Revealing “Mafia Inc.”? Financial Crisis, Organized Crime, and the Birth of New Enterprises∗

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Abstract
We study the investment of criminal organizations in the legal economy. By using the shock induced on the Italian credit market by the 2007 subprime mortgage crisis, we document how areas with a high presence of organized crime saw less impact on the establishment of new enterprises than those less infiltrated. Our findings are consistent with the presence of investments by criminal organizations into the legal economy. We corroborate this interpretation by comparing our results with the characterization of such investments made by the judicial authority. Finally, to provide a more general picture of the impact of mafia presence on local entrepreneurship, we extend the analysis to closed and registered enterprises.


Keywords: Mafia, Organized Crime, Illegal Enterprises, Subprime Mortgage Crisis.

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1 Introduction

The presence of criminal organizations has been found to be largely detrimental for economic prosperity and development (Pinotti, 2015; Detotto and Otranto, 2010; Peri, 2004). Although organized crime usually operates through the use of violence, killings, and corruption to obtain power and territorial control, it also represents an important actor within the economy of many countries. According to Demoskopika, in 2013 the Italian mafia-type organization 'Ndrangheta was able to raise revenues of €53 billion from its illicit trafficking, an amount higher than the earnings of McDonald’s and Deutsche Bank combined.\(^1\) A consistent share of these revenues is reinvested in the legal economy. Between 1983 and 2011, Italian authorities seized 19,987 assets from criminal organizations operating nationwide (Ministry of Interior, 2013).

In this work, we depart from the current literature on the disruptive effects induced by the territorial presence of criminal organizations to shed light on organized crime’s investment in the local economy. Such investment is important in many dimensions. First, investment in the legal economy is one of the main channels used by criminal organizations to launder money and make profits.\(^2\) In addition, it might be an important tool used by organized crime to raise forms of social consensus in a segment of the population. Indeed, through its investment in the legal economy, organized crime may act as a sort of social insurance or an alternative provider of capital and jobs.\(^3\)

We focus on Italy, a country that has been plagued by a massive number of criminal organizations since the nineteenth century. By exploiting the mandatory registration for all enterprises operating nationwide and the shock on the credit market induced by the 2007 subprime mortgage crisis, we compare the number of newly established enterprises between provinces with and without the presence of organized crime pre- and post-2007.

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\(^2\)Money laundering is a vast global phenomenon. As an example, see Ardizzi et al. (2014) for an estimate of its impact on the Italian financial sector.
\(^3\)Social consensus is one of the fundamental milestones of the empowerment of criminal organizations. For instance, the Sicilian Mafia in Italy rose to power in the nineteenth century as a movement fulfilling the need of the population to protect its land from predatory attacks (Bandiera, 2003). Similar cases have arise worldwide, e.g. terrorist organizations, drug cartels, etc.
in a Difference-in-Differences (DiD) setting.\footnote{For the remainder of the study, we will refer to organized crime using different synonyms such as mafia, mafia-type organizations, and criminal organizations. The term mafia is often used to define the Sicilian Mafia (\textit{Cosa Nostra}); here it also refers to other criminal organizations that have arisen in Italy in the past, such as the \textit{Camorra}, the \textit{’Ndrangheta}, and the \textit{Sacra Corona Unita}.}

The identification of the investment of organized crime in the legal economy is challenging because of organized crime’s illegal nature. Thus, understanding and quantifying a behavior that economic agents strive to hide is complicated. We employ concepts of forensic economics to deal with these difficulties. The forensic economics approach deals with the use of information about licit markets to highlight different insights on illicit activities (Zitzewitz, 2012). Although criminal organizations mainly operate in illegal markets, their activities often require complementary goods and services produced in the legal economy. For this reason, organized crime is also subject to the rules and laws governing the legal economy. Italian National Law 580/1993 requires each Italian enterprise to register its activity in the Registry of Enterprises. Registration is mandatory for all enterprises operating nationwide and it is undertaken both by legal enterprises and by those enterprises with some connections to organized crime.\footnote{By illegal enterprises we mean both the enterprises whose activities are directly carried out by members of criminal organizations or financed by their capital and those not directly linked to mafia but that are economically connected with the enterprises in which mafia invest (i.e. as suppliers or customers).} To disentangle the impact of mafia capital inflows on the registry through actual investments from the effect of other illegal lending practices such as usury, we focus our main analysis on the number of new registrations. We use new registrations because they are probably less affected by these kind of activities than closed and registered enterprises.\footnote{In fact, there is still the possibility that new entrepreneurs without mafia connections eventually turn to mafia-type organizations to borrow capital to set up their new business, but such phenomenon is definitively narrower than in the case of closed and registered enterprises, for which instead illegal lending may often represent a source of credit of last resort (UNIONCAMERE, 2014; SOS Impresa, 2012). Established and closed enterprises are flow measures, while the number of registered enterprises is a stock measure representing the total number of enterprises operating in a specific point in time.}

To quantify the incidence of the number of new enterprises with mafia connections on the public registry, we take advantage of the shock on the supply of legal credit generated by the 2007 subprime mortgage crisis. We do this for three reasons. First, the shock induced by that event can be considered as exogenous with respect to the presence of criminal organizations. The crisis originated in the United States, reducing the...
possible existence of anticipation effects, especially for countries far from the U.S. banking and financial sectors. Second, this event destabilized the worldwide banking sector and stock markets, which affected the supply of legal credit provided to entrepreneurs across Italy. Third, the subprime mortgage crisis left mafia sources of capital almost unaffected (Organised Crime Portfolio, 2015), making the consequences of the credit market shock likely to be less severe for mafia-connected enterprises. As a result, one should expect that the incidence of new mafia-connected enterprises in the Registry of Enterprises has increased in the post-crisis period, making it more detectable, especially for provinces with a strong organized crime presence. This framework allows for the implementation of a DiD estimation strategy, in which provinces with a high presence of criminal organizations, and potentially a greater share of new mafia-connected enterprises, are compared to provinces with a low level of organized crime infiltration, before and after the outbreak of the subprime mortgage crisis.

Our results show that provinces with higher mafia infiltration experienced a less severe drop—around 7 percent—in the number of new enterprises established in the post-crisis period. The effect is robust to the use of alternative definitions and measures for mafia presence and to a complete set of sensitivity tests. The analysis of the structure of the local banking sector supports the implemented identification strategy by suggesting that the mafia effect on newly established enterprises in the post-crisis period is particularly strong in areas characterized by higher levels of credit rationing.

To corroborate the interpretation of the results in terms of mafia investment in the legal economy, we test whether further evidence obtained through our empirical strategy is consistent with the specific characteristics of the mafia investment in the legal economy produced by the Italian judicial authority. First, judicial evidence reveals massive mafia investments in specific economic sectors such as the construction sector; organized crime invests few resources in sectors characterized by higher levels of innovation. Accordingly, we introduce a validation and a falsification test based on sector-specificity of

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7Criminal organizations raise their capital in markets barely affected by credit market reactions to economic downturns. See Section 3.2 for the analysis of one of the main sources of profits for criminal organizations, namely the illegal drug market.
mafia investment. A negative, but statistically insignificant effect is detected in sectors traditionally not infiltrated by mafia (i.e. professional, scientific, and technical activities), while a sizable effect appears in the construction sector, traditionally deemed as one of the most infiltrated. Second, we look at the preferred legal form of enterprises adopted by mafia to run its businesses, namely Limited Companies. Consistent with the judicial evidence, we find that the mafia effect on the number of new enterprises in the post-crisis period is even larger than in the baseline when only limited companies are considered. Third, judicial evidence also sheds light on the demographic characteristics of individuals (figureheads) running businesses connected with mafia. In general, these individuals are particularly young or particularly old (retirement age). We find similar evidence in our empirical framework. On the one hand, after the onset of the crisis, we observe in mafia provinces a larger increase in the number of new Limited Companies run by young people (younger than 25) as opposed to those provinces without organized crime. On the other hand, we also observe a narrower drop in the number of new Limited Companies directed by older individuals (older than 65) in provinces with mafia presence than in those provinces without it.

Finally, we look at closed and registered enterprises to get an overall picture of the impact of mafia presence on the Registry of the Enterprises and on the degree of local entrepreneurship generally. The analysis of closed enterprises pinpoints a higher rate of closures in areas with mafia presence during the period characterized by the credit shortage. This might be explained by the fact that the negative spillovers associated with mafia presence are likely to exacerbate the impact of the economic downturn by imposing additional costs on local entrepreneurs, who have already to deal with a decrease in the supply of legal credit. However, the analysis of registered enterprises highlights a less severe decline in the stock of enterprises operating in areas with mafia presence, suggesting a possible role played by criminal organization in stabilizing the impact of the crisis on entrepreneurial activity, at least in the short run.

This work represents the first attempt to reveal the actual investment of organized crime in the legal economy through evidence of its impact on the degree of local en-
entrepreneurial activity. It is impossible to infer the precise reasons behind this investment. However, anecdotal and juridical evidence provide important insights. Through this investment, organized crime is likely to accomplish several tasks such as money laundering, generating profits, and raising forms of social consensus in the local population. The latter is often responsible for the ineffectiveness of policies targeted at reducing leniency toward organized crime.

We also shed light on different aspects of mafia investment in the legal economy. On the one hand, our research suggests that positive-in-sign spillovers related to mafia presence and its territorial activity are larger in contexts characterized by harsher conditions in the local credit market—e.g. less availability of credit, high cost of credit, etc. As a consequence, negative shocks to the credit market conditions should be carefully monitored in these areas in order to preempt an even higher infiltration of organized crime in the legal economy. On the other hand, by confirming the existing qualitative evidence on mafia preferences when it comes to investing money in economic sectors and adopting legal forms, and the demographics of managers running mafia-related businesses, we pinpoint where monitoring and vigilance could be improved.

The remainder of the paper is structured as follows. Section 2 provides a brief review of the literature about the origin and activity of criminal organizations in Italy. Section 3 describes the identification strategy and the data used for the analysis. Sections 4 and 5 present the main results on newly established enterprises and further supportive evidence for their interpretation. In Section 6, we extend the analysis to closed and registered enterprises. Section 7 concludes.

2 Organized Crime in Italy

In recent years, economists have devoted growing attention to the empirical analysis of organized crime and its behavior. In this context, Italy’s case has represented rich soil for research as a result of the exceptional heterogeneity across regions and the existence of complex and well-established criminal activities managed by mafia-type organizations.
The Sicilian Mafia (Cosa Nostra)—the traditional term for organized crime in Italy—dates to the nineteenth century. It rose in response to the demand of the population to protect its land from predatory attacks in a weak institutional context (Bandiera, 2003). Similarly, Buonanno et al. (2015) and Dimico et al. (2017) trace the expansion of the Sicilian Mafia to the presence of weak institutions in an area with valuable natural resources.\(^8\) The expansion of Cosa Nostra in Sicily was contemporaneous with the birth of similar criminal organizations in other Italian regions, namely the Camorra in the Campania region and the 'Ndrangheta in the Calabria region.

Although initially characterized by immobility, all these criminal organizations started to expand their influence and activity to the more productive and profitable central-northern areas. Buonanno and Pazzona (2014) investigate the determinants of this expansion from the southern regions to the rest of Italy by highlighting the importance of two key factors. The first was the “Italian economic miracle,” which occurred between the late 1950s and the early 1970s, and was responsible for massive migration from the south to the north of the country. The second was the Confino law, which in the 1960s and 1970s, imposed resettlement to different provinces on individuals likely to be involved in mafia-type criminal activities. These two factors, in addition to a series of other contextual conditions, produced the first evidence of a mafia presence in northern Italy during the late 1960s. In the 1970s, mafia power increased even more due to its role in dealing drugs, kidnapping, and racketeering. In the 1980s and 1990s, these organizations completed their entrenchment through the acquisition of power not only in the illegal market but in the legal one as well.

