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Mafia Firms and Aftermaths

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Summary

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Keywords: Organized Crime, Mafia Firm, Mafia and Development

JEL Classification: D02, K14, L11

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MAFIA FIRMS AND AFTERMATHS

By

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Abstract

We use a unique and unexplored dataset to investigate the determinants and effects of mafia firms in Italy. Mafia may use several tools to expand its firms. However, in this paper, we show that they prefer political corruption to violence to expand mafia firms. In particular, they use the latter more to build up their reputation in new established regions. Mafia firms hamper entrepreneurial activity but they can have beneficial effects on unemployment if mafia firms add to not substitute current economic activities. Policy makers should take account of this twofold effects of mafia firms.

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1. Introduction

There are no doubts that the understanding of the mafias¹ is far below those requested by the relevance of this phenomenon in the Italian economy. So, despite more than fifty years ago Schelling (1967) pointed out the tendency toward monopolization as the main feature of the organized crime, the conditions and the strategies the mafias use to build up and maintain monopoly power are still largely unknown; as are largely unexplored issues related to the nature of the mafia firms and their relationship with the markets; the conditions that favor mafia to succeed in some sectors and areas more than others; how mafia organizations rebuild market power when mafia firms are confiscated by the State. The consequences are that knowledge of why and how mafias survive and spread in Italy and other countries is inadequate to design and implement effective policy tools necessary to weed out criminal organizations.

As a matter of fact, mafia is a multidimensional phenomenon, dealing with criminal groups providing illicit and licit goods and services; involving the use of violence, threat, or intimidation; and the infiltration of political system (see, among others, Calderoli, 2010, Pinotti, 2015). The aim of the paper is to contribute to a better understanding of its economic dimension. Specifically, we use a unique and unexplored dataset that includes all the confiscated firms belonging to mafia, and we investigate the determinants and effects of mafia firms in the Italian provinces and regions. Although mafia firms capture only one aspect of mafia economic activities, they better reflect the several scopes of the criminal organization. Indeed, mafia firms allow their members to increase profits, money laundering, and to expand market power. Mafia firms exercise market power by economic and non-economic tools. The economic dimension includes the capacity of mafia firms to affect entry and exit in the market, to determine prices and quality of the goods and services they produce, to affect the costs of inputs they use and the conditions of production of the other firms participating in the market. In addition, mafia firms may have a comparative advantage also in the capital markets, due to the availability of illegal returns to finance investments, and because of their capacity to provide better conditions to access to the credit market than the other firms. The non-economic tools used by mafia to exercise market power include corruption of public officials; bribes imposed to the other firms, and also the use of violence. Depending on the circumstances, these different means sometimes is complementary some others are substitutes.

The first aim of the paper is to understand the determinants of the mafia firms in local markets. Mafia firms include all those firms that were confiscated by the State because of the mafia-related nature of their activities. Our definition of mafia firm comes from Article 416-bis of the Italian Criminal Code, and being the outcome of a judicial process, it is less subject to controversies related to what is mafia (see Calderoni, 2010). Notice that the determinants and effects of the mafia firms may differ from those of the criminal organization. Mafia firms can expand, if they abide by the rule of the law, and they have the consensus to enter into voluntary relationships with the other subjects participating in the markets. On the other hand, mafia can increase its economic and social influence without establishing new firms, and without operating in legal markets. However, the economic impact of mafia firms may be more

¹ For the purpose of this study, ‘mafias’ refers to the Sicilian Mafia as well as the other similar criminal groups there are in Italy: notably, Camorra, ‘Ndrangheta and the Sacra Corona Unita. Camorra has its origins in Campania, Ndrangheta in Calabria and Sacra Corona Unita in Apulia. Hence, it is customary to apply the term ‘mafia’ (in the singular) to criminal organizations other than the Sicilian Mafia. This habit occurs also in criminal law. The last paragraph of Article 416-bis of the Italian Criminal Code (mafia-type association) explicitly states: “the provisions above apply also to the camorra, the ‘ndrangheta and other associations, however known or called, even foreign, which use the intimidatory power of the group to achieve the goals typical of a mafia-type association”.

pervasive than that of illegal activities, because mafia firms can affect the entire process of resources allocation in the economy.

Using this unexplored dataset, in the first part of the paper we address the following questions: What ends do mafia firms pursue, and what tools do mafia organizations use to expand mafia firms in local markets? How does the local environment favor the growth of mafia firms? Does the judicial and the banking systems play any role in the diffusion of mafia enterprise?

In the second part of the paper we investigate the effects of mafia firms on local markets, by investigating their impact on entrepreneurial activity, unemployment, and the propensity to migrate from the jurisdiction. Notice that also the effects of mafia firms may be ambiguous. Mafia firms hamper entry and spur exit (Mirenda et al. 2019), and they are detrimental to economic growth (Pinotti, 2015). In addition, they distort in several ways the allocation process and the structure of economy (Lavezzi, 2008, Astarita et al., 2018). Moreover, since mafia firms are more oriented toward traditional activities (Calderoni, 2010, Mirenda et al. 2019, Le Moglie and Sorrenti, 2017), they may have adverse effects on the quality and quantity of human capital existing in the economy as well as on migration from the jurisdiction. So, we expect in provinces with a higher proportion of mafia firms entrepreneurial activity is weaker. By contrast, Dixit (2003) claims that mafia favors market transactions. In markets characterized by asymmetric information trust may be weak, and mafia can provide the services necessary to execute the transactions: information and enforcement (Dixit, 2003) and so, assessing whether the economic costs generated by the mafia firms are greater or lower than the benefits is an empirical matter.

The paper contributes to the literature on the economic dimension of the mafia on a few aspects. First, to our knowledge, it is the first study to investigate a unique and unexplored dataset that includes all the confiscated firms for mafia-related reasons. This dataset is a byproduct of the new Italian Criminal Code implemented in 2011. Second, it explores the relationship between ends and means of the mafia, by investigating what means is used by mafia and in what circumstances mafia firms increase their market power. In addition, we get new insights in what are the macroeconomic conditions in local markets that favor the expansion of the mafia firms. Finally, we contribute to the literature on the effects of mafia on economic development, by investigating through which mechanisms mafia spurs or hampers economic development.

Among the main findings of the paper, we show that political corruption is the main tool criminal organizations use to expand mafia firms. Violence is used to build up a reputation in new established markets or it is a substitute for corruption, if the latter is ineffective. Unemployment and tensions in the credit market favor mafia firms only in the Southern regions. On the other hand, mafia firms determine displacements effects on the other firms and hamper entrepreneurship as well as reduce the impact of the recession on the unemployment rate. These results are robust to our definition and measurement of mafia firm.

The paper includes six sections. The next provides a review of the relevant literature; section 3 describes data; section 4 sets up the hypothesis and the econometric models; section 5 provides the results of the econometric estimations and some robustness checks; section 6 concludes the paper.

2. Review of the literature

Current literature analyzes the causes and consequences of mafias activity, assuming that organized crime is a complex and multi-faceted phenomenon (Pinotti, 2015). Mafias provide goods and services in the legal and illegal economy, use violence and corruption to reach their aims, collect bribes, provide intermediation services in the exchange of goods and services and private protection, and they may even substitute banks in lending activity. So, all the proxies measuring the relevance and effects of the mafia at local level use composite indexes, which include economic and non-economic indicators.

However, the focus of our paper is the analysis of the causes and consequences of the diffusion of the mafia firms at a local level, and we review only the literature related to this topic. To the best of our knowledge, there are no papers addressing the issue of mafia firms. The main reason is that the construction of a dataset on mafia firms started only in 2011, with the established National Agency for the Management of Assets Confiscated to the Mafias (ANBSC). However, several authors provided indirect evidence on the determinants and effects of mafia firms. Mirenda et al. (2019) studied the infiltrations of the 'Ndrangheta in firms located in the Centre and North of Italy, and they show that (i) the 'Ndrangheta tends to enter firms in economic and financial distress and prefers sectors that most rely on public sector demand (Constructions and Real estate, Wholesale and retail trade, Professional business services); (ii) infiltrations generate a significant raise in the firm's own volume of sales likely due to money laundry and to the coercive power of the organization; (iii) the spread of the 'Ndrangheta through the infiltration on legal firms generally produces a displacement effect on competitor firms. Also Lavezzi (2008) provided evidence of a correlation between economic structure and organized crime. Mafia firms are more likely to increase with larger size of the construction sector, large number of small firms, low level of technology, and a large public sector.

Revenues from illegal economic activities, particularly those connected to drug trade, represent the main source of funding of mafias. It follows that they need to transfer money from illegal markets to legitimate businesses. So, money laundering is another reason why mafia firms exist. Evidence of this phenomenon is provided, among others, by Ardizzi et al. (2014), Transcrime (2015), and Le Moglie and Sorrenti (2017). The latest authors examined the determinants of new established firms, and show that the consequences of the 2007-2008 financial crisis have been less severe in areas with more organized crime, since in a crisis mafia firms may recur to alternative source of finance.

Among the tools criminal organizations use to expand in the legal economy is corruption of public officials and politicians. Pinotti (2015a) provides evidence that organized crime goes hand-in-hand with greater corruption, and Barone and Narciso (2015) show that criminal organizations may distort the allocation of public investment subsidies toward their area of influence.

While corruption is the main tool used to deal with public procurement, extortion is the most common tool mafia uses to extract rent from the private sector (La Spina et al., 2014). The aims of extortions are to extract economic rent, create a demand for protection, or take over rival firms.

On the other hand, a weak State (Acemoglu et al. 2017) and weak law-enforcement institutions (Buonanno et al. 2015) are among the determinants of the origin of the mafias, as well as of their spread to other Italian regions in more recent decades (Varese, 2006, Buonanno and Pazzona, 2014, Mirenda et al., 2019). So, several papers (Calderoni, 2010, Mirenda et al., 2019, Del Monte, 2016) provided evidence of a positive correlation between municipalities dissolved for mafia related reasons and the diffusion of criminal organizations.

