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Mafia infiltrations in times of crisis: Evidence from the Covid-19 shock

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Evidence from the Covid-19 shock

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Abstract

We analyse the risk of mafia capture of firms operating in the legal economy. Specifically, we study the relationship between firm performance and mafia infiltration. To overcome possible endogeneity concerns we exploit the abrupt drop in revenues caused by the (unexpected) Covid-19 related closures imposed in Spring 2020 in Italy. Our estimates reveal that the induced sudden and significant worsening of affected firms financial conditions increased the likelihood of them being infiltrated by mafia-connected entrepreneurs. According to our preferred specification, a 10% drop in revenues leads to a 4.8% increase in the probability of a firm being infiltrated by the mafia compared to the baseline. These effects, however, were partly offset by the extraordinary measures put in place by the government to support financially distressed firms. Heterogeneity in the effectiveness of the different measures provides indirect evidence that firms are more likely to resort to mafia lending when they face temporary difficulties in repaying their debts.

JEL Classification: D22; G32; K42

Keywords: organised crime; firm performance; Covid-19

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1 Introduction

The relation between mafia expansion and the economy is complex and goes in both directions. On the one hand, some local economic conditions may provide a more fertile ground for the mafia to take root. The existing literature shows that mafia-type organisations have appeared and flourished in response to sudden large positive economic shocks that took place in contexts generally characterised by weak institutions, where mobsters were better able to enforce rules and thus gain power (Bandiera, 2003; Buonanno et al., 2015; Dimico et al., 2017; Acemoglu et al., 2020). On the other hand, however, the presence and expansion of mafia in a given area deeply influences its economic and social development. Evidence suggests that the overall long run impacts on GDP or social development indicators such as literacy rates, are negative (Peri, 2004; Pinotti, 2015a,b; Acemoglu et al., 2020). While this literature has identified some determinants and effects of mafia expansion at the aggregate level and in the long run, very little evidence is still available on the relation between mafia presence and local economic conditions at a micro level, especially for what concerns the determinants of mafia penetration.[2]

This paper contributes to filling this gap by investigating the role of mafia organisations as lenders to firms in financial distress. To this end, we use Italian firm-level data and estimate the relationship between firm performance and the likelihood of mafia entry in the firm's share capital. This exercise allows us to establish whether and to what extent a worsening in a firm's economic and financial situation increases the demand for mafia liquidity facilitating the take over of the firm by a criminal organisation and thus the expansion of mafia in the legal economy. Moreover, we take stock of the government interventions aimed at supporting firms in distress after the Covid shock to investigate what features of the formal credit system most hamper access to it by financially distressed firms hence favouring their resort to mafia capitals.

To provide contextual background, imagine that legal firms in financial distress can resort to two types of lenders: commercial banks providing formal credit and illegal mafia-type liquidity providers. In this setting, entrepreneurs face a trade-off when selecting their funding

[2] Mirenda et al. (2022) provided a deep analysis of the effects of the entry of mafia into a firm's ownership or governance structure on the firm's performance.

source. On the one hand, banks operate within the boundaries of the law but demand firms to meet specific requirements in order to receive credit. On the other hand, illegal liquidity providers have fewer requirements for firms in the short run but, by means of threats and violence, may eventually take control of the firm and push it into illegal activities, even when holding a small share of it. Under normal circumstances, legal firms would thus typically prefer to resort to banks. However, illegal lenders may be preferred during times of financial distress in case firms face an unexpected and urgent need for liquidity and are not able to meet the criteria required by banks.

Our analysis draws from detailed microdata on Italian incorporated firms, combining panel balance sheet data with information on the full shareholder structure of firms for the years 2018-2020. The infiltration of mafia into a given firm is proxied following the methodology introduced by Mirenda et al. (2022). While we do apply our methodology to all the Italian mafia organisations, our main focus will be the 'ndrangheta, for which we are better able to identify criminal connections within the firm's ownership.[3] Using this methodology, we find that about 0.84% of firms in our sample were connected to the 'ndrangheta in 2020, 0.79% in 2018.

A natural concern is that a firm's performance and the likelihood of it being connected to mafia may be endogenously related. This would be the case if, for instance, more capable entrepreneurs were also generally more honest, so that better performing firms would be less likely to be infiltrated. Moreover, to the extent that mafia acts as a liquidity provider to firms which have more difficulty in accessing formal credit, better performing firms will be less likely to be in need for such loans. In order to overcome such endogeneity concerns, we employ an instrumented Difference-in-Differences (DDIV) strategy where we exploit the closing of firms operating in *non-essential activities* ruled by the Italian government in response to the Covid-19 pandemic as an instrument for the change in firm performance. Italy was the first country, after China, that faced the pandemic through lockdowns, so that the measures, enacted from March 2020, were completely unexpected. Moreover, the closures did not affect

[3]The 'ndrangheta, as argued in Mirenda et al. (2022), is characterised by a tight family structure so that clans and families largely overlap. As the methodology is based on the predictive power of family names, it is more accurate in the case of 'ndrangheta than for other other mafia organisations. In Appendix B we extend our analysis to other mafias.

all types of businesses, but only the *non-essential* ones, as defined on the basis of a 4- or 6-digit sectoral classification made at the beginning of the emergency. The closures lasted more than two months and implied an immediate massive drop in revenues for the firms involved.

Our main estimates show that: (i) being affected by the forced closures of March 2020 produced a large significant worsening in all indicators of firm performance and financial soundness (*first stage*); revenues dropped by almost 10%, profitability by about 2.5%, current assets (a measure of available liquidity) by 2.7%, the risk score increased by 0.11 points on a 1 to 10 scale (where a higher score indicates a less reliable firm) and equity decreased by almost 4%; (ii) such exogenous worsening of firm performance increased the probability of mafia infiltration in the firm. Our preferred specification shows that a 10% drop in revenues raises the probability of a firm being infiltrated by about 0.04 percentage points. While small in absolute value, this coefficient corresponds to an increase in infiltrations of almost 5% over the baseline. Similar results are obtained when substituting revenues with other economic and financial indicators, such as profitability, available liquidity, risk score and equity. (iii) Moreover, we find some heterogeneity in treatment effects with slightly larger effects for firms located in the North of Italy, a more contestable and profitable market, and for firms operating in the service sector.

Finally, we offer insights into the factors influencing legal firms' reliance on mafia lending. To investigate this, we leverage data on three extraordinary policies implemented by the Italian government to support distressed firms during the Covid-19 crisis. These policies aimed to provide either free liquidity or improved access to credit for firms. By interacting firm revenues with dummy variables indicating the receipt of any or specific government aids, we find compelling evidence suggesting that the receipt of these measures reduced the likelihood of mafia infiltration. Moreover, among the various government assistance programs, grants, which provided quick, free liquidity to all small firms, proved to be the most effective in deterring infiltration. In addition, debt moratorium was also particularly effective in preventing infiltration, indicating that firms burdened with existing debts are more susceptible to falling under the influence of the mafia. On the other hand, the receipt of government guaranteed loans did not reduce the likelihood of infiltration, thus suggesting

that, at least in our setting, the need for collateral to access formal credit is not a significant factor that pushes firms towards mafia lending.

Our baseline results prove robust to a set of checks, namely (i) comparing mafia infiltration to *clean* shareholder entry, (ii) excluding historical mafia regions, (iii) restricting the control group to firms not infiltrated by any other mafia, (iv) employing different sets of fixed effects.

