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## Mafia Inc.: When godfathers become entrepreneurs

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**“Mafia Inc.”:  
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Marco Le Moglie and Giuseppe Sorrenti

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# “Mafia Inc.”: When Godfathers Become Entrepreneurs\*

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## Abstract

We study the investment of criminal organizations in the legal economy. We focus on Italy, a country historically plagued by a conspicuous presence of mafia-type organizations. By using the exogenous credit contraction imposed by the 2007 financial crisis we highlight how the consequences for newly established enterprises have been less severe in areas with organized crime. Although criminal organizations are largely detrimental for local economic conditions, their economic activity might act as an economic stabilizer in the short-run, especially in a context of weak institutional presence. The investment in the legal economy allows criminal organizations to launder money, make profits, and raise social consensus through the provision of alternative sources of social insurance.

*JEL classification:* K42, L26.

*Keywords:* Mafia, Organized Crime, Illegal Enterprises, Financial Crisis.

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*“[Mafia] lives in absolute harmony with a myriad of protectors, accomplices, informers, borrowers, other characters, people who are frightened or blackmailed and who belong to any social class. This is the breeding ground where Cosa Nostra flourishes, with all the direct or indirect consequences, which may be conscious or unconscious, voluntary or forced, and that often benefit from the consensus of the population.”*

Giovanni Falcone, Anti-Mafia Prosecutor, assassinated by *Cosa Nostra*

## 1 Introduction

The presence of organized crime is found to be largely detrimental for economic prosperity and development (Pinotti, 2015; Peri, 2004). Criminal organizations usually operate through the use of terror, killings and intimidating behaviors to obtain power and territorial control. However, organized crime also invests huge amounts of capital in the legal economy. According to the European Commission organized crime invests in the legal economy of 24 out of 28 EU member states (European Commission, 2015). Between 1983 and 2011 the Italian authorities have seized 19,987 assets to criminal organizations operating nationwide (Ministry of Interior, 2013). The proportion of criminal economic infiltration into the Italian real estate market is on average equivalent to 22 million euro for every 100 billion euro worth of building assets (UNICRI, 2016).

In this work, we depart from the current literature on the detrimental effect induced by the territorial presence of criminal organizations, to study some aspects related to positive-in-sign effects of organized crime at local level. We investigate the investment in the legal economy as a tool used by organized crime to raise forms of social consensus. The investment in the legal economy is one of the main channels used by criminal organizations to launder money and make profits.<sup>1</sup> However, by investing in the legal economy, organized crime may also act as an economic stabilizer and a social insurance that lowers the effects of economic downturns. Through the investment in the legal economy, criminal

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<sup>1</sup>Money laundering is a vast phenomenon in the Italian economic system. See Ardizzi et al. (2014) for an estimate of its impact in the Italian financial sector.

organizations are therefore able to raise forms of social consensus and to win silence and support by part of the population. Social consensus has been one of the fundamental milestones of the empowerment of many criminal organizations. The Sicilian Mafia in Italy rose to power in the nineteenth century as a movement fulfilling the need of the population for land protection from predatory attacks (Bandiera, 2003). Pablo Escobar, the leader of a criminal organization that controlled roughly 80% of the cocaine trade in the world and the instigator of an extraordinary number of killings against members of other drug cartels, police officers, and government officials, gained the consensus of a large fraction of the population of Medellin and Colombia by offering services not provided by the Colombian institutional framework.<sup>2</sup>

We focus on the case of Italy, a country historically plagued by a massive number of criminal organizations since the nineteenth century. By exploiting the credit contraction induced by the outbreak of the 2007 financial crisis we compare the number of newly established enterprises between provinces with and without presence of organized crime in a Difference-in-Differences (DiD) setting.<sup>3</sup> Despite the illegal investment in the legal economy is not a recent phenomenon, the shock induced by the credit contraction started in 2007 represents a unique opportunity to provide the first quantitative analysis of such investment by showing not only its general magnitude but also its characteristics.

The identification of features related to the investment of organized crime in the legal economy is a challenging task. The detection of activities perpetrated by criminal organizations is particularly difficult because of its illegal nature. Thus, it is very complicated to understand and quantify a behavior that economic agents strive to hide. We exploit concepts of forensic economics applied to the case of Italy to deal with the difficulty of identifying hidden practices perpetrated by organized crime. The forensic economics approach deals with the use of information about *licit* markets to highlight different insights

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<sup>2</sup>In the 1960s and 1970s new housing projects, hospitals, schools, sport facilities were financed by Pablo Escobar and contributed to the creation of his “Robin Hood” image guaranteeing him protection and devotion from a considerable part of the local community.

<sup>3</sup>In 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 (*Cosa Nostra*), while here it also refers to other criminal organizations that have risen in Italy in the past, such as the *Camorra*, the *'Ndrangheta* and the *Sacra Corona Unita*.

on *illicit* activities (Zitzewitz, 2012). Although criminal organizations mainly operate through illegal activities and markets, their involvement in the legal economy leaves detectable traces. Italian National Law 580/1993 requires each Italian enterprise to register its activity in the Registry of Enterprises. The registration is mandatory for all enterprises operating nationwide, so it is undertaken both by legal enterprises and by those enterprises with some connections with organized crime.<sup>4</sup> In our main analysis we will focus on the number of new enterprises established at provincial level as representing the sum of both enterprises with some connections and enterprises with no connections to criminal organizations.

To isolate the possible investment by organized crime in the legal economy, we take advantage of the contraction of the legal credit supply generated by the outbreak of the 2007 financial crisis. The financial crisis sparked a sharp contraction in the legal credit supply provided to entrepreneurs across the Italian territory, while it left mafia sources of capital almost unaltered (Organised Crime Portfolio, 2015).<sup>5</sup> Moreover, the shock induced by the financial crisis is exogenous with respect to the presence of criminal organizations. The financial crisis originated in the United States, reducing the possible existence of anticipation effects, especially for countries far from the American banking and financial sectors. This framework allows for the implementation of a DiD estimation strategy, in which provinces with a high presence of criminal organizations are compared to provinces with a low level of organized crime infiltration before and after the outbreak of the financial crisis.

Provinces with higher mafia infiltration experienced a less severe drop — around 6 percentage points — in the number of new enterprises established in the period after the outbreak of the financial crisis. The effect is robust to alternative measures for mafia presence, to different sensitivity tests, and to the implementation of a novel instrumen-

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<sup>4</sup>By illegal enterprises we mean all those enterprises whose activities are carried out by members of criminal organizations or whose capital is raised through the exercise of illegal activities — for example, drug dealing.

<sup>5</sup>Criminal organizations raise their capital in markets — e.g., drug dealing, racketeering — almost unaffected by the financial crisis. See Section 4.1 for the analysis of one of the main sources of profits for criminal organizations, namely the drug market.

tal variable identification strategy coping with possible residual endogeneity concerns. A breakdown of our findings allows us to understand the drivers behind different performances and the features underlying the possible investment by criminal organizations in the legal economy. In line with our identifying assumption, the mafia-effect appears particularly strong in areas characterized by higher levels of credit rationing. In terms of mafia preferences, we find that sectors historically considered to be plagued by criminal infiltrations (Construction) and favorable legal forms (Limited Companies and Partnerships) appear to be particularly at risk for illegal investments. On the other hand, no significant effect is detected in sectors traditionally less infiltrated by organized crime — e.g., professional, scientific, and technical sector — which validates the implemented identification strategy. The analysis of closed enterprises pinpoints a higher rate of closed enterprises during the financial crisis in areas characterized by a higher presence of criminal organizations. This result is more than balanced by the effect on new enterprises, resulting in a positive net effect on registered enterprises. Finally, we test the existence of spillovers in the labor market induced by the presence of criminal organizations and find a significant effect on the employment rate, which seems to be highly heterogeneous according to the size of the local informal labor market.

This work sheds light on the investment of organized crime in the legal economy by showing its role of economic stabilizer, especially during economic downturns. This role allows criminal organizations to raise forms of consensus among the local population that are responsible for the ineffectiveness of policies targeted at reducing leniency toward organized crime. Our results call for the adoption of standard repression policies complemented by a massive institutional intervention aimed at undermining the roots of the social consensus obtained by mafia. These interventions might be based on the provision of resources such as credit, subsidies, and employment opportunities to those territories with high presence of organized crime. More attention by the state and the institutions would reduce the space for mafia infiltration. This work sheds also light on different aspects of the mafia investment in the legal economy. Through the comparison of established and closed enterprises we highlight how the general positive effect on established

enterprises is sizable enough to counterbalance the negative general effect on the closed ones. In addition, we confirm anecdotal evidence on mafia preferences when it comes to laundering money raised through illegal activities. Specifically, by focusing on economic sectors and adopted legal forms, we pinpoint where the investment in monitoring and vigilance activity should be improved in the future. Furthermore, clear preferences in terms of sectors or legal forms call for the adoption of a stricter legislation for new enterprises that are established or that operate in such sectors or with such specific legal forms. Finally, our research suggests that positive spillovers related to mafia presence and its territorial activity are larger in contexts characterized by harsher conditions of the local credit market — e.g., less availability of credit, high cost of credit, etc. As a consequence, negative 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.

The remainder of the work is structured as follows. In Section 2, a brief review of the literature about the origin and activity of criminal organizations in Italy will be provided. Section 3 introduces the database used for the analysis and descriptive statistics of our sample, while Section 4 explains in detail the implemented identification strategy and presents the baseline estimates. Section 5 discusses some potential threats to identification. Section 6 sheds light on the features of the investment by criminal organizations in the legal economy, while Section 7 discusses the additional effects in terms of entrepreneurial activity and labor market opportunities induced by the presence of organized crime. Section 8 concludes the work.

## 2 Organized Crime in Italy

In recent years, economists have devoted growing attention to the empirical analysis of organized crime and its behavior. With reference to the US, [Miller \(2009\)](#) studies both theoretically and empirically the leniency in cartel enforcement, [Levitt and Venkatesh \(2000\)](#) analyze criminal behavior of drug-selling street gangs, while [Mastrobuoni \(2015\)](#)

focuses on the US mafia members to detect the criminal network effect on their economic status. The Italian case represents rich soil for research as a result of the exceptional heterogeneity across regions and the existence of a complex and well-established criminal activity managed by mafia-type organizations. Article 416-bis introduced into the Italian Penal Code in 1982 defines a mafia-type organization 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”*.