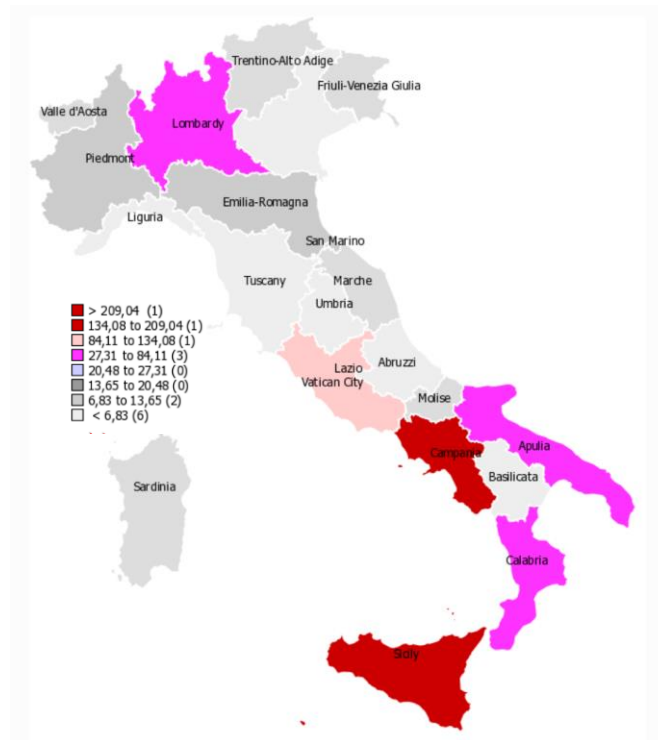
Similarly to the determinants of mafia firms, very few papers address the effects of the mafia firms on the economy. Mirenda et al. (2019), using firm level data, show that mafia firms expand in the sectors characterized by a higher incidence of the shadow economy, and the infiltration has displacing effects on the economy: competitors experience a loss in terms of revenues, their likelihood of exiting increases while the propensity of new firms to enter infiltrated markets decreases. Pinotti (2015b) studying the impact of mafia on two Southern Italian regions, estimated that the presence of the mafia lowers GDP per capita by 16%, and Daniele (2009), reviewing the impact of organized crime on regional development, concluded that the mafia organization determines lower productivity and reduces both local and foreign investments. In addition, it determines an unfavorable local socio-institutional climate for business activities. Also Astarita et al. (2018) provide evidence of a negative macroeconomic impact of the mafia on the Italian economy. Acconcia et al. (2014) estimate the output multiplier of public investment at provincial level in Italy and they show that city council dismissals – due to mafia infiltration - result in unexpected, large contraction in spending. In this paper we estimate whether previous conclusions related to criminal organizations extend also to mafia firms.

3. Data

The empirical analysis is based on an original dataset created by several data sources. First, we collect data from the National Agency for the administration and destination of seized and confiscated assets (ANBSC) established in 2010. The Agency was created to manage firms and other assets confiscated to the mafias; from first confiscation until they are redeployed.

The Agency collects data on firms confiscated from the mafia organizations as well as on the confiscated firms that after a trial are allocated to other uses. We consider only the latter “mafia firms”, since the former include also firms confiscated and returned to their owners after the trial. So, our definition of mafia firm coincides with what is established by law, and proved in a court to be a mafia firm. Mafia firms are entities operating in the over ground economy, and they include new established firms by the members of criminal organization or their relatives, existing companies with one or more owners related to mafia organizations, firms with front men owners only, where mafia provides capital and manages “de facto” the firm. In the period 1985-2016 there were 861 mafia firms in the ANBSC dataset. Figure 1 shows the distribution of mafia firms across Italian regions.

Figure 1. Distribution of mafia firms by regions.

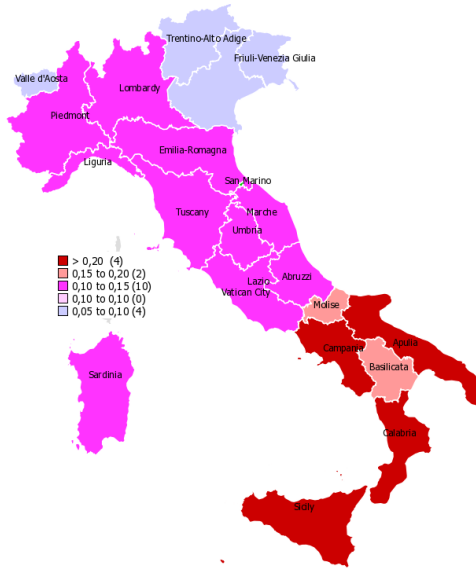


Source: Our elaborations on ANBSC data.

As expected, the majority of mafia firms are located in Southern regions, especially Campania and Sicily. However, the presence of mafia firms in the Northern regions has increased in the last decade. So, mafia firms in Lombardy are the same range as Calabria and Apulia. Recently, the mafia phenomenon has been rooting also in others regions, like Lazio and Emilia. The geo-map points out that mafia groups left their traditional strongholds in the South of Rome and spread their tentacles across the whole country, taking advantage of the economic crisis to snap up ailing businesses and ramp up their loan-shark operations.

This evidence is confirmed also by data on Crime. The latter is widespread in the Southern regions, but it is quite diffuse also in the rest of the country, with some exceptions (Valle D'Aosta, Veneto, Trentino e Friuli).

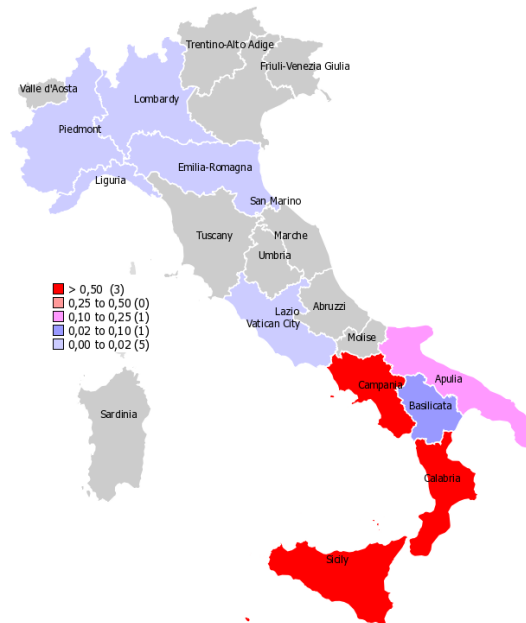
Figure 2. Average number of crimes by thousands of inhabitants, 1998-2016.



Source: Our elaborations on Home Office and Istat data.

Recently, the mafia has been also rooting in political and social institutions, as pointed out by municipalities dissolved for mafia infiltration reported in Figure 3. As shown by this figure, political infiltration is higher in high density mafia regions, but also regions like Lazio, Liguria and Basilicata are affected by this phenomenon.

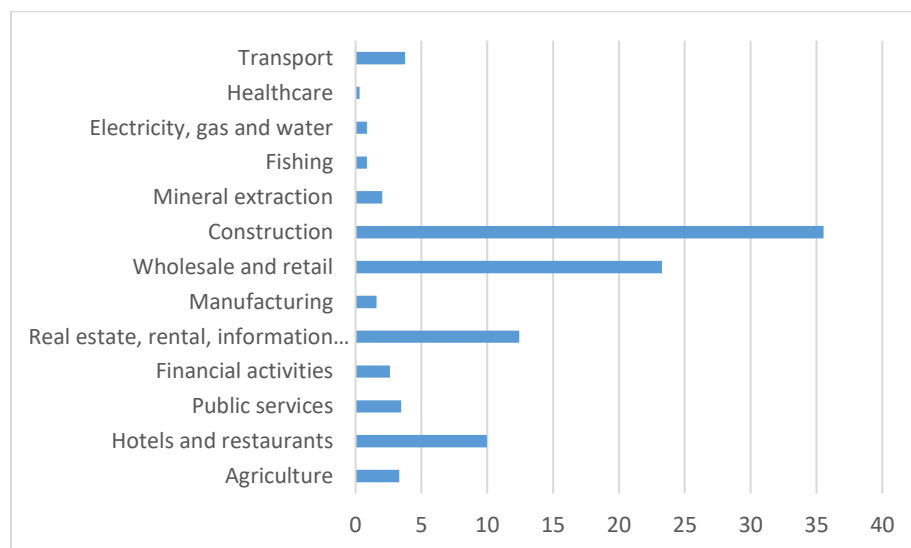
Figure 3. Percentage of dissolved municipalities over total municipalities at regional level, 1998-2016.



Source: Our elaborations on Home Office data.

Similar to previous evidence in the literature, also the distribution of mafia firms by economic sectors shows that mafias' economic activities are concentrated in a few sectors. Indeed, about 69% of these mafia firms belong to Construction, Wholesale and retail, Real estate rental and information technology, hotels and restaurants.

Figure 4. Distribution of mafia firms by sector (percentage values).



To assess the relevance of this phenomenon, we merged data on mafia firms from ANBSC and the AIDA database, provided by Bureau Van Dijk Company. Specifically, from the latter we extracted annual data on revenues, total asset, financial information, etc. Finally, we used macroeconomic variable at regional or provincial level to capture economic conditions in local markets.

