets in the regression for column (2), the natural logarithm of the revenue per employee in the regression for column (3), and return on assets in the regression for column (4). All regressions include *firm* fixed effects and *province x year* fixed effects. All dependent variables are winsorized at the 1% and 99% levels. *t*-statistics are given in parentheses; standard errors are clustered at the municipality level; \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% levels, respectively.

**Panel A: Confiscation dummy**

LHS	(1) Revenue	(2) Assets	(3) Revenue per employee	(4) ROA
Confiscation Dummy	-0.042*** (-2.64)	-0.014* (-1.93)	-0.016*** (-2.64)	-0.001 (-1.52)
Firm FE	Yes	Yes	Yes	Yes
Province x Year FE	Yes	Yes	Yes	Yes
N	9,287,935	9,336,706	4,799,734	9,316,457
R-Squared	0.805	0.900	0.796	0.371

**Panel B: Number of confiscations**

LHS	(1) Revenue	(2) Assets	(3) Revenue per employee	(4) ROA
Confiscation Dummy	0.033 (1.50)	0.020** (1.99)	-0.004 (-0.59)	0.002* (1.72)
#Confiscations	-0.062*** (-5.17)	-0.029*** (-5.30)	-0.010*** (-2.85)	-0.003*** (-4.73)
Firm FE	Yes	Yes	Yes	Yes
Province x Year FE	Yes	Yes	Yes	Yes
N	9,287,935	9,336,706	4,799,734	9,316,457
R-Squared	0.805	0.900	0.796	0.371

**Table VIII: Tradable and non-tradable goods**

This table provides results of the analysis of the relation between confiscations of assets and firm characteristics by firms' sector. In Panel A, the analysis follows that for Table VII Panel A except that in the regression, *Confiscation Dummy* is interacted with an indicator variable for firms in the tradable sector. Tradable sectors are identified using Mano and Castillo's (2015) classification. Regressions include *firm* fixed effects and *province x year* fixed effects. In Panel B, *municipality x year* fixed effects are also included in the regression. *t*-statistics are given in parentheses; standard errors are clustered at the municipality level; \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% levels, respectively.

**Panel A: Main result**

LHS	(1) Revenue	(2) Assets	(3) Revenue per employee	(4) ROA
Confiscation Dummy	-0.086*** (-5.36)	-0.024*** (-3.17)	-0.052*** (-7.62)	-0.002* (-1.81)
Confiscation Dummy x Tradable	0.184*** (7.86)	0.040*** (3.43)	0.115*** (10.71)	0.002 (1.17)
Firm FE	Yes	Yes	Yes	Yes
Province x Year FE	Yes	Yes	Yes	Yes
N	9,258,508	9,307,885	4,705,846	9,287,171
R-Squared	0.777	0.886	0.752	0.301

**Panel B: Municipality x year fixed effects**

LHS	(1) Revenue	(2) Assets	(3) Revenue per employee	(4) ROA
Confiscation Dummy x Tradable	0.117*** (5.23)	0.031*** (2.83)	0.093*** (8.18)	-0.001 (-0.74)
Firm FE	Yes	Yes	Yes	Yes
Municipality x Year FE	Yes	Yes	Yes	Yes
N	9,255,657	9,305,037	4,702,072	9,284,321
R-Squared	0.777	0.886	0.751	0.300

**Table IX: The role of mafia strength**

This table provides results of the analysis of the relation between confiscations of assets and firm characteristics by the presence of the mafia around incorporation. In Panel A, the analysis follows Table VII Panel A but additionally interacts *Confiscation Dummy* with the mafia strength in a firm's incorporation year, which is measured by the number of homicides per capita in that year. Regressions include *firm* fixed effects and *province x year* fixed effects. In Panel B, *municipality x year* fixed effects are also included. In Panel C, the analysis is conducted on the subset of firms incorporated prior to 1992. *t*-statistics are given in parentheses; standard errors are clustered at the municipality level; \*, \*\*, and \*\*\* denote significance at the 10%, 5%, and 1% levels, respectively.