The rise of the Sicilian Mafia — traditionally deemed the term for organized criminal activities in Italy — historically dates to the nineteenth century as a response to a weak institutional context that led to the demand for land protection from predatory attacks (Bandiera, 2003). Also Buonanno et al. (2015) trace the Sicilian Mafia’s expansion to the presence of weak institutions in a land with valuable natural resources.<sup>6</sup> The rise of the Sicilian Mafia was contemporaneous with the birth of similar criminal organizations, *Camorra* in Campania and the *’Ndrangheta* in Calabria, in other Italian regions. After an initial setting characterized by immobility, these criminal organizations started to expand their influence and activity to the more central-northern productive and profitable 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: on the one hand, the “Italian economic miracle” between the late 1950s and the early 1970s was responsible for a massive migration phenomenon from the south to the north of the country. On the other hand, in the 1960s and 1970s a specific law — the *Confino* law — also contributed to the national spread of criminal organizations by imposing resettlement in a different province than the original one for individuals likely to be involved in mafia-type criminal activities. These two factors, plus a series of other contextual conditions, produced the first evidence of mafia presence in northern Italy during the late 1960s. In

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<sup>6</sup>For further studies on the relationship between weak institutions, natural resources, and organized crime, see also Gambetta (1993) and Konrad and Skaperdas (2012).

the 1970s, mafia power increased because of its role in dealing drugs, kidnapping, and racketeering crimes, while in the 1980s and 1990s, these organizations completed their settlement 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 relevant. [Acemoglu et al. \(2017\)](#), [De Feo and De Luca \(2017\)](#), [Alesina et al. \(2016\)](#), and [Daniele and Geys \(2015\)](#) highlight the influence and interference of mafia in the political competition, the quality of politicians, and the election results.<sup>7</sup> The presence of criminal organizations generates a sizable loss in terms of economic resources. [Pinotti \(2015\)](#), by comparing two Italian regions after the 1970s, estimates that the presence of mafia lowers the GDP per capita by 16 percentage points. [Peri \(2004\)](#) shows the lower levels of employment rates and employment growth induced by the presence of organized crime, while [Albanese and Marinelli \(2013\)](#) analyze the negative impact on productivity. The 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 activities, the cost of credit tends to increase as the credit supply is affected by the amount of money spent by the 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 directed investments (FDI) are also negatively affected by the local presence of criminal organizations ([Daniele and Marani, 2011](#)).<sup>8</sup> Finally, although it is undeniable that mafia-type organizations constitute a deterrent for both national and international private investors, [Barone and Narciso \(2015\)](#) demonstrate how mafia presence is associated with higher probability to receive public funds in the form of business subsidies.

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<sup>7</sup>These works are inspired by [Dal Bó et al. \(2006\)](#), where the authors develop a theoretical model in which groups attempt to influence policies using both bribes and the threat of punishment.

<sup>8</sup>FDI inflows are crucial in determining future investments from abroad as they summarize the difficulty of setting up new companies, the government and judicial system effectiveness, and the level of property rights security ([Globerman and Shapiro, 2002](#); [Bénassy-Quéré et al., 2007](#); [Wei, 2000](#)).

### 3 Data and Descriptives

We assemble a new panel database containing information about the number of enterprises established yearly at provincial level from 2003 to 2013.<sup>9</sup> The presence of criminal organizations at provincial level is measured through the Transcrime Mafia Index (TMI) provided by Transcrime, an Italian research center on transnational crime. The TMI index is constructed by using criminal records collected between 2000 and 2011 on mafia’s criminal association, murders committed by mafia members, city councils dissolved because of mafia infiltration, and assets seized to organized crime.<sup>10</sup> The use of data on the time period between 2000 and 2011 needs some clarifications. Admittedly, since the index is constructed with data collected also after the outbreak of the crisis, it might become partially endogenous with respect to mafia presence because of possible changes of the location of organized crime in response to the outbreak of the 2007 financial crisis. However, the presence of organized crime is a persistent phenomenon in the short-medium run, therefore it is highly unlikely — as confirmed by anecdotal evidence — to observe remarkable changes in a circumscribed time period such as the one of interest in this study.<sup>11</sup> To be more cautious we will propose a robustness test based on an index capturing the presence of organized crime based on criminal records predetermined (2004-2007) with respect to the outbreak of the financial crisis.

We adopt the TMI’s definition as it is the most general available definition for mafia presence. It includes features related both to mafia territorial occupation and its infiltration in the local economic and social life. Mafia is defined 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”*. Figure 1 graphically shows the territorial distribution of

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<sup>9</sup>In order to get a balanced panel, we use the classification of the Italian provinces in force until 2005. The number of provinces was 103 until 2005, at which time the number rose to 107. Since 2009, the Italian territory is divided into 110 provinces. Data about the number of new enterprises are collected by the National Institute of Statistics (ISTAT).

<sup>10</sup>Appendix A.2 provides details about TMI’s construction.

<sup>11</sup>The presence of organized crime according to the TMI index is similar — despite the two indexes capture different aspects of mafia presence — to the one obtained with different indexes based on records antecedent to the period of analysis of this study, e.g. the Power Syndicate Index (PSI) discussed below.

the index. Mafia presence is spread nationwide, although a strong prevalence emerges in areas in the center and the south of the country. The rule applied to define the group of provinces with high mafia presence is based on the distribution of the TMI. In the baseline analysis we consider as provinces with *Mafia* those belonging to the fourth quartile of the TMI distribution.<sup>12</sup>

The relation between the number of new enterprises and mafia presence in a province is subject to the influence of many contextual factors that might be controlled for in the empirical strategy. The establishment of new enterprises is 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. We use the provincial number of bank agencies divided by bank size — big banks vs. small/medium banks — to control for the structure of the banking system.<sup>13</sup> Another crucial factor influencing the establishment of new enterprises is 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 vs. secondary (excluding construction) vs. tertiary — and the average size of the local production unit. As some sectors — e.g., construction, health care, waste treatment, and tourism — are more at risk for criminal infiltration, 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. As proxies for the provincial degree of entrepreneurial activity and innovation, we use the provincial level of self-employment and the provincial number of patent applications to the European patent office. We also consider the size of the infrastructure network by using the total length of roads within each province.

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<sup>12</sup>From now on, we will label Italian provinces, distinguishing between those with mafia and those without mafia according to this definition. The 75th percentile of the TMI distribution corresponds to a TMI value of 0.083. According to this definition, the number of provinces considered within *Mafia* is 25, and it includes all the provinces in the three upper classes in Figure 1, with the exception of the province of Milan. The province of Milan reports a value that is between 0.08 and the value of the 75th percentile. Several robustness tests for the definition of the variable *Mafia* will be discussed.

<sup>13</sup>Big banks are defined by the Bank of Italy as those with a total value of traded funds greater than 26 billion euro.

Concerning the political-institutional framework, the efficiency of the judicial system stands out as the main institutional factor affecting both the number of new enterprises (positive relationship) and mafia presence (negative relationship). We proxy the efficiency of the judicial system with the provincial average duration in days of a bankruptcy trial. The political environment is summarized by an indicator for the possible political alignment of the incumbent governments at provincial, regional, and national levels. Finally, for the social environment, we consider the territorial level of social and human capital measured by the regional average number of blood donations and newspaper provincial circulation.<sup>14</sup> Table 1 provides summary statistics for our sample.

## 4 The Mafia Investment in the Legal Economy

### 4.1 Identification Strategy

We use concepts of forensic economics as the starting point for our identification strategy. The forensic economics approach deals with the use of information about *licit* markets to highlight different insights of *illicit* activities (Zitzewitz, 2012). Italian National Law 580/1993 requires each Italian enterprise to register its activity on the Registry of Enterprises (*Registro delle Imprese*). This registration is mandatory for all enterprises operating nationwide. As a result, the number of new enterprises undeniably contains a subgroup of enterprises with connections with criminal organizations.

To isolate the investment of organized crime in the legal economy from the long-term disruption effect induced by mafia presence, we take advantage of the exogenous shock in the supply of credit generated by the 2007 financial crisis. The shock was not anticipated by the Italian credit market as it started in the United States. Figure 2 supports the thesis of exogeneity of the credit shock by representing the credit supplied to the industrial sector between 2003 and 2013. The pre-crisis period is characterized by a continuous increase in the provision of credit to the industrial sector. Since 2008, the year following the outbreak of the financial crisis, credit suddenly stopped growing. No anticipation effect is detected

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<sup>14</sup>Unfortunately, data about blood donations are unavailable at the provincial level.

in the pre-crisis period. As individuals might finance their business by turning to their own income or wealth, Figure 3 shows the evolution of per capita taxable income. There is also no evidence of anticipation effects, while it is clear that the growth process of per capita taxable income was suddenly interrupted by the outbreak of the financial crisis.

The financial crisis sparked a sharp contraction in the legal sources of credit provided to entrepreneurs across the Italian territory, while it left almost unaltered mafia sources of capital (Organised Crime Portfolio, 2015; ARIEL, 2015). The activity generating the highest profits for organized crime in Italy is drug dealing.<sup>15</sup> Figure 4 shows the evolution of the Italian market for drugs in the period of interest for this study by focusing on four different drugs — amphetamine, cocaine, cannabis, and heroin — and by measuring the total number of drug offenses, the total number of seizures, the total quantity of drugs seized, and the average price. Drug consumption is stable over time, suggesting that profits raised in this market were not affected by the financial crisis. Looking at the top-left panel, the number of offenses related (only) to drug use — the thick black line — has been increasing or almost constant since 2007.

The presented framework allows us to implement a Difference-in-Differences (DiD) estimation strategy in which we define provinces with a high level of mafia presence as the treatment group, while provinces with a low level of mafia presence constitute the control group. We compare the number of new enterprises between the two groups both before and after the financial crisis. Figure 5 presents a graphical test for the parallel trends assumption.<sup>16</sup> The parallel trends assumption is confirmed. In the period of 1997 to 2006, the trend for the number of new enterprises for provinces with no mafia fairly mimics the trend for those provinces with presence of organized crime. The vertical distance between the two trends remains similar in the pre-2007 period. The overall effect of the crisis, as highlighted by the drop in the number of new enterprises, is evident for both groups after the outbreak in 2007. The possible mafia-effect is detectable after the

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<sup>15</sup>According to the estimates of Transcrime, drug dealing generates 7.7 billion euro per year, an amount that almost double the second source of revenues of criminal organizations, namely racketeering.

<sup>16</sup>The empirical analysis will be focused on the period starting from 2003 because of data availability. However, we include here also the period 1997-2002 to show trends over a longer time period. A formal test for parallel trends will be also discussed in Section 4.2.

outbreak of the crisis: the vertical distance post-2007 remarkably decreases, making the two trends progressively closer.

The DiD baseline equation of interest is the following:

$$NewEnterprises_{i,t} = \beta_0 + \beta_1 Mafia_i * Crisis_{i,t} + \beta \mathbf{X}_{i,t} + \alpha_i + \gamma_t + \varepsilon_{i,t} \quad (1)$$

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 our treatment *Mafia* — to be a province within the fourth quartile of the TMI distribution — and *Crisis* — an indicator variable for the period starting from 2007. 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  $\mathbf{X}_{it}$  contains time-varying determinants at provincial or regional levels that might affect the number of new enterprises and mafia presence.<sup>17</sup>

## 4.2 Baseline Results

The estimates of equation (1) are reported in Table 2. The model in column (1) includes province fixed effects. Column (2) also includes the full set of controls previously introduced, while column (3) adds year fixed effects. From now on, we will refer to the model in column (3) as the full model. Standard errors are adjusted for heteroskedasticity and clustered at provincial level in all models.