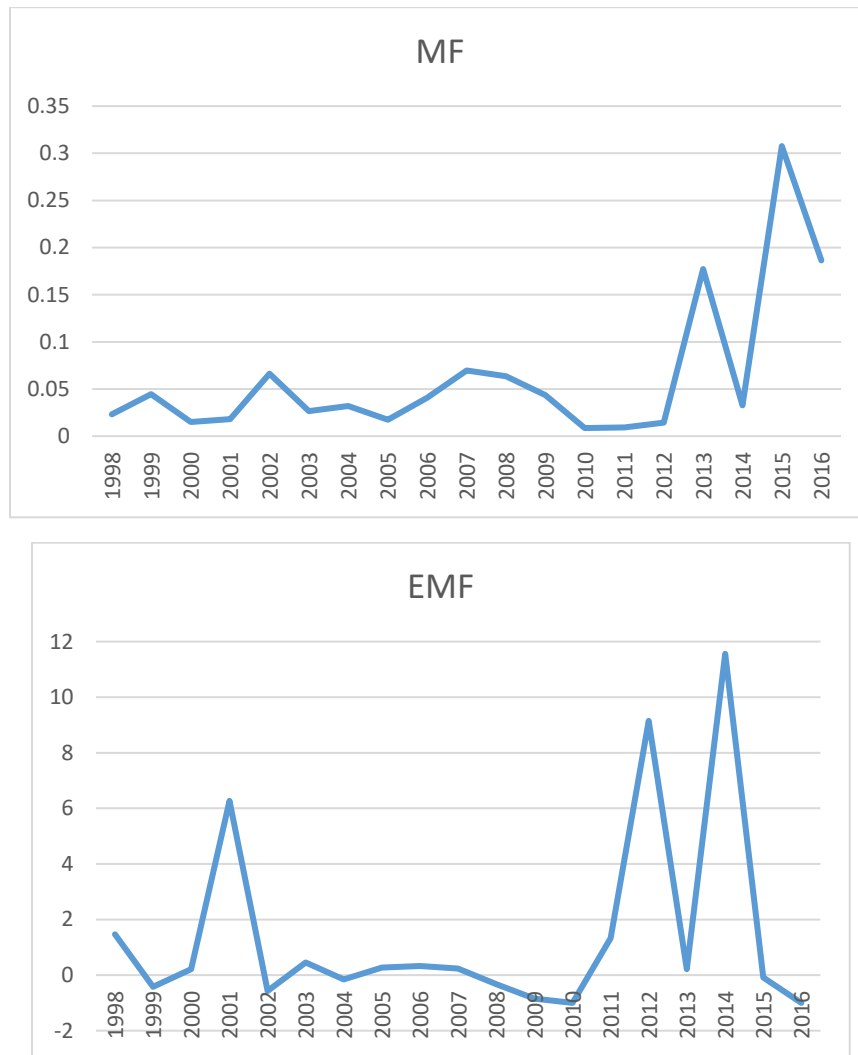
Table 1 reports some features of mafia firms relative to the other firms. On average, mafia firms have much higher revenues than “legal” firms, but also the standard deviation of revenue is higher. This implies that mafia firms undertake activities characterized by much higher returns but also higher risk.

Table 1. Revenue and risk of mafia firms and legal firms

Variable	Mean	Std. Dev.	Min	Max
Mafia firms	2879.317	5074.451	0	22138
Legal firms	437.1039	229.0963	126.3721	1163.747

Using information about mafia firms, we build two indices, MF and EMF. The MF index is the number of mafia firms over total firms active in the jurisdiction (Province or Region). It measures the presence of mafias in the legal economic activities. The EMF index is the annual percentage change of “mafia firms” in the jurisdiction. The last indicator reflects more entry and exit of mafia firms in the jurisdiction. Figures 5 and 6 show the trend of these indices in the period 1998-2016.

Figure 5. Mafia firms and their evolution in the period 1998-2016.

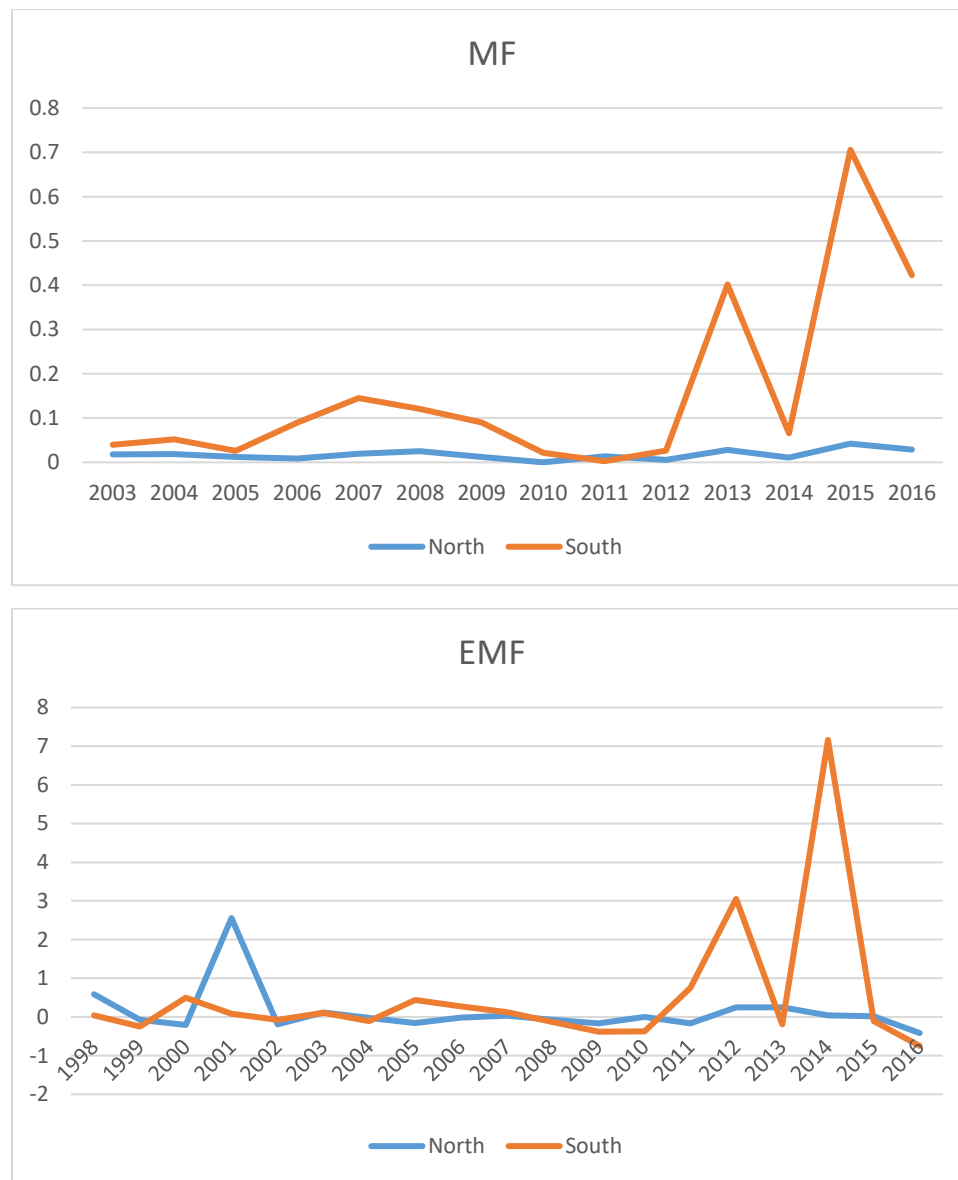


Source: Our elaboration on ANBSC Database.

Both MF and EMF show two peaks in recent years. Moreover, an increase of mafia firms' entry in a territory (2012 and 2015) precedes an increase in the economic relevance of mafia firms (2013 and 2016). This is particularly true in the periods 2000-2001 and 2011-2015.

One may argue that mafia is a phenomenon eradicated in Southern Italy. However, recent studies (e.g., Miranda et al., 2019, Varese, 2006) show that the presence of mafia in the Northern regions has increased in the last decades. Our data provide support to these evidence. Figure 6 shows the evolution of mafia firms in the two macro-areas: Centre – North and South of Italy. The economic presence of the mafias is higher in the South, especially after 2012, it increased also in Centre-North of the country (Figure 6). Starting from 2011, the spread of mafia firms in the last area is particularly evident.

Figure 6. Mafia firms in the South and the Centre-North of Italy



From the above evidence, it is quite clear that Mafia is mostly a Southern Italy's problem, but criminal organizations are well established in other parts of the country, as confirmed also by several recent judicial sentences.²

Notice that our dataset on mafia firms underestimates the economic relevance of this phenomenon. First, courts may make type 2 errors: they accept the hypothesis the firm is not a mafia firm, but indeed it is. So, confiscated firms were returned to their owners even if they were mafia firms. In addition, the

² As an example, the High Court pointed out in a recent sentence that "in the Lombardy region the 'ndrangheta has managed to create a parallel structure, characterized by a high degree of autonomy in its action" therefore, "Italy's locomotive" has become one of the 'ndrangheta's "provinces."

number of mafia firms depends on the degree of efficiency of the judicial system, and the latter may change between regions and through time. On the other hand, our definition and measure of mafia firm is less arbitrary, since it is based on the evidence of the connection of these firms with mafia organization proved in a court, and at multiple levels of jurisdiction.

4. Hypothesis and the econometric models

The starting point of the paper is that mafias pursue the aim of maximizing wealth of their members. They do this by undertaking legal and illegal activities. Though the latter are highly rewarding, they face the risk to be detected and expropriated by the State. In addition, undertaking illegal activities mafia members face the risk to be convicted and incarcerated, losing the possibility to enjoy the profits. By contrast, legal activities provide the members of organization with more certain and long lasting source of income, and they reduce also the probability to be convicted. The main tool the criminal organizations use to expand their legal activities is the mafia firm.

Hypothesis 1. Mafia firm's market power increases with the number of mafia firms operating in local markets.