**Panel A: Main results**

LHS	(1) Revenue	(2) Assets	(3) Revenue per employee	(4) ROA
Confiscation Dummy	-0.029 (-0.90)	0.104*** (6.23)	0.012 (0.67)	-0.013*** (-5.09)
Confiscation Dummy x Mafia Strength	-0.006 (-0.33)	-0.075*** (-7.18)	-0.018 (-1.64)	0.007*** (5.09)
Firm FE	Yes	Yes	Yes	Yes
Province x Year FE	Yes	Yes	Yes	Yes
N	8,547,019	8,594,545	4,238,999	8,574,404
R-Squared	0.767	0.878	0.753	0.301

**Panel B: Municipality x year fixed effects**

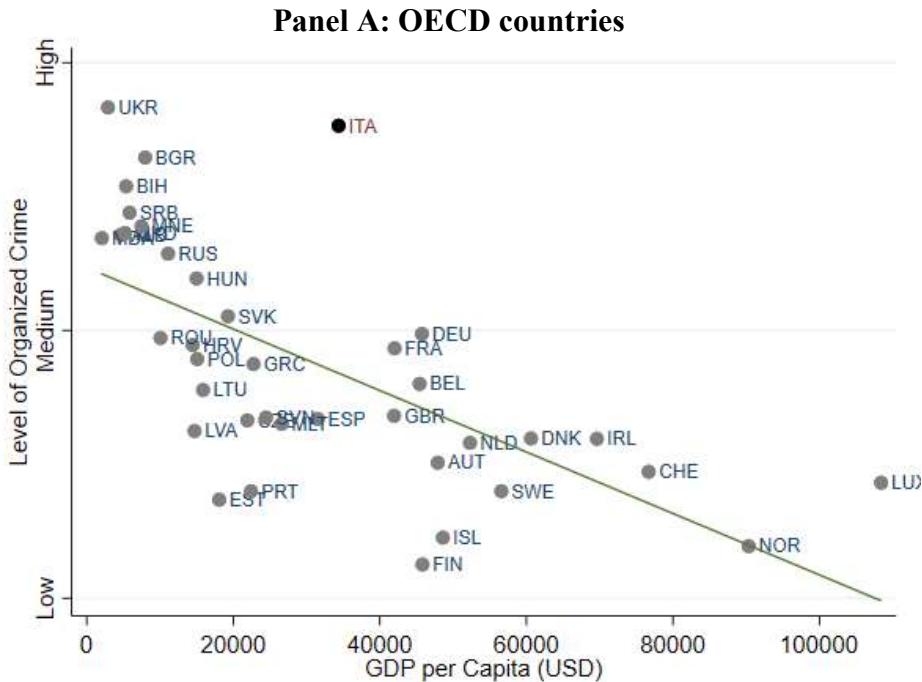
LHS	(1) Revenue	(2) Assets	(3) Revenue per employee	(4) ROA
Confiscation Dummy x Mafia Strength	-0.096*** (-5.71)	-0.019*** (-3.05)	-0.039*** (-5.10)	-0.003*** (-2.80)
Firm FE	Yes	Yes	Yes	Yes
Municipality x Year FE	Yes	Yes	Yes	Yes
N	8,543,845	8,591,374	4,234,809	8,571,229
R-Squared	0.767	0.878	0.752	0.300