Results highlight how provinces with a high level of mafia presence experienced a less severe reduction in the number of new enterprises in the period between 2007 and

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<sup>17</sup>We include in the vector all the variables introduced in Section 3. In the specifications without year fixed effects, this vector will also contain the indicator variable *Crisis* to capture the general effect of the crisis on the number of new enterprises established yearly.

2013. The coefficient of interest is always statistically significant and remarkably high in magnitude. The effect of mafia presence is bounded between 3.8 and 8.4 percentage points, with the full model displaying a value of 5.8 percentage points.

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 parallel trends assumption, 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:

$$NewEnterprises_{i,t} = \beta_0 + \sum_{j=2003}^{2013} (Mafia_i * Year_j) \beta_{1,j} + \beta \mathbf{X}_{i,t} + \alpha_i + \gamma_t + \varepsilon_{i,t} \quad (2)$$

where the coefficients  $\beta_{1,j}$  represent the interaction between mafia presence and the indicator variables for each year.<sup>18</sup> Table 3 reports the estimates of the full model, while Figure 6 shows a graphical representation of the results. Provinces with and without a strong mafia presence were performing similarly before the outbreak of the crisis. All the coefficients are remarkably small in magnitude and, with the exception of the weak significance of 2003, never statistically significant. The interaction between *Mafia* and each *Year* becomes significant starting in 2007. The coefficient for provinces with more presence of criminal organizations experienced an increase from 0.03 percentage points in 2005 to 3 percentage points in 2007 — when 2005 and 2007 are compared to the reference value of 2006. Since 2007, with the exception of 2008, the interaction between *Mafia* and each year progressively increases because of the persistence of the crisis and exacerbation of its consequences. The peak was reached in 2012 with a value of 12.1 percentage points.

The results presented so far are based on the TMI index and the specific rule we applied to define the variable *Mafia*. The TMI, as all the indexes for mafia presence, is possibly affected by measurement error. Measurement error might be the consequence of the rule applied by Transcrime to map data sources into a mafia index, as well as under-reporting of criminal records, which is typical. The choice to use an indicator

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<sup>18</sup>We use as a reference category the interaction between *Mafia* and the year 2006, the year before the outbreak of the crisis.

variable based on the quartile of index distribution mitigates the risk of measurement error. However, we replicate our main analysis, adopting a less restrictive definition for mafia presence by including into the treatment group those provinces in the third quartile — TMI greater than 0.011 — of the distribution. This exercise is crucial as it allows us to introduce more geographical heterogeneity in the distribution of criminal organizations.<sup>19</sup> Territorial heterogeneity mitigates the possibility that the effect in the baseline models was only driven by regional characteristics typical of the south of Italy, the area where mafia is more concentrated.<sup>20</sup> Table 4 reports the analysis. The effect of interest remains positive, strongly significant, and similar to the one in the baseline model. The point estimates of the coefficient is between 3.6 and 5.4 percentage points.

To test also for the mapping rule used by Transcrime and the data used to construct this index, we propose here an alternative index for the presence of criminal organizations, namely the Power Syndicate Index (PSI), elaborated by the Fondazione RES. The PSI relies on the concept developed by Block (1980) 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., mafia’s criminal association, murders by mafia members, and racketeering practices.<sup>21</sup> The results obtained with the PSI index to measure mafia presence are reported in Table 5. We define as provinces with mafia presence those with a value of PSI greater than 0. This classification compares provinces with some trace — also marginal — of mafia territorial presence with those without any sign of criminal infiltration, therefore reducing possible concerns related to the measurement of mafia presence. The effect is almost unchanged with respect to the one of the baseline model, confirming that the results are robust to the use of alternative indexes for mafia presence.

A second possible source of measurement error relates to the sources used to define the

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<sup>19</sup>Notice that by the use of the third quartile of the distribution, many additional provinces in the center and north of Italy are categorized as infiltrated by organized crime.

<sup>20</sup>A further robustness test discussed below addresses the same concern about the predominant concentration of organized crime in the south of Italy.

<sup>21</sup>Appendix A.3 provides further details about these activities and how they are combined to construct the index and the sources of data used. Figure 7 shows the distribution of organized crime according to the PSI.

activity of criminal organizations. These sources are strongly affected by under-reporting, which is in turn correlated with many unobservable factors impossible to control for. We will specifically address this measurement issue in Section 5.

## 5 Threats to Identification

The non-random assignment of mafia presence across the Italian territory might be carefully analyzed. Let us assume a framework in which mafia has changed its territorial infiltration in the period of analysis because of the existence of factors driving the establishment of new enterprises. In this context, our estimates might reflect both the real effect of the mafia infiltration in the legal economy and the effect of the specific characteristics of an area that are likely to attract criminal organizations. The endogeneity concern in our framework is likely to marginally affect our estimates as mafia presence is time persistent especially in the short-medium run. However, to verify this hypothesis we introduce here two further sets of robustness tests to deal with the possible endogeneity of mafia presence. First, by replicating the analysis in [Biderman et al. \(2010\)](#) or [Galiani et al. \(2005\)](#), we consider whether our results are driven by specific time trends of the covariates or by the predominance of organized crime in the southern part of Italy; second, we propose a novel instrumental variable approach to correct the potential endogeneity of mafia presence.

The reaction to the crisis might depend on secular differences across provinces. To rule out this possibility, we estimate a further specification in which we allow for time trends of 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 variable as in 2006 with the year dummies.<sup>22</sup> The estimates are reported in Table 6. In column (1), we test the trends for the variables that capture the credit market conditions, in column (2) we test variables for economic conditions, in column (3) we test the political-institutional context, and in column (4)

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<sup>22</sup>We assume that 2006 represents the last observable value of the secular trends of each group of covariates before the shock (possibly) induced by the outbreak of the crisis.

we test the variables for the social environment. The coefficient of interest is always remarkably similar to the coefficient of the baseline estimates suggesting that our results are unlikely to be driven by such trends in the covariates. We propose to additional robustness tests in columns (5) and (6). In particular, we verify whether the massive presence of organized crime in the southern part of the Italian territory and the intrinsic difference between the south and the rest of the country undermine the reliability of our findings. The estimate of a model controlling for the average effect of being a province in the south of Italy and its interaction with single-year dummies mitigates this concern. The coefficient for mafia presence remains positive and significant despite the reduction in estimate precision induced by the high multicollinearity between the explanatory variable and the south-year interactions. Finally, we also propose in column (6) a model where the 2006 value for all the controls used in our baseline models are interacted with the dummy variable for the crisis. This exercise allows us to rule out the possibility that all the controls have moved in the same way as *Mafia \* Crisis* in the post-crisis period. Again, the coefficient remains similar with a point estimate close to 4 percentage points.

Instrumental variable analysis allows us to attempt to further address residual concerns about mafia presence endogeneity. Moreover, through an IV approach it is also possible to address possible measurement error in indexes for mafia presence due to under-reporting. We introduce a novel instrument aimed at capturing the historical process leading to the rise of mafia-type organizations. With this framework we try to correct endogenous changes in mafia presence occurred after its origin in the nineteenth century. A weak institutional context together with the presence of valuable assets — i.e., land and natural resources — has been found to be conducive to the establishment and growth of criminal organizations ([Gambetta, 1993](#); [Konrad and Skaperdas, 2012](#)). In the nineteenth century, the demise of feudalism between 1806 and 1809 — Law 130, August 1806 — and the crumbling of the Bourbons’ dominance were the basis of a growing demand for land protection, mainly driven by an increase in the number of landowners ([Gambetta, 1993](#)). Because of the incapacity of both the falling Bourbon’s reign and the new Italian state — founded in 1861 — to provide clear legislation protecting property rights, private

protection was needed to defend newly acquired plots. Local armed groups in the southern part of the country — often referred to as the “*Picciotteria*” or the “*Onorata Società*” — that were used to provide protection to large landowners, expanded their activities and obtained more power. In this context, the value of lands and the availability of natural resources became one of the main determinants of the demand for protection.<sup>23</sup>

We propose a new instrument for the historical rise in the nineteenth century of criminal organizations in Italy by using the location of volcanoes across the territory. The Italian territory is characterized by the presence of nine active — meaning an eruption episode has occurred in the last 10,000 years — volcanoes.<sup>24</sup> Their location, as shown in Figure 8, is mainly in the center and the south of the country. Two volcanoes — Etna and Stromboli — are permanently active, while the others have cycles of activity with high variation. All nine volcanoes are characterized by several phenomena of “*secondary volcanism*”, such as the emission of different types of gases or thermal water. Mount Vesuvius, with at least 50 eruptive events between 1631 and 1944, and Vulcano, continuously active from 1727 to 1890, are the most active volcanoes. The least active volcanoes are Campi Flegrei, with one eruption in the last 3,000 years, and Colli Albani, whose last eruption was between 6000 and 2000 B.C.<sup>25</sup>

Volcano location and activity is independent of human control, and it remarkably affects the fertility and the value of the surrounding lands. Volcanic soils are extremely productive and attractive in terms of agriculture. The periodic addition of volcanic ash improves the physical and chemical properties of the soil, thus renewing its productivity (Shoji and Takahashi, 2002). The region around Mount Vesuvius is characterized by particularly rich soils as it has benefited from two large eruptions 35,000 and 12,000 years ago that left the region blanketed with thick deposits of volcanic ash. As a consequence,

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<sup>23</sup>The rise of the Sicilian Mafia is explained with sulfur availability in Buonanno et al. (2015). Barone and Narciso (2015) instrument current mafia activity with historical and geographical measures of land productivity, specifically rainfalls, shocks, slope, and altitude. A similar instrument is developed in Acemoglu et al. (2017).

<sup>24</sup>The Italian National Institute of Geophysics and Volcanology reports the presence of ten active volcanoes, including also a submarine volcano (Ferdinandea) located between Pantelleria and Sicily. Given the peculiar submarine nature of this volcano, we restrict our analysis only to volcanoes above sea level.

<sup>25</sup>Data about eruptions are provided by the Italian National Institute of Geophysics and Volcanology.

the region has been intensively cultivated since before the birth of Christ (Fisher et al., 1997; Sheets and Grayson, 1979). Similarly, around one quarter of the entire population of Sicily lives on the slopes of Mount Etna as the soils have historically been extremely fertile (Chester et al., 1985). Finally, also the Calabria region — the region where the *'Ndrangheta* originated — is characterized by the presence of substances and materials typical of volcanic soils derived from past volcanic eruptions occurred in the Eolie islands (Vingiani et al., 2014). Delmelle et al. (2015) show that volcanic soils are among the highest value soils as they have unique properties. One of the most important properties for human agriculture is their capacity to accumulate relatively large quantities of organic carbon. In fact, although the portion of the land surface covered by volcanic soils is limited, this surface contains up to 5% of the global soil organic carbon. Organic carbon strongly affects agriculture since it increases soil fertility (Bolinder et al., 2010) and improves physical and biological properties of the soil (Hati et al., 2007) by decreasing the bulk density, improving soil structure and water-holding capacity, and by enhancing microbial activity (Yang et al., 2011).