The textbook narrative is that firms increase market power if they have some advantage in costs or production, or they may collude in the market. In addition, the lower the number of firms the higher the possibility to collude in the market. Mafia firms build up and exercise market power in different ways. First, they may generate a competitive disadvantage to the other firms, by using extortions and bribes to increase the costs of production of the other firms. In addition, mafia firms may jeopardize the labor and the good markets, underpaying the workers and producing low quality goods and services, which they can also impose to other firms or to public entities. Moreover, they may even use the violence to prevent entry into the market or induce exit. Finally, mafia firms may corrupt public officials and politicians to fold the rules and the allocation of resources to their advantage.³ Very often mafia firms operating in the same territory belong to the same criminal organization, and therefore they behave like a cartel, even when they operate in different sectors. It follows that the higher the number of mafia firms in a territory the greater the possibility to exercise market power, by hurting competitors and/or by expanding in other sectors or territories. On the other hand, if two or more criminal organizations compete for the same territory or sector, the number of the mafia firms may be unrelated to the degree of market power.

Hypothesis 2. Mafia firms prefer political corruption to violence to build up and maintain market power, but they use the latter if the former is not effective to the scope.

We posit that an increase of violence and corruption by mafia increases mafia firms' market power. However, we state that violence and corruption are not equivalent to increase market power. The capacity to use violence is the main asset of the criminal organization. It creates a reputation, which in many circumstances may allow to pursue their ends without using it. However, the use of violence is not without costs to the criminal organization. It hurts the victims and creates a reaction of the prosecutors, which may have detrimental effects on their activities. By contrast, corruption of public officials and politicians, although very detrimental to the allocation of resources, is beneficial to both the mafia and their "victims". It follows that mafia firms prefer corruption to violence to pursue their aims. However,

³ Among many others, Sylos Labini (2014) and La Spina (2008) reported how criminal organizations impose "cuts", forcing activities to move elsewhere, or to give up to the idea to open a business.

violence may be necessary if corruption of politicians and public officials does not work to the scope, or competitors contend market power to the established mafia firms.⁴

Nevertheless, there are circumstances in which the use of violence may not increase mafia firms' market power. The first case occurs when murders of politicians, judges, prosecutors, or threats to the State may determine a strong reaction of the government. The assassination of the judges, Giovanni Falcone and Paolo Borsellino in 1992 in Palermo, resulted into a new legislation against the mafias and spurred the capacity of the police to fight them, which, in turn, reduced the possibility of the mafias to expand in the legal economy. So, the new legislation created an environment that induced the mafias to reduce the propensity to use violence, and generated new strategies to infiltrate the legal economy.

Another example when violence may not increase market power is when two or more criminal organizations compete for the supremacy of the same territory. This war for monopoly increases mafia' murders, without favoring the expansion mafia firms located in the same territory. Del Monte (2016) documented that wars among criminal organizations occurred from time to time in all the territories with a high density of mafia organizations, without increasing market power.

Hypothesis 3. The impact of the mafia firms on the economy depends on the aim they pursue. If they pursue an increase in market power, there will be detrimental effects on the economy. If their aim is money laundering, the effects of mafia firms on the economy may be beneficial.

Mafia firms may arise to create a monopoly power, for money laundering and to divert public funding to their aims. They build up a monopoly power by displacing incumbent firms, limiting or blocking entry, and spurring exit. Hence, the increase of the mafia firms is likely to have a detrimental effect on entrepreneurial activity. Pinotti (2015b) and Detotto and Otranto (2010), among others, documented the detrimental effects of mafias on the economy. More precisely, Pinotti (2015a) shows that mafia firms are more likely to expand in the sectors where public expenditure is higher (construction, real estate, utilities). These sectors are also those where productivity and innovation is lower. It follows that diverting resources from more productive to less productive sectors mafia firms hamper development and reduce the number of firms existing in the economy. Also Detotto and Otranto (2010), using regional data, provided evidence that the crime negatively impacts the economic performance, by discouraging investments, reducing the competitiveness of the firms and reallocating resources by creating uncertainty and inefficiency. The negative impact of crime on Italian economic performance is 5% stronger during the recession than the expansions. Centorrino and Ofria (2008) and Albanese and Marinelli (2013) provided evidence that criminal organizations reduce labor productivity in the Southern regions of Italy. Finally, mafia firms may hamper entrepreneurial activity by reducing the quality of politicians and by hurting efficiency and distorting the allocation of public expenditure. Daniele and Geys (2015), using data on municipalities dissolved for mafia infiltration, proved that the average education level of local politicians significantly increases when active mafia infiltration of local politics is remedied through the implementation of a stricter legal institutional (see also Pinotti, 2013). Acconcia et al. (2014), using also data on dissolved municipalities, proved that mafia reduces fiscal multipliers. We claim that these effects are likely to increase unemployment and to induce more people, especially more educated and skilled workers, to migrate from local labor markets.

⁴ Pinotti (2015a), among others, provides evidence that organized crime goes hand-in-hand with greater corruption.

However, the displacement effects on the other firms may not occur if mafia uses legal firms mainly for money laundering reasons. In this case, mafia firms may add to incumbent firms, without displacing the latter. Evidence of mafia infiltration for money laundering is provided by Mirenda et al. (2019) and Le Maglie and Sorrenti (2017). The first authors find that after the infiltration sales and revenue increases relative to the other firms, and despite this exit is higher among infiltrated firms. Also the latter confirm the higher exit and entry in areas with a higher presence of mafia, with no significant effects on the stock of registered enterprises. Since provinces with high mafia presence experienced a reduced drop in the number of new enterprises during the recession relative to the other provinces, Le Maglie and Sorrenti (2017) pointed out the role of economic stabilizer played by the organized crime during the last great recession.

Similar contrasting effects mafia firms can have on local labor markets. Peri (2004) provided evidence of the negative impact of crime on unemployment. Mafia is likely to reduce job opportunities in the local labor markets, and increase unemployment.⁵ On the other hand, Le Maglie and Sorrenti (2017) find that provinces with higher infiltration of criminal organizations have experienced a more severe drop in employment and a less relevant increase in unemployment during and after the last financial crisis, with a consequent increase in the rate of inactive workers. These results support the hypothesis that, as a consequence of the crisis, local population is more likely to switch from a regular to a non-regular job. Indeed, criminal organizations are acknowledged as promoters of illegal jobs and salary compressions also to displace legal enterprises (Ministry of Interior, 2013).

Summing up, the underlying assumption is that mafia firms have an advantage relative to the other firms in terms of lower costs of inputs, easier access to the capital market and their capability to determine prices by colluding in the markets. It follows that the higher the number of the mafia firms in a province or region the higher the sectors affected by mafia firms, and the greater the number of the other firms displaced in the markets. Mafia firms create this advantage by violence, corruptions and by easier access to the capital markets. In addition, they are favored by troublesome environment conditions, specifically by higher unemployment and tighter conditions in the credit market. However, mafia firms may also have beneficial effects on the economy if they are established only for money laundering reasons.

We tested the above hypotheses by the following two models.

First, we estimated the determinants of mafia firms in each province or region. Following the literature, we assume among the determinants of mafia firms there are political corruption at local level, crimes,

⁵ Indeed, there may be also a reverse causality relationship between mafia firms and unemployment. It is commonplace that unemployment spurs mafia, by increasing supply of labor for their activities. Marselli and Vannini (2000), using data at regional level, provided evidence of this causal relationship. Although it is difficult to establish this causality nexus, there are circumstances in which it is possible to disentangle whether mafia affects unemployment or vice versa. Following the assassination of the judges Falcone and Borsellino, a new legislation against mafias was implemented. This legislation is an exogenous shock, which affected first the criminal organizations and then unemployment. By contrast, the 2007-2008 financial crash may be considered an exogenous shock on unemployment, with subsequent consequences on the size and behavior of criminal organizations. So, the period subsequent the financial crash is suitable to test the hypothesis that an increase in unemployment spurs the growth of mafia firms.

inefficiency of the judicial system, and bad economic conditions. Consequently, we estimated the following model:

$$MF_{it} = \alpha_0 + \alpha_1 Diss_{it-1} + \alpha_2 Crime_{it-1} + \alpha_3 Diss_{it-1} * Crime_{it-1} + \alpha_4 NP_loans_{it-1} + \alpha_5 Kg_wastes_{it-1} + \alpha_6 Just_eff_{it-1} + \alpha_7 Unempl_{it-1} + \alpha_8 Va_pc_{it-1} + \varepsilon_{it} \quad (1)$$

With MF indicating the Number of mafia firms over total firms in jurisdiction i (Province or Region), Diss denotes Municipality Committees dissolved due to mafia infiltration relative to total municipalities of the jurisdiction; Crime denotes Number of crimes (Mafia connections+ criminal conspiracy+ extortion) committed by people of the jurisdiction per thousand inhabitants, NP_loans are Non-performing loans of bank customers located in the jurisdiction; Kg_wastes indicates Per capita Urban wastes collected in the jurisdiction (in Kg); Just_eff is the Average duration of criminal proceedings defined with collegial Courts (Days); Unempl is the Unemployed rate of people aged 25-65 in the jurisdiction; Va_pc indicates the Log of Per capita value added of the jurisdiction. Hence, the unit of analysis is the province or the region. Alternatively, we estimated as dependent variable EMF: the percentage change in the number of mafia firms in the jurisdiction. While MF captures the economic relevance of mafia in a province or region, EMF reflects more the dynamics of mafia firms' entry and exit in a territory.