**Panel C: Municipality x year fixed effects; Firms incorporated prior to 1992**

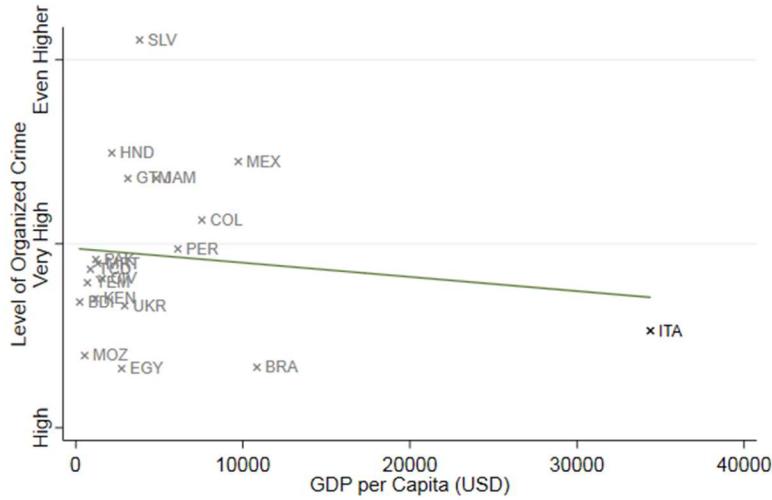
LHS	(1) Revenue	(2) Assets	(3) Revenue per employee	(4) ROA
Confiscation Dummy x Mafia Strength	-0.075*** (-5.00)	0.002 (0.35)	-0.028*** (-2.86)	-0.005*** (-5.25)
Firm FE	Yes	Yes	Yes	Yes
Municipality x Year FE	Yes	Yes	Yes	Yes
N	2,227,513	2,236,301	1,341,676	2,231,902
R-Squared	0.803	0.883	0.740	0.262

**Figure I: Organized crime and economic development**

This figure shows economic development (x-axis) and level of organized crime for OECD countries (Panel A) and the 20 countries most infiltrated by organized crime (Panel B). *Economic development* is proxied with *GDP per capita* using World Bank data for 2016. *Level of organized crime* is measured using responses to the following question from the 2016 Executive Opinion Survey (EOS) by the World Economic Forum: “*In your country, to what extent does organized crime (mafia-oriented racketeering, extortion) impose costs on businesses? [1] To a great extent, imposes huge costs, [7] No costs at all.*” We average the answers of 14,000 executives across 148 countries and interpret answers closer to “1” as high levels of organized crime.