A threat to the validity of our instrument can be represented by the possibility that the high value of volcanic lands before the Italian unification would have a direct effect on current agricultural levels, thus on the total number of new enterprises within this sector. This might invalidate the exclusion restriction assumption of the instrument. Such a possibility is unlikely to happen. As noted by Barone and Narciso (2015), the current role of the agricultural sector in the Italian economy is consistently lower than it used to be.<sup>26</sup> In addition, in our regression we address possible differences in the importance of the agricultural sector across provinces by including the percentage of employed people within the primary sector in each province. A second concern still related to the exclusion restriction assumption regards the possible indirect effect that volcano location might play on the current number of new enterprises through channels other than mafia presence. A possible channel might be tourism, especially the one directly connected with the volcanic

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<sup>26</sup>According to the Italian National Institute of Statistics, the agriculture sector in 2014 accounted for 2.2% of the Italian GDP. In terms of employment, the share of employment in the agriculture sector was about 70% in 1861, while it represented only 4% in 2009 (ISTAT, 2011). Part of the decline is due to the automatization process that has involved the agricultural sector in the last century.

activity — e.g., the presence of thermal water. Also, in this case, our empirical models always include a specific variable that captures the general capacity of each province to attract tourism-related consumption.

The IV model fairly mimics the one proposed in the DiD setting. As volcanoes are located only in the central and southern part of the country, it is extremely important to isolate the geographical effect. In this regard, we adopt the most cautious approach by including — as in previous specifications — province fixed effects both in the first and in the second stage, and we estimate the following first stage equation:

$$Mafia_i * Crisis_{i,t} = \delta_0 + \delta_1 DistanceVolcano_i * Crisis_{i,t} + \delta \mathbf{X}_{i,t} + \alpha_i + \gamma_t + \varepsilon_{i,t} \quad (3)$$

where  $\mathbf{X}_{i,t}$  is a vector containing the same control variables as in equation (1). As an external instrument, we use the geodetic distance between each province — we use the province’s main city (*Capoluogo di Provincia*) — and the closest volcano, weighted by the time distance between the year of the Italian Unification (1861) and the year of the last eruption at that time.<sup>27</sup> This measure relies on the idea that not only the proximity to a volcano matters but also the frequency of its activity.<sup>28</sup> As the possibly endogenous regressor  $Mafia_i * Crisis_{i,t}$  is the interaction between the time-fixed dummy  $Mafia_i$  and the exogenous variable  $Crisis_{i,t}$ , we interact the external instrument with the dummy  $Crisis_{i,t}$  (Baltagi, 2011). This transformation of the instrument allows us to control for time-fixed heterogeneity also in the first stage — e.g., the specific geographical distribution of active volcanoes only in the central and southern part of the country. Table 7 reports the analysis. The first stage confirms the relation between the volcanoes’ location and the raise of mafia-type organizations. The instrument is highly significant and with the expected negative sign. Provinces more distant from volcanoes are less likely to be highly infiltrated by organized crime. The tests in the bottom part of the table rule out the

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<sup>27</sup>Weighting here is obtained in a multiplicative way. This means that each distance is multiplied by the number of years between the last eruption and 1861.

<sup>28</sup>As Mount Etna and Mount Stromboli are permanently active, we assigned them a unitary weight. The date of the last eruption before 1861 for the other volcanoes is: 1855 (Vesuvio), 1831 (Vulcano), 1783 (Pantelleria), 1538 (Campi Flegrei), 1302 (Ischia), 600 (Lipari) and between 6000 and 2000 B.C. (Colli Albani).

possibility of under or weak identification.

The results of the second stage are larger than the ones obtained in the baseline analysis and suggest a less severe drop in the number of new enterprises — 10 percentage points — in those areas with high mafia infiltration. The increase in point estimates with respect to the baseline model is likely to be driven by the correction for the selection of organized crime in areas with high entrepreneurial opportunities and attenuation bias due to measurement error in criminal records used to construct mafia indexes.

## 6 Understanding the Mafia Investment in the Economy

This section clarifies features of the mafia investment in the legal economy to confirm the baseline results and to provide further insights about the mechanism underlying such investment in the legal economy.

### 6.1 Heterogeneous Effects of the Credit Contraction

Our identification strategy is based on the credit contraction caused by the 2007 financial crisis. We start by verifying the possible existence of different levels of credit contraction when provinces with and without organized crime are compared. Figure 2 shows the total amount of credit granted to the industrial sector before and after the spread of the crisis. The trend for provinces with mafia presence mimics the one for provinces without organized crime. This evidence suggests that the credit contraction was similar in the two groups of provinces, therefore, the results highlighted in the baseline analysis are unlikely to be generated by different levels of credit contraction across provinces with or without mafia.<sup>29</sup>

Although the credit contraction had affected, on average, provinces with and without

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<sup>29</sup>We also produce a set of formal tests for this difference, highlighting the same conclusion. In particular, we have replicated the analysis by including the number of credits granted to the industrial sector in each province as an additional control.

the presence of organized crime in the same way, we propose an additional check aimed at verifying our identification strategy. The test is based on possible heterogeneity of credit contraction within each group of provinces: one might expect to find a stronger evidence of investment by mafia in those areas characterized by high levels of legal credit contraction. The credit contraction in Italy caused by the outbreak of the financial crisis has been particularly severe for the case of 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.<sup>30</sup> At the same time, within each group of provinces there exists variability in terms of the presence of big banks.

We implement a triple DiD estimator based on the following specification:

$$\begin{aligned} NewEnterprises_{i,t} = & \beta_0 + \beta_1 Mafia_i * Crisis_{i,t} + \beta_2 Crisis_{i,t} * BigBanks_{i,2003} + \\ & \beta_3 Mafia_i * Crisis_{i,t} * BigBanks_{i,2003} + \beta X_{it} + \alpha_i + \gamma_t + \varepsilon_{i,t} \end{aligned} \quad (4)$$

where the number of big banks in 2003 is interacted with both *Crisis* and *Mafia*\**Crisis*. Since 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 8 shed light on an interesting pattern related to the mafia investment in the legal economy. The interaction between *Mafia* and *Crisis* shifts to a negative value. The coefficient for the interaction between *Crisis* and the number of big banks is negative, confirming that the credit contraction has been harsher in those areas with 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 higher level of credit contraction — the drop in the number of enterprises set up after the outbreak of the crisis in 2007 was less severe.

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<sup>30</sup>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.

## 6.2 Validation and Falsification Tests: Sector-Specificity

This section has a dual aim, as it provides tests for the empirical setting presented so far and new evidence about the investment of criminal organizations in the legal economy. In particular, we estimate the differential impact of mafia presence on two specific economic sectors. The first sector is the construction sector. Italian mafia-type organizations are particularly active in the construction sector.<sup>31</sup> 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 would also monitor and be involved in complementary markets such as the ones of stone-pits, storage of materials, etc. This way, all the other actors involved in the process would risk being absorbed by criminal organizations, therefore conveying the market to a monopoly managed by mafia (Falcone, 1991). The monopoly arises as a consequence of the competitive advantage — e.g., deterrence of competitors, salary compression due to the use of illegal labor force, and consistent capital flows from the illegal economy — typical of criminal organizations. Because of mafia preference for the construction sector, our estimates might be seen as a validation test for our baseline results. We might expect a stronger impact of mafia presence when this sector is analyzed in isolation. The second sector investigated includes professional, scientific, and technical activities.<sup>32</sup> This sector is usually not infiltrated by criminal organizations as it is highly professionalized, with a very high level of competition and know-how. According to this falsification test framework, one would expect to find no evidence of mafia-effect.

The validation and falsification tests are reported in Table 9. A significant and positive effect of mafia presence on the number of new enterprises in the construction sector is detected. On average, after 2007, provinces with higher levels of mafia presence experienced a less severe decrease — 8.8 percentage points — in the number of new enterprises in the construction sector. Unsurprisingly, the effect in the construction sector is higher in magnitude than the effect in the baseline estimates, confirming mafia preference for the

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<sup>31</sup>Around 30% of firms seized to mafia-type organizations by the Italian judicial authority were operating in the construction sector (Ministry of Interior, 2013).

<sup>32</sup>This sector includes activities such as scientific research and innovation, engineering, etc.

construction sector. The coefficient in the falsification test is negative and non-significant. In provinces with a high presence of criminal organizations, the number of new enterprises established as providers of professional, scientific, and technical services had experienced a more severe drop in the post-crisis period with respect to provinces less infiltrated by organized crime.

### 6.3 Legal Form of New Enterprises

The Italian Ministry of Interior states what mafia preferences are in terms of legal forms of enterprises for its investment ([Ministry of Interior, 2013](#)). Limited companies are by far the first best option for criminal organizations (46.6%) when it comes to investing their capital. These societies are particularly easy to establish and require a minimum initial capital of 10,000 euro. Moreover, societies guarantee limited patrimonial responsibility of business partners. Other commonly used legal forms adopted by mafia are individual companies (25.8%) and partnerships (23.3%).

To understand whether the results reported by the Ministry of Interior are also confirmed in our research framework, we analyze the three mentioned legal ways to form companies in societies: limited companies, individual companies, and partnerships. The estimates are reported in Table 10. The coefficient for the DiD estimator is positive and statistically significant when limited companies are considered. The result is sizable in magnitude — 10.8 percentage points — and it is in line with the evidence provided by the Italian Ministry of Interior. The effect is also positive and significant — 5.7 percentage points — when partnerships are considered. The effect for individual companies is positive, although not statistically significant. Individual companies are smaller in terms of size and require lower levels of external capital; this is likely to make these types of firms less sensitive to credit contraction in the short-run.

## 7 Additional Effects of the Mafia Investment in the Legal Economy

### 7.1 Closed and Registered Enterprises

Up to now we have only considered the number of new enterprises. 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. To provide evidence of the overall effect of mafia presence on the entrepreneurial local activity, we focus on the number of closed and registered enterprises.<sup>33</sup> This analysis aims to understand the size and the possible contemporaneous existence of effects on the local entrepreneurial activity other than those detected in terms of established enterprises.

Table 11 reports the results. When closed enterprises are considered as a dependent variable, the interaction term  $Mafia * Crisis$  is positive and statistically significant. Areas with high mafia presence experienced a higher number during the financial crisis — around 8.6 percentage points — of closed enterprises. The consequences of mafia presence are exacerbated in a context of credit contraction as organized crime perpetrates activities such as racketeering and usury that are detrimental for operating enterprises. Moreover, this result reinforces the interpretation of our results as connected with the investment in the legal economy by organized crime. It is indeed well known that mafia-type organizations often launder money by creating fictitious firms or enterprises with very short life cycle. The sum of the effect of racketeering and usury practices with the investment in fictitious businesses are likely to generate the significant result on closed enterprises. The effect in terms of the stock measure of registered enterprises is positive although non-significant. This effect is likely to be generated by the organized crime investment in the legal economy plus the combined effect of racketeering that, on one hand, negatively affects entrepreneurial local activity, while on the other hand it constitutes a financial support for entrepreneurs experiencing financial difficulties.