Dissolved municipalities is an indicator of institutional weakness, and reflects also corruption in the public sector. We assume political corruption spurs mafia firms' growth. Similar effects have an increase in mafia related crimes. Notice that criminal organizations may use infiltration into local government and violence as complementary or substitute tools to expand mafia firms' power. By the interaction term in equation 1 we investigate what strategy is more likely to occur. If mafia firms use first corruption and eventually violence, we expect the interaction term has a negative sign; but if they use jointly these two tools, we expect the sign of the interaction term is positive. Non-performing loans is the first variable capturing the environmental characteristics affecting mafia firms. We expect the higher the number of firms unable to repay the loans the greater the probability they will be captured by the criminal organization, and the greater the diffusion of mafia firms. On the other hand, Kg_wastes is an indicator of compliance with the law in the province or region. There is evidence that mafias fostered the illegal market of wastes (Germani, et al., 2016). Public awareness on the impacts of illegally disposing and burning wastes may affect the implementation of adequate waste management policies, and increase the collection of per capita urban wastes in the jurisdiction (Germani, et al., 2016). Hence, we expect wastes collection has a negative impact on MF. We expect also an increase in efficiency of judicial system has a negative impact on MF. By contrast, an increase in the rate of unemployment in the province or region increases MF. The impact of per capita GDP on the number of mafia firms may be less clear cut. On one hand, less developed area may favor criminal organizations. On the other hand, more developed regions may be a better target for criminal organizations, since by infiltrating firms in this areas they can make higher profits.

We performed the empirical analysis by estimating the effects of time-varying explanatory variables in a panel data context. Dealing with panel data implies a choice between Fixed Effects and Random Effects estimator, the main difference being the assumption relative to the correlation between the unobserved heterogeneity and the explanatory variables. Since there are no reasons to believe that α_i are correlated with some explanatory variables through the unobservables, we estimate the model by Random Effects.

A formal Housman test confirms our choice.⁶ In order to control for heteroskedasticity, every estimated equation in Table 2 has robust standard errors. However, a problem of endogeneity arise due to simultaneity and/or reverse causality. For example, we argue that violence is a strategy mafia tool to enter in a market, thus the higher the number of crimes the higher the number of mafia firms. On the other hand, it may also be the case that in jurisdictions, where mafia firms spread, there are more crimes. The first attempt to correct for endogeneity is to take lags of the explanatory variables. Moreover, we re-estimate the model using a two-stage instrumental variables estimator, where the potentially endogenous variables are instrumented with their lags and other variables (results in the last column of Table 2). When the dependent variable is EMF we capture the dynamics of the phenomenon, thus we add the lag of the dependent variable among the regressors and we estimate the model by Arellano–Bond panel data techniques. Again, we control for heteroscedasticity through robust standard error and we estimate the complete model with a two-stage instrumental variables estimator, to correct for potential endogeneity.

After estimating the determinants of mafia firms, we investigated the impact of the latter on entrepreneurial activity, human capital, employment and unemployment in the jurisdiction. To estimate the impact of mafia firms on entrepreneurship we tested the following model:

$$\text{Entrepr}_{it} = \alpha_0 + \alpha_1 \text{Entrepr}_{it-1} + \alpha_2 \text{Entrepr}_{it-2} + \alpha_3 \text{L_firms}_{it-2} + \alpha_4 \text{MF}_{it-2} + \alpha_5 \text{Crime}_{it-2} + \alpha_6 \text{Unempl}_{it-2} + \alpha_7 \text{Va_pc}_{it-2} + \alpha_8 \text{Pub_exp}_{it-2} + \varepsilon_{it} \quad (2)$$

Where *Entrepr* is the Percentage variation of the firms over population in jurisdiction *i*. *L_firms* is a natural logarithm of the number of active firms, and *Va_pc* is per capita value added in the jurisdiction. Finally, *Sp_pop* is per capita public expenditure in the jurisdiction. Eq. (2) is a dynamic panel data model which has been estimated using Arellano–Bond panel data techniques with cluster-robust standard errors. When the jurisdiction is the region, we may use two lags of the dependent variable as covariates since the data are available for a longer period of time (1998-2016). On the contrary, the time series for the provincial data are shorter (2009-2016), thus we may use just one lag of the dependent variable as well as the other explanatory variables.

We posit that the effects of mafia firms on entrepreneurial activity may depend on the reasons why criminal organizations establish new firms; i.e., whether the money laundering effect is greater or lower than the displacement effect generated by the search for greater market power.⁷

Using an equation similar to (2), we estimated also the impact of mafia firms on local labor markets. Notice that, also in this case there may be contrasting effects, depending on whether mafias' investments in the legal economy are motivated by money laundering or productive investments. Peri (2004) provided evidence that the benefits of mafia investments are limited, whereas their costs in terms of deterioration of the local labor market are possibly high. But, Le Maglie and Sorrenti (2017) show that, as a consequence of the 2007-2008 financial crisis, provinces with a higher infiltration of criminal organizations have experienced a more severe drop in employment but also a less relevant increase in the unemployment rate. This may be due to an increase in discouraged people and/or because local population in jurisdictions with high density mafia switched more easily from regular to non-regular jobs

⁶ Results available upon request.

⁷ Indeed, Le Moglie and Sorrenti (2017) find non- significant effects of mafia investments on the number of enterprises in local markets, despite a positive and significant effects on entry and exit of the firms.

(Le Maglie and Sorrenti, 2017). So, the net effects of mafia firms on entrepreneurial activity and on local labor markets is an empirical matter.

5. Results and robustness checks

Next we report the estimation results related to the determinants of mafia firms in local markets. In the following tables we report the results when the unit of analysis is the region, and in the appendix the results at provincial level.

Table 2. Determinants of Mafia firms diffusion by region

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Diss_{t-1}	0.635*** (4.22)	0.636*** (4.21)	0.639*** (4.24)	0.650*** (4.62)	0.610*** (4.81)	0.609*** (5.05)	0.904*** (6.71)
Crime_{t-1}	0.205 (1.31)	0.218 (1.39)	0.246 (1.58)	0.186 (1.00)	-0.003 (-0.02)	-0.007 (-0.04)	0.270 (0.98)
Diss *Crime_{t-1}	-1.811*** (-3.21)	-1.812*** (-3.22)	-1.828*** (-3.24)	-1.874*** (-3.66)	-1.743*** (-3.71)	-1.739*** (-4.00)	-3.125*** (-4.76)
Np_loans_{t-1}		0.146** (2.25)	0.142** (2.33)	0.147** (2.22)	0.134** (2.21)	0.135** (2.18)	0.99 (0.000)
kg_waste_{t-1}			0.000 (0.78)	0.000 (0.93)	0.000 (0.58)	0.000 (0.59)	0.000 (0.35)
Just_eff._{t-1}				0.000* (1.67)	0.000 (1.61)	0.000 (1.15)	0.000 (1.50)
Unempl_{t-1}					0.0021** (2.37)	0.021** (2.43)	0.016** (2.34)
VA_pct_{t-1}						-0.104 (-0.04)	1.007 (0.42)
Cons	-0.015 (-0.63)	-0.179** (-2.41)	-0.214** (-2.26)	-0.263** (-2.31)	-0.443*** (-2.69)	-0.441** (-2.57)	-0.452** (-2.58)
N. obs.	358	358	358	338	338	338	318
R²	0.41	0.41	0.41	0.41	0.43	0.43	0.45

Notes. The dependent variable is *MF*. All regressions contain calendar year dummies (results not reported); the time span is 2003-2016. Standardised normal z-test values are in parentheses; cluster-robust standard errors. Equations from (1) to (6): random effects estimations. Eq. (7): IV estimation where **Diss**, **Crime** and **Diss*Crime** are treated as endogenous and they are instrumented with lags of exogenous regressors and IV: **Murders** and **Laundering**. Significant coefficients are indicated by * (10% level), ** (5% level) and *** (1% level).

In the previous section we posit that mafia firms prefer corruption to violence, but they use the latter if the former is not effective to the scope. Table 2 shows that crime alone is not significant, whatever the model specification. By contrast, dissolved municipalities are always significant in determining the share of mafia firms in the region. However, the joint effect of dissolved municipalities and crime is always significant, and with negative sign. This indicates that mafia organizations are likely to use crime and political corruption as alternative tools to pursue market power in local markets. Interestingly, mafia firms diffusion is favored also by an increase in non-performing loans as well as by higher unemployment rate in the region. By contrast, the level of per capita GDP is never significant, indicating that the diffusion of mafia firms is not an exclusive phenomenon of the less developed Italian regions. Finally, greater efficiency of the judicial system has a positive impact on the share of mafia firms, likely due to the higher capacity to detect them.

While results reported in Table 2 refer to the structure of the firms in the region (i.e., mafia versus non-mafia firms), Table 3 provides the results on the determinants of mafia firms when the dependent variable

is the percentage changes in the number of mafia firms in the region. The last variable reflects more the dynamics of the mafia firms entry and exit in the region. The results in Table 3 confirm previous conclusions on the role of political corruption mafias use to expand mafia firms in the region. However, non-performing loans and the unemployment rate are not any more significant determinants of the changes in the number of mafia firms between subsequent years.