The political, economic, and social consequences generated by the territorial presence of organized crime are far-reaching. Acemoglu et al. (2017), De Feo and De Luca (2017), Daniele and Dipoppa (2017), Alesina et al. (2016), and Daniele and Geys (2015) highlight the influence and interference of mafia in political competition, the quality of politicians, and election results.\(^9\) The presence of criminal organizations generates a sizable loss in

\(^8\)For further studies on the relationship between weak institutions, natural resources, and organized crime, see also Gambetta (1993) and Konrad and Skaperdas (2012).

\(^9\)These works are inspired by Dal Bó et al. (2006), in which the authors develop a theoretical model in which groups attempt to influence policies using both bribes and the threat of punishment.
terms of economic resources. Pinotti (2015), by comparing two Italian regions with their synthetic counterparts before and after the 1970s, estimates that the presence of mafia lowers the GDP per capita by 16 percentage points. Detotto and Otranto (2010) reach similar conclusions. Peri (2004) shows lower levels of employment and employment growth as a result of the presence of organized crime, and Ganau and Rodriguez-Pose (2017) and Albanese and Marinelli (2013) analyze the negative impact on productivity.

Economic loss results from a series of factors. Mafia is able to control the local entrepreneurial activity and to obtain forms of monopolistic power by adopting violent and intimidating behavior (Falcone, 1991; ARIEL, 2015). Moreover, in areas characterized by high levels of criminal activity, the cost of credit tends to increase as the credit supply is affected by the amount of money spent by banks on security and protection. The uncertainty about the quality of borrowers and their future behavior consistently reduces the propensity to grant loans not backed by collateral (Bonaccorsi di Patti, 2009). Foreign direct investment (FDI) is also negatively affected by the local presence of criminal organizations (Daniele and Marani, 2011). Moreover, areas with mafia presence are more likely to adopt lower levels of technology in the production processes (Caglayan et al., 2017). Finally, Barone and Narciso (2015) demonstrate how mafia presence might also lead to a misallocation of public funds in the form of business subsidies.

3 Detecting Mafia Investment in the Legal Economy

In this section, we present the empirical strategy underlying this study. In particular, we extensively discuss the two main challenges related to the study of criminal organizations and their activity. The first challenge concerns the definition of mafia presence and its measurement. The second challenge relates to the identification of possible behaviors (e.g. investments) that economic agents strive to hide because of their illegal nature.

\[\text{FDI inflows are crucial in determining future investments from abroad as they encapsulate the difficulty of setting up new companies, the effectiveness of the government and the judicial system, and the security of property rights (Globerman and Shapiro, 2002; Bénassy-Quéré et al., 2007; Wei, 2000).}\]
3.1 Measures for Mafia Presence

One of the main challenges when it comes to studying organized crime is that the analysis relies on the identification and measurement of the presence of organized crime in specific territories. The illegal nature of activities perpetrated by criminal organizations makes it difficult to find reliable and satisfactory measures.

As the construction of new measures for mafia presence goes beyond the scope of this work, we base our analysis on a reference index for mafia presence. We also consider all the alternative available proxies for mafia presence to compare the results obtained with different measures. Our reference measure for the presence of criminal organizations at the provincial level is the *Transcrime Mafia Index* (TMI) produced by *Transcrime*, an Italian research center on transnational crime.\textsuperscript{11} We adopt the TMI definition because it is the most generally available definition for mafia presence, and includes features related both to territorial infiltration in terms of military occupation and mafia’s capacity to provide illegal goods and services.

The TMI is a composite index constructed by using criminal records collected between 2000 and 2011 on Association of Mafia (Law 646, art.416-bis), murders committed by mafia members, city councils dissolved because of mafia infiltration, and assets seized due to organized crime.\textsuperscript{12}

The main potential concern of the TMI is that the data used to compute the index were collected between 2000 and 2011. As the index is (also) constructed with data collected after the outbreak of the subprime crisis (our identifying shock), it might become partially endogenous with respect to the subprime crisis because of possible changes in the location of organized crime due to the crisis itself. However, the presence of organized crime is a persistent phenomenon in the short to medium run; therefore, it is highly unlikely that remarkable changes in a circumscribed time period such as the one of interest in this

\textsuperscript{11}Specifically, we rely on the version of the index provided in the report “Mafia Investments,” funded by the Italian Ministry of Internal Affairs and the European Union (Ministry of Interior, 2013). We use the classification of the Italian provinces in force until 2005. The number of provinces is 103.

\textsuperscript{12}The TMI defines mafia as a “system characterized by the presence of criminal groups providing illicit goods and services; using violence, threat, or intimidation to pursue their aims; and with a high degree of infiltration in the political and the economic system.” Appendix A.2 provides details about the TMI’s construction.
study would be observed.  

Figure 1 graphically shows the territorial distribution of the index by dividing provinces according to the quartiles of the TMI distribution. Mafia presence is spread nationwide, although it is most pervasive in areas in the center and south of the country. We define mafia presence as high based on the TMI distribution. For the remainder of the paper, otherwise differently specified, we consider provinces with Mafia as those belonging to the fourth quartile of the TMI distribution.

The discretization of the TMI index is due to the difficulty of measuring marginal differences in criminal presence and activity at the local level. The measurement issue, which undermines the reliability of the comparison based on the continuous index, derives from facts such as the underreporting of criminal records or different efficiency levels of the local police and judicial system. This issue is mitigated by the use of the last quartile of the index distribution as it is based only on objective evidence of a strong presence of criminal organizations.

As stated, scholars do not agree on which mafia index should be used to define the presence of criminal organizations. To take into account the possible limitations of each possible mafia index, our analysis will not uniquely rely on the TMI but will be based on the alternative available measures for mafia presence. Specifically, we will consider an alternative version of the TMI index (Calderoni, 2011) based almost exclusively on pre-subprime crisis records (i.e. 1983–2009). We will also consider with the Power Syndicate Index (PSI) provided by Fondazione RES, which relies on records averaged during the period of 2004–2007. Finally, we will conclude by using the average number of cases pursuant to article 416-bis during the period 2003–2006. Article 416-bis captures the adherence of Italian mafias to the theoretical framework of Schelling (1971) as well as

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13 The high correlation of the index with alternative mafia indexes exclusively based on pre-crisis data supports this statement. This comparison, as well as with the replication of the main analysis of this study by using alternative indexes for mafia presence, will be discussed below.

14 The 75th percentile of the TMI distribution corresponds to a TMI value of 0.080.

15 In Appendix A.4, we show that our analysis conveys similar findings when the definition of mafia is based also on the third quartile of the TMI distribution.
their interest and infiltration in the official economy (Pinotti, 2015). Appendix A.4 shows that all the indexes display high levels of correlation.

3.2 Identification Strategy

It is difficult to identify mafia interference in the legal economy. The illegal nature of mafia business makes it hard to find direct evidence of criminal organizations’ activity. Our identification strategy relies on three main elements: (i) the mandatory registration (in a specific registry) required of each enterprise operating in Italy; (ii) the exogeneity of the credit contraction induced by the 2007 subprime mortgage crisis; and (iii) the reduced impact of the crisis on the source of capital of mafia-type organizations.

The first element of the identification strategy uses information about licit markets to infer insights about illicit activities (see the forensic economics approach described in Zitzewitz (2012)). Illicit trafficking and activities often interface (and interfere) with legal markets. This relation leaves detectable traces as it is subjected to the laws and rules governing legal activities. We exploit National Law 580/1993, which requires each Italian enterprise to register its activity on the Registry of Enterprises (Registro delle Imprese). This registration is mandatory for all enterprises that operate nationwide with the exception of liberal professions such as lawyers or architects.16 As a result, the Registry of Enterprises undeniably contains a subgroup of enterprises with connections to criminal organizations, especially in provinces strongly infiltrated by mafia. Given the specific role of mafia investments as potential source of social consensus, this work attempts to disentangle mafia capital inflows to the legal economy through actual investments from other types of interference in local entrepreneurial activity such as usury. To do that, we will mainly focus on the registration of new enterprises, since they are possibly less affected by illegal mafia lending practices. It is possible that new entrepreneurs could eventually turn to organized crime to borrow capital for starting a new business. However, that is

16The Registry of Enterprises was established by the Italian legislature in 1942. Originally, the registration was compulsory only for commercial enterprises. National Law 580/1993 extended such compulsory requirement to all the other kinds of enterprises except liberal professions (article 2195 of Italian civil code). For a subgroup of enterprises, i.e. limited companies, the date they were established coincides with the registration date.
more likely to happen when closed and registered enterprises are considered, in which cases mafia can often be a lender of last resort (UNIONCAMERE, 2014; SOS Impresa, 2012). In order to provide a general overview, an extended analysis that also covers closed and registered enterprises will be presented in Section 6.

The second element of the identification strategy is the shock induced by the 2007 subprime mortgage crisis. Ideally, in order to compare possible consequences induced by the shock in areas with different levels of mafia presence, we would need the shock to be exogenous and homogeneously affect the entire Italian credit market. We discuss these two conditions below.

The shock induced by the subprime mortgage crisis was not anticipated by the Italian credit market as it started in the United States in 2007 and rapidly propagated to the rest of the world.17 Figure 2 shows the difference between interbank interest rates (LIBOR for United States and EURIBOR for the European Union) and the interest rate on the equivalent index swap rate. This difference represents a common measure of liquidity of the banking system and the counterparty risk. The spread between the interbank interest rate and the index swap rate is negligible up to the second half of 2007, when it suddenly starts to rapidly increase to its peak in the second half of 2008 with the breakup of Lehman Brothers in September 2008.

[Figure 2 around here]

The loss of confidence among financial institutions was directly reflected in their supply of credit to borrowers. In Figure 3, we show the diffusion index for the general supply of credit in Italy during the period 2003-2013. The diffusion index reflects the weighted differences between the share of banks reporting that credit standards have been tightened and the share of banks reporting that credit standards have been eased. The index

17 As noted by Jean-Claude Trichet, the President of the European Central Bank (ECB) in 2010: “[T]he difficulties experienced by a small number of investment funds in June 2007, owing to the non-performance of U.S. sub-prime mortgage securities, led rating agencies to downgrade a large number of asset-backed instruments. The immediate consequence of these downgrades was a deterioration in the quality of the balance sheets of banks holding those securities, as their price fell and capital losses were incurred. As the number of large and complex financial institutions severely affected by the re-pricing of asset-backed securities was recognized, this financial shock was propagated to the broader financial market and real economy. The ensuing rounds of write-downs and a lack of transparency regarding exposures to these toxic instruments created an atmosphere of anxiety and suspicion (Trichet, 2010).”
is produced by the ECB using the information contained in the Bank Lending Survey (BLS).

Italian loan officers started to report a tightening of the lending standards almost contemporaneous to the beginning of the financial turmoil in the U.S. in 2007. This timing is consistent with the trend of credits granted by the Italian banking system to all industries. Figure 4 plots the rate of change of credit supplied to the industrial sector in Italy by quarter as provided by the Bank of Italy. Each point in the figure represents the variation in the credit supplied to the industrial sector with respect to the same quarter of the previous year. At the national level, it is important to notice that no anticipation effect appears in the pre-2007 period. Credit grew at a constant rate in the initial period (2004–2005). In 2006, the provision of credit shows increasing (positive) growth rates. The (relative) increasing trend in the credit granted to the industrial sector suddenly stopped in 2007 becoming almost flat, before starting a decreasing trend.