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<sup>33</sup>The number of registered enterprises is a stock measure indicating the number of official enterprises operating in a territory at a specific point in time.

## 7.2 The Mafia Investment and the Local Labor Market

The mafia-effect on both established and closed enterprises requires a reflection on the labor market impact of organized crime. Criminal organizations invest in the entrepreneurial sector not only to launder money or to raise profit, but also to increase social consensus through the improvement of the local — formal and informal — labor market conditions. We investigate here whether the mafia investment in the legal economy is also responsible for a change in the local employment, or whether it is only an instrument to foster the informal labor market and to launder capital raised through illegal activities.

We replicate our DiD estimation strategy using separately as dependent variable the employment, unemployment, and inactive rate. According to the results in the first three columns of Table 12, after the outbreak of the financial crisis, provinces with a higher infiltration of criminal organizations have experienced a more severe drop in employment, and a less relevant increase in the unemployment rate. At the same time the coefficient is positive and significant when it comes to analyzing inactivity.

These results are consistent with two possible explanations. On one hand, mafia presence and its investment in the legal economy might be mostly directed to accomplish money laundering rather than a proper productive investment. In this case, the benefits in terms of employment would likely be limited, whereas their cost in terms of deterioration of the local labor market are possibly high (Peri, 2004). This implies a reduced number of people having or looking for a job, and an increased number of discouraged individuals who give up searching for one.<sup>34</sup> On the other hand, criminal organizations are acknowledged as promoters of illegal jobs. Salary compression — mainly obtained through irregular jobs — is used by criminal organizations to obtain a considerable competitive advantage with respect to legal enterprises (Ministry of Interior, 2013). This means that the decrease in employment and unemployment and the relative increase in inactivity are not only generated by worse local labor market conditions, but it might also be due to part of the local population switching from a regular to a non-regular job.

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<sup>34</sup>As a result, they pass from the unemployment status to the inactive status.

To clarify this possible mechanism, we replicate our estimates in columns (4), (5), and (6) using a triple DiD approach where the percentage of non-regular jobs at regional level as in 2003 is interacted with both *Mafia*, *Crisis*, and *Mafia \* Crisis*.<sup>35</sup> Admittedly, as the percentage of irregular jobs is a measure difficult to precisely quantify, this analysis might be taken with caution as it only provides suggestive evidence. Concerning employment rate, once the relevance of the illegal labor market is taken into account, the coefficient for the effect of mafia presence turns to a positive and significant value. The drop in employment due to the crisis was less severe in areas with organized crime. The negative triple DiD coefficient shows how the employment drop was more severe in those areas with organized crime and a larger informal labor market with respect to areas with organized crime but a smaller informal labor market. Individuals are in fact more likely to find occupation in non-regular jobs in the informal labor market. This finding is corroborated by the analysis of the effect of mafia presence on inactivity. The coefficient for the triple interaction is positive. Individuals are more likely to switch to an inactive status where the informal labor market is a more accessible alternative. The effect on the unemployment rate is non-significant.

This evidence seems to suggest that the investment by organized crime in the legal economy is likely to generate a positive effect on local employment. However, this effect strongly depends on the level of informality of the local labor market. When the local labor market is characterized by high levels of informality, criminal organizations tend to privilege irregular jobs, therefore reducing the overall impact on regular employment and increasing the number of inactive people.

## 8 Conclusion

In this work we analyze the investment of criminal organizations in the legal economy by exploiting the mandatory registration required by both legal and illegal enterprises operating in the Italian territory. A Difference-in-Differences (DiD) empirical strategy,

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<sup>35</sup>Data on irregular jobs are collected by [ISTAT \(2005\)](#). More details are provided in Appendix [A.1](#).

based on the credit contraction that started with the outbreak of the 2007 financial crisis, allows us to identify the effect of mafia presence on the number of new enterprises set up each year at the provincial level. The comparison before and after the outbreak of the crisis pinpoints that provinces with high mafia presence experienced a reduced drop in the number of new enterprises during the recession compared to those provinces with no mafia presence. These findings suggest that mafia-type organizations act as a sort of “social insurance” mitigating the consequences induced by negative phases of the economic cycle. This role of economic stabilizer played by organized crime should be carefully analyzed because it constitutes not only a way for mafia to make profit and launder money, rather it is also an instrument to raise social consensus among the local population.

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 by mafia. Moreover, by showing what are mafia preferences in terms of sectors and legal forms to be adopted, we underline where the investment in monitoring, vigilance activity, and stricter legislation should be improved in the future. Finally, our research suggests that positive spillovers related to mafia presence and its territorial activity are larger in contexts characterized by harsher conditions of the local credit market. As a consequence, negative 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.

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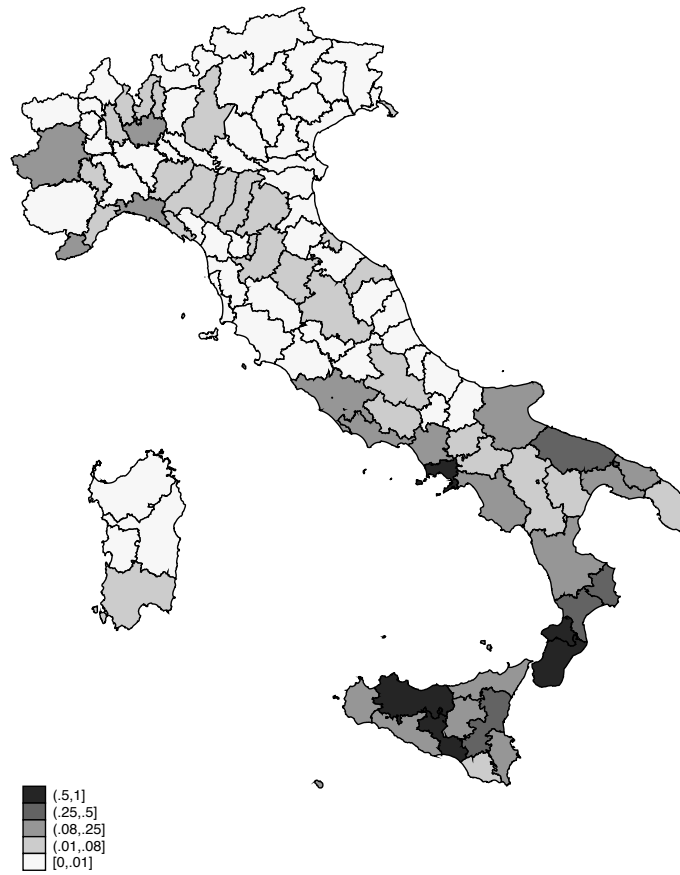
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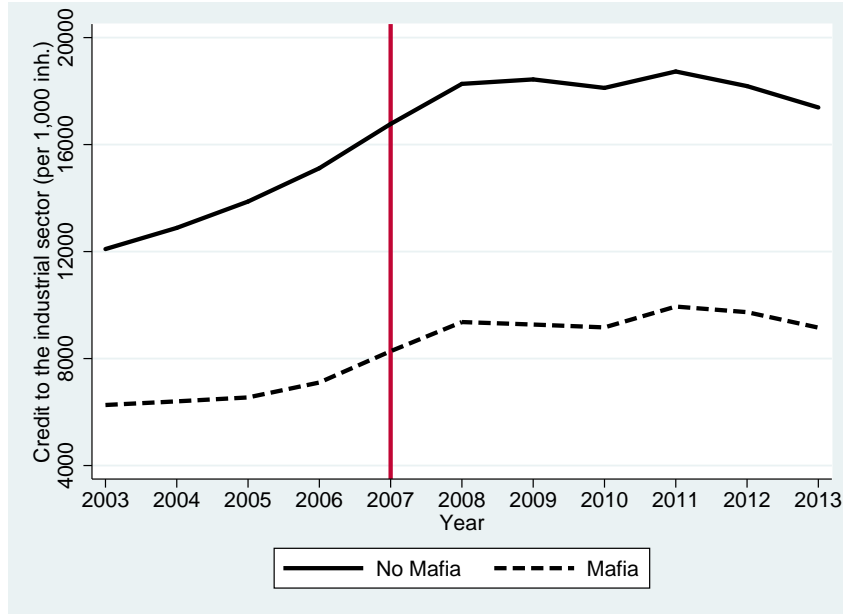
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Figure 1: Geographical Distribution of the TMI



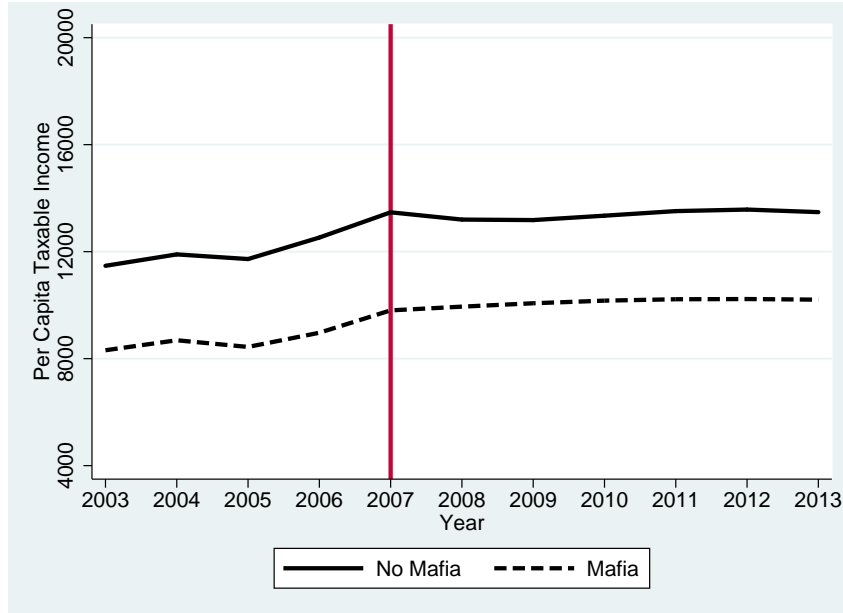
**Note:** The map shows the geographical distribution of the *Transcrime Mafia Index* (TMI) over the Italian provinces. The more intense the filling color of a province, the higher the TMI is in that province.