Table 3. Determinants of Mafia firms dynamics by region

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
EMF_{t-1}	-0.116** (-2.31)	-0.124** (-2.40)	-0.122** (-2.33)	-0.132** (-2.44)	-0.132** (-2.50)	-0.130** (-2.46)	-0.123*** (-3.56)
Diss_{t-1}	4.106*** (4.39)	4.306*** (5.31)	4.222*** (6.75)	5.191*** (7.58)	5.203*** (8.11)	5.234*** (9.06)	9.317*** (2.67)
Crime_{t-1}	-8.036 (-1.62)	-7.081 (-1.64)	-7.581** (-2.31)	-10.271* (-1.89)	-9.991 (-1.35)	-8.599 (-1.24)	1.275 (0.41)
Diss*Crime_{t-1}	-13.38*** (-4.00)	-13.96*** (-4.71)	-13.56*** (-6.30)	-18.462*** (-6.40)	-18.48*** (-6.92)	-18.528*** (-7.31)	-26.120*** (-2.63)
Np_loans_{t-1}		5.494 (1.30)	5.5519 (1.33)	5.466 (1.25)	5.481 (1.26)	5.806 (1.31)	4.757 (1.23)
Kg_wastes_{t-1}			-0.003 (-0.30)	-0.005 (-0.42)	-0.005 (-0.37)	0.000 (0.01)	0.001 (0.12)
Just_eff._{t-1}				0.004 (1.37)	0.004 (1.30)	0.004 (1.36)	0.003 (1.18)
Unempl_{t-1}					-0.142 (-0.10)	-0.957 (-0.71)	-0.488 (-0.41)
VA_pct_{t-1}						-556.83*** (-3.61)	-201.891 (-1.28)
Cons	1.722 (1.37)	-4.507 (-1.21)	-2.718 (-0.31)	-3.852 (-0.36)	-2.118 (-0.008)	16.965 (0.66)	3.623 (0.18)
N. obs.	338	338	338	318	318	318	318

The dependent variable is *EMF*. All regressions contain calendar year dummies (results not reported); the time span is 2004-2016. Standardised normal z-test values are in parentheses; cluster-robust standard errors. Equations from (1) to (6): GMM estimation with all regressors exogenous. Eq. (7): GMM estimation where **Diss**, **Crime** and **Diss*Crime** are treated as endogenous and they are instrumented with lags of exogenous regressors and IV: **Murders** and **Laundering**. Significant coefficients are indicated by * (10% level), ** (5% level) and *** (1% level).

The results reported in Table 2 are confirmed also when the unit of analysis is the province (see Table A.4 in the Appendix), but those related to the determinants of EMF do not hold at provincial level (see Table A.5 in the Appendix). This is a general pattern when we move from regional to provincial level. In the latter case the number of observations sharply increases, but the variation in the data decreases, due to the fact that in most provinces records take zero value. By contrast, at regional level the number of observations decreases but their variability increases, since very few values at regional level are zero.

To get more insights in these results, we split the sample on the determinants of mafia firms between the two macro areas of Italy: Centre-North and South. Among other things, these two areas are very different in terms of level of development, efficiency of the judicial system and the public sector, density of criminal organizations. In addition, in the last decade the Centre-North regions experienced a higher mafias' infiltration rate. Table 4 reports the results.

Table 4. Determinants of MF in Centre-North and South of Italy using data at regional level.

	Centre-North		South	
	(1)	(2)	(3)	(4)
Diss_{t-1}	-0.356* (-1.72)	2.454 (1.47)	0.552*** (3.69)	0.728*** (3.49)
Crime_{t-1}	0.204** (2.09)	0.064 (0.25)	-0.154 (-0.53)	-0.093 (-0.17)
Diss*Crime_{t-1}	1.367 (0.99)	-11.86 (-1.01)	-1.621*** (-2.89)	-2.440** (-2.49)
Np_loans_{t-1}	0.042 (1.43)	0.069 (0.84)	0.377** (2.41)	0.373 (1.18)
Kg_wastes_{t-1}	0,000 (0.28)	0,000 (0.20)	0.000 (0.11)	0.000 (0.17)
Cond_{t-1}	0.231 (0.69)	-0.095 (-0.26)	0.019 (0.08)	0.182 (0.24)
Just_eff_{t-1}	0.000 (1.51)	0.000 (0.71)	0.000 (0.39)	0.000 (0.80)
Unempl_{t-1}	0.015** (2.23)	0.005 (1.20)	0.040* (1.86)	0.038 (1.07)
VA_pc_{t-1}	6.718* (1.93)	2.299 (1.22)	-6.637 (-0.43)	-6.126 (-0.42)
Cons	-0.453** (-2.14)	-0.230* (-1.93)	-0.806 (-1.48)	-0.876* (-1.66)
N. obs.	204	192	134	126
R²	0.14	0.02	0.59	0.58

Notes. The dependent variable is *MF*. All regressions contain calendar year dummies (results not reported); the time span is 2003-2016. Standardised normal z-test values are in parentheses; cluster-robust standard errors. Equations (1) and (3): random effects panel data estimations; equations (2) and (4): IV estimation where **Diss**, **Crime** and **Diss*Crime** are treated as endogenous and they are instrumented with lags of exogenous regressors and IV: **Murders** and **Laundering**. Significant coefficients are indicated by * (10% level), ** (5% level) and *** (1% level).

Even though the results are affected by the econometric methodology (random effect estimations, columns 1 and 3 in Table 4, versus instrumental variables estimations, columns 2 and 4), there are some interesting differences in the determinants of mafia firms in Centre-North and South of Italy. In the former area crime has a positive impact on mafia firms, while in the latter crime never is significant when taken alone (it becomes significant when it interacts with dissolved municipalities for mafia related reasons). By contrast, political corruption is the most important determinant of mafia firms in the Southern regions, but it is not significant or it has a negative impact on mafia firms in the Centre-North regions. These results seem to suggest that mafias use more violence in newly established regions, to build up a reputation and bend victims, whereas in regions where they are well established they use more political corruption. Additional results are that greater credit risk and unemployment are determinants of the mafia firms' diffusion in the Southern but not in Centre-North regions (see Table 4). However, when we estimate the econometric model using data at provincial level, these conclusions are not confirmed (see Table A.6).

Next we investigated the impact of the mafia firms on entrepreneurship, unemployment and migration of the jurisdiction. We expect that whenever mafia firms pursue an increase in market power they hamper entrepreneurial activity, and induce more people to migrate from the jurisdiction. Since in this case mafia firms are likely to displace current activities without replacing them, we expect also an increase in the unemployment rate. On the other hand, if mafia firms are established for money laundering reasons, the last effect may not occur, since mafia firms add to current economic activities.

Table 5. The effects of mafia firms on entrepreneurship, unemployment and migration of the region.

	Y= Migr_rate	Y=Unempl	Y=Impr_rate
Y_{t-1}	0.370*** (5.53)	0.491*** (10.95)	0.065 (1.31)
Y_{t-2}	0.131** (2.40)	0.211** (2.51)	-0.053* (-1.73)
L_firms_{t-2}	0.002 (1.10)	0.458* (1.69)	-0.073*** (-3.69)
MF_{t-2}	-0.000*** (-2.55)	-0.123** (-2.42)	-0.012*** (-2.85)
Crime_{t-2}	0.003** (2.07)	0.365 (1.64)	-0.002 (-0.08)
Unempl_{t-2}	-0.000 (-0.54)		0.006 (1.10)
VA_pc_{t-2}	0.053 (0.60)	6.283 (0.54)	-1.939 (-1.17)
Pub_exp_{t-2}	-0.032 (-0.69)	12.539 (1.52)	-1.065 (-1.13)
Cons	-0.025 (-1.05)	-2.514 (-0.84)	0.867*** (3.04)
N. obs.	238	278	278

Notes. All regressions contain calendar year dummies (results not reported); the time span is 2004-2016. Standardised normal z-test values are in parentheses; cluster-robust standard errors. GMM estimation with all regressors exogenous. Significant coefficients are indicated by * (10% level), ** (5% level) and *** (1% level).

To estimate the impact of mafia firms on entrepreneurial activity, we use as dependent variable the percentage change of the number of firms over population in the jurisdiction. The results reported in Table 5 provide evidence that the presence of mafia firms in the region has detrimental effects on entrepreneurial activity. However, an increase of the mafia firms in the region reduces the unemployment rate and the migration rate from the region, even though crime spurs the latter. The beneficial effects of mafia firms on local labor markets are also confirmed by the positive impact of mafia firms on the level of employment over population.⁸ Hence, the presence of mafia firms seems to have detrimental effects on economic activities but beneficial social effects. However, when the unit of analysis is the province results are mainly not confirmed. In the last case, MF has a significant and negative impact only on the migration rate (see Table A.7).

The explanation of these counterintuitive results lies in the fact that our sample includes mainly the period during and after the great recession (2004-2016). The crisis hit both the Centre-North as well as the South of Italy. On the other hand, Le Moglie and Sorrenti (2017) provided evidence that the consequences of the crisis have been less severe in areas with higher density organized crime, due to the possibility of the latter to recur to alternative sources of finance (money laundering), and to substitute legal with illegal activities.

The main conclusions of the foregoing analysis are that political corruption and violence are the main determinants of the mafia firms' expansion in local markets. In addition, violence and political corruption are alternative tools to expand mafia firms. However, these results may be driven by the specific definition of mafia firm we used. So, we investigate whether our results hold when we consider an alternative indicator of mafia firm, based on the infiltration of criminal organizations in firms located in areas that had no previous tradition of mafia settlements.

⁸ These results are available upon request.

Indeed, Miranda et al. (2019) investigate the infiltration of 'Ndrangheta in Central and Northern Italy, using firm-level data, and including more than nine thousands firms. Infiltration is measured by the family names of mafia people born in Calabria region, who are owners and administrators of firms located in the Centre and the North of Italy. In a similar way, they compute the infiltration index at provincial level (BI_index). So, BI index is the share of firms infiltrated by the 'Ndrangheta over total firms located in the provinces of the Centre-North. Notice that, the correlation between BI_index and the MF index is very low: -0.006. This is due to the different definition of mafia firms we use. Indeed, as explained before, we consider mafia firms those firms that were confiscated and destined to other uses, independently on the specific mafia organization they belong to (Camorra, Sicilian mafia, 'Ndrangheta, etc.) and the region they are located in. By contrast, they consider infiltrated firms only those located in the Centre-North and infiltrated by 'Ndrangheta.

Using the BI_index as dependent variable, we estimated whether the determinants of the infiltration index are similar to the determinants of our mafia firms' index. Table 6 summarizes the results.