[Figures 3, and 4 around here]

An additional necessary condition underlying our identification strategy requires the credit shock to similarly affect areas with different levels of mafia presence. The graphical representation by provinces with and without mafia (Figure 4) suggests similar trends with the exception of a slightly more rapid decline of credit granted to mafia provinces in the period between the first and fourth quarters of 2008. We formally test similarity across areas with and without mafia in Table 1 by estimating two different econometric models. For the sake of exposition clarity, we aggregate credit at the year level in order to report all the coefficients in the table. In column (1), we model the rate of change of credit supplied to the industrial sector as a linear function of the interaction term Mafia*Crisis (where Mafia is defined as described in Section 3.1 and Crisis is a dummy variable indicating the post-2007 period), province fixed effects, and year fixed effects. In column (2), we

\[
\text{Credit}_{it} = \beta_0 + \beta_1 \text{Mafia}_{i} \times \text{Crisis}_{t} + \gamma_{it} + \alpha_{it} + \epsilon_{it}
\]

where \(\text{Credit}_{it}\) is the rate of change of credit supplied to the industrial sector in province \(i\) in year \(t\), \(\text{Mafia}_{i}\) is a dummy variable indicating the presence of mafia in province \(i\), \(\text{Crisis}_{t}\) is a dummy variable indicating the post-2007 period, \(\gamma_{it}\) are province fixed effects, \(\alpha_{it}\) are year fixed effects, and \(\epsilon_{it}\) is the error term.

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\(^{18}\)The survey, run since 2003 by the Bank of Italy in collaboration with the ECB, asks senior loan officers responsible for credit policies of the main banks of the euro area (around 150, with 10 representing the major Italian banks) to express their opinions on the relative importance of demand and supply factors in explaining lending patterns. This information is then summarized by the diffusion index (see https://www.ecb.europa.eu/stats/money/surveys/lend/html/index.en.html for further details about the index). The original index varies between -1 (all banks reporting easing lending standards) and 1 (all banks reporting tightening lending standards). To make easier its interpretation, in Figure 3 we reverted the sign of the original index, with positive (negative) values indicating easing (tightening) in bank lending standards.
replicate the same model by considering year and province fixed effects and interacting the variable *Mafia* with each year dummy in the period 2004–2014.\(^{19}\) Both specifications suggest that the change in the amount of credit granted to the industrial sector since 2007 was similar between provinces with and without mafia presence. All the coefficients are remarkably small and never statistically significant.

The last element of our identification requires the subprime mortgage crisis to leave mafia sources of capital nearly unaltered (Organised Crime Portfolio, 2015; ARIEL, 2015). Drug dealing generates the highest profits for organized crime in Italy.\(^{20}\) Figure 5 shows the evolution of the Italian market for illegal drugs in our period of interest by focusing on four different drugs—amphetamines, cocaine, heroin, and cannabis—and on four different market indicators, namely, the total number of drug offenses, the total number of seizures, the total quantity of drugs seized, and the average price, as collected by the European Monitoring Centre for Drugs and Drug Addiction. Illegal drug demand (and consumption) is stable over time. The top-left panel shows that the number of offenses related (only) to drug use has been almost constant since 2007. The exception is cannabis, which saw a (slight) decrease in cases. On the supply side of the market, both the volume (i.e. top-right and bottom-left panels) and prices (i.e. bottom-right panel) remain almost stable during the entire period considered here, except for a dramatic increase in the quantity of cannabis seized and a small drop in the price of cocaine and heroin.\(^{21}\)

The three elements presented above are the milestones of our identification strategy. In a context of mandatory enterprise registration and homogeneous credit contraction across provinces, areas with a higher infiltration of organized crime might experience a less severe drop in the number of new enterprises established each year under the hypothesis that mafia invests a fraction of its resources in the local legal economy. In other words,

\(^{19}\)We use 2006 as reference year in the regression.

\(^{20}\)According to the estimates of Transcrime, drug dealing generates €7.7 billion per year, an amount almost double than that of criminal organizations’ second source of revenue—racketeering.

\(^{21}\)The after-2006 adjustments in both the demand and supply sides of the cannabis market are likely driven by the change in Italian legislation on illegal drugs introduced at the beginning of 2006 (Law 49/2006). Law 49/2006 eliminated the distinction between “soft” and “hard” drugs, thus equating cannabis consumption with the consumption of other harder drugs. Such law coincides with a decrease in offenses related to cannabis use and to an increase in the quantity of cannabis seized, as shown in Figure 5.
the onset of the subprime mortgage crisis should depress entrepreneurial activity (and consequently the number of new registrations) across different provinces in a similar way. However, in the presence of mafia investment in the local economy, the number of newly registered enterprises should decrease less than in places without such investment, making mafia interference in the entrepreneurial activity more detectable.

### 3.3 Data

We assemble a new panel data set containing information on 103 Italian provinces, observed yearly from 2003 through 2013.\(^{22}\) The first important piece of information of the data set regards the number of new enterprises in the Registry of Enterprises in each year, which is provided by the Italian National Institute of Statistics (ISTAT).\(^ {23}\)

The relation between the number of new enterprises and mafia presence in a province is subject to the influence of many contextual factors that should be controlled for in the analysis. We collect information on each of these factors.

The establishment of new enterprises (Lærkholm Jensen et al., 2014) as well as the intensity of specific mafia activities—for instance usury (Dalla Pellegrina, 2008) and money laundering (Dalla Pellegrina et al., 2017)—are related to the characteristics of the local credit market such as the percentage of big banks. Big banks are able to deal with higher and more risky credit costs, so we use the provincial number of bank agencies divided by bank size—big banks versus small/medium banks—to account for the structure of the banking system.\(^ {24}\)

Other crucial factors influencing both the establishment of new enterprises and the degree of mafia presence within a territory are the quality of the economic, political-institutional, and social environments. To consider the economic context, we include information on the provincial level of employment in each macro-sector—primary ver-

\(^{22}\)In order to get a balanced panel, we use the classification of the Italian provinces in force until 2005. We choose to start in 2003 because of data availability for the control variables used in the baseline specification.

\(^{23}\)ISTAT makes publicly available only the number of new enterprises at the provincial level, so we do not have access to more detailed information (e.g. enterprise name, size, registration day, etc.).

\(^{24}\)Big banks are defined by the Bank of Italy as those with a total value of traded funds greater than €26 billion.
sus secondary (excluding construction) versus tertiary—and the average size of the local production unit (Lavezzi, 2008). As some sectors—e.g. construction, health care, waste treatment, and tourism—are more at risk for criminal infiltration (Ministry of Interior, 2013; Savona, 2015), we collect data on the employment rate in the construction sector, the number of beds in the public National Health Service (NHS), the per capita quantity of produced waste, and an index of attractiveness of tourism-related consumption. Additionally, the provincial degree of entrepreneurial activity might have an effect on crime (Parker, 2015) and new firm formation (Armington and Acs, 2002); therefore, we use the provincial level of self-employment to control for it. In addition to that, as both new-firm formation (Delfmann et al., 2014) and crime (Christens and Speer, 2005) are affected by the urban-living population, we also include the provincial percentage of the urban population in our data set.

In the political-institutional framework, the efficiency of the judicial system stands out as one important factor positively affecting the cost of credit (Jappelli et al., 2005) and the level of entrepreneurial activity (Chemin, 2009) and negatively affecting crime (Blanco, 2012). We proxy the efficiency of the judicial system with the provincial average duration in days of a bankruptcy trial. The capacity of central and local governments to coordinate has been proved to increase the effectiveness of policies aimed at containing the presence of criminal organizations (Rios, 2015) and fostering local development (Asher and Novosad, 2017). Thus, we collect data on the degree of coordination by constructing an indicator variable for the possible political alignment between the incumbent governments at the provincial, regional, and national levels.

To account for the general effect of human and social capital both on the number of newly established enterprises (Acs and Armington, 2004; Nieto and González-Álvarez, 2016) and on crime (Buonanno et al., 2009; Machin et al., 2011), we gather data on newspaper circulation within each province and the regional average number of blood donations respectively. Table 2 provides summary statistics for our sample.

---

25 Given the possible endogeneity between mafia presence and the actual size of these sectors, we control for the latter by using variables that can be fairly considered as predetermined with respect to the mafia presence within these sectors.

26 Unfortunately, data about blood donations are unavailable at the provincial level.
3.4 The DiD Estimator

The foregoing framework and conditions allow us to implement a DiD estimation strategy in which we compare the number of new enterprises: (i) before and after the outbreak of the 2007 subprime mortgage crisis; and (ii) between provinces with high levels of mafia presence and provinces with low levels of mafia presence.\(^{27}\)

The DiD baseline equation of interest is:

\[
NewEnterprises_{i,t} = \beta_0 + \beta_1 \text{Mafia}_i \ast \text{Crisis}_{i,t} + \beta X_{i,t} + \alpha_i + \gamma_t + \varepsilon_{i,t}
\]  

(1)

where \(i\) defines the province and \(t\) the year. \(NewEnterprises\) is expressed as the logarithm of the number of new enterprises per 100,000 inhabitants. We aim to consistently estimate the coefficient \(\beta_1\) obtained as the interaction between \(Mafia\)—a province within the fourth quartile of the TMI distribution—and \(Crisis\)—an indicator variable for the period starting with the onset of the subprime mortgage crisis. This coefficient sheds light on the different trends in the number of new enterprises in areas characterized by different levels of mafia presence once the legal source of credit has been constrained.

Equation (1) contains province fixed effects (\(\alpha_i\)) to take into account time-invariant unobserved heterogeneity at the provincial level and year fixed effects (\(\gamma_t\)) to consider common shocks across provinces. The vector \(X_{i,t}\) contains the control variables introduced in Section 3.3.\(^{28}\)

We start by verifying the main assumption underlying a DiD empirical strategy, namely the parallel trends assumption. Figure 6 presents a graphical test for the parallel trends assumption.\(^{29}\) We plot both the trends in the number of new enterprises for...
provinces with and without mafia presence and the linear fit for such trends. In the period of 1997 through 2006, the trend for the number of new enterprises for provinces with no mafia presence fairly mimics the trend for those provinces with organized crime. The vertical distance between the two trends remains similar up to 2007. The overall effect of the subprime crisis, as highlighted by the drop in the number of new enterprises, is evident for both groups starting from 2007.

In the post-2007 period, the vertical distance between the two lines remarkably decreases, making the two trends progressively closer. The dotted lines for the linear interpolations in the pre- and post-2007 trends suggest the same conclusion: the two trends are parallel pre-2007, while they start converging after 2007. This graphical evidence suggests that areas with high mafia presence suffered less harsh consequences of the 2007 subprime mortgage crisis than areas with low mafia presence. In the next sections, after quantifying this graphical result, we will look for evidence potentially relating these converging trends with investments in the legal economy by organized crime.

**Figure 6 around here**

### 4 Baseline Results

Table 3 reports estimates of Equation (1). The model in column (1) includes only province fixed effects without any control variable. Column (2) augments the model by adding year fixed effects and control variables. From now on, we will refer to the model in column (2) as the full model.