Figure 2: Change in the Supply of Legal Credit to the Industrial Sector



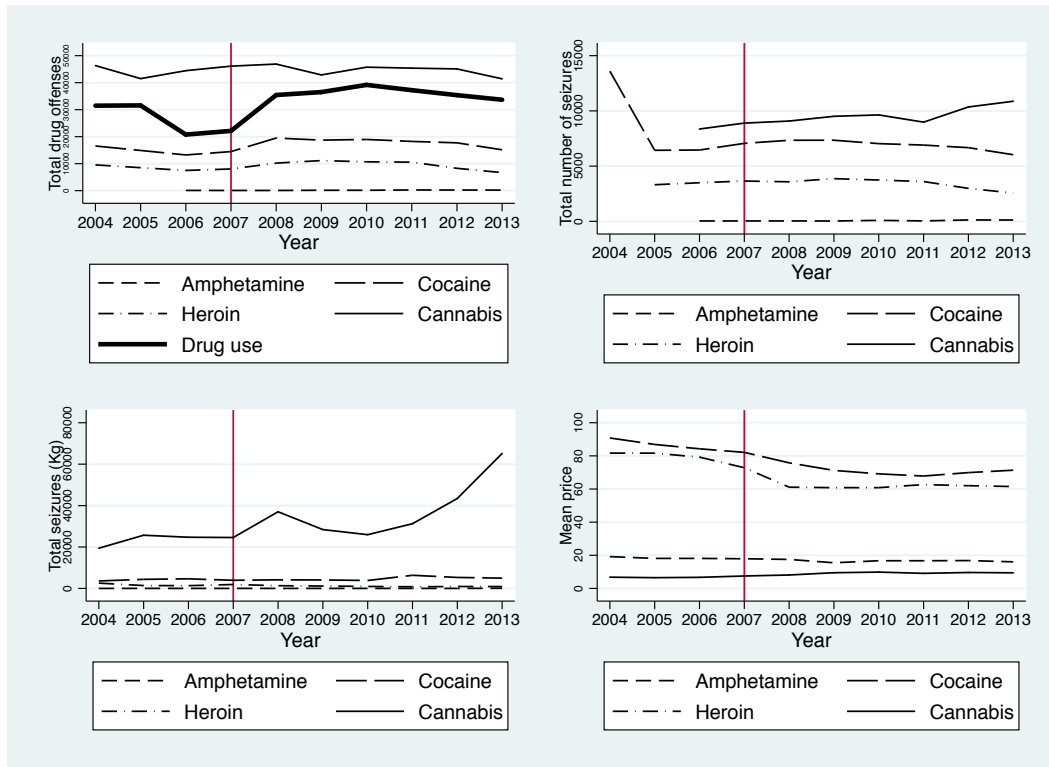
**Note:** The figure shows the dynamics of the yearly amount of credits granted (per 1,000 inhabitants) to the industrial sector. The comparison is between provinces within the first three quartiles of the TMI distribution (No Mafia, continuous line) and those belonging to the last quartile (Mafia, dashed line).

Figure 3: Change in Per Capita Taxable Income



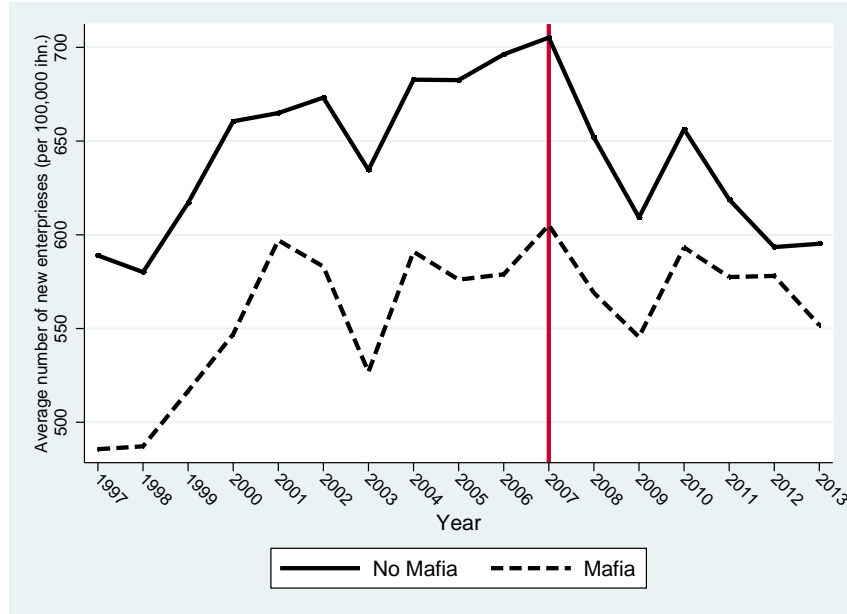
**Note:** The figure shows the dynamics of the yearly amount of per capita taxable income. The comparison is between provinces within the first three quartiles of the TMI distribution (No Mafia, continuous line) and those belonging to the last quartile (Mafia, dashed line).

Figure 4: The Drug Market in Italy



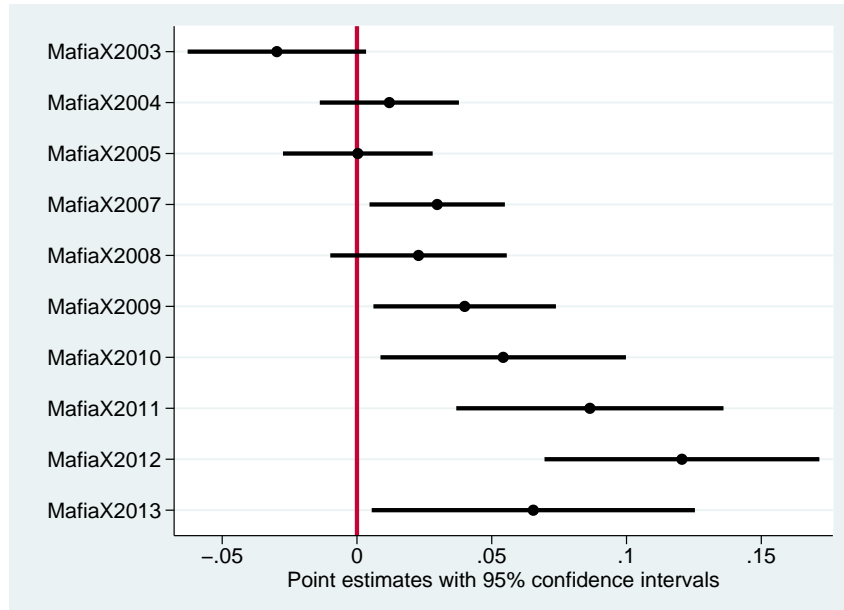
**Note:** The figure shows four indicators of the Italian drug market (amphetamine, cocaine, heroin, cannabis). The top-left panel reports the time trend of the total number of drug offenses (the black thick line represents the total number of drug offenses related to drug use only). The top-right panel 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 5: Parallel Trends Assumption



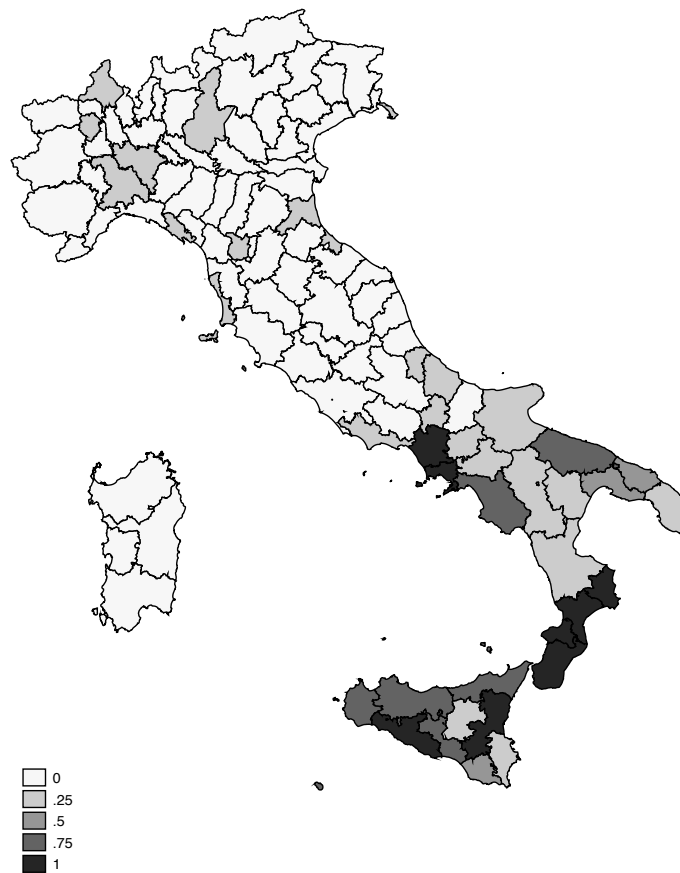
**Note:** The figure shows the trends of the average number of new enterprises (per 100,000 inhabitants). The comparison is between provinces within the first three quartiles of the TMI distribution (No Mafia, continuous line) and those belonging to the last quartile (Mafia, dashed line).

Figure 6: DiD with Leads and Lags



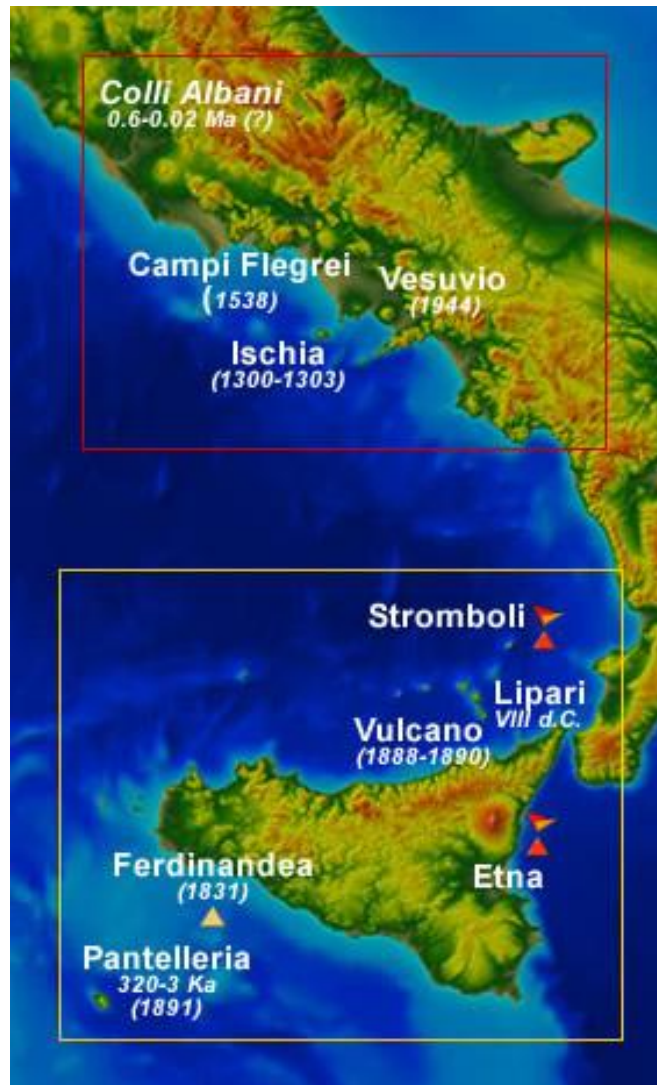
**Note:** The figure shows point estimates and the 95% confidence intervals of the model in Table 3. The omitted category is the interaction between *Mafia* and the dummy for the year 2006 (the year before the outbreak of the crisis).