Overall, the findings of this paper prove that mafia takes advantage of situations of firm financial distress. Thanks to its ability to provide prompt liquidity, it exploits negative economic shocks to infiltrate legal firms and widen its presence, especially in most profitable areas like Northern Italy. The results in the second part of the paper further specify which firms are more at risk of infiltration, pointing to those that are less able to obtain formal credit due to their deteriorated credit history.

Our research contributes to the expanding body of literature that examines the intricate relationship between organised crime and the economy (Pinotti, 2013; Acconcia et al., 2014; Savona et al., 2016; Di Cataldo and Mastrorocco, 2021). More specifically, we add to the strand of literature which studies the infiltration of organised crime in legal firms (Slutzky and Zeume, 2018; Calamunci and Drago, 2020; Bianchi et al., 2021; Mirenda et al., 2022; Marcolongo, 2023). Some recent papers have shown that firms located in more mafia intense areas (provinces) generally suffer less in times of crisis (Le Moglie and Sorrenti, 2022) and specifically are more likely to experience changes in their ownership structure (De Luca et al., 2023), an occurrence that may signal mafia infiltration. Relative to these contributions, we are able to take a micro (firm-level) approach by exploiting information on firms' shareholders and balance sheets to directly identify mafia infiltration at the firm level and hence show that financial distress causally increases the likelihood of mafia infiltration in the firm. Our estimates allow us to qualify the magnitude of such relation. In addition, we leverage data on the extraordinary policies implemented by the government to investigate the drivers behind the firms' decision to resort to mafia-type rather than legal lending.

The remainder of the paper is structured as follows: Section 2 introduces the data used for the analysis and provides some descriptive statistics; Section 3 discusses our identification strategy; Section 4 shows our results; Section 5 investigates the role of the formal lending system; Section 6 is dedicated to our robustness checks; Section 7 concludes.

2 Data and Descriptive Statistics

2.1 Data

Our paper combines several data sources on Italian incorporated firms to estimate the relationship between firm performance and mafia infiltration.

First, we exploit the Company Account Data Service (CADS), which contains balance sheet information for the universe of Italian corporations. We extract yearly information covering the time span 2016-2020 on sector of economic activity, age, revenues, debts, equity, assets, measures of profitability – EBIT, EBITDA and Return On Assets (ROA) –, proxies of liquidity (e.g. current assets), leverage and a risk score – which is assigned by the CADS on a scale from 1 to 10, where a higher score indicates a less reliable firm.

Second, we retrieve information on the full ownership structure of Italian firms from the Italian Chamber of Commerce database (*Infocamere*). Imposing the lower bound on ownership to 0.01% of a firm's shares, we reconstruct the ownership structure by tracking the owners of the owning companies up to eight levels. In such a way, we consider both direct and indirect shareholders.

Third, we make use of the information published by the Anti-Mafia Investigation Directorate (DIA), an Italian multi-force investigation body under the Ministry of the Interior which aims at contrasting mafia-related organised crime. We extract from its first (of two) 2021 report[4] the family names of clans' components from four Italian mafias ('Ndrangheta, Camorra, Sacra Corona Unita and Mafia Lucana). We exclude Cosa Nostra as the report does not contain full information on the family names of the affiliates.

Fourth, we exploit the division of business activities between *essential* and *non-essential activities* ruled by the Italian government in March 2020 with the objective of preventing the diffusion of the Covid-19 pandemic. The division is based on a 4- or 6-digit sectoral classifications and it is used to create the *Closing* instrumental variable that we describe in Section 3.

Finally, we have information on the take-up of three extraordinary policies that the

[4]An online version can be found at https://direzioneinvestigativaantimafia.interno.gov.it/relazioni-semestrali/ and it is available in Italian.

Italian government launched to help firms in financial distress after March 2020 – grants, debt moratorium and government guaranteed loans. The data sources for these measures are described in detail in Pelosi et al. (2021). For our purposes, one caveat is that data on debt moratorium cover only firms which have been sampled by Anacredit – more than half of the firms in our sample – which only include firms with ongoing credit relations with banks. Hence, the analyses which use these data will be based on this subsample.

The infiltration of mafia into a firm is proxied following the methodology introduced by Mirenda et al. (2022). This indicator exploits the predictive power of family names by combining data on firms' governance and ownership with reports from anti-mafia investigations. The indicator flags as infiltrated any firm that, in a given year, lists among its shareholders at least one person who is (i) born in a mafia region, and (ii) whose family name coincides with one of those listed by DIA among mafia families. Whenever these two conditions are jointly met we flag the firm as infiltrated from that year onwards. As in Mirenda et al. (2022), our main focus will be the 'ndrangheta, a mafia organisation that originates from the Italian region of Calabria and that is characterised by a tight family structure so that clans and families largely overlap. To show the validity of the indicator in this context, we perform several robustness checks in Section 6.[5]

2.2 Descriptive Statistics

Our final sample covers the period 2018-2020 and is a balanced panel made of 549,203 corporations which are observed during the entire period. We match firms on their fiscal code, which is a unique identifier for every Italian firm. The reasons why we are not including the universe of corporations in the sample are the following: (i) we include only firms for which we have complete 6-digit sectoral classification in 2020, in order to accurately impute the forced closure, (ii) we keep firms which are observed in the entire 3-years period to estimate how criminal organisations infiltrate *existing* firms after negative economic shocks.[6]

According to our methodology, 4,652 firms had at least one shareholder connected to

[5]For a more comprehensive discussion of the indicator see Mirenda et al. (2022) and, in particular, Online Appendix B.

[6]Imposing these two conditions leads us to drop 351,321 (39%) firms among those covered by CADS data in 2018.

'ndrangheta in 2020 and 250 of these were infiltrated exactly in 2020[7]. It increased from 0.79% to 0.84% between 2019 and 2020.

Focusing on the 'ndrangheta, we observe that it concentrates in the construction sector (19% of all infiltrated firms), followed by wholesale and retail trade, real estate, manufacturing and accommodation and food services (Figure 1). However, when looking at the change in sectoral distribution between 2019 and 2020 we notice that 'ndrangheta expanded its presence in all macrosectors (industry, market and non-market services) - with its growth led by manufacturing, professional business services, information and communication and utilities - without growing in any of its top three sectors.

[Figure 1]

Geographically the 'ndrangheta concentrates in Calabria – the region of origin – and in the Noth-West of Italy, where the business is more profitable and thus attractive (Figure 2). The high share observed in Calabria (more than 20%) suggests that either Calabrian firms are largely infiltrated by 'ndrangheta, or that our methodology tends to overestimate infiltration in the region of origin.[8] Interestingly, the share of 'ndrangheta infiltrated firms is very low in many Southern regions (Puglia, Campania, Sardegna and Basilicata), suggesting that mafias shield their territories of origin from external criminal organisations and that there is competition between criminal organisations.[9]

[Figure 2]

3 Identification: the Covid-19 shock

3.1 Instrumented Difference-in-Differences

A natural concern is that a firm's performance and the likelihood of being connected to mafia may be endogenously related. This would be the case if, for instance, more capable

[7]The share of infiltrated is larger than what has been found by Mirenda et al. (2022) in the Centre and North only (0.84% vs 0.7%).

[8]To mitigate this concern, we run our estimates in section 6 also excluding the region of origin and show that our results hold anyway.