[Table 3 around here]

Results confirm the graphical evidence shown in Figure 6. Provinces with mafia presence experienced a less severe reduction in the number of new enterprises in the period after the onset of the subprime crisis. The coefficient of interest is always statistically significant and remarkably high. The effect of mafia presence is 8.4 percent in the model.

---

30 We include this specification in the results to consider possible criticism related to the inclusion of control variables potentially affected by mafia presence. All our estimates are remarkably similar with and without the inclusion of control variables.
with only province fixed effects, while it is 7.2 percent in the full model.

To shed more light on the timing of the effect of interest, we estimate an alternative DiD model including leads and lags. The analysis of leads allows us to formally test the similarity of trends in the pre-2007 period, while lags show whether the treatment effect changes over time after the treatment (Autor, 2003). The model with leads and lags is described in the following equation:

$$NewEnterprises_{i,t} = \beta_0 + \sum_{j=2003}^{2013} (Mafia_i \times Year_j) \beta_{1,j} + \beta X_{i,t} + \alpha_i + \gamma_t + \varepsilon_{i,t}$$

(2)

where the coefficients $\beta_{1,j}$ represent the interaction between mafia presence and the indicator variables for each year.

Figure 7 shows the graphical representation of the estimates of the full model. Provinces with and without mafia presence were performing similarly before 2007. All the coefficients are remarkably small and never statistically significant. The interaction between Mafia and each Year becomes significant starting in 2007. Since 2007, with the exception of 2008, the interaction between Mafia and each year progressively increases because of the worsening economic conditions due to the persistence of the crisis. The peak is reached in 2012, with an estimated effect around 15 percent.

As anticipated, the exact quantification of illegal activities, such as the ones perpetrated by criminal organizations, sparks concerns. Some concerns rely on measurement issues, while others are more related to the rule adopted to identify mafia presence. We address these concerns in Appendix A.4 by showing how baseline estimates respond to a different rule to identify areas characterized by a high presence of organized crime (i.e. inclusion of the third quartile of the TMI distribution) and to the use of different indexes for mafia presence. In both cases, any significant change is detected with respect to the baseline estimates. Our results do not depend either on the rule adopted to identify mafia presence or on the index used for the same purpose. In Appendix A.4, we also

---

31The year 2006, the one before the outbreak of the subprime crisis, is the reference year in this model.
consider the count data nature of the number of new enterprises by testing whether our estimates are sensitive to the use of a nonlinear regression specification. We estimate a fixed-effect negative binomial regression model and find results remarkably similar to baseline estimates.

The nonrandom assignment of mafia presence across Italy is another concern that potentially threatens the reliability of our estimates. The positive coefficient presented in the baseline could be generated by the presence of structural differences between provinces with and without mafia presence. To rule out this hypothesis, we replicate the analysis provided by Galiani et al. (2005) and Biderman et al. (2010), and we consider whether our results are driven by specific trends of the covariates.

The total sample size does not allow for precise estimates of all time trends contemporaneously. We gather covariates in four different groups, and we include in the model the interaction of each predetermined variable as of 2006 with the year dummies.\textsuperscript{32} Table 4 reports the results. In column (1), we test the trends for the variable that captures the credit market structure (i.e. percentage of big banks); in column (2) we test variables for economic conditions; in column (3) we test the political-institutional context; and in column (4) we test the variables for the social environment.\textsuperscript{33} Although in some cases it is less precisely estimated, the coefficient of interest \textit{Mafia} \textit{* Crisis} remains in line with the coefficient of the baseline estimates, which suggests that our results are unlikely to be driven by such trends in the covariates.

[Table 4 around here]

Another important example of structural differences between areas with and without mafia presence relates to their geographical distribution. The specific characteristics of southern Italy with respect to the rest of the country may have played a role in the

\textsuperscript{32}We assume that 2006 represents the last observable value of the secular trends of each group of covariates before the shock induced by the outbreak of the subprime crisis.

\textsuperscript{33}Credit market structure is proxied by the percentage of big banks. We consider the following economic conditions: provincial level of employment in each macro-sector, average size of the local production unit, employment rate in the construction sector, number of beds in the public NHS, per capita quantity of produced waste, index of attractiveness of tourism-related consumption, provincial level of self-employment, and the percentage of urban population. Political-institutional context is proxied by the average duration in days of a bankruptcy trial and the political alignment between central and local administrations. For social environment variables, we include newspaper circulation and blood donations.
reaction to the economic shock induced by the onset of the crisis.\textsuperscript{34} We run two additional specifications in columns (5) and (6) to test for the effect of such geographical differences. In column (5), we estimate a model in which we allow the year fixed effects to vary differently for southern Italy and the rest of the country. To do that we add to the regression as further controls the interactions between the year dummies and a dummy equal to 1 for southern provinces and 0 otherwise. The coefficient for mafia presence remains positive and significant, despite the reduction in the size of the estimate and its precision induced by the high multicollinearity between the explanatory variable (i.e $Mafia \times Crisis$) and the south-year interactions. In column (6), we replicate our exercise by considering only the provinces in northern and central Italy. Therefore, we exclude the south from the analysis and we update the indicator variable $Mafia$ using the fourth quartile of the TMI distribution across the north and center of the country. Results remain similar to the baseline with a highly significant coefficient of around 3.3 percent.

Finally, as our identification strategy is based on the credit market reaction to the subprime mortgage crisis, we propose an additional check aimed both at validating our identification strategy and at providing evidence about the possible channel through which the effect detected in the baseline analysis takes place.

The test is based on possible heterogeneity of the credit market contraction within each group of provinces: one might expect to find stronger evidence of investment by mafia in those areas in which the credit supply shrunk more after the subprime mortgage crisis. In particular, lending conditions have particularly worsened for banks with headquarters distant from Italy (Presbitero et al., 2014). These banks are typically part of large international banking groups. On average, provinces with and without mafia display a similar number of big banks per 1,000 inhabitants.\textsuperscript{35} At the same time, within each group of provinces, there is variability in terms of the presence of big banks.

\textsuperscript{34}Among these characteristics there is the fact that southern provinces generally receive more European and national development funds than the rest of the country. Unfortunately, we cannot directly control for this amount of funds because of data unavailability for the period covered in the analysis.

\textsuperscript{35}The number of big banks is 34 per 1,000 inhabitants in provinces without mafia and 47 in provinces with mafia. The difference is weakly significant at the 10% level.
We implement a triple DiD estimator based on the following specification:

\[
NewEnterprises_{i,t} = \beta_0 + \beta_1 \text{Mafia}_i \ast \text{Crisis}_{i,t} + \beta_2 \text{Crisis}_{i,t} \ast \text{BigBanks}_{i,2003} + \\
\beta_3 \text{Mafia}_i \ast \text{Crisis}_{i,t} \ast \text{BigBanks}_{i,2003} + \beta X_{i,t} + \alpha_i + \gamma_t + \epsilon_{i,t}
\]  

(3)

where the number of big banks as of 2003 is interacted with both Crisis and Mafia \ast Crisis. Because the number of big banks is also among the set of controls of our specification, to avoid multicollinearity we restrict the sample to the period between 2004 and 2013.

The results in Table 5 shed light on an interesting pattern related to mafia investment in the legal economy. The interaction between Mafia and Crisis shifts to a statistically insignificant negative value. The coefficient for the interaction between Crisis and the number of big banks is negative, confirming that the credit market reaction has been harsher in those areas with a higher presence of big banks. The triple interaction is always positive and statistically significant. The net impact of mafia presence on the number of new enterprises is positive, and it confirms that in areas characterized by a higher presence of organized crime and big banks—and therefore by a stronger credit market contraction—the drop in the number of enterprises established after the subprime crisis was even less severe.

[Table 5 around here]

5 Is It a Matter of Mafia Investment?

Up to now we have shown a differential reaction to the subprime mortgage crisis for areas with high presence of organized crime with respect to areas with less infiltration. Specifically, we reveal a less severe drop in the number of new enterprises established post crisis in those areas more exposed to organized crime. Despite these results are consistent with the presence of mafia investments in the legal economy, to ascribe this differential trend to capital inflows by criminal organizations is challenging. However, the rich anecdotal and judicial evidence available about mafia infiltration in the legal
economy provides us with some facts that can be tested in our empirical framework. In the next sections, we are going to introduce these facts and look for empirical evidence reinforcing the possible interpretation of our findings in terms of mafia investment in the legal economy.  

5.1 Sector Specificity of Mafia Investment

Mafia has strong sectoral preferences when it comes to investing its money. Italian mafia-type organizations are particularly active in the construction sector.  

The construction sector is characterized by high movement of capital and high levels of profitability, allowing criminal organizations to launder money. Through investment in the construction sector, mafia-type organizations can also monitor and be involved in complementary markets such as stone-pits, storage of materials, etc. The other actors involved in the process risk being absorbed by criminal organizations with the result being a monopoly managed by mafia (Falcone, 1991).

On the contrary, organized crime does not heavily invest in professional, scientific, and technical activities. This sector is usually not infiltrated by criminal organizations as it is highly professionalized and involves a very high level of competition and know-how (Ministry of Interior, 2013).

Due to the mafia’s preference for the construction sector, the estimates for that sector could be a validation test for the baseline results. Indeed, given this specific preference, we can expect a generally higher number of mafia-connected enterprises established each year within this sector, and thus a greater impact of this subgroup on the total number of newly established enterprises in each year. On the other hand, mafia’s aversion for the professional, scientific, and technical sector provides us with a natural falsification framework to test the validity of our identification strategy because, contrary to the construction sector, one would expect to find no evidence of the impact of mafia presence.

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[36] As all the tests are based on a DiD estimator as in the baseline analysis, Appendix A.5 provides the graphical tests of the parallel trend assumption for all the outcome variables employed in this analysis.  

[37] Around 30% of mafia-type organizations firms seized by the Italian judicial authority were operating in the construction sector (Ministry of Interior, 2013; Savona, 2015).

[38] This sector includes activities such as scientific research and innovation, engineering, etc.
on the number of newly established enterprises in the post-crisis period.

Table 6 shows the results. We detect a significant and positive effect of mafia presence on the number of new enterprises in the construction sector. As shown in column (2), on average, post-crisis, provinces with higher levels of mafia presence experienced a less severe decrease—9.6 percent—in the number of new enterprises in the construction sector. Unsurprisingly, the effect in the construction sector is higher than the effect in the baseline estimates, confirming a strong mafia preference for this sector. The coefficient in the falsification test in column (4) is negative and statistically insignificant. In provinces with a high presence of criminal organizations, the number of new professional, scientific, and technical services enterprises experienced a more severe drop in the post-crisis period than in provinces less infiltrated by organized crime.

[Table 6 around here]

5.2 Legal Form of New Enterprises

Mafia preferences for legal forms of enterprises for investments are provided by the Italian Ministry of Interior (Ministry of Interior, 2013; Savona, 2015). Limited companies are by far the first option for criminal organizations (46.6%) when it comes to investing their capital. These companies are particularly easy to establish and require a minimum initial capital of €10,000. Moreover, they guarantee limited responsibility of business partners.

To understand whether the results reported by the Ministry of Interior are also confirmed in our research framework, we repeat our analysis only on limited companies to possibly find a coefficient for mafia presence greater than the one obtained in the baseline analysis. Table 7 shows the result. The coefficient for the DiD estimator in column (2) is positive and statistically significant when limited companies are considered. The result is sizable in magnitude (12.2 percent), greater than in the baseline, and in line with the evidence provided by the Italian Ministry of Interior.