Figure 7: Geographical Distribution of the PSI



**Note:** The map shows the geographical distribution of the *Power Syndicate Index* (PSI) across the Italian provinces. The more intense the filling color of a province, the higher the PSI is in that province.

Figure 8: Active Volcanoes in Italy



**Note:** The map shows the geographical distribution of active volcanoes over the Italian territory. A volcano is considered active if it showed some activity in the last 10,000 years. An approximate date of the last eruption for each volcanoes is presented in parentheses. A red triangle indicates a volcano with persistent activity. Source: Italian National Institute of Geophysics and Volcanology (INGV)

Table 1: Summary Statistics

	Mean	Std. Dev.	Min	Max
Enterprises	629	134	329	1,420
TMI	0.08	0.17	0	1
Big banks (per 1,000 inh.)	0.36	0.15	0.05	0.79
Employed primary sector	0.05	0.04	0.00	0.25
Employed secondary sector, no constructions	0.21	0.09	0.05	0.43
Employed tertiary sector	0.65	0.08	0.46	0.85
Size of the local production unit (num. of workers)	3.36	0.54	2.26	4.65
Employed construction sector	0.09	0.02	0.03	0.15
N.Beds in public hospitals (per 1,000 inh.)	3.67	0.99	1.56	16.15
Waste per capita (tons.)	0.53	0.10	0.05	0.88
Tourism	2.57	3.67	0.22	29.61
Self-employed	0.27	0.04	0.03	0.44
Patents (per 1,000,000 inh.)	62.30	64.68	0.25	532.40
Roads ( $Km$ per 100 $Km^2$ )	58.89	13.27	19.66	109.66
Trial duration (days)	8.03	0.23	7.03	8.65
Political alignment	0.40	0.49	0	1
Blood donations (per 100 inh.)	3.41	1.77	0.62	6.86
Newspaper circulation (per 1,000 inh.)	4.51	0.47	2.94	6.10

Table 2: Difference-in-Differences: Baseline

	(1)	(2)	(3)
Mafia*Crisis	0.0836*** (0.0170)	0.0385** (0.0169)	0.0581*** (0.0162)
Controls	NO	YES	YES
Year FE	NO	NO	YES
Province FE	YES	YES	YES
Observations	1,133	1,133	1,133
Number of provinces	103	103	103
$R^2$	0.112	0.319	0.496

**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 (a dummy taking the value of 1 if the province belongs to a province with a high level of mafia presence) with *Crisis* (a dummy taking the value 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 number of offices of big banks (per 1,000 inhabitants), employed in the primary sector (%), employed in the secondary sector excluding construction (%), average size of the local production unit (num. 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 (%), number of patent applications (per 100,000 inhabitants), average duration trial for bankruptcy (days) length of road system (per 100  $km^2$ ), political alignment, number of blood donations (per 100 inhabitants) and newspaper circulation (per 1,000 inhabitants). Standard errors are clustered at provincial level. \*, \*\*, \*\*\* indicate statistical significance at 10%, 5%, and 1% level, respectively.

Table 3: DiD with Leads and Lags

	(1)
Mafia*2003	-0.0297* (0.0167)
Mafia*2004	0.0120 (0.0130)
Mafia*2005	0.0003 (0.0140)
Mafia*2007	0.0298** (0.0127)
Mafia*2008	0.0228 (0.0165)
Mafia*2009	0.0400** (0.0171)
Mafia*2010	0.0543** (0.0230)
Mafia*2011	0.0864*** (0.0250)
Mafia*2012	0.1210*** (0.0257)
Mafia*2013	0.0654** (0.0302)
Controls	YES
Year FE	YES
Province FE	YES
Observations	1,133
Number of provinces	103
$R^2$	0.513

**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 \* Year* is the interaction of the treatment (a dummy taking the value of 1 if the province belongs to a province with a high level of mafia presence) with indicator variables for each years 2003 to 2013. The omitted category is the interaction between *Mafia* and the dummy for the year 2006 (the year before the outbreak of the crisis). 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 number of offices of big banks (per 1,000 inhabitants), employed in the primary sector (%), employed in the secondary sector excluding construction (%), average size of the local production unit (num. 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 (%), number of patent applications (per 100,000 inhabitants), average duration trial for bankruptcy (days), political alignment, length of road system (per 100  $km^2$ ), number of blood donations (per 100 inhabitants) and newspaper circulation (per 1,000 inhabitants). Standard errors are clustered at provincial level. \*, \*\*, \*\*\* indicate statistical significance at 10%, 5%, and 1% level, respectively.

Table 4: DiD: 3rd and 4th Quartile of TMI

	(1)	(2)	(3)
Mafia*Crisis	0.0543*** (0.0176)	0.0359** (0.0162)	0.0401*** (0.0149)
Controls	NO	YES	YES
Year FE	NO	NO	YES
Province FE	YES	YES	YES
Observations	1,133	1,133	1,133
Number of provinces	103	103	103
$R^2$	0.095	0.321	0.491

**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 (a dummy taking the value of 1 if the province belongs to a province with high level of mafia presence) with *Crisis* (a dummy taking the value 1 for the years 2007 to 2013). 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. The set of controls includes number of offices of big banks (per 1,000 inhabitants), employed in the primary sector (%), employed in the secondary sector excluding construction (%), average size of the local production unit (num. 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 (%), number of patent applications (per 100,000 inhabitants), average duration trial for bankruptcy (days), political alignment, length of road system (per 100  $km^2$ ), number of blood donations (per 100 inhabitants), and newspaper circulation (per 1,000 inhabitants). Standard errors are clustered at provincial level. \*, \*\*, \*\*\* indicate statistical significance at 10%, 5%, and 1% level, respectively.

Table 5: DiD: PSI

	(1)	(2)	(3)
Mafia*Crisis	0.0738*** (0.0168)	0.0354** (0.0154)	0.0447*** (0.0144)
Controls	NO	YES	YES
Year FE	NO	NO	YES
Province FE	YES	YES	YES
Observations	1,133	1,133	1,133
Number of provinces	103	103	103
$R^2$	0.113	0.320	0.493

**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 (a dummy taking the value of 1 if the province belongs to a province with high level of mafia presence) with *Crisis* (a dummy taking the value 1 for the years 2007 to 2013). Mafia presence is computed according to the PSI index; provinces with a PSI greater than 0 are classified as *Mafia* = 1. The set of controls includes number of offices of big banks (per 1,000 inhabitants), employed in the primary sector (%), employed in the secondary sector excluding construction (%), average size of the local production unit (num. 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 (%), number of patent applications (per 100,000 inhabitants), average duration trial for bankruptcy (days), political alignment, length of road system (per 100  $km^2$ ), number of blood donations (per 100 inhabitants) and newspaper circulation (per 1,000 inhabitants). Standard errors are clustered at provincial level. \*, \*\*, \*\*\* indicate statistical significance at 10%, 5%, and 1% level, respectively.

Table 6: Robustness Tests

	(1)	(2)	(3)	(4)	(5)	(6)
Mafia*Crisis	0.0548*** (0.0165)	0.0445** (0.0211)	0.0647*** (0.0152)	0.0437** (0.0197)	0.0305* (0.0178)	0.0363* (0.0208)
Interactions	Credit Market *Year	Ec. Env. *Year	Polit.-Instit. Env. *Year	Social Env. *Year	South *Year	All Controls <sub>2006</sub> *Crisis
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	1,133
Number of provinces	103	103	103	103	103	103
$R^2$	0.586	0.637	0.591	0.615	0.630	0.398

**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 (a dummy taking the value of 1 if the province belongs to a province with high level of mafia presence) with *Crisis* (a dummy taking the value 1 for years from 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. All the specifications control for the number of offices of big banks (per 1,000 inhabitants), employed in the primary sector (%), employed in the secondary sector excluding construction (%), average size of the local production unit (num. 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 (%), number of patent applications (per 100,000 inhabitants), average duration trial for bankruptcy (days), political alignment, length of road system (per 100  $km^2$ ), number of blood donations (per 100 inhabitants) and newspaper circulation (per 1,000 inhabitants). Standard errors are clustered at provincial level. \*, \*\*, \*\*\* indicate statistical significance at 10%, 5%, and 1% level, respectively.

Table 7: Instrumental Variables

	(1)
Mafia*Crisis	0.1009** (0.0298)
<i>First stage:</i>	
Weighted Min. Distance Volcano	-0.0733*** (0.0116)
Under ident. test (Kleibergen-Paap LM statistic):	
$\chi^2$	23.85
P-val	0.000
Weak ident. test (Kleibergen-Paap Wald F statistic)	
F statistic	40.28
Controls	YES
Year FE	YES
Province FE	YES
Observations	1,133
Number of provinces	103

**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 (a dummy taking the value of 1 if the province belongs to a province with high level of mafia presence) with *Crisis* (a dummy taking the value 1 for years from 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 first stage dependent variable is *Mafia \* Crisis*. The instrument is the minimum geodetic distance between each province capital and the closest active volcano, weighted by the time distance between the year of Italian Unification (1861) and the last eruption of each volcano at that time. The instrument is interacted with the dummy *Crisis*. The set of controls includes number of offices of big banks (per 1,000 inhabitants), employed in the primary sector (%), employed in the secondary sector excluding construction (%), average size of the local production unit (num. 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 (%), number of patent applications (per 100,000 inhabitants), average duration trial for bankruptcy (days), political alignment, length of road system (per 100  $km^2$ ), number of blood donations (per 100 inhabitants) and newspaper circulation (per 1,000 inhabitants). Standard errors are clustered at provincial level. \*, \*\*, \*\*\* indicate statistical significance at 10%, 5%, and 1% level, respectively.

Table 8: Triple DiD: Number of Big Banks

	(1)	(2)	(3)
Mafia*Crisis	-0.0207 (0.0456)	-0.0669 (0.0430)	-0.0611 (0.0430)
Crisis*Big banks	-0.0795 (0.0738)	-0.0299 (0.0720)	-0.0181 (0.0643)
Mafia*Crisis*Big banks	0.2352** (0.1016)	0.2268** (0.0899)	0.2365*** (0.0894)
Controls	NO	YES	YES
Year FE	NO	NO	YES
Province FE	YES	YES	YES
Observations	1,030	1,030	1,030
Number of provinces	103	103	103
$R^2$	0.178	0.383	0.538

**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 (a dummy taking the value of 1 if the province belongs to a province with high level of mafia presence) with *Crisis* (a dummy taking the value 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 number of offices of big banks (per 1,000 inhabitants), employed in the primary sector (%), employed in the secondary sector excluding construction (%), average size of the local production unit (num. 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 (%), number of patent applications (per 100,000 inhabitants), average duration trial for bankruptcy (days), political alignment, length of road system (per 100  $km^2$ ), number of blood donations (per 100 inhabitants) and newspaper circulation (per 1,000 inhabitants). Standard errors are clustered at provincial level. \*, \*\*, \*\*\* indicate statistical significance at 10%, 5%, and 1% level, respectively.