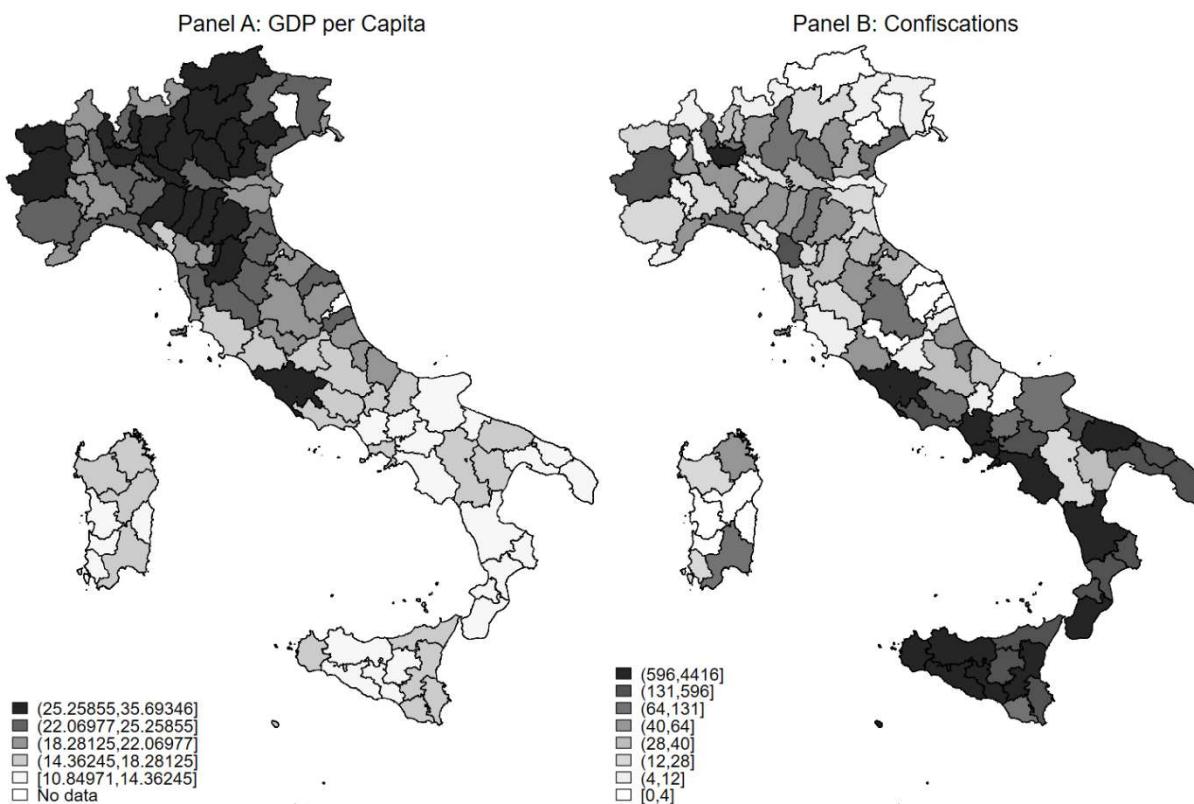


**Panel B: 20 countries that are most infiltrated by organized crime**



**Figure II: Italian province characteristics**

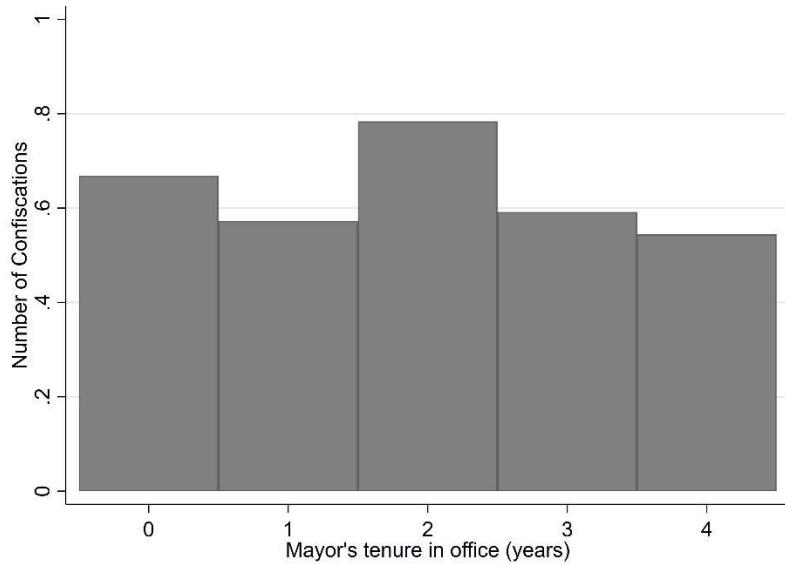
This figure shows economic development (Panel A) and anti-mafia enforcement actions (Panel B) by Italian province. Economic development is measured using GDP per capita for the year 2000. Anti-mafia enforcement actions are measured using accumulated confiscations between 1995 and 2015. The data on GDP and Population are from the Italian National Institute of Statistics (*Istat*) and the data on asset confiscations are from the Italian National Agency for the administration and destination of assets seized and confiscated from organized crime (*ANBSC*).