[Table 7 around here]
5.3 The Age of Figureheads

Mafia-type organizations often employ figureheads to run their legal businesses (Fantó, 1999; Ministry of Interior, 2013; Savona, 2015). This strategy is fundamental to hiding the identity of actual owners or reducing the risk of future seizures. Figureheads are often chosen among mafia members’ relatives with strong preferences for very young (younger than 25) or very old (older than 65, retired) individuals (Caneppele et al., 2009).

The particular age profile of figureheads provides a further opportunity to test whether our findings match with anecdotal and judicial evidence concerning mafia investment in the legal economy. Clearly, the age of the director of an enterprise cannot be considered as an unequivocal marker of mafia infiltration of legal businesses. Nonetheless, it is also true that youngsters rarely cover top management positions at newly established enterprises. Therefore, youngsters in top management positions at newly established enterprises in mafia provinces may indicate infiltration (especially during an economic downturn).

We test this hypothesis by exploiting the information contained in the data set Analisi Informatizzata delle Aziende Italiane (AIDA). AIDA provides detailed information on all Italian companies operating under the limited company legal form (the legal form preferred by organized crime). AIDA collects information such as the date the enterprises was established (i.e., the registration was completed) and the demographic characteristics of the management. In particular, the data about the age of directors allow us to compute the number of enterprises with a director younger than 25 or older than 65 at the provincial-year level.\(^{39}\) We use this number as a dependent variables in the same model as in Equation (1).\(^{40}\)

\[ \text{Table 8 around here} \]

Table 8 reports the results. On the one hand, in the post-crisis period, provinces with a high mafia presence experienced a larger increase in the number of new enterprises directed

\(^{39}\)The period covered is 2003–2013.
\(^{40}\)In some province-year combinations, the number of companies is equal to 0 making it impossible to adopt the logarithmic transformation used in the rest of the paper. We drop these observations from the analysis. However, to exploit the entire sample, we replicate the analysis using a fixed-effect Poisson regression model. Results remain almost the same and are available upon request.
by young individuals as opposed to provinces with a lower criminal presence. On the other
hand, mafia provinces saw a less severe drop in the number of new enterprises directed
by old individuals. Both results match the judicial and anecdotal evidence introduced
above and further corroborate our interpretation of the baseline results in terms of mafia
investment in the legal economy.

6 Closed and Registered Enterprises

The evidence presented so far suggests that the positive variation in the number of
newly established enterprises detected in the post-crisis period for provinces with a high
mafia presence is compatible with the presence of mafia investments within the legal
economy. However, the literature about organized crime in Italy, e.g. Pinotti (2015),
highlights the detrimental effect on the local economy induced by the presence of criminal
organizations. In this section, we get a more complete picture of the general impact of
mafia presence on the local degree of entrepreneurial activity by extending our analysis
to the number of closed and registered enterprises. Appendix A.5 provides the graphical
test of the parallel trend assumption for both.

Table 9 reports the results. Areas with high mafia presence experienced a ten percent
increase in the number of enterprises that were closed during the post-crisis period (column
1), indicating that the negative consequences of the credit rationing induced by the 2007
subprime mortgage crisis have been exacerbated where there is a strong organized crime
presence. This result probably derives from the negative economic spillovers associated
with mafia presence, which lead operating enterprises to face even more binding credit
constraints during an economic recession.\footnote{In Section 2, we provide a detailed overview of the possible negative consequences of mafia presence for the economic, political, and social environments.} In this context it becomes relatively more
difficult for enterprises without mafia connections to deal with the shortage of legal credit
induced by the onset of the crisis. As a consequence, higher credit constraints in areas
with the presence of organized crime are likely to negatively affect the survival rate of
operating enterprises, increasing the number of closures in the post-crisis period.
The analysis of registered enterprises (column 2) provides an assessment of the overall effect in the short term of mafia presence on the local stock of operating enterprises. The effect on this latter is positive, with a statistically significant coefficient of three percent. On average, in the post-crisis period, registered enterprises in provinces with a mafia presence experienced a less severe drop.

The positive differential on the number of operating enterprises between the treatment and control groups signals that the higher number of closures recorded in mafia provinces after the crisis is fully offset by: (i) the less severe drop in newly established enterprises for these provinces in the same period, induced by the mafia investments in the legal economy; and (ii) the possible positive-in-sign spillover of some practices perpetrated by organized crime, such as usury, which on the one hand negatively affects the survival of operating firms that have to deal with higher funding and operating costs, but on the other hand might represent a source of “last resort” credit for entrepreneurs experiencing strong financial distress, allowing them to temporarily preserve their business even when all the other legal sources of credit are no longer available (Dalla Pellegrina, 2008).

7 Conclusion

In this work, we assess the investment of criminal organizations in the Italian legal economy by exploiting the mandatory registration required by both legal and illegal enterprises. We implement a Difference-in-Differences (DiD) empirical strategy based on the comparison of new enterprises established (i) before and after the onset of the 2007 subprime mortgage crisis; and (ii) between provinces with high levels of mafia presence and provinces with low levels of mafia presence. We find differential trends in the number of new enterprises when provinces with high versus low mafia presence are compared. The consequences of the crisis (on the number of new enterprises) were less severe in areas with mafia presence. We interpret this finding as possible evidence of mafia investment in the legal economy.
We turn to judicial and anecdotal evidence to corroborate our interpretation. First, we exploit such evidence to characterize the mafia investment in the legal economy. In particular, we focus on mafia preferences for specific sectors of activity, adopted legal form, and type of individual running the business. Then, we replicate our analysis in light of this factual evidence; our empirical results fairly match such judicial and anecdotal facts.

Our results call for the adoption of standard repression policies against criminal organizations complemented by a massive institutional intervention—e.g. provision of credit, intervention to enhance employment opportunities, etc.—aimed at undermining the roots of the social consensus obtained through mafia investment in the legal economy. Moreover, by showing mafia preferences in terms of sectors and forms of legal organization, we underline where vigilant monitoring and stricter legislation should be improved. Finally, our research suggests that positive-in-sign spillovers related to mafia investments, and more generally to its territorial presence, are larger in contexts characterized by harsher conditions in the local credit market. As pointed out by Mario Draghi, the ex-governor of the Bank of Italy, during his speech at Italian parliamentary anti-mafia commission in 2009: “During recession firms see their cash flows dry up and watch the market value of their assets fall. Both these phenomena render companies more easily assailable by organized crime” (Anti-Mafia commission, July 22, 2009). As a consequence, shocks in the credit market conditions should be carefully monitored in these areas in order to preempt an even higher infiltration of organized crime in the legal economy.

References


Note: The map shows the quartiles of the distribution of the *Transcrime Mafia Index* (TMI) across the Italian provinces. The more intense the filling color of a province, the higher the quartile to which it belongs.
Figure 2: Interbank Market Spread

Note: The figure shows the difference between 12-month EURIBOR (blue line), LIBOR (red line), and Overnight Index Swap rates, in basis points.
Source: Reuters/Haver Analytics and ECB calculations

Figure 3: Bank Lending Survey: The Diffusion Index

Note: The figure shows the BLS diffusion index for the general supply of credit in Italy during the period 2003–2013. Positive (negative) values indicate easing (tightening) in bank lending standards.
Source: Authors’ calculation on data from the BLS and Bank of Italy
Figure 4: Change in the Supply of Legal Credit for Businesses

Note: The figure shows the change over 4 quarters in the amount of credit granted to all the industries operating within Italy. The comparison is between provinces within the first three quartiles of the TMI distribution (No Mafia, continuous line) and those belonging to the last quartile (Mafia, dashed line). The vertical red line indicates the quarter of the year in which the financial turmoil started.
Figure 5: The Market for Illegal Drugs in Italy

Note: The figure shows four indicators of the Italian drug market (amphetamine, cocaine, heroin, cannabis). The top-left panel reports the time trend of the total number of offenses for drug use. The top-right panel reports the time trend of the total number of seizures. The bottom-left panel reports the total number of kilograms seized. The bottom-right panel reports the estimated average price.
Figure 6: Parallel Trends Assumption

Note: The figure shows the trends of the average number of new enterprises (per 100,000 inhabitants). The comparison is between provinces within the first three quartiles of the TMI distribution (No Mafia, continuous line) and those belonging to the last quartile (Mafia, dashed line).

Figure 7: DiD with Leads and Lags

Note: The figure shows point estimates and the 95% confidence intervals of the model including leads and lags. The omitted category is the interaction between Mafia and the dummy for the year 2006 (the year before the onset of the subprime mortgage crisis).
Table 1: Credit Market Reaction to the Crisis and Mafia Presence

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**Dependent variable:** Rate of change in the amount of credit provided to the industrial sector. The rate of change is calculated with respect to the previous year (t-1). In column (1), the variable Mafia*Crisis is the interaction of the treatment Mafia (a dummy taking the value of 1 if the province has a high level of mafia presence) with Crisis (a dummy taking the value of 1 for 2007 to 2013). In column (2), the variable Mafia*Year is the interaction of Mafia with indicator variables for each year from 2004 to 2013. The omitted category is the interaction between Mafia and the dummy for the year 2006 (the year before the onset of the subprime mortgage crisis). Mafia presence is computed according to the TMI index; provinces within the last quartile of the index distribution are classified as Mafia = 1. All standard errors are clustered at the provincial level. *, **, *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.
<table>
<thead>
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<tr>
<td>Big banks (per 1,000 inh.)</td>
<td>0.36</td>
<td>0.15</td>
<td>0.05</td>
<td>0.79</td>
</tr>
<tr>
<td>Employment primary sector (%)</td>
<td>0.05</td>
<td>0.04</td>
<td>0.00</td>
<td>0.25</td>
</tr>
<tr>
<td>Employment secondary sector, no construction (%)</td>
<td>0.21</td>
<td>0.09</td>
<td>0.05</td>
<td>0.43</td>
</tr>
<tr>
<td>Employment tertiary sector (%)</td>
<td>0.65</td>
<td>0.08</td>
<td>0.46</td>
<td>0.85</td>
</tr>
<tr>
<td>Size of the local production unit (num. of workers)</td>
<td>3.36</td>
<td>0.54</td>
<td>2.26</td>
<td>4.65</td>
</tr>
<tr>
<td>Employment construction sector (%)</td>
<td>0.09</td>
<td>0.02</td>
<td>0.03</td>
<td>0.15</td>
</tr>
<tr>
<td>N.Beds in public hospitals (per 1,000 inh.)</td>
<td>3.67</td>
<td>0.99</td>
<td>1.56</td>
<td>16.15</td>
</tr>
<tr>
<td>Waste per capita (tons.)</td>
<td>0.53</td>
<td>0.10</td>
<td>0.05</td>
<td>0.88</td>
</tr>
<tr>
<td>Tourism</td>
<td>2.57</td>
<td>3.67</td>
<td>0.22</td>
<td>29.61</td>
</tr>
<tr>
<td>Self-Employment (%)</td>
<td>0.27</td>
<td>0.04</td>
<td>0.03</td>
<td>0.44</td>
</tr>
<tr>
<td>Trial duration (days)</td>
<td>8.03</td>
<td>0.23</td>
<td>7.03</td>
<td>8.65</td>
</tr>
<tr>
<td>Political alignment</td>
<td>0.40</td>
<td>0.49</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Urban population (%)</td>
<td>0.26</td>
<td>0.13</td>
<td>0.08</td>
<td>0.87</td>
</tr>
<tr>
<td>Blood donations (per 100 inh.)</td>
<td>3.41</td>
<td>1.77</td>
<td>0.62</td>
<td>6.86</td>
</tr>
<tr>
<td>Newspaper circulation (per 1,000 inh.)</td>
<td>4.51</td>
<td>0.47</td>
<td>2.94</td>
<td>6.10</td>
</tr>
</tbody>
</table>