[9]See Appendix Figure B1 for comparison with the geographical distribution of other mafias.

entrepreneurs were also generally more honest, so that better performing firms would be less likely to be infiltrated. Similarly, better performing firms will be less likely to be in need for illegal liquidity as they will more easily access the formal lending sector. On such grounds, OLS regression estimates of a dummy for mafia infiltration on firm's performance is unlikely to be consistent.

In order to overcome these endogeneity concerns, we exploit a large and unexpected shock to firm performance which caused an immediate massive drop in firms' revenues. Specifically, we exploit the closing of firms operating in *non-essential activities* ruled by the Italian government in March 2020 with the objective of preventing the diffusion of the Covid-19 pandemic. Italy was the first country, after China, that came to face the pandemic through lockdowns, so that the measures were completely unexpected. Moreover, the closures did not affect all types of businesses, but only the *non-essential* ones, as defined on the basis of a 4- or 6-digit sectoral classification (ATECO, the Italian equivalent of NAICS). The closures were established, through Decrees of the Prime Minister, on March 8, March 11, March 25, April 14 and April 26. Each decree provided a list of activities that could not be operated, hence the duration of the closing period varied across sectors. On May 3 all bans were lifted and all firms could get back in business. To impute firm closings, we use the sector of activity indicated in the 2020 balance sheets, as this was what defined the closing during the Covid period.[10] In 2020, more than 60% of firms in our sample had been closed for at least 19 calendar days, the maximum length being 67 days.

To give the reader a better sense of the identifying variation we are using, consider two manufacturing firms, both working in the 4-digit sector *Repair of machinery* – 33.12. However, one is specialised in the repair of agricultural tractors (33.12.60) and the other in the repair of interchangeable parts for machine tools (33.12.91). The former was exempted from closures because considered an essential activity whereas the latter had to close for 38 days. An other interesting example is that of firms in wholesale of measuring machinery and equipment for scientific use (46.69.91, left open) and firms in wholesale of measuring machinery and equipment for non-scientific use (46.69.92, closed for 19 days).

[10]Many in Italy have been worried by the fact that firms might have changed their sector code to avoid forced closures. However, we believe this has had a negligible impact on our analysis as not even 2% of firms in our sample eventually changed it and this number is in line with data in the previous years.

Figure 3 shows the distribution of firm closings by sector. We define firms under the forced closings as *treated* and the others as *controls*. We notice that there is significant heterogeneity across ISIC sectors, with manufacturing, construction, accommodation and food services, and real estate (C, F, I, L) being the most affected by closings. The definition of activities ruled by the Italian government provides also heterogeneity within ISIC sectors, as many of these are almost evenly split between treated and control firms.

[Figure 3]

Overall, the closures implied an immediate massive drop in revenues for the firms involved. However, the effects may have been mitigated by the spread in the use of work from home arrangements, which allowed firms to keep operating even during closures. Moreover, some exceptions to the decrees were ruled by the local (province-level) prefects allowing more firms to operate. Hence, our coefficients of the effects of closures on firm performance indicators may overall be slightly underestimated.

Regarding the final impact on mafia infiltration, there has been a widespread concern that the Covid shock may have facilitated the expansion of criminal organisations in the legal economy. Data from the Bank of Italy's survey on firms show that the fear of mafia infiltration raised significantly after Covid, especially for what concerns operations of anomalous business financing and acquisitions, in particular among entrepreneurs operating in sectors more affected by the shock (Mocetti and Rizzica, 2023). The proportion of firms reporting occurrences of phenomena associated with organised crime in their operating market in 2020 has shown a notable increase, rising from 9% to 16% with respect to the previous year. Notably, this increase has been particularly significant in Northern Italy, where there has been an almost threefold rise in offers to enter as shareholders.

Our final identification strategy exploits closures as an exogenous source of variation for revenues (or other balance sheet variables). This allows us to identify the causal impact of a drop in revenues on the likelihood of infiltration. Specifically, we implement the following instrumented difference-in-differences strategy (DDIV):

$$NDR_{ijlt} = \alpha_i + \beta X_{ijlt} + \phi_{Jt} + \psi_{lt} + \epsilon_{ijlt} \tag{1}$$

$$X_{ijlt} = \gamma_i + \pi Z_j T_{2020} + \xi_{Jt} + \nu_{lt} + \eta_{it} \tag{2}$$

where Equation 2 is the First Stage equation and Equation 1 is the Second Stage equation of our model. NDR_{ijlt} is is a dummy variable which equals 1 if firm i operating in (6-digit) sector j and province l is infiltrated from year t onwards. X_{ijlt} is a proxy of firm performance in year t as from balance sheet variables. Z_j is the closing instrument, which is different from zero for firms operating in a sector required to close. In our preferred specification, we employ the closing instrument as a dummy variable, while in Section 4.3 we further explore differences stemming from the intensity of treatment. T_{2020} is a dummy variable for year 2020. ϕ_{Jt} and ξ_{Jt} are 4-digit-sector by year fixed effects and ψ_{lt} and ν_{lt} are province by year fixed effects to account for potential shocks which may affect firms across sectoral and spatial clusters. By controlling for firm fixed effects α_i and γ_i we are also able to account for a set of unobservable and idiosyncratic time-invariant firms' characteristics which might be an important driver of mafia infiltration. Robust standard errors are clustered at firm level.[11] The coefficient of interest is β which represents the *average causal response* of a change in firm performance on the likelihood of mafia infiltration for firms whose revenues are affected by the forced closures.

3.2 Identifying assumptions

As outlined by Imbens and Angrist (1994) and Hudson et al. (2017), our methodology requires two exclusion restrictions and two further assumptions:

- Exclusion Restriction 1 (ER1): *Covid-related closures affect 'ndrangheta infiltration only through the change in firm performance.* This assumption would be violated if, for example, mafia had taken part in the decision process through which essential and non-essential activities were decided - given its seemingly arbitrary nature. That is, it might have convinced policymakers to either list as essential the sectors in which its presence is consolidated, or list as non-essential the sectors in which it aimed to expand. However, two pieces of evidence contrast with this hypothesis. The first one is the nature of the decision. The list was proposed by the Minister of Health and approved

[11] See Section 6 for alternative specifications and in particular Appendix Tables A1 and A2.

by the Italian Prime Minister after consultations with the other Ministers. Unless one suspects that high members of the Italian government were easily manipulable by lobbies (and even mafia members) in a situation of great emergency, the division of business activities should not be strategically related to mafia infiltration. As a second point, Table 1 reports some balance tests between control and treated firms in 2020. Column (3) shows the raw difference in means and column (4) shows the difference in means controlling for province and (four-digit) sector fixed effects. It suggests that treated firms are those in which mafia is more present before 2020 and hence, if anything, the division of activities has penalised infiltrated firms. The same holds for the other mafias, both taken all together or separately. Another potential mechanism which may impair the exclusion restriction is the following: according to *Istituto Superiore di Sanità*, Italy's top health institute, in 2020 75,891 people died because of Covid-19 and Covid-related deaths were more likely among the elderly. The death of a shareholder might make a firm more vulnerable and therefore more easily captured by mafia. We check for this by inspecting whether the average age of shareholders is different across treated and control group. The last row of Table 1 shows indeed that, after controlling for province and sector fixed effects, there is no difference in average shareholders' age, implying that this channel should not be a concern;

[Table 1]

- Exclusion Restriction 2 (ER2): *the closing instrument does not affect past infiltration nor past balance sheets*, which is trivially satisfied as closures were unexpected and completely unrelated to firm's performance before March 2020;
- Parallel Trend Assumption (PTA): parallel trends on the outcome variable and the balance sheet variables can be visually inspected in Figures A1 and A2 where we plot the results of an event study regression using the fixed effects employed in our most preferred specification; the figures show no differences between treated and control firms in the trend of the variables before 2020 (with the partial exception of profitability);

- Instrument Monotonicity (IM): the closing instrument affects firm's performance only in one direction, in our case negatively. This assumption can be verified by looking at the significance of the coefficient π in the First Stage Equation 2 and by considering that shutting down activities for a certain period should have consequences only in one direction – for instance, lowering revenues – for every treated firm.