Table 6. Determinants of the mafia infiltration index in the provinces of the Centre-North.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Diss_{t-1}	0.005** (2.25)	0.005** (2.25)	0.005** (2.24)	0.005** (2.42)	0.005** (2.45)	0.005** (2.49)	0.010* (1.79)
Crime_{t-1}	0.000 (0.02)	-0.000 (-0.04)	-0.000 (-0.17)	-0.001 (-0.38)	-0.001 (-0.37)	-0.001 (-0.38)	0.005 (0.61)
Diss*Crime_{t-1}	-0.034** (-2.39)	-0.034** (-2.39)	-0.034** (-2.35)	-0.034** (-2.55)	-0.033** (-2.57)	-0.033*** (-2.58)	-0.051* (-1.72)
Np_loans_{t-1}		-0.000 (-0.90)	-0.000 (-0.89)	-0.000 (-1.19)	-0.000 (-1.19)	-0.000 (-1.16)	0.000 (0.15)
Kg_wastes_{t-1}			0.000 (0.95)	0.000 (0.97)	0.000 (1.00)	0.000 (0.83)	0.000 (0.82)
Just_eff._{t-1}				0.000** (2.06)	0.000** (1.98)	0.000** (2.04)	0.000 (0.85)
Unempl_{t-1}					0.000 (1.31)	0.000 (1.29)	0.000 (1.55)
VA_pc_{t-1}						0.045 (0.65)	0.082 (1.24)
Cons	0.006*** (11.03)	0.006*** (10.66)	0.005*** (3.08)	0.004** (2.35)	-0.000 (-0.01)	-0.001 (-0.28)	-0.003 (-0.79)
N. obs.	399	399	399	399	399	399	331
R²	0.01	0.01	0.05	0.01	0.02	0.04	0.11

The dependent variable is **BI_index**. All regressions contain calendar year dummies (results not reported); the time span is 2011-2016. Standardised normal z-test values are in parentheses; cluster-robust standard errors. Equations from (1) to (6): random effects estimations. Eq. (7): IV estimation where **Diss**, **Crime** and **Diss*Crime** are treated as endogenous and they are instrumented with lags of exogenous regressors and IV: **Murders** and **Laundering**. Significant coefficients are indicated by * (10% level), ** (5% level) and *** (1% level).

It is remarkable to notice that, despite the very different measure of mafia firm, the determinants of mafia infiltration in the legal economy are very similar to the determinants of our mafia firm index. Political corruption is always significant also to infiltrate firms in the Centre-North, and crime is not significant in determining the infiltration rate. Moreover, also 'Ndrangheta uses political corruption and violence as substitute tools to infiltrate firms located in the Centre and North. Finally, neither non-performing loans nor unemployment are significant determinants of the infiltration rate. By contrast, the efficiency of judicial system in Central and Northern Italy has a positive effect on the infiltration rate in this area.

6. Concluding remarks

The presence of mafia organizations is among the most important problems of Italy. In this paper we investigated the determinants of mafia firms, both in the areas where they are well established and in the regions where mafias have infiltrated in the last decades. In both areas, political corruption is the main determinant of mafia firms' expansion. However, criminal organizations substitute political corruption with violence if the former is ineffective to pursue their aims. In addition, mafias use violence to establish a reputation in new established regions.

Interestingly, unemployment favors mafia firms only in Southern regions. In this area, also tensions in the bank-firm relationship, due to the inability of the borrowers to repay the loans, is beneficial to mafia firms.

The macroeconomic effects of mafia firms in local markets are twofold. On one hand, mafia firms hamper entrepreneurial activity and displace competitors. On the other hand, they contribute to reduce the detrimental effects of the crisis, by reducing the unemployment rate and the propensity to migrate from local markets. However, our evidence on the distribution of mafia firms among sectors suggests that mafia firms distort the economic structure and have an adverse effect on development.

The main policy implication of our analysis is that, to eradicate this phenomenon, it is relevant to consider the overall economic impact of mafia firms and the conditions that may favor their regeneration.

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Appendix

Table A.1. *Description and sources of the variables*

MF	Ratio of “mafia firms” to total firms in jurisdiction <i>i</i> (region or province). Source: National Agency for the Management of Assets Confiscated to the Mafias (ANBSC).
EMF	Percentage variation of “mafia firms” in jurisdiction <i>i</i> . Source: (ANBSC).
Diss	Percentage of municipality Committees dissolved due to mafia infiltration relative to total municipalities of jurisdiction <i>i</i> . Source: Italian Home Office.
Crime	Number of crimes (Mafia connections+ criminal conspiracy+ extortion) committed by people of jurisdiction <i>i</i> per thousand inhabitants. Source: Italian Home Office and Italian Statistical Institute (Istat), https://www.istat.it/it/giustizia-e-sicurezza?dati
Va_pc	Log of Per capita value added at jurisdiction level. Source: Istat database.
L_firms	Log of active firms operating in jurisdiction <i>i</i> . Source Camera di Commercio database: http://www.mc.camcom.it/P42A784C90S39/Open-Data-Demografia-Imprese-RDF-Data-Cube-JSON-stat.htm
Cond	Number of people of jurisdiction <i>i</i> convicted (Mafia connections+ criminal conspiracy+ extortion) per thousand inhabitants. Source: Italian Home Office and Istat, https://www.istat.it/it/giustizia-e-sicurezza?dati .
Np_loans	Non-performing loans of bank customers located in jurisdiction <i>i</i> . Source: Banca d’Italia https://www.bancaditalia.it/statistiche/index.html
Kg_waste	Collected Per capita Urban wastes (in Kg). Source: http://www.istat.it/storage/politiche-sviluppo/Rifiuti.xls
Unempl	Unemployed rate in jurisdiction <i>i</i> of people aged 25-65. Source: Istat.
Just_eff	Average duration of criminal proceedings defined with collegial Courts (Days). Source: Italian Home Office, Istat, and our calculation for years 1999-2004 from tables 2.2 and 2.2b - Movement of the proceedings at the Judicial Offices – Collegial. Court of Appeal.
Migr	Migration from jurisdiction <i>i</i> in percentage of the population. Source: Istat, Dataset: Migrazioni (Trasferimenti di residenza)
Entrepr	Percentage variation of the firms in jurisdiction <i>i</i> . Source: Camera di Commercio database: http://www.mc.camcom.it/P42A784C90S39/Open-Data-Demografia-Imprese-RDF-Data-Cube-JSON-stat.htm

Table A.2. Descriptive statistics**Province: 2009-2016**

Variable		Mean	Std. Dev.	Min	Max	Observations
MF	Overall	0.0548318	0.2090506	0	1.921414	N = 917
	Between		0.1137213	0	.6337884	n = 103
	Within		0.1770487	-0.5789566	1.423301	T-bar = 8.90291
EMF	Overall	-0.2704876	1.589095	-1	7	N = 97
	Between		0.6846496	-1	1.499868	n = 39
	Within		1.377173	-2.720355	5.862846	T = 2.48718
Diss	Overall	0.1635924	0.7832738	0	8.333333	N = 917
	Between		0.4981705	0	3.240059	n = 103
	Within		0.6240698	-2.725296	7.571	T-bar = 8.90291
Crime	Overall	0.1362337	0.0593228	0.0361217	0.4210539	N = 811
	Between		0.0436121	0.0554007	0.2789665	n = 103
	Within		0.0403609	0.0269096	0.3254291	T-bar = 7.87379
Np_loans	Overall	3.626217	1.949372	0.356541	20.18317	N = 917
	Between		1.114234	0.943239	7.046103	n = 103
	Within		1.605314	-1.25549	16.76329	T-bar = 8.90291
kg_waste	Overall	509.2198	97.62302	318.7035	850.9949	N = 917
	Between		93.33581	340.9733	777.0095	n = 103
	Within		28.82391	401.5648	647.327	T-bar = 8.90291
Just_eff	Overall	536.5965	148.0167	246	1232	N = 917
	Between		129.5908	326.4444	929.7778	n = 103
	Within		72.31131	290.1521	873.9298	T-bar = 8.90291
Unempl	Overall	10.0314	0.8685762	8.085474	12.98287	N = 917
	Between		0.8432474	8.504586	12.77731	n = 103
	Within		0.2292866	9.028704	10.69628	T-bar = 8.90291
VA_pc	Overall	0.0225291	0.0058285	0.0130806	0.0427856	N = 814
	Between		0.00583	0.0132755	0.0415939	n = 103
	Within		0.0006477	0.0193823	0.0250892	T = 7.90291

Regions: 2003-2016

Variable	Mean	Std. Dev.	Min	Max	Observations
MF Overall	0.0499771	0.1597514	0	1.427626	N =358
Between		0.0837333	0	.3164926	n = 20
Within		0.137977	-0.2665155	1.314294	T-bar = 17.9
EMF Overall	1.084109	5.661708	-1	38.5	N = 98
Between		1.481853	-1	3.070707	n = 14
Within		5.500632	-2.986598	36.69869	T = 7
Diss Overall	0.1108939	0.3542757	0	3	N =358
Between		0.2776274	0	1.070588	n = 20
Within		0.2341557	-0.9596944	2.040306	T-bar = 17.9
Crime Overall	0.1334486	0.0643971	0.0320482	0.4383797	N = 338
Between		0.0528544	.0759132	0.2638282	n =20
Within		0.0391604	0.0319964	0.3080002	T =16.9
Np_loans Overall	1.070559	0.0607951	0.68	1.41	N =358
Between		0.0176626	1.021111	1.096111	n = 20
Within		0.0582947	0.6733364	1.403336	T-bar =17.9
kg_waste Overall	515.8406	79.57241	345.17	716.53	N =358
Between		75.45177	376.9878	661.0322	n =20
Within		29.8963	439.7256	603.4517	T-bar =17.9
Just_eff Overall	586.7492	207.9735	174.2	1561	N = 358
Between		163.0781	322.9556	1025.3	n =20
Within		133.5559	285.6492	1447.29	T-bar =17.9
Unempl_ Overall	11.36152	1.260467	7.662623	13.48894	N = 338
Between		1.259039	8.077056	13.16136	n =20
Within		.281869	10.83421	12.0701	T =16.9
VA_pc Overall	0.0237095	0.005859	0.0138691	0.033464	N = 338
Between		0.0059361	0.0150491	0.0324879	n = 20
Within		0.000974	0.0206116	0.025718	T = 16.9

Table A.3. Correlations coefficients

Regions.