**Note:** Summary statistics are calculated on a sample including 1,133 observations made by 103 Italian provinces observed yearly during 2003–2013.
Table 3: Baseline Estimates: New Enterprises

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mafia*Crisis</td>
<td>0.0836***</td>
<td>0.0715***</td>
</tr>
<tr>
<td></td>
<td>(0.0170)</td>
<td>(0.0165)</td>
</tr>
<tr>
<td>Controls</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Year FE</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Province FE</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Observations</td>
<td>1,133</td>
<td>1,133</td>
</tr>
<tr>
<td>Number of provinces</td>
<td>103</td>
<td>103</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.112</td>
<td>0.560</td>
</tr>
</tbody>
</table>

**Dependent variable: number of new enterprises.**

The number of new enterprises is computed per 100,000 inhabitants and expressed in logarithmic scale. The variable Mafia $\times$ Crisis is the interaction of the treatment Mafia (a dummy taking the value of 1 if the province has a high level of mafia presence) with Crisis (a dummy taking the value of 1 for the years 2007 to 2013). Mafia presence is computed according to the TMI index; provinces within the last quartile of the index distribution are classified as Mafia = 1. The set of controls includes the number of offices of big banks (per 1,000 inhabitants), employment in the primary sector (%), employment in the secondary sector excluding construction (%), average size of the local production unit (number of workers), employed in the construction sector (%), number of beds in public hospitals (per 1,000 inhabitants), waste per capita (tons), capacity to attract tourism, number of self-employed (%), average duration of bankruptcy trials (days), political alignment, urban population (%), number of blood donations (per 100 inhabitants), and newspaper circulation (per 1,000 inhabitants). Standard errors are clustered at the provincial level. *, **, *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.
Table 4: Mafia Presence and New Enterprises: Robustness Tests

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mafia*Crisis</td>
<td>0.0637***</td>
<td>0.0402*</td>
<td>0.0695***</td>
<td>0.0476**</td>
<td>0.0340*</td>
<td>0.0327**</td>
</tr>
<tr>
<td></td>
<td>(0.0176)</td>
<td>(0.0216)</td>
<td>(0.0165)</td>
<td>(0.0207)</td>
<td>(0.0186)</td>
<td>(0.0134)</td>
</tr>
</tbody>
</table>

Interactions/Subsample  | Credit Market  | Ec. Env. *Year | Polit.-Instit. Env. *Year | Social Env. *Year | South *Year | Central and Northern Provinces |
------------------------|----------------|----------------|---------------------------|-------------------|-------------|--------------------------------|
Controls                | YES            | YES            | YES                       | YES               | YES         | YES                            |
Year FE                 | YES            | YES            | YES                       | YES               | YES         | YES                            |
Province FE             | YES            | YES            | YES                       | YES               | YES         | YES                            |
Observations            | 1,133          | 1,133          | 1,133                     | 1,133             | 1,133       | 759                            |
Number of provinces     | 103            | 103            | 103                       | 103               | 103         | 69                             |
$R^2$                   | 0.568          | 0.642          | 0.568                     | 0.603             | 0.616       | 0.721                          |

**Dependent variable: number of new enterprises.** The number of new enterprises is computed per 100,000 inhabitants and expressed in logarithmic scale. The variable Mafia*Crisis is the interaction of the treatment Mafia (a dummy taking the value of 1 if the province has a high level of mafia presence) with Crisis (a dummy taking the value of 1 for years from 2007 to 2013). Mafia presence is computed according to the TMI index: in columns (1) to (5), provinces within the last quartile of the index distribution are classified as Mafia = 1. Column (6) considers as Mafia = 1 those provinces within the last quartile of the index distribution over northern and central Italy. All the specifications control for the number of offices of big banks (per 1,000 inhabitants), employment in the primary sector (%), employment in the secondary sector excluding construction (%), average size of the local production unit (number of workers), employed in the construction sector (%), number of beds in public hospitals (per 1,000 inhabitants), waste per capita (tons), capacity to attract tourism, number of self-employed (%), average duration of bankruptcy trials (days), political alignment, urban population (%), number of blood donations (per 100 inhabitants), and newspaper circulation (per 1,000 inhabitants). Standard errors are clustered at the provincial level. *, **, *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.
Table 5: Mafia Presence, Number of Big Banks, and New Enterprises

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mafia*Crisis</td>
<td>-0.0596</td>
</tr>
<tr>
<td></td>
<td>(0.0393)</td>
</tr>
<tr>
<td>Crisis*Big banks</td>
<td>-0.0054</td>
</tr>
<tr>
<td></td>
<td>(0.0531)</td>
</tr>
<tr>
<td>Mafia<em>Crisis</em>Big banks</td>
<td>0.2580***</td>
</tr>
<tr>
<td></td>
<td>(0.0866)</td>
</tr>
</tbody>
</table>

Controls: YES
Year FE: YES
Province FE: YES
Observations: 1,030
Number of provinces: 103
$R^2$: 0.592

**Dependent variable: number of new enterprises.** The number of new enterprises is computed per 100,000 inhabitants and expressed in logarithmic scale. The variable Mafia * Crisis is the interaction of the treatment Mafia (a dummy taking the value of 1 if the province has a high level of mafia presence) with Crisis (a dummy taking the value of 1 for the years 2007 to 2013). Mafia presence is computed according to the TMI index; provinces within the last quartile of the index distribution are classified as Mafia = 1. The variable Crisis * BigBanks is the interaction of Crisis with BigBanks, defined as the number of big banks per 1,000 inhabitants within each province in 2003. The variable Mafia * Crisis * BigBanks is the interaction of the three variables previously described. The set of controls includes the number of offices of big banks (per 1,000 inhabitants), employment in the primary sector (%), employment in the secondary sector excluding construction (%), average size of the local production unit (number of workers), employed in the construction sector (%), number of beds in public hospitals (per 1,000 inhabitants), waste per capita (tons), capacity to attract tourism, number of self-employed (%), average duration of bankruptcy trials (days), political alignment, urban population (%), number of blood donations (per 100 inhabitants), and newspaper circulation (per 1,000 inhabitants). Standard errors are clustered at the provincial level. *, **, *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.
### Table 6: Sector Specificity of Mafia Investment

<table>
<thead>
<tr>
<th></th>
<th>(1) Construction Sector</th>
<th>(2) Professional, Scientific, Technical Sector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mafia*Crisis</td>
<td>0.0955***</td>
<td>-0.0583</td>
</tr>
<tr>
<td></td>
<td>(0.0340)</td>
<td>(0.0459)</td>
</tr>
<tr>
<td>Controls</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Year FE</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Province FE</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Observations</td>
<td>1,133</td>
<td>1,133</td>
</tr>
<tr>
<td>Number of provinces</td>
<td>103</td>
<td>103</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.732</td>
<td>0.499</td>
</tr>
</tbody>
</table>

Dependent variable: number of new enterprises in the construction sector (col. 1) and in the professional, scientific, and technical sectors (col. 2). The number of new enterprises is computed per 100,000 inhabitants and expressed in logarithmic scale. The variable $Mafia*Crisis$ is the interaction of the treatment $Mafia$ (a dummy taking the value of 1 if the province has a high level of mafia presence) with $Crisis$ (a dummy taking the value of 1 for the years 2007 to 2013). Mafia presence is computed according to the TMI index; provinces within the last quartile of the index distribution are classified as $Mafia = 1$. The set of controls includes the number of offices of big banks (per 1,000 inhabitants), employment in the primary sector (%), employment in the secondary sector excluding construction (%), average size of the local production unit (number of workers), employed in the construction sector (%), number of beds in public hospitals (per 1,000 inhabitants), waste per capita (tons), capacity to attract tourism, number of self-employed (%), average duration of bankruptcy trials (days), political alignment, urban population (%), number of blood donations (per 100 inhabitants), and newspaper circulation (per 1,000 inhabitants). Standard errors are clustered at the provincial level. *, **, *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.
Table 7: Mafia Presence and New Limited Companies

| Mafia*Crisis | 0.1220*** (0.0275) |
| Controls | YES |
| Year FE | YES |
| Province FE | YES |
| Observations | 1,133 |
| Number of provinces | 103 |
| $R^2$ | 0.493 |

**Dependent variable: number of new Limited Companies.** The number of new limited companies is computed per 100,000 inhabitants and expressed in logarithmic scale. The variable Mafia * Crisis is the interaction of the treatment Mafia (a dummy taking the value of 1 if the province has a high level of mafia presence) with Crisis (a dummy taking the value of 1 for the years 2007 to 2013). Mafia presence is computed according to the TMI index; provinces within the last quartile of the index distribution are classified as Mafia = 1. The set of controls includes the number of offices of big banks (per 1,000 inhabitants), employment in the primary sector (%), employment in the secondary sector excluding construction (%), average size of the local production unit (number of workers), employed in the construction sector (%), number of beds in public hospitals (per 1,000 inhabitants), waste per capita (tons), capacity to attract tourism, number of self-employed (%), average duration of bankruptcy trials (days), political alignment, urban population (%), number of blood donations (per 100 inhabitants), and newspaper circulation (per 1,000 inhabitants). Standard errors are clustered at the provincial level. *, **, *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.
Table 8: New Limited Companies with Young or Old Directors

<table>
<thead>
<tr>
<th></th>
<th>(1) Dir. Age ≤ 25 y.o.</th>
<th>(2) Dir. Age ≥ 65 y.o.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mafia(^{\ast})Crisis</td>
<td>0.4489***</td>
<td>0.1005**</td>
</tr>
<tr>
<td></td>
<td>(0.1079)</td>
<td>(0.0459)</td>
</tr>
<tr>
<td>Controls</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Year FE</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Province FE</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Observations</td>
<td>723</td>
<td>1,133</td>
</tr>
<tr>
<td>Number of provinces</td>
<td>103</td>
<td>103</td>
</tr>
<tr>
<td>(R^2)</td>
<td>0.645</td>
<td>0.319</td>
</tr>
</tbody>
</table>

Dependent variable: number of new Limited Companies with a director aged younger than 25 (col. 1), or older than 65 (col. 2). The number of new limited companies is computed per 100,000 inhabitants and expressed in logarithmic scale. The variable Mafia\(^{\ast}\)Crisis is the interaction of the treatment Mafia (a dummy taking the value of 1 if the province has a high level of mafia presence) with Crisis (a dummy taking the value of 1 for the years 2007 to 2013). Mafia presence is computed according to the TMI index; provinces within the last quartile of the index distribution are classified as Mafia = 1. The set of controls includes the number of offices of big banks (per 1,000 inhabitants), employment in the primary sector (%), employment in the secondary sector excluding construction (%), average size of the local production unit (number of workers), employed in the construction sector (%), number of beds in public hospitals (per 1,000 inhabitants), waste per capita (tons), capacity to attract tourism, number of self-employed (%), average duration of bankruptcy trials (days), political alignment, urban population (%), number of blood donations (per 100 inhabitants), and newspaper circulation (per 1,000 inhabitants). Standard errors are clustered at the provincial level. * *, **, *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.
Table 9: Mafia Overall Effect: Closed and Registered Enterprises