4 Results

4.1 Reduced form estimates

First we investigate the relation between firm closures and the likelihood of being infiltrated by 'ndrangheta by estimating the reduced form of our DDIV model (Equations 1 and 2):

$$NDR_{ijlt} = a_i + bZ_jT_{2020} + c_{Jt} + d_{lt} + e_{ijlt} \tag{3}$$

Table 2 shows the estimates of the reduced form regression under two specifications. The closing instrument is a dummy variable – $Z_j = \{0, 1\}$ – in Panel A and the number of closing days – $Z_j \in [0, 67]$ – in Panel B. The firm fixed effects are added only in column (3), to show the cleanest estimate we have available. The coefficient shown is b and it is positive and significant, suggesting that closing was associated with an increase in the likelihood of being infiltrated in the order of 0.00036 pp (0.45% over the baseline). In addition, although estimates are less precise, Panel B shows that every extra closing day is associated with an increase in the likelihood of infiltration.

[Table 2]

4.2 DDIV results

Table 3 presents the key findings of our study, with revenues serving as the primary variable of interest. The relation between revenues (or other firm performance indicator) and the likelihood of infiltration is ex-ante ambiguous: on the one hand we expect criminal organisations

to be better able to capture firms in distress, on the other hand they will preferably target sound activities so as to make profits.

In column (1) we report our OLS estimates. We find that higher revenues are associated with a slightly higher likelihood of mafia infiltration. This positive, though small, coefficient can be interpreted as the signal of the interest of criminal organisations for profitable activities. However, in order to attach a causal interpretation to our estimates, we need to resort to the 2SLS estimates in columns (2) to (4).

First, in Panel C, we document a significant and substantial negative impact on firm revenues resulting from the forced closures of Spring 2020. Relative to essential activities, firms that were forced to close their business for some period of time, experienced a drop in revenues of almost 9 to 10% depending on the specification.

Second, this exogenous shock to revenues is found to increase the likelihood of infiltration by the 'ndrangheta (Panel B). The F-statistic indicates that our measure is not weak according to the commonly used rule of thumb (Staiger and Stock, 1997), as it is largely above 10. Furthermore, our coefficient estimates remains highly significant, though slightly smaller in magnitude, even after incorporating firm fixed effects. In our preferred specification (column 4), which includes firm fixed effects, we find that the Covid-related closures led to a 9% decrease in revenues. The induced variation in revenues caused an increase in the probability of 'ndrangheta infiltration: the estimated effect is of 0.039 percentage points (pp) increase in the likelihood of infiltration for a 10% decrease in revenues. While apparently small in magnitude, if we compare these coefficients to the baseline likelihood of infiltration we can argue that a drop in revenues of 10% increases the probability of a firm getting infiltrated by 'ndrangheta by almost 5%. Reassuringly, the product of our first and second stage coefficients returns the reduced form coefficient estimated in Table 2.

[Table 3]

4.3 Other results

We then explore the relationship between firm performance and infiltration through several other balance sheet variables including both other economic and financial indicators. Specifically, in Table 4, we include EBITDA, current assets[12], equity, and a credit risk score in our model. Overall, the forced closures caused a significant and substantial deterioration in all indicators of firm performance and financial stability. Profitability experienced a decline of about 2.6%, current assets decreased by 2.7%, equity decreased by over 4%, and the risk score increased by more than 0.1 points on a scale of 1 to 10 (where a higher score indicates a less reliable firm). Importantly, a worsening in financial conditions led to an increase in the likelihood of 'ndrangheta infiltration. Specifically, a decrease in profitability by 10% increases the likelihood of infiltration by 0.14 pp. A decrease in current assets of the same amount increases the likelihood of infiltration by 0.13 pp. A decrease in equity by 10% leads to an increase in the likelihood of infiltration by 0.09 pp. Finally, an increase in the risk score of 1 leads to an increase in the likelihood of infiltration by 0.003 pp. Given the size of the first stage coefficients and the baseline incidence of mafia infiltrations, these estimates suggest that the magnitude of the shock caused by Covid-19 related closings coherently implied an increase in the likelihood of infiltration in the order of 4.5% for the loss in profitability, 4.3% for the loss in current assets, 4.6% for the loss in equity and 4.7% for the increase in the risk score.

[Table 4]

In Table 5, then, we investigate whether the intensity of the shock, specifically the duration of the forced closure, affects the probability of infiltration. To explore this, we substitute the instrument dummy of our main specification with a continuous instrument which takes values between 0 and 67 depending on the number of closing days. These estimates reveal the importance of the closing period length, as they imply that going from the 10^{th} percentile to the 90^{th} percentile in terms of closing days (38 to 67) increased the likelihood of infiltration from 2.8% to 4.9%. Note that the implied estimated elasticity

[12]Current assets represent the most accurate proxy for liquidity we have available, given that they are defined as cash or cash equivalents which can be converted to cash through liquidation, use, or sales within one year.

between revenues and the likelihood of infiltration remains very similar to the one of the main specification.

[Table 5]

Table 6 reports the estimates of some heterogeneous effects. First, in columns (1) and (2) we split our sample of firms between those operating in industry (manufacturing, agriculture and mining), and those operating in the service sector. Our findings indicate that 'ndrangheta has exploited the exogenous shock to expand its presence in the service sector. The likelihood of infiltration in this sector increases by more than 5%, which is higher than the baseline results. The preference for the service sector can be explained both by the fact that these are on average more profitable activities and by the fact that they are also more prone to money laundering (Mirenda et al., 2022).

In columns (3) to (5), finally, we explore differences related to the geographical area in which firms are located. Our estimates here are less precise but the coefficients of the second stage point to the prevalence of northern regions among 'ndrangheta investments. In particular, the coefficient for southern regions, excluding Calabria, is essentially null – almost thirty times smaller in magnitude than the one for the North – and that for central Italy about one third of the one for the North. This is an interesting result implying that 'ndrangheta consolidated its presence where the business is more profitable (North), avoiding regions where its presence is contrasted by other mafias (Central and Southern Italy especially). This set of results is also consistent with the findings in Bosisio et al. (2021) for which after the Covid-19 shock a much larger share of firms located in Northern Italy changed their ownership structure – a phenomenon considered as a red flag for mafia infiltration.

[Table 6]

5 Formal credit versus mafia lending

In this section, we examine the relationship between some features of the formal lending system and mafia infiltration. Leveraging some specific public policy interventions aimed at

providing financial support to distressed firms, we aim at identifying which features of the formal lending system most explain why firms resort to mafia lending.