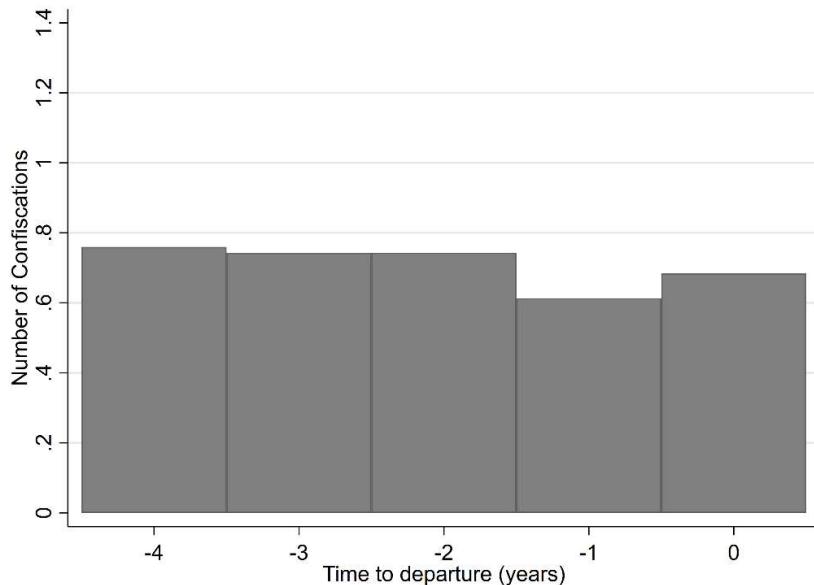
**Figure III: Mayor's tenure and confiscations**

This figure shows the number of asset confiscations per year after a mayor is elected (Panel A), and the number of asset confiscations per year before a mayor's term ends. The sample is limited to municipalities with confiscations. The data on asset confiscations are from the Italian National Agency for the administration and destination of assets seized and confiscated from organized crime (*ANBSC*), and the data on political appointments is from the Italian Ministry of the Interior (*Ministero dell'Interno*).