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Close</td>
<td>Closed</td>
</tr>
<tr>
<td>Mafia* Crisis</td>
<td>0.1000***</td>
<td>0.0300***</td>
</tr>
<tr>
<td></td>
<td>(0.0335)</td>
<td>(0.0100)</td>
</tr>
<tr>
<td>Controls</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Year FE</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Province FE</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Observations</td>
<td>1,133</td>
<td>1,133</td>
</tr>
<tr>
<td>Number of provinces</td>
<td>103</td>
<td>103</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.494</td>
<td>0.506</td>
</tr>
</tbody>
</table>

**Dependent variable: number of enterprises by status.**
The statuses considered are Closed Enterprises (col. 1) and Registered Enterprises (col. 2). The number of enterprises is computed per 100,000 inhabitants and expressed in logarithmic scale. The variable $Mafia \times Crisis$ is the interaction of the treatment $Mafia$ (a dummy taking the value of 1 if the province has a high level of mafia presence) with $Crisis$ (a dummy taking the value of 1 for the years 2007 to 2013). Mafia presence is computed according to the TMI index: provinces within the last quartile of the index distribution are classified as $Mafia = 1$. The set of controls includes the number of offices of big banks (per 1,000 inhabitants), employment in the primary sector (%), employment in the secondary sector excluding construction (%), average size of the local production unit (number of workers), employed in the construction sector (%), number of beds in public hospitals (per 1,000 inhabitants), waste per capita (tons), capacity to attract tourism, number of self-employed (%), average duration of bankruptcy trials (days), political alignment, urban population (%), number of blood donations (per 100 inhabitants), and newspaper circulation (per 1,000 inhabitants). Standard errors are clustered at the provincial level. *, **, *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.
Appendix

A.1 Data Sources

The following list describes all the variables used in our analysis with their source(s).

- **Number of New Enterprises**: number of new enterprises (per 100,000 inhabitants) set up each year at the provincial level. The data are collected by the Italian National Institute of Statistics (ISTAT).

- **Number of New Enterprises — Construction Sector**: number of new enterprises in the construction sector (per 100,000 inhabitants) set up each year at the provincial level. The construction industry is labeled as F in the Ateco 2002 and the Ateco 2007 classifications. The data are collected by the Italian Chamber of Commerce.

- **Number of New Enterprise — Professional, scientific, and technical activities**: number of new enterprises in the sector of professional, scientific, and technical activities (per 100,000 inhabitants) set up each year at the provincial level. Professional, scientific, and technical activities are labeled as M in the Ateco 2002 and the Ateco 2007 classifications. The data are collected by the Italian Chamber of Commerce.

- **Number of New Enterprises — Limited Liability Company**: number of new enterprises registered as a limited company (per 100,000 inhabitants) set up each year at the provincial level. Limited Liability Companies include the so-called **Società a Responsabilità Limitata**. The data are collected by the Italian Chamber of Commerce.

- **Number of New Enterprises — Limited Liability Company with director under age 25**: number of new enterprises registered as a limited company (per 100,000 inhabitants) set up each year at the provincial level and having a director younger than 25 years old. The data are from the database Analisi Informatizzata delle Aziende Italiane (Aida)
• Number of New Enterprises — Limited Liability Company with director over age 70: number of new enterprises registered as a limited company (per 100,000 inhabitants) set up each year at the provincial level and having a director older than 70 years old. The data are from the database Analisi Informatizzata delle Aziende Italiane (Aida).

• Number of Closed Enterprises: number of enterprises (per 100,000 inhabitants) shut down each year at the provincial level. The data are collected by the Italian National Institute of Statistics (ISTAT).

• Number of Registered Enterprises: stock of registered enterprises (per 100,000 inhabitants) each year at the provincial level. The data are collected by the Italian National Institute of Statistics (ISTAT).

• Employment — Primary Sector: percentage of the population employed in agriculture and fishing over the total number of employed people at the year-province level. The data are collected by the Italian National Institute of Statistics (ISTAT).

• Employment — Secondary Sector: percentage of the population employed in industry (excluding construction) over the total number of employed people at the year-province level. The data are collected by the Italian National Institute of Statistics (ISTAT).

• Employment — Construction Sector: percentage of the population employed in the construction sector over the total number of employed people at the year-province level. The data are collected by the Italian National Institute of Statistics (ISTAT).

• Employment — Tertiary Sector: percentage of the population employed in service over the total number of employed people at the year-province level. The data are collected by the Italian National Institute of Statistics (ISTAT).

• Self-Employment: percentage of the population that is self-employed over the total number of employed people in each province. The data are collected by the Italian National Institute of Statistics (ISTAT).
• Credit: total amount of credit (per inhabitant) granted to all industries at the provincial level by the banking system in 2003. The data are collected by the Bank of Italy.

• Big Banks: total number of big banks (per 1,000 inhabitants) at the year-province level. The data are collected by the Bank of Italy. The Bank of Italy defines big banks as those with a total value of traded funds greater than €26 billion.

• Non-Regular Jobs: percentage of irregular jobs over the total working force in each Italian region in 2003. The data are collected by the Italian National Institute of Statistics (ISTAT, 2005).

• Size of Local Unit of Production: average number of workers per local unit of production at the year-province level. Data for 2003, 2005, and 2013 are unavailable. Values for 2003 are computed as averages over the period of 2004 to 2006. Values for 2005 are computed as averages between 2004 values and 2006 values. Values for 2013 are computed as averages over the period of 2010 to 2012. The data are collected by the Italian National Institute of Statistics (ISTAT).

• Number of Beds in Public Hospitals: number of beds in public NHS (per 1,000 inhabitants) at the year-province level. Data for 2011, 2012, and 2013 are unavailable. Values for 2011, 2012, and 2013 are computed as averages calculated over the periods 2008 to 2010, 2009 to 2011, and 2010 to 2012, respectively. The data are collected by the Italian National Institute of Statistics (ISTAT).

• Waste: per capita number of tons of waste produced at the year-province level. The data are collected by the research center Istituto Superiore per la Protezione e Ricerca Ambientale (ISPRA).

• Tourism: index of the capacity of a given province to attract tourism-type consumption in a specific year. The data are collected by the Italian National Institute of Statistics (ISTAT).
• Trial Duration: average length in days of a trial for bankruptcy at the year-province level. Data are available for the period 2000 to 2007. For each of the remaining years, we substituted the missing values with the average over the eight preceding years (e.g., for 2008 we computed the average between 2000 and 2007). The data are collected by the Italian National Institute of Statistics (ISTAT).

• Political Alignment: the indicator variable is equal to 1 if the political party of the incumbent governors at the provincial, regional, and national level is the same, and 0 otherwise. The data are collected by the Italian Ministry of Interior.

• Urban Population: percentage of urban population over the total provincial population at the year-province level. The data are collected by the Italian National Institute of Statistics (ISTAT).

• Blood Donations: number of blood donations (per 100 inhabitants) at the year-regional level. The data are collected by the Italian National Agency for Blood Donation (Agenzia Volontari Italiani del Sangue - AVIS).

• Newspaper Circulation: total number of newspapers sold (per 1,000 inhabitants) at the year-province level. The data are collected by the Italian National Press Agency (Accertamenti Diffusione Stampa - ADS).

A.2 Measuring Mafia Presence: The Transcrime Mafia Index

The Transcrime Mafia Index (TMI) is provided by Transcrime, an Italian research center on transnational crime. The construction of the index is based on the work of Calderoni (2011). The version of the index employed in this paper is the one provided in the report “Mafia Investments,” funded by the Italian Ministry of Internal Affairs and the European Union (Ministry of Interior, 2013). According to the TMI, a mafia-type organization is characterized by four main dimensions:

• Presence of criminal groups providing illegal goods and services;

• Use of violence, threat, or intimidation to pursue its aims;
• Infiltration into the political system;

• Infiltration into the economic system.

These four dimensions are approximated by using four different types of criminal activities and criminal records as specific markers for them. In particular, the type of criminal records taken into account are:

• Association of Mafia (Associazione Mafiosa) as described in Law 646 (art.416-bis). Association of Mafia is defined as “a group of people that by use of intimidating behavior, membership to the organization subjugation, and a code of silence, commit criminal activities to acquire direct or indirect control of economic activities, concessions, authorizations, public contracts, or to generate illicit profits or advantages or to impede or obstruct the exercise of the right to vote or to ensure the procurement of votes for them or for others during elections.” The data are provided for the period 2004 to 2011 by the Ministry of Interior (Sistemi D’Indagine - SDI);

• Murders committed by mafia members. The data are provided for the period 2004 to 2011 by the Ministry of Interior (Sistemi D’Indagine - SDI);

• City councils dissolved because of mafia infiltration. The data are provided for the period of 2000 to 2011 by the Ministry of Interior;

• Assets seized from organized crime. The data are provided for the period 2000–2011 by the Agenzia Nazionale per l’Amministrazione e la Destinazione dei Beni Sequestrati e Confiscati alla Criminalità Organizzata and Agenzia del Demanio.

All the records are normalized per 10,000 inhabitants (with the exception of city councils dissolved because of mafia infiltration) and averaged at the provincial level. Then, for each type of crime, a rank of the provinces is created and the following indexes are calculated for each province:

\[ Index_{c,i} = \left( \frac{\text{NormRec}_{c,i}}{\text{NormRec}_{c,\text{max}}} \right) \times 1000 \]  

(A.1)
In particular, the index for crime $c$ in province $i$ is equal to the ratio (expressed in thousands) between the average number of records for crime $c$ in province $i$ and the highest average number of records for the same crime registered among the Italian provinces. The final TMI score for each province is just the simple average of the four indexes. For simplicity, the final score (used in this paper) has been rescaled to the 0–1 interval.

### A.3 Measuring Mafia Presence: The Power Syndicate Index

The Power Syndicate Index (PSI) is recovered from the report “Alleanze nell’ombra. Mafie ed economie locali in Sicilia e nel Mezzogiorno,” produced by Fondazione RES. It defines a set of illicit activities aimed at exercising control of territory. These activities include Association of Mafia (Associazione Mafiosa) as described in Law 646 (art.416-bis), murders committed by mafia members, and racketeering practices. Association of Mafia is defined as “a group of people that by use of intimidating behavior, membership to the organization subjugation and a code of silence, commit criminal activities, to acquire direct or indirect control of economic activities, concessions, authorizations, public contracts or to generate illicit profits or advantages or to impede, obstruct the exercise of the right to vote or to ensure the procurement of votes for them or for others during elections.”

For all the core activities, the average number of cases at the province level and the crime rates (per 100,000 inhabitants) for the years 2004 to 2007 have been calculated, as have the country average for each type of crime.

Finally, the provinces have been classified along a four-point scale according to the following structure:

- Index = 0: All core activities are smaller than the country’s average level;
- Index = 1: At least one core activity is greater than the country’s average level;
- Index = 2: At least two core activities are greater than the country’s average level;
- Index = 3: All the core activities are greater than the country’s average level.
A.4 Sensitivity Analysis

In this Appendix, A.4, we show how baseline estimates respond to a different rule to identify areas characterized by the high presence of organized crime, to the use of different indexes for mafia presence and to the use of a different regression model. Any significant change is detected as a response to the alternative ways used to define mafia presence.