Interestingly, the Italian government implemented several extraordinary measures to provide liquidity and facilitate the granting of credit to firms, particularly Small and Medium Enterprises (SMEs), during the financial distress caused by the COVID-19 pandemic. We focus on three specific policies enacted between March and May 2020: (i) grants (*contributi a fondo perduto*), given to SMEs if their assets in 2019 were below 5,000,000 € and either had experienced a large drop in revenues between April 2019 and April 2020 or were not born before 2019, (ii) debt moratorium, available to SMEs (according to the European Union definition, i.e., employees below 250 and either revenues below 50,000,000 € or total assets below 43,000,000 €) that did not have any non-performing loan and (iii) government guaranteed loans, available to all firms with less than 500 employees.[13]

The three policies were promptly announced by the government, within two months of the onset of the Covid-19 pandemic. They are considered the most significant actions taken by the Italian government to support Italian firms in response to the shock caused by the pandemic. It is important to note that there were significant overlaps in the eligibility criteria for these policy instruments. Many firms were eligible for and received multiple forms of assistance, as the government aimed to target all SMEs in financial distress. Figure 4 shows the share of firms that benefited from these policies by length of their closing period: while treated firms were generally more likely to receive some type of government aid, there is sufficient variation in the take up across groups to estimate our DDIV model. We thus augment our baseline DDIV model (Equation 1) by interacting revenues with indicators for having received some, or a specific, government aid.[14]

[Figure 4]

Our analysis provides first evidence on the overall effectiveness of the measures adopted by the government in preventing mafia infiltration; second, and most interestingly in this

[13] Most of the public guarantees given were subject to a limit of 30,000 euro, a rather low value.

[14] This implies estimating a 2SLS regression in which we instrument revenues and the interaction between revenues and aids with the instrument and the interaction between the instrument and aids (Wooldridge, 2001)

context, it allows us to infer the specific needs of firms in financial distress by examining the effectiveness of the different policies. Indeed, grants highlight the need for free and quick liquidity without constraints nor requirements. Debt moratorium sheds light on the challenges posed by the pre-existing burden of debt to repay. Government guaranteed loans respond to the need for collateral.

The results from our augmented DDIV regression, as shown in Table 7, explore the role of receiving at least one form of government aid (col 1), and (at least) every specific aid type (col 2-4), in preventing mafia infiltration. First, we find that receiving any form of aid significantly mitigates the negative impact of revenue decline on the likelihood of infiltration, nearly halving its effect. Second, among the different aids, grants proved the most effective. This suggests that in a situation of financial distress firms benefit from the possibility of receiving liquidity with no constraints attached. Also debt moratorium proved effective, suggesting that firms with large existing debts are more likely to end up in the hands of mafia when they have difficulties in repaying their outstanding debts. Conversely, the fact that access to guaranteed loans did not reduce the risk of infiltration, is suggestive that firms do not resort to mafia lending rather than formal credit because they lack of collateral.[15]

[Table 7]

Overall, these findings suggest that firms resort to mafia lending not because they lack collateral (as in the case of government guaranteed loans), but rather due to expensive or difficult access to formal credit alternatives, in particular when they already face difficulties in repaying their outstanding debts with banks (as in the case of debt moratorium).

6 Robustness Checks

In this section we provide several robustness checks to assess the validity of our causal estimates.

[15]Looking at the various possible combinations of aids received, we find that grants and debt moratorium reinforce each other so that receiving both decreases the probability of infiltration more than receiving only one of the two. In the case of guaranteed loans, instead, results are generally not significant and seem to point at a lack of effectiveness of the instrument in preventing Mafia infiltration as shown in Table A3.

First, we aim to establish the effectiveness of our chosen indicator in predicting mafia infiltration.[16] We estimate our DDIV model using three main modifications:

1. We change the outcome variable from NDR_{ijlt} to $ENTRY_{ijlt}$, which is a dummy which takes value one from the date in which there is the entry of *any* shareholder onwards. This enables us to examine the overall trend of shareholder entries in financially constrained firms,

2. We change the outcome variable by considering $ENTRY\ NO\ NDR_{ijlt}$, which captures the entry of shareholders not affiliated with the mafia. This modification allows us to investigate whether financial distress triggers the entry of *clean* shareholders[17].

Our analysis demonstrates that financial distress reduces the likelihood of shareholder entry, regardless of whether we consider all entrants or only *clean* entrepreneurs (Table 8, columns (1) and (2)). This suggests that in general the presence of financial distress discourages new shareholder involvement – the likelihood of entry decreases by 8% with respect to baseline.

[Table 8]

Hence, the shock has two different implications. On the one hand, it leads to an increase in the likelihood of mafia infiltration, implying that mafia takes advantage of a situation of financial distress. On the other hand, it decreases the likelihood of shareholder entry, since the firm is now less appealing for an external entrepreneur. Overall, the modifications we made and the corresponding findings derived from our analysis provide strong evidence supporting the validity of our indicator in this particular context.

Second, we provide some indirect test of the exclusion restriction. For instance, it might be argued that the 'ndrangheta infiltrated firms that were listed among the forced closings

[16] Mirenda et al. (2022) show that in their context – where NDR_{ijlt} was employed as independent variable of the main specification – the estimates could be interpreted as a lower bound of the effects of mafia infiltration on firm performance. Our case is different, with NDR_{ijlt} being our dependent variable.

[17] To gain insights into the behaviour of flagged shareholders in comparison to their clean counterparts, we might also limit the analysis to firms that have experienced at least one shareholder entry. That is, firms that have experienced at least one shareholder entry in the period 2018-2020. Although we have tried this specification we have decided not to report it. Due to the low number of observations (N=176998), the first stage coefficient is be only borderline significant and the F-Stat is not strong.

because it anticipated that these would obtain more generous government aid. To check this potential violation of the exclusion restriction, we estimate the following equation:

$$Aids_{ijl} = \alpha + \beta_1 NDR_{ijl} + \beta_2 Entry\ NDR_{ijl} + \beta_3 Z_j + \beta_4 Z_j \times NDR_{ijl} + \beta_5 Z_j \times Entry\ NDR_{ijl} + \gamma_J + \delta_l + \epsilon_{ijl} \tag{4}$$

keeping only observations in 2020.

The dependent variable $Aids_{ijl} \in [0, 1, 2, 3]$ shows the number of government aids obtained by each firm i. $Entry\ NDR_{ijl}$ is a dummy variable which equals one only if the firm has been infiltrated in 2020. We also control for sector and province fixed effects, to deal with common spatial and sectoral shocks, and for other possible confounders which are highly correlated with eligibility to government aids (drop in revenues and labor costs between 2019 and 2020, and firm's age). The estimates of this equation may shed light on the validity of the exclusion restriction. In particular, we will interpret the coefficients on 'ndrangheta entry and on the interaction between 'ndrangheta entry and the closing dummy as follows: in case $\hat{\beta}_2$, $\hat{\beta}_5 < 0$, 'ndrangheta infiltration might be considered a substitute of government intervention, implying that mafia provides liquidity which enables firms to survive and therefore acts as a substitute of formal government; in case $\hat{\beta}_2, \hat{\beta}_5 > 0$, 'ndrangheta infiltration can be considered a complement of government intervention, suggesting that 'ndrangheta is attracted by government funds. This might suggest also that 'ndrangheta has more ability to receive extraordinary support. However, this seems highly implausible because of the nature of government aids and because it has been documented that the policy take-up rate has been very high for all measures. For instance, Arnaudo et al. (2022) shows that by the end of 2020, almost two firms out of three among those surveyed by Anacredit had received either debt moratorium or government guaranteed loans.