Table 9: Validation and Falsification Tests: Sector Specificity

	(1) Construction Sector	(2) Professional, Scientific, Technical Sector
Mafia*Crisis	0.0879** (0.0340)	-0.0664 (0.0451)
Controls	YES	YES
Year FE	YES	YES
Province FE	YES	YES
Observations	1,133	1,133
Number of provinces	103	103
$R^2$	0.715	0.494

**Dependent variable: number of new enterprises in the construction sector (col. 1) and in the professional, scientific and technical sector (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 (a dummy taking the value of 1 if the province belongs to a province with high level of mafia presence) with *Crisis* (a dummy taking the value 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 number of offices of big banks (per 1,000 inhabitants), employed in the primary sector (%), employed in the secondary sector excluding construction (%), average size of the local production unit (num. 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 (%), number of patent applications (per 100,000 inhabitants), average duration trial for bankruptcy (days), political alignment, length of road system (per 100  $km^2$ ), number of blood donations (per 100 inhabitants) and newspaper circulation (per 1,000 inhabitants). Standard errors are clustered at provincial level. \*, \*\*, \*\*\* indicate statistical significance at 10%, 5%, and 1% level, respectively.

Table 10: DiD: Legal Form of Society

	(1) Limited Company	(2) Partnership	(3) Individual Company
Mafia*Crisis	0.1080*** (0.0273)	0.0575** (0.0270)	0.0074 (0.0178)
Controls	YES	YES	YES
Year FE	YES	YES	YES
Province FE	YES	YES	YES
Observations	1,133	1,133	1,133
Number of provinces	103	103	103
$R^2$	0.414	0.789	0.348

**Dependent variable: number of new enterprises by legal form.** The legal forms considered are Limited Company (col. 1), Partnership (col. 2) and Individual Company (col. 3). 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 (a dummy taking the value of 1 if the province belongs to a province with high level of mafia presence) with *Crisis* (a dummy taking the value 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 number of offices of big banks (per 1,000 inhabitants), employed in the primary sector (%), employed in the secondary sector excluding construction (%), average size of the local production unit (num. 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 (%), number of patent applications (per 100,000 inhabitants), average duration trial for bankruptcy (days), political alignment, length of road system (per 100  $km^2$ ), number of blood donations (per 100 inhabitants) and newspaper circulation (per 1,000 inhabitants). Standard errors are clustered at provincial level. \*, \*\*, \*\*\* indicate statistical significance at 10%, 5%, and 1% level, respectively.

Table 11: DiD: Closed and Registered Enterprises

	(1) Closed	(2) Registered
Mafia*Crisis	0.0864** (0.0354)	0.0183 (0.0110)
Controls	YES	YES
Year FE	YES	YES
Province FE	YES	YES
Observations	1,133	1,133
Number of provinces	103	103
$R^2$	0.463	0.202

**Dependent variable: number of enterprises by status.** The status 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 \* 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 presence) with *Crisis* (a dummy taking the value 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 number of offices of big banks (per 1,000 inhabitants), employed in the primary sector (%), employed in the secondary sector excluding construction (%), average size of the local production unit (num. 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 (%), number of patent applications (per 100,000 inhabitants), average duration trial for bankruptcy (days), political alignment, length of road system (per 100  $km^2$ ), number of blood donations (per 100 inhabitants) and newspaper circulation (per 1,000 inhabitants). Standard errors are clustered at provincial level. \*, \*\*, \*\*\* indicate statistical significance at 10%, 5%, and 1% level, respectively.

Table 12: DiD: Employment, Unemployment and Inactivity

	(1)	(2)	(3)	(4)	(5)	(6)
	Employment	Unemployment	Inactivity	Employment	Unemployment	Inactivity
Mafia*Crisis	-0.0085** (0.0040)	-0.0073** (0.0036)	0.0142*** (0.0051)	0.0270** (0.0127)	0.0045 (0.0126)	-0.0357** (0.0144)
Crisis*Non-Regular jobs				-0.0012* (0.0007)	-0.0009* (0.0005)	0.0017*** (0.0006)
Mafia*Crisis*Non-Regular jobs				-0.0017* (0.0009)	-0.0004 (0.0009)	0.0024** (0.0010)
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	1,133
Number of provinces	103	103	103	103	103	103
R <sup>2</sup>	0.369	0.670	0.192	0.401	0.675	0.265

**Dependent variable: employment, unemployment, and inactivity rate.** 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 presence) with *Crisis* (a dummy taking the value 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. Columns (4), (5), and (6) also contain a variable *Crisis \* Non - Regular Jobs* representing the interaction between *Crisis* and *Non-regular jobs*, defined as the percentage of irregular jobs within each region in 2003, and a variable *Mafia \* Crisis \* Non - Regular Jobs* that is the interaction of the three variables previously described. The set of controls includes number of offices of big banks (per 1,000 inhabitants), employed in the primary sector (%), employed in the secondary sector excluding construction (%), average size of the local production unit (num. 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 (%), number of patent applications (per 100,000 inhabitants), average duration trial for bankruptcy (days), political alignment, length of road system (per 100 km<sup>2</sup>), number of blood donations (per 100 inhabitants) and newspaper circulation (per 1,000 inhabitants). Standard errors are clustered at provincial level. \*, \*\*, \*\*\* indicate statistical significance at 10%, 5%, and 1% level, respectively.

# Appendix

## A.1 Data Sources

The following list describes all the variables used in our analysis together with their source(s). We collected data during 2014.

- Number of New Enterprises: number of new enterprises (per 100,000 inhabitants) set up each year at provincial level. The data is collected by the Italian National Institute of Statistics (ISTAT).
- Number of New Enterprise - 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 is collected by the Italian Chamber of Commerce.
- Number of New Enterprises - Limited Company: number of new enterprises registered as a limited company (per 100,000 inhabitants) set up each year at the provincial level. Limited companies include the so-called *Società per Azioni*, *Società in Accomandita per Azioni*, and *Società a Responsabilità Limitata*. It is recorded yearly for all 103 Italian provinces. The data is collected by the Italian Chamber of Commerce.
- Number of New Enterprises - Partnership: number of new enterprises registered as a partnership (per 100,000 inhabitants) set up each year at the provincial level. Partnerships include the so-called *Società Semplice*, *Società in Accomandita Semplice*, and *Società in Nome Collettivo*. The data is collected by the Italian Chamber of Commerce.
- Number of New Enterprises - Individual Company: number of new enterprises registered as an individual company (per 100,000 inhabitants) set up each year at the provincial level. Individual companies include the so-called *Imprese Individuali*. The data is collected by the Italian Chamber of Commerce.

- Employment: Employment rate among working population at year-province level. The data is collected by the Italian National Institute of Statistics (ISTAT).
- Unemployment: Unemployment rate among working population at year-province level. The data is collected by the Italian National Institute of Statistics (ISTAT).
- Inactivity: Inactivity rate among working population at year-province level. The data is 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 year-province level. The data is 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 year-province level. The data is 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 year-province level. The data is collected by the Italian National Institute of Statistics (ISTAT).
- Employment - Tertiary Sector: percentage of the populations employed in service over the total number of employed people at year-province level. The data is 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 is 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 is collected by the Bank of Italy.

- **Big Banks:** total number of big banks (per 1,000 inhabitants) at year-province level. The data is collected by the Bank of Italy. The Bank of Italy defines big banks as those characterized by a total value of traded funds greater than 26 billion euro.
- **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 year-province level. Data for 2003, 2005, and 2013 are unavailable. Values for 2003 are computed as averages over the period 2004 to 2006. Values for 2005 are computed as averages between values of 2004 and values of 2006. Values for 2013 are computed as averages over the period of 2010 to 2012. The data is 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 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 is collected by the Italian National Institute of Statistics (ISTAT).
- **Waste:** per capita number of tons of waste produced at year-province level. The data is 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 is collected by the Italian National Institute of Statistics (ISTAT).
- **Patents:** number of patent applications (per 1,000,000 inhabitants) submitted to the European Patent Office at year-province (NACE3) level. The data is collected by Eurostat.

- Trial Duration: average length in days of a trial for bankruptcy at 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 is collected by the Italian National Institute of Statistics (ISTAT).
- Political alignment: the indicator variable is equal to 1 if the political color of the incumbent governors at the provincial, regional, and national level is the same, and 0 otherwise. The data is collected by the Italian Ministry of Interior.
- Roads: length of the road system (in  $Km$  per  $100Km^2$ ) at year-province level. The data is collected by the Italian National Institute of Statistics (ISTAT).
- Blood Donations: number of blood donations (per 100 inhabitants) at year-regional level. The data is collected by the Italian National Agency for Blood Donation (*Agenzia Italiana Volontari Sangue - AVIS*).
- Newspaper Circulation: total number of newspaper sold (per 1,000 inhabitants) at year-province level. The data is 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 \(2011\)](#). 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 as specific markers for them. In particular, the type of criminal records taken into account are:

- Mafia's criminal association (*Associazione Mafiosa*) as described in Law 646 (art.416-bis). Mafia's criminal association 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 2000 to 2011 by the Ministry of Interior;
- Assets seized to 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 averaged at the provincial level. The calculation of the TMI for each province is based on the rank of each province among all Italian provinces for each type of criminal record. Specifically, for each indicator, the TMI calculates the average of the annual rates for each province, and then it ranks all the Italian provinces in decreasing order, attributing the score of 100 to the province with the highest rank and proportionally lower scores to the other provinces, according to their rank. For simplicity, the final score has been re-scaled 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 directed to exercise control of the territory. These activities have been divided into core and minor ones, relying on their role as markers of such a specific concept of mafia. The core activities include mafia’s criminal association (*Associazione Mafiosa*) as described in Law 646 (art.416-bis), murders committed by mafia members, and racketeering practices. Mafia’s criminal association 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.” Minor activities include the number of properties seized to mafia and the city councils dissolved because of mafia infiltration.

For all the crimes 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. In order to obtain a measure of the deviation of the province with respect to the country as a whole, the rates have been standardized with respect to the country (Italy=1).

Finally, the provinces have been classified along a five-point scale according to the following structure. The classification used is slightly different with respect to the original one provided by Fondazione RES. It defines:

- Index=0: All core and all minor activities are smaller than the country’s average level;
- Index=1: At least one activity among the core and minor activities is greater than the country’s average level;
- Index=2: At least two activities among the core and minor activities are greater than the country’s average level;

- Index=3: At least three activities among the core and minor activities are greater than the country's average level;
- Index=4: All the core and minor activities are greater than the country's average level.

For simplicity, the final score has been re-scaled to the 0-1 interval.