**Panel A: Time since elected**



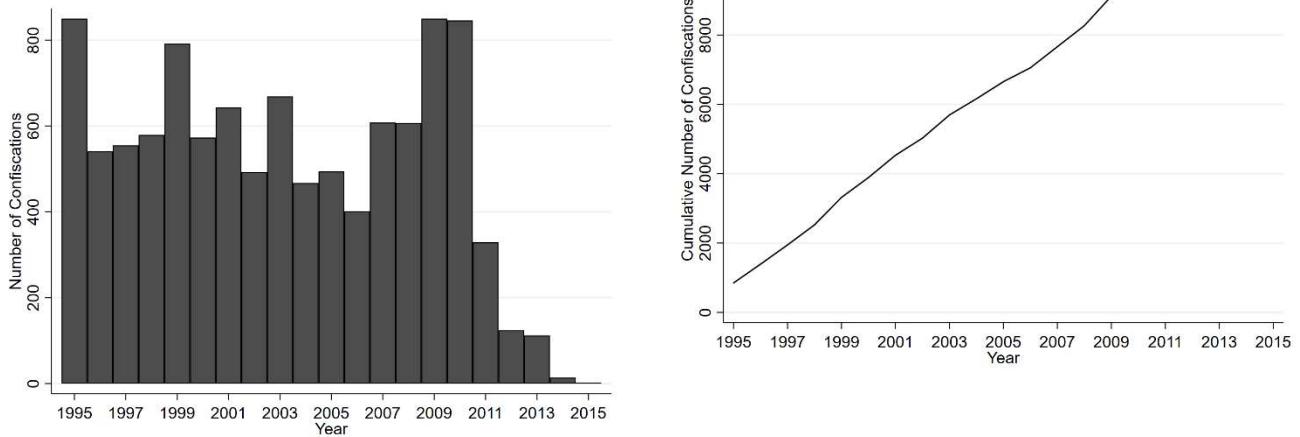
**Panel B: Time to departure**



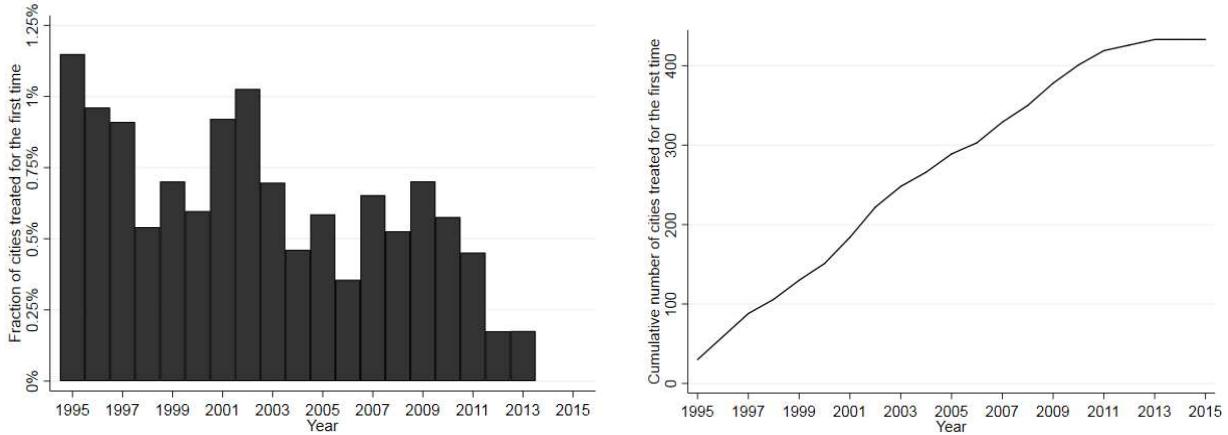
**Figure IV: Asset confiscations, treated cities, and treated firms**

This figure shows the number of asset confiscations (Panel A), treated municipalities (Panel B), and treated firms (Panel C) over time. Panel A shows the number of confiscations per year (left) and the cumulative number of confiscations (right). Panels B and C show the number of municipalities/firms treated for the first time (left) and the cumulative number of treated municipalities/firms (right). The data on asset confiscations are from the Italian National Agency for the administration and destination of assets seized and confiscated from organized crime (*ANBSC*), and data on firms are from Bureau Van Dijk's Orbis database.

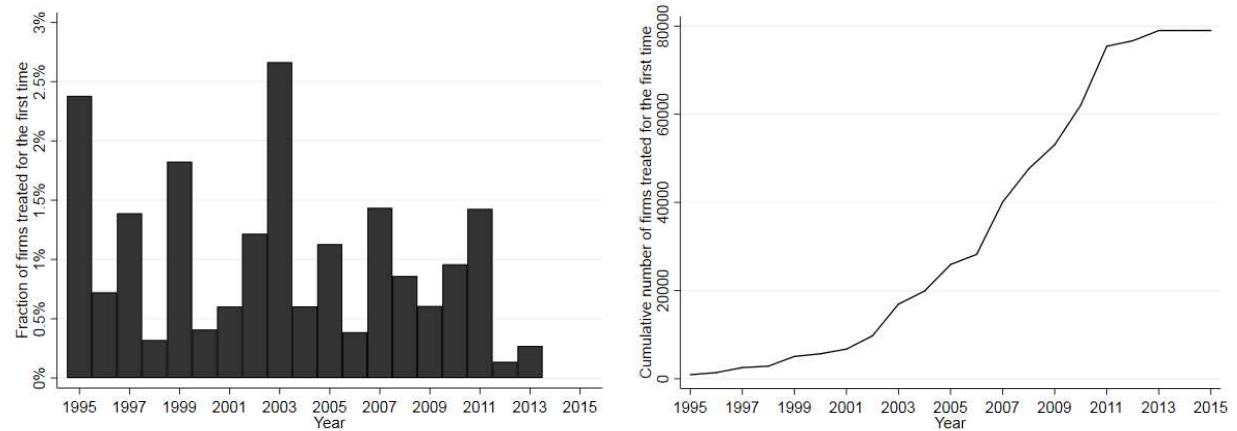
**Panel A: Number of confiscations over time**