	MF	EMF	Diss	Crime	Np_loans	kg_waste	Just_eff	Unempl	VA_pc
MF	1.0000								
EMF	-0.0350	1.0000							
Diss	0.3220	0.2493	1.0000						
Crime	0.2556	0.0695	0.4236	1.0000					
Np_loans	-0.0646	0.0413	-0.0561	-0.0494	1.0000				
kg_waste	-0.1037	-0.0484	-0.2082	-0.3658	0.0159	1.0000			
Just_eff	0.0971	0.0310	0.1473	0.5597	-0.0203	-0.3575	1.0000		
Unempl	0.4520	0.1934	0.3994	0.5104	0.0135	-0.1424	0.2026	1.0000	
VA_pc	-0.2725	-0.1000	-0.4200	-0.6394	0.0942	0.5433	-0.5953	-0.3756	1.0000

Provinces.

	MF	EMF	Diss	Crime	Np_loans	kg_waste	Just_eff	Unempl	VA_pc
MF	1.0000								
EMF	-0.2052	1.0000							
Diss	0.1768	0.0660	1.0000						
Crime	0.2551	0.0025	0.2028	1.0000					
Np_loans	0.1875	0.0604	0.1259	0.2835	1.0000				
kg_waste	-0.1284	-0.0153	-0.1179	-0.1432	-0.1503	1.0000			
Just_eff	0.1914	0.0070	0.1418	0.3720	0.3626	-0.3486	1.0000		
Unempl	0.2687	0.0083	0.1615	0.3125	0.1558	-0.2025	0.2517	1.0000	
VA_pc	-0.2710	-0.0426	-0.2332	-0.3451	-0.3891	0.3953	-0.5740	-0.1765	1.0000

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Table A.4. Determinants of MF when the unit of analysis is the province

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Diss _{t-1}	0.325*** (4.73)	0.306*** (4.19)	0.315*** (4.45)	0.314*** (4.52)	0.288*** (4.49)	0.281*** (4.37)	1.130*** (5.55)
Crime _{t-1}	0.753*** (3.31)	0.546** (2.33)	0.509** (2.19)	0.389* (1.84)	0.159 (0.77)	-0.007 (-0.03)	0.090 (0.16)
Diss*Crime _{t-1}	-0.833* (-1.75)	-0.763 (-1.57)	-0.824* (-1.72)	-0.821* (-1.74)	-0.704 (-1.60)	-0.692 (-1.57)	-4.285*** (-4.29)
Np_loans _{t-1}		0.035*** (2.70)	0.034*** (2.69)	0.030** (2.19)	0.030** (2.19)	0.023 (1.63)	0.022* (1.85)
kg_waste _{t-1}			-0.000*** (-3.18)	-0.000** (-2.53)	-0.000** (-2.05)	-0.000 (-0.53)	-0.000 (-0.77)
Just_eff _{t-1}				0.000 (1.36)	0.000 (1.11)	0.000 (0.13)	0.000 (0.24)
Unempl _{t-1}					0.058*** (4.48)	0.060*** (3.85)	0.046* (1.86)
VA_pc _{t-1}						-8.231** (-2.31)	-6.427 (-1.34)
Cons	-0.131*** (-3.33)	-0.188*** (-4.15)	-0.021 (-0.40)	-0.133 (-1.63)	-0.692*** (-4.13)	-0.466*** (-3.54)	-0.333 (-1.08)
N. obs.	717	717	717	717	717	717	613
R ²	0.17	0.18	0.19	0.19	0.20	0.21	0.17

Notes. The dependent variable is MF. All regressions contain calendar year dummies (results not reported); the time span is 2011-2016. Standardised normal z-test values are in parentheses; cluster-robust standard errors. Equations from (1) to (6): random effects estimations. Eq. (7): IV estimation where **Diss**, **Crime** and **Diss*Crime** are treated as endogenous and they are instrumented with lags of exogenous regressors and IV: **Murders** and **Laundering**. Significant coefficients are indicated by * (10% level), ** (5% level) and *** (1% level).

Table A.5. Determinants of EMF when the unit of analysis is the province

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
EMF_{t-1}	-0.117*** (-4.73)	-0.120*** (-4.88)	-0.120*** (-4.80)	-0.121*** (-4.83)	-0.121*** (-5.02)	-0.119*** (-4.65)	-0.231*** (-4.34)
Diss_{t-1}	0.173 (0.45)	0.171 (0.44)	0.173 (0.45)	0.177 (0.45)	0.178 (0.45)	0.159 (0.40)	1.287 (1.50)
Crime_{t-1}	-0.006 (-0.01)	0.075 (0.12)	0.081 (0.13)	0.097 (0.16)	0.101 (0.17)	0.237 (0.39)	6.718* (1.88)
Diss*Crime_{t-1}	-1.354 (-0.71)	-1.320 (-0.69)	-1.332 (-0.69)	-1.354 (-0.70)	-1.359 (-0.70)	-1.242 (-0.63)	-6.335 (-1.37)
Np_loans_{t-1}		0.022 (1.16)	0.023 (1.19)	0.022 (1.15)	0.022 (1.16)	0.023 (1.21)	0.026 (1.30)
kg_waste_{t-1}			-0.000 (-0.12)	-0.000 (-0.13)	-0.001 (-0.12)	0.000 (0.06)	-0.003 (-0.77)
Just_eff._{t-1}				-0.000 (-0.09)	-0.000 (-0.12)	-0.000 (-0.05)	0.000 (0.60)
Unempl_{t-1}					-0.016 (-0.08)	-0.054 (-0.25)	-0.039 (-0.14)
VA_pc_{t-1}						-98.063* (-1.93)	-207.724* (-1.68)
Cons	-0.009 (-0.08)	-0.084 (-0.61)	0.084 (0.06)	0.134 (0.09)	0.292 (0.16)	2.612 (1.03)	4.534 (1.21)
N. obs.	613	613	613	613	613	613	510

Notes. The dependent variable is *EMF*. All regressions contain calendar year dummies (results not reported); the time span is 2012-2016. Standardised normal z-test values are in parentheses; cluster-robust standard errors. Equations from (1) to (6): GMM estimation with all regressors exogenous. Eq. (7): GMM estimation where **Diss**, **Crime** and **Diss*Crime** are treated as endogenous and they are instrumented with lags of exogenous regressors and IV: **Murders** and **Laundering**. Significant coefficients are indicated by * (10% level), ** (5% level) and *** (1% level).

Table A.6. Determinants of MF in Centre-North and South of Italy using data at provincial level.

	Centre-North		South	
	(1)	(2)	(3)	(4)
Diss_{t-1}	-0.125 (-1.00)	-0.173 (-0.23)	0.287*** (3.54)	0.944*** (3.08)
Crime_{t-1}	0.807 (0.96)	1.025 (0.21)	-0.651 (-1.36)	0.463 (0.35)
Diss*Crime_{t-1}	1.367 (0.99)	-11.86 (-1.01)	-0.769* (-1.79)	-3.793** (-2.42)
Np_loans_{t-1}	0.017 (1.01)	0.020*** (3.27)	0.043** (1.56)	0.048* (1.67)
Kg_wastes_{t-1}	-0.000 (-0.74)	-0.000 (-0.82)	0.001 (0.93)	0.000 (0.27)
Cond_{t-1}	-0.000 (-0.44)	-0.000 (-0.57)	0.000 (0.01)	0.000 (0.32)
Just_eff_{t-1}	0.07 (0.69)	0.005 (0.43)	0.069 (1.55)	0.061 (0.85)
Unempl_{t-1}	1.831 (0.65)	2.168 (0.92)	-29.773* (-1.92)	-25.187 (-1.14)
VA_pc_{t-1}	-0.135** (-2.27)	-0.115 (-0.89)	-0.540 (-1.04)	-0.680 (-0.70)
N. obs.	466	398	251	215
R²	0.05	0.05	0.27	0.22

Notes. The dependent variable is *MF*. All regressions contain calendar year dummies (results not reported); the time span is 2010-2016. Standardised normal z-test values are in parentheses; cluster-robust standard errors. Equations (1) and (3): random effects panel data estimations; equations (2) and (4): IV estimation where **Diss**, **Crime** and **Diss*Crime** are treated as endogenous and they are

instrumented with lags of exogenous regressors and IV: **Murders** and **Laundering**. Significant coefficients are indicated by * (10% level), ** (5% level) and *** (1% level).

Table A.7. *The effects of mafia firms on entrepreneurship, unemployment and migration at provincial level.*

	Y= Migr_rate	Y=Unempl	Y=Impr_rate
Y_{t-1}	0.195*** (3.10)	0.308*** (3.82)	0.273*** (11.80)
L_firms_{t-1}	-0.000 (-0.33)	0.034 (0.48)	-1.310*** (-11.43)
MF_{t-1}	-0.000*** (-2.67)	-0.005 (-0.43)	0.001 (0.41)
Crime_{t-1}	0.000 (0.42)	-0.162 (-0.88)	-0.018 (-0.57)
Unempl_{t-1}	-0.000 (-1.05)		0.118 (1.41)
VA_pc_{t-1}	0.008 (0.21)	-22.629** (-2.05)	19.688 (1.16)
Cons	0.008* (1.69)	7.191*** (5.94)	12.135*** (10.77)
N. obs.	613	613	613

Notes. All regressions contain calendar year dummies (results not reported); the time span is 2012-2016. Standardised normal z-test values are in parentheses; cluster-robust standard errors. GMM estimation with all regressors exogenous. Significant coefficients are indicated by * (10% level), ** (5% level) and *** (1% level).

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