[Table 9]

Table 9 shows the estimates of the above equation. First, both $\hat{\beta}_2$ and $\hat{\beta}_5 < 0$, although they are not statistically different from zero. This implies that 'ndrangheta does not systematically infiltrate firms which obtained government aids. If anything, it suggests the opposite. Second, both $\hat{\beta}_1$ and $\hat{\beta}_3 > 0$, meaning that being infiltrated and being forced to shut down

the activities are both positively correlated with the number of aids received. However, the coefficient on their interaction term, $\hat{\beta}_4$, is actually negative, suggesting that infiltrated firms forced to close have a propensity to apply for (and receive) government aids that is lower than the other firms. Finally, notice that fixed effects and control variables do not change the sign nor the significance of our estimates. We also run the above specification substituting the number of aids received with each single aid[18].

Third, we check the robustness of our estimates to other three potential flaws: (i) our indicator might be overestimating 'ndrangheta infiltration in its region of origin, where the affiliates family names are more frequent compared to the rest of Italy, (ii) the selected control group is not the most desired one as it includes firms that are infiltrated by other mafias and (iii) there might be other regional shocks related to the *second phase* of the pandemic which differentially affected firms. Indeed, during the *second phase* (October 2020 – March 2021), a new Decree of the Prime Minister approved restrictions which had to be implemented at the regional level according to the local contagion index R_t. These rules were mainly restricting the freedom of movement of inhabitants (e.g. curfews at 11pm), rather than the regular course of business activities and for this reason we do not believe they impair the validity of our main specification.

To address the first concern, we run our baseline DDIV regression excluding either Calabria (Table 10, column 1) or all regions where the criminal organisations under consideration originate from (Calabria, Campania, Puglia and Basilicata, column 2). The results are robust to both sample restrictions, although the magnitude of the second-stage coefficients almost halves and is borderline significant (p-value equals 10.4). To address the second concern, we drop all firms which are infiltrated by other mafias at any point in time, in order to select as control group those firms which are never infiltrated by any mafia (column 3). In this case, our estimates are basically identical to our baseline specification, with statistical significance at 90% level. Finally, we also add sector-region-year fixed effects to take into account shocks to firms related to the *second phase*. In all circumstances we can state confidently that our predictions do not change qualitatively.

[18]The results are along the same lines and are shown in Appendix Table A4, A5 and A6.

7 Concluding remarks

The expansion of mafia organisations in the legal economy is a major and growing concern. In recent years criminal organisations have turned into multinational businesses where the boundary between illegal affairs and licit investments has become progressively more blurred. By taking over companies that operate in legal businesses mobsters manage to funnel the money coming from illegal activities into the legal economy and, in some circumstances, make substantial profits. Understanding when and how the mafia takes over legal activities is thus of primary importance to restrict the boundaries of its power and action.

This paper analyses the relationship between firms' financial conditions and the likelihood of being infiltrated by the mafia. In order to overcome the possible endogeneity concerns, we exploit the shock to firms revenues caused by the outburst of the Covid-19 pandemic and the subsequent sudden closure of all non essential activities in Italy in Spring 2020. Our main results show that an unexpected substantial drop in revenues, like the one caused by the anti Covid-19 restrictions, increases the likelihood of being infiltrated by the mafia significantly. To understand why firms resort to mafia lending allowing mobsters to infiltrate their businesses, rather than using formal legal credit, we exploit the availability of some extraordinary government measures aimed at quickly providing liquidity to firms in distress. Generally, our results show that access to any form of extraordinary government aid halved the impact of revenue decline on the likelihood of infiltration. However, most interestingly, by assessing the effectiveness of each single instrument, our results allow us to provide some indirect evidence about the underlying mechanisms behind firms' resorting to mafia lending. In this respect our findings suggest that firms resort to criminal organisations to obtain liquidity when access to formal credit is expensive – hence infiltration is less likely when firms obtain non-repayable grants – or when they have difficulties in repaying pre-existing debts – hence a debt moratorium reduced their need for extra, illicit, liquidity.

All in all, this paper enhances our still limited knowledge of how the mafia expands beyond its traditional boundaries into the legal economy and how such phenomenon can be counteracted. Further research should be done to uncover, for example, the structure of mafia investments and its effects on competition and aggregate productivity.

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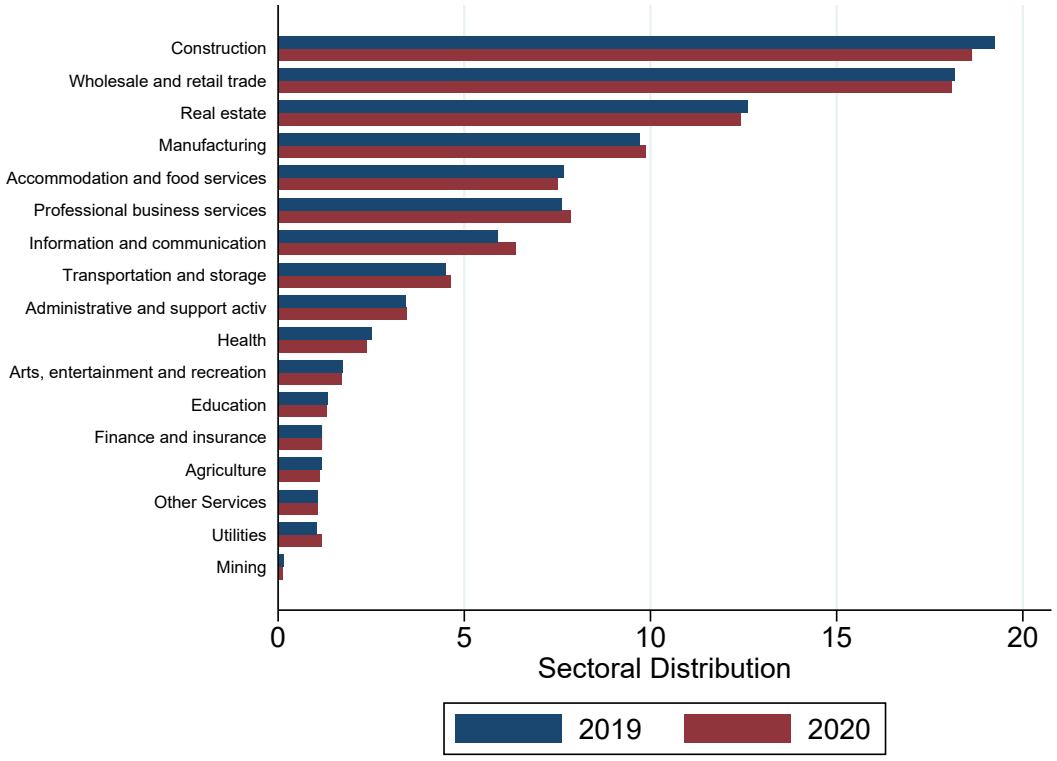
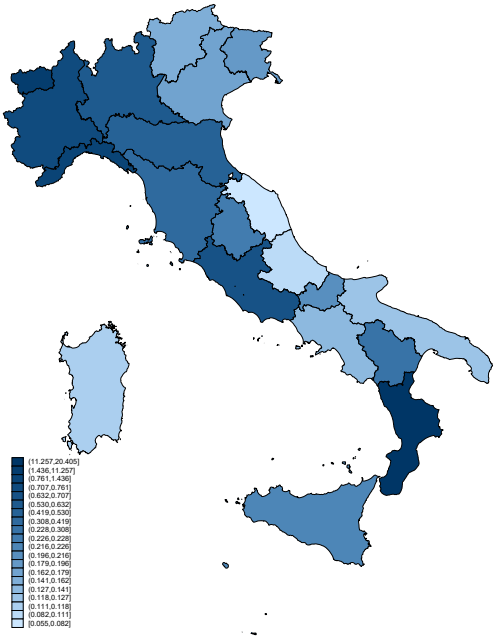
8 Figures