First, we analyze possible effects induced by our rule—the use of the fourth quartile of the TMI distribution—to define the variable *Mafia*. Afterward, we analyze possible alternative indexes for mafia presence. We start with an older version of the TMI based almost exclusively on pre-crisis records (1983–2009, Calderoni, 2011). Then we focus on the Power Syndicate Index (PSI), which starts with the concept developed by Block (1980) and elaborated on by Fondazione RES, to classify the presence of criminal organizations by the type and scope of their activities in a given area. The PSI maps mafia degree of control of a territory in terms of military occupation—e.g. Association of Mafia, murders by mafia members, and racketeering practices. It employs records for these types of crimes, which are averaged during the period of 2004–2007.\(^{A.1}\)

Finally, as in Pinotti (2015), we use the average number of cases pursuant to art.416-bis during the period of 2003–2006 as an indicator for the local presence of organized crime. Article 416-bis captures the adherence of Italian mafia to the theoretical framework of Schelling (1971), as well as their interest and infiltrations in the official economy.

Figure A.1 shows the distribution of organized crime according to the three different measures presented so far. Table A.1 shows that the original TMI index used in the baseline analysis is highly and significantly correlated with the other three mafia indexes. The correlation among the original TMI used in the baseline analysis and other mafia indexes (column 1) ranges between 77\% and 82\%.

To be more precise, we also run the baseline analysis by using these alternative indexes. Specifically, for the pre-crisis version of TMI, we adopt both the usual measure, based on the fourth quartile of the distribution, to define provinces with mafia, as well as the

\(^{A.1}\)Appendix A.3 provides further details about these activities, how they are combined to construct the index, and the sources of data used.
measure that includes the third quartile. For the PSI and the art.416-bis, we define as provinces with mafia presence those with a value of the PSI or the average number of cases pursuant to art.416-bis greater than 0. This classification compares provinces with some marginal trace of mafia territorial presence with those without any sign of criminal infiltration. This reduces possible concerns related to the measurement of mafia presence.

Table A.1: Correlation Matrix: Mafia Measures

<table>
<thead>
<tr>
<th></th>
<th>TMI</th>
<th>TMI pre-crisis</th>
<th>PSI</th>
<th>416-bis</th>
</tr>
</thead>
<tbody>
<tr>
<td>TMI</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TMI pre crisis</td>
<td>0.77***</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PSI</td>
<td>0.79***</td>
<td>0.87***</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>416-bis</td>
<td>0.82***</td>
<td>0.57***</td>
<td>0.64***</td>
<td>1</td>
</tr>
</tbody>
</table>

Note: *** indicates statistical significance at the 1% level.

Table A.2 reports results of the analysis. Column (1) adopts a less restrictive definition for mafia presence by including into the treatment group those provinces within the third quartile—TMI greater than 0.011—of the TMI distribution. This exercise is crucial as it allows us to introduce more geographical heterogeneity in the distribution of criminal organizations.\(^\text{A.2}\) Territorial heterogeneity mitigates the possibility that the effect in the baseline models is only driven by regional characteristics typical of southern Italy, the area where mafia is more concentrated. Column (2) presents the results obtained with the revised pre-crisis version of the TMI index using the last quartile of its distribution to define mafia presence, while column (3) also includes the third quartile. Column (4) uses the PSI index, whereas column (5) is based on the number of cases pursuant to art.416-bis.

Our baseline results are unaffected by the rule adopted and the index used to define mafia presence. All the specifications display very similar results with respect to the ones in the baseline analysis. The inclusion of provinces in the third quartile of the TMI distribution index does not substantially modify previous findings. The point estimates for the effect of mafia presence remain strongly statistically significant at 5.1 percent. In

\(^\text{A.2}\) Notice that by using the third quartile of the distribution, many additional provinces in central and northern Italy are categorized as infiltrated by organized crime.
Figure A.1: Alternative Measures for Mafia Presence

Note: The figure shows the geographical distribution of the Italian provinces with and without mafia presence according to the alternative TMI measure (left panel, see text for further details about this measure), the Power Syndicate Index (PSI) (central panel), and the number of cases pursuant to art.416-bis. We consider as provinces with mafia presence those belonging to the fourth quartile of the TMI distribution or having a PSI score or the number of cases pursuant to art.416-bis greater than 0.
addition, the models in columns (2) to (5), which test for sensitivity to alternative mafia indexes, confirm that results are unaffected by the specific index used to measure the presence of organized crime at the local level.

Table A.2: Sensitivity Tests for Mafia Definition: Rule and Indexes

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mafia*Crisis</td>
<td>0.0510***</td>
<td>0.0824***</td>
<td>0.0578***</td>
<td>0.0567***</td>
<td>0.0525***</td>
</tr>
<tr>
<td></td>
<td>(0.0129)</td>
<td>(0.0154)</td>
<td>(0.0138)</td>
<td>(0.0131)</td>
<td>(0.0158)</td>
</tr>
<tr>
<td>Mafia index</td>
<td>TMI</td>
<td>TMI pre-crisis</td>
<td>TMI pre-crisis</td>
<td>PSI</td>
<td>416-bis</td>
</tr>
<tr>
<td></td>
<td>3rd+4th quartiles</td>
<td>4th quartile</td>
<td>3rd+4th quartiles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Controls</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Year FE</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Province FE</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Observations</td>
<td>1,133</td>
<td>1,133</td>
<td>1,133</td>
<td>1,133</td>
<td>1,133</td>
</tr>
<tr>
<td>Number of provinces</td>
<td>103</td>
<td>103</td>
<td>103</td>
<td>103</td>
<td>103</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.555</td>
<td>0.567</td>
<td>0.559</td>
<td>0.558</td>
<td>0.552</td>
</tr>
</tbody>
</table>

Dependent variable: number of new enterprises. The number of new enterprises is computed per 100,000 inhabitants and expressed in logarithmic scale. The variable Mafia $\ast$ Crisis is the interaction of the treatment Mafia (a dummy taking the value of 1 if the province has a high level of mafia presence) with Crisis (a dummy taking the value of 1 for the years 2007 to 2013). In column (1), mafia presence is computed according to the TMI index; provinces within the third and fourth quartile of the index distribution are classified as Mafia = 1. In columns (2) and (3), mafia presence is computed according to the TMI index constructed using information only related to the period 2000–2008. In column (2), provinces within the fourth quartile of the index distribution are classified as Mafia = 1, while column (3) also includes those within the third quartile. In column (4), mafia presence is computed according to the PSI index; provinces with a PSI greater than 0 are classified as Mafia = 1. In column (5), mafia presence is computed according to the average number of cases pursuant to art.416-bis during the period 2003–2006; provinces with a number of cases greater than 0 are classified as Mafia = 1. The set of controls includes the number of offices of big banks (per 1,000 inhabitants), employment in the primary sector (%), employment in the secondary sector excluding construction (%), average size of the local production unit (number of workers), employed in the construction sector (%), number of beds in public hospitals (per 1,000 inhabitants), waste per capita (tons), capacity to attract tourism, number of self-employed (%), average duration of bankruptcy trials (days), political alignment, urban population (%), number of blood donations (per 100 inhabitants), and newspaper circulation (per 1,000 inhabitants). Standard errors are clustered at the provincial level. *, **, *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Finally, we test the sensitivity of our results with respect to the use of a different regression model. We do this because of the count data nature of the number of new enterprises. In particular, given the overdispersion in the distribution of this latter, we estimate a fixed-effect negative binomial regression model. The control variables used are the same as in the baseline specification. Table A.3 reports the estimates of the model, in terms of Incidence Rate Ratio (IRR). All the results are consistent with those produced
in the baseline specification. The DiD strategy shows a positive effect of mafia’s presence on the number of new enterprises set up in the period after the onset of the crisis. The coefficient is statistically significant and with a magnitude of 6.8 percent, remarkably close to the one shown in the baseline specification. This test provides a reassuring pattern showing how estimates are not sensitive to the regression model chosen.

Table A.3: Negative Binomial Regression

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mafia*Crisis</td>
<td>1.0867***</td>
<td>1.0684***</td>
</tr>
<tr>
<td></td>
<td>(0.0185)</td>
<td>(0.0179)</td>
</tr>
<tr>
<td>Controls</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Year FE</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td>Province FE</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Observations</td>
<td>1,133</td>
<td>1,133</td>
</tr>
<tr>
<td>Number of provinces</td>
<td>103</td>
<td>103</td>
</tr>
</tbody>
</table>

Dependent variable: number of new enterprises. All the coefficients represent Incidence Rate Ratios (IRR). The number of new enterprises is computed per 100,000 inhabitants. The variable Mafia * Crisis is the interaction of the treatment (a dummy taking the value of 1 if the province belongs to a province with high level of mafia’s presence) with Crisis (a dummy taking the value of 1 for years from 2007 to 2013). Mafia’s presence is computed according to the TMI index; provinces within the last quartile of the index distribution are classified as Mafia = 1. The set of controls includes funding risk, number of offices of big banks (per 1,000 inhabitants), FDI (net flow), number of employed in the primary sector (%), number of employed in the secondary sector excluding construction (%), average size of the local production unit (num. of workers), number of employed in the construction sector (%), number of beds in public hospitals (per 1,000 inhabitants), waste per capita (tons.), capacity to attract tourism, per capita taxable income, number of self-employed (%), number of patent applications (per 100,000 inhabitants), average duration trial for bankruptcy (days) length of road system (per 100 km²), number of blood donations (per 100 inhabitants), newspaper circulation (per 1,000 inhabitants), urban population (%), male youth population (%) and a dummy variable capturing the change in the provincial administrative structure. Standard errors are clustered at the provincial level. *, **, *** indicate statistical significance at the 10%, 5% and 1% levels respectively.
A.5 Parallel trends

Figure A.2: Parallel Trends Assumption: Construction Sector

Note: The figure shows the trends of the average number of new enterprises in the construction sector (per 100,000 inhabitants). The comparison is between provinces within the first three quartiles of the TMI distribution (No Mafia, continuous line) and those belonging to the last quartile (Mafia, dashed line).
Note: The figure shows the trends of the average number of new enterprises in the research sector (per 100,000 inhabitants). The comparison is between provinces within the first three quartiles of the TMI distribution (No Mafia, continuous line) and those belonging to the last quartile (Mafia, dashed line).

Note: The figure shows the trends of the average number of new limited liability companies (per 100,000 inhabitants). The comparison is between provinces within the first three quartiles of the TMI distribution (No Mafia, continuous line) and those belonging to the last quartile (Mafia, dashed line).
Note: The figure shows the trends of the average number of new limited liability companies having a director aged ≤ 25 years old (per 100,000 inhabitants). The comparison is between provinces within the first three quartiles of the TMI distribution (No Mafia, continuous line) and those belonging to the last quartile (Mafia, dashed line).

Note: The figure shows the trends of the average number of new limited liability companies having a director aged ≥ 65 years old (per 100,000 inhabitants). The comparison is between provinces within the first three quartiles of the TMI distribution (No Mafia, continuous line) and those belonging to the last quartile (Mafia, dashed line).
Figure A.7: Parallel Trends Assumption: Closed Enterprises

Note: The figure shows the trends of the average number of closed enterprises (per 100,000 inhabitants). The comparison is between provinces within the first three quartiles of the TMI distribution (No Mafia, continuous line) and those belonging to the last quartile (Mafia, dashed line).

Figure A.8: Parallel Trends Assumption: Registered Enterprises

Note: The figure shows the trends of the average number of registered enterprises (per 100,000 inhabitants). The comparison is between provinces within the first three quartiles of the TMI distribution (No Mafia, continuous line) and those belonging to the last quartile (Mafia, dashed line).