**Panel B: Municipalities treated for the first time**



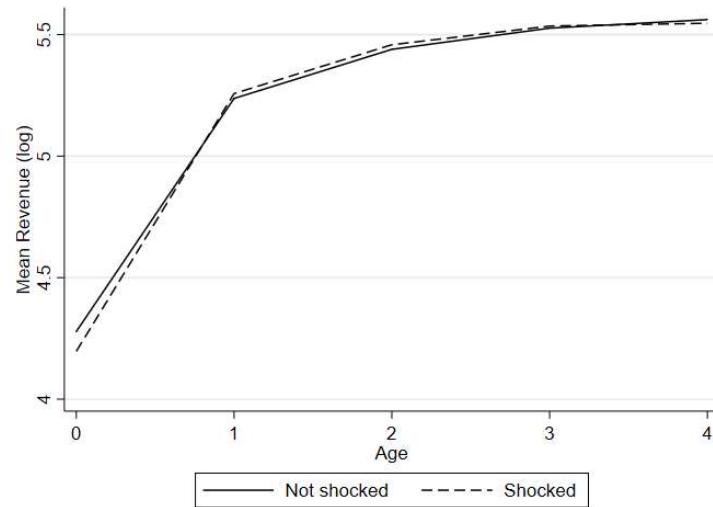
### Panel C: Firms treated for the first time



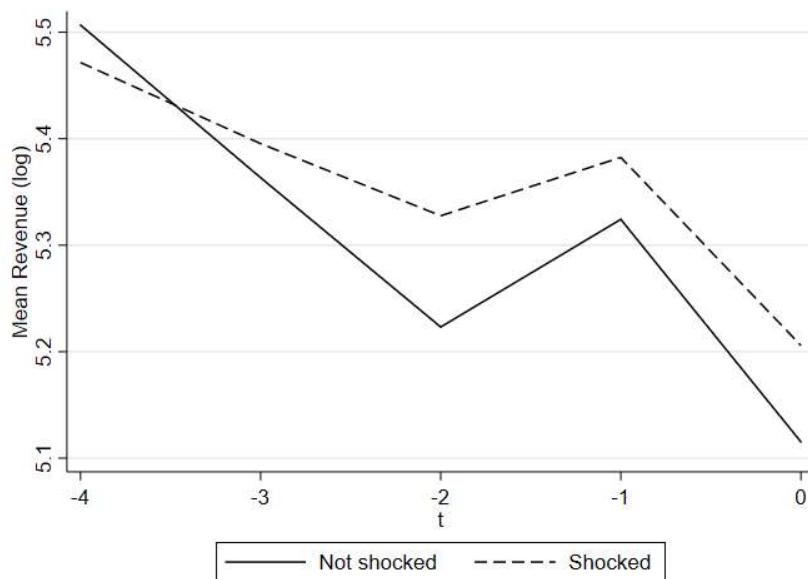
**Figure V: New firms and firms that exit**

This figure shows the revenues of new firms and exiting firms through time. Panel A compares the revenue of firms entering municipalities that were treated with firms entering municipalities that were not treated. Panel B compares the revenues of firms exiting municipalities that were treated with those of firms exiting municipalities that were not treated. The data on asset confiscations are from the Italian National Agency for the administration and destination of assets seized and confiscated from organized crime (*ANBSC*), and data on firms are from Bureau Van Dijk's Orbis database.

**Panel A: New firms**



**Panel B: Exiting firms**



**Figure VI: Key firm-level outcomes around treatment**

This figure shows the evolution of the key firm-level variables around anti-mafia enforcement actions. Variables of interest are *Revenue* (top left), *Total Assets* (top right), *Revenue per Employee* (bottom left), and *Return on Assets* (bottom right). Each graph plots the difference in these variables between a portfolio of firms in treated municipalities and a portfolio of matched firms in non-treated municipalities. For each treated firm, the matching is performed with replacement using a same-industry requirement and such that the control firm is the closest in geographic distance and total assets a year prior to treatment. The data on asset confiscations are from the Italian National Agency for the administration and destination of assets seized and confiscated from organized crime (*ANBSC*), and data on firms are from Bureau Van Dijk's Orbis database.