Figure 1: Infiltrations by sector



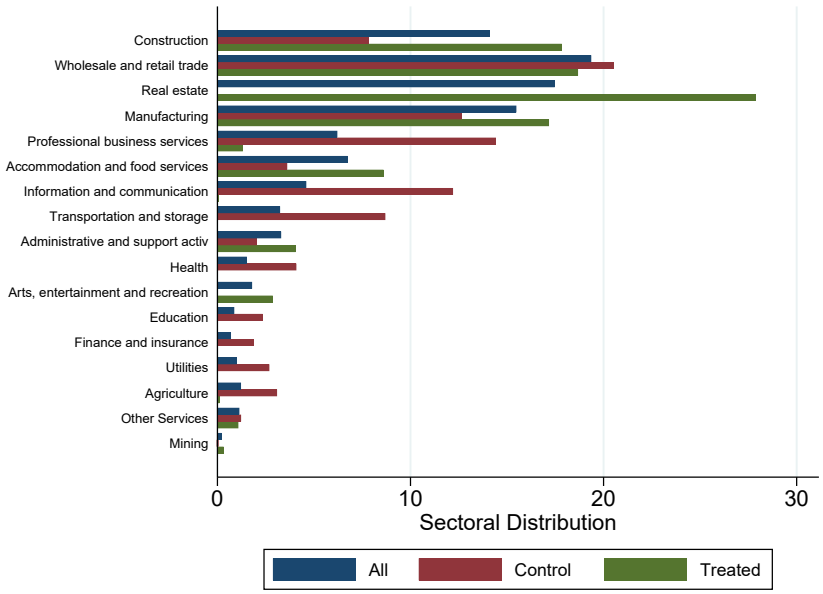
Notes: Panel A shows the sectoral distribution (i.e. the share of infiltrated firms by sector) of infiltrated firms in 2019 and 2020. Firms are sorted by the sectoral distribution in 2019.

Figure 2: Infiltrations by region



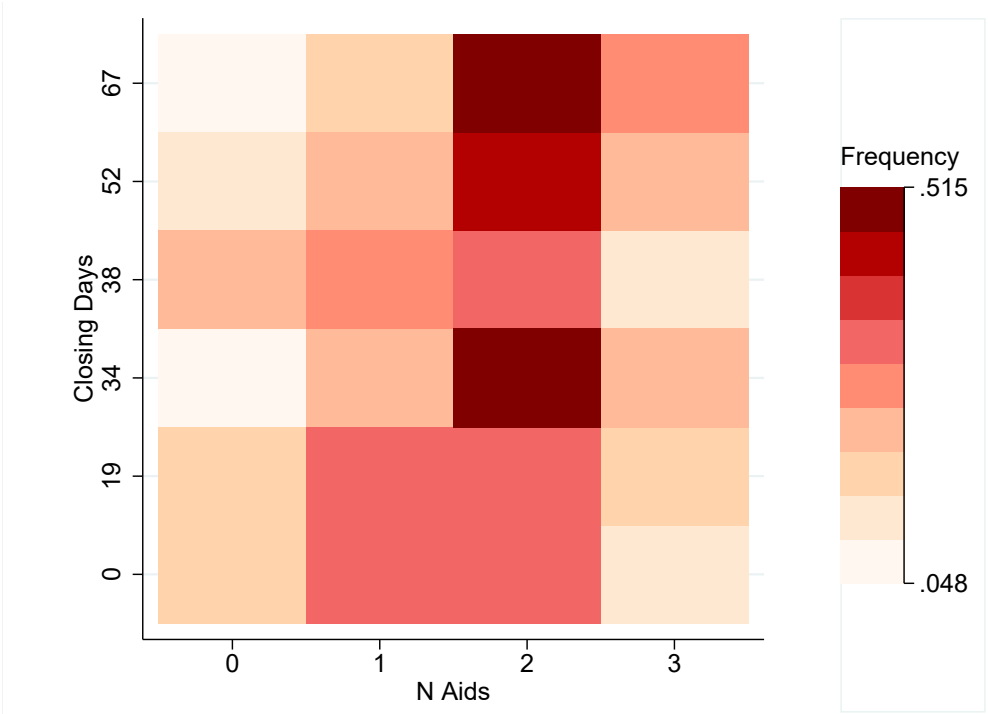
Notes: Share of 'ndrangheta infiltrated firms by region in 2020.

Figure 3: Closings by sector



Notes: Sectoral distribution of firms among all, control and treated units. Sectors are sorted by the sectoral distribution of infiltrated firms (i.e. the share of infiltrated firm by sector) in 2020.

Figure 4: Take-up by closing days



Notes: Share of firms obtaining government aids according to the closing period

9 Tables

Table 1: Balance Table

	(1) Control	(2) Treated	(3) Δ_1	(4) Δ_2
NDR	0.009	0.007	-0.002***	0.001
	(0.096)	(0.085)	(0.000)	(0.001)
CAM	0.023	0.019	-0.004***	-0.003
	(0.150)	(0.136)	(0.000)	(0.002)
SCU	0.010	0.007	-0.002***	-0.001
	(0.097)	(0.086)	(0.000)	(0.001)
MAF L	0.000	0.000	-0.000	0.000
	(0.012)	(0.011)	(0.000)	(0.000)
All Mafias	0.039	0.031	-0.008***	-0.002
	(0.194)	(0.174)	(0.001)	(0.002)
Shareholders' Age	49.895	51.764	1.869***	-0.091
	(10.585)	(11.820)	(0.032)	(0.148)
Observations	204,985	344,218	549,203	

Notes: Columns (1) and (2) report mean values for control and treated firms in 2019, respectively. Column (3) shows the raw difference in means between (2) and (1). Column (4) shows the difference in means after controlling for province and sector fixed effects. Robust standard error in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 2: Reduced Form

	(1)	(2)	(3)
Dependent variable:		NDR	
Panel A: Closing dummy			
Closing	0.000526**	0.000582***	0.000357**
	(0.000220)	(0.000218)	(0.000165)
Panel B: Number of Days			
Closing days	0.0000187	0.0000187	0.00000590*
	(0.0000145)	(0.0000134)	(0.00000339)
N	1518090	1518090	1518090
Firm FE			Yes
Sector-Year FE	Yes	Yes	Yes
Province-Year FE		Yes	Yes
Mean of Dep Var (%)	0.807	0.807	0.807

Notes: MWFE estimator. HDFE Linear regression. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level. Robust standard errors clustered at firm level in parentheses. Sector-Year fixed effects are at ATECO 4 digit level.

Table 3: Main results: revenues

	(1)	(2)	(3)	(4)
Dependent variable:	NDR			
Panel A: OLS				
(log) Revenues	0.0000923***			
	(0.0000349)			
Panel B: 2SLS				
(log) Revenues		-0.00535**	-0.00601**	-0.00388**
		(0.00231)	(0.00235)	(0.00184)
Panel C: First-Stage				
Closing		-0.0983***	-0.0968***	-0.0918***
		(0.00977)	(0.00980)	(0.00834)
N	1518090	1518090	1518090	1518090
Firm FE	Yes			Yes
Sector-Year FE	Yes	Yes	Yes	Yes
Province-Year FE	Yes		Yes	Yes
Mean of Dep Var (%)	0.807	0.807	0.807	0.807
F-Stat		101.2	97.44	121.3

Notes: MWFE estimator. HDFE Linear regression. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level. Kleibergen-Paap Wald rk F-statistic reported. Robust standard errors clustered at firm level in parentheses. Sector-Year fixed effects are at ATECO 4 digit level.

Table 4: Main results: alternative variables

	(1)	(2)	(3)	(4)
Dependent variable:	NDR			
Panel A: 2SLS				
(log) EBITDA	-0.0140**			
	(0.00691)			
(log) Current Assets		-0.0134*		
		(0.00695)		
(log) Equity			-0.00914*	
			(0.00468)	
Risk score				0.00302**
				(0.00152)
Panel B: First-Stage				
Closing	-0.0261***	-0.0266***	-0.0419***	0.118***
	(0.00435)	(0.00605)	(0.00842)	(0.0228)
N	1489892	1516561	1405220	1517114
Firm FE	Yes	Yes	Yes	Yes
Sector-Year FE	Yes	Yes	Yes	Yes
Province-Year FE	Yes	Yes	Yes	Yes
Mean of Dep Var (%)	0.801	0.808	0.814	0.807
F-Stat	35.99	19.33	24.81	26.75

Notes: MWFE estimator. HDFE Linear regression. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level. Kleibergen-Paap Wald rk F-statistic reported. Robust standard errors clustered at firm level in parentheses. Sector-Year fixed effects are at ATECO 4 digit level.

Table 5: Intensity of the shock

	(1)	(2)	(3)
	NDR		
Panel A: 2SLS			
(log) Revenues	-0.00600	-0.00578	-0.00314*
	(0.00469)	(0.00419)	(0.00183)
Panel B: First Stage			
Closing days	-0.00311***	-0.00323***	-0.00188***
	(0.000299)	(0.000296)	(0.000150)
N	1518090	1518090	1518090
Firm FE			Yes
Sector-Year FE	Yes	Yes	Yes
Province-Year FE	Yes	Yes	Yes
Mean of Dep Var (%)	0.807	0.807	0.807
F-Stat	32.21	35.79	140.5

Notes: MWFE estimator. HDFE Linear regression. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level. Kleibergen-Paap Wald rk F-statistic reported. Robust standard errors clustered at firm level in parentheses. Sector-Year fixed effects are at ATECO 4 digit level.

Table 6: Heterogeneous treatment effects

	(1)	(2)	(3)	(4)	(5)
Dependent variable:	NDR				
Panel A: 2SLS					
(log) Revenues	0.0000459	-0.00534**	-0.00347	-0.00108	-0.000122
	(0.000414)	(0.00252)	(0.00250)	(0.000982)	(0.000189)
Panel B: First-Stage					
Closing	-0.0984***	-0.0902***	-0.0818***	-0.132***	-0.0771***
	(0.0158)	(0.00980)	(0.0113)	(0.0181)	(0.0176)
N	469903	1030997	814446	357587	321868
Firm FE	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	Yes	Yes	Yes	Yes	Yes
Province-Year FE	Yes	Yes	Yes	Yes	Yes
Subsample	Industry	Services	North	Centre	South
Mean of Dep Var (%)	0.785	0.818	0.605	0.568	0.173
F-Stat	38.97	84.72	52.41	53.52	19.13

Notes: MWFE estimator. HDFE Linear regression. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level. Kleibergen-Paap Wald rk F-statistic reported. Robust standard errors clustered at firm level in parentheses. Sector-Year fixed effects are at ATECO 4 digit level. Col (5) has been obtained by keeping firms which are located in Southern Italy (excluding Calabria)

Table 7: Government Intervention

	(1)	(2)	(3)	(4)
Dependent variable:	NDR			
(log) Revenues	-0.00838**	-0.00556**	-0.00762**	-0.00512*
	(0.00415)	(0.00279)	(0.00373)	(0.00269)
(log) Revenues × Any Aid	0.00391*			
	(0.00207)			
(log) Revenues × Moratorium		0.00106*		
		(0.000556)		
(log) Revenues × Grants			0.00456**	
			(0.00206)	
(log) Revenues × Guaranteed Loans				-0.000165
				(0.000526)
N	910836	910836	910836	910836
Firm FE	Yes	Yes	Yes	Yes
Sector-Year FE	Yes	Yes	Yes	Yes
Province-Year FE	Yes	Yes	Yes	Yes
Mean of Dep Var (%)	0.810	0.810	0.810	0.810
F-Stat	44.25	54.51	40.39	55.19

Notes: MWFE estimator. HDFE Linear regression. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level. Cragg-Donald F-Statistic reported. Robust standard errors clustered at firm level in parentheses. Sector-Year fixed effects are at ATECO 4 digit level. Second-stage regression, obtained interacting revenues with a dummy if the firm obtained at least one aid (1) or at least moratorium (2), grants (3) amd guaranteed loans (4).

Table 8: Robustness Checks

	(1)	(2)
Dependent variable:	ENTRY	ENTRY NO NDR
Panel A: 2SLS		
(log) Revenues	0.0839**	0.0902**
	(0.0412)	(0.0412)
Panel B: First-Stage		
Closing	-0.0918***	-0.0918***
	(0.00834)	(0.00834)
N	1518090	1518090
Firm FE	Yes	Yes
Year FE	Yes	Yes
Sector-Year FE	Yes	Yes
Province-Year FE	Yes	Yes
Sample	All	All
Mean of Dep Var	9.49	9.32
CD F-Stat	121.3	121.3

Notes: MWFE estimator. HDFE Linear regression. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level. Kleibergen-Paap Wald rk F-Statistic reported. Robust standard errors clustered at firm level in parentheses. Sector-Year fixed effects are at ATECO 4 digit level.

Table 9: Corroborating the Exclusion Restriction

	(1)	(2)
Dependent variable:	Gvt Aids	
NDR	0.0757***	0.0659**
	(0.0263)	(0.0271)
Entry NDR	-0.0365	-0.0317
	(0.0926)	(0.0909)
Closing	0.171***	0.172***
	(0.0158)	(0.0157)
Closing × NDR	-0.0417	-0.0317
	(0.0357)	(0.0357)
Closing × Entry NDR	-0.139	-0.133
	(0.153)	(0.151)
Age	-0.00323***	-0.00303***
	(0.0000851)	(0.0000852)
Δ log(Revenue)	-0.0971***	-0.0979***
	(0.00303)	(0.00302)
Δ log(Wage Bill)	-0.0429***	-0.0416***
	(0.00283)	(0.00282)
N	298681	298681
Sector FE	Yes	Yes
Province FE		Yes
Mean of Dep Var	1.491	1.491

Notes: MWFE estimator. HDFE Linear regression. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level. Robust standard errors clustered at firm level in parentheses. Sector-Year fixed effects are at ATECO 4 digit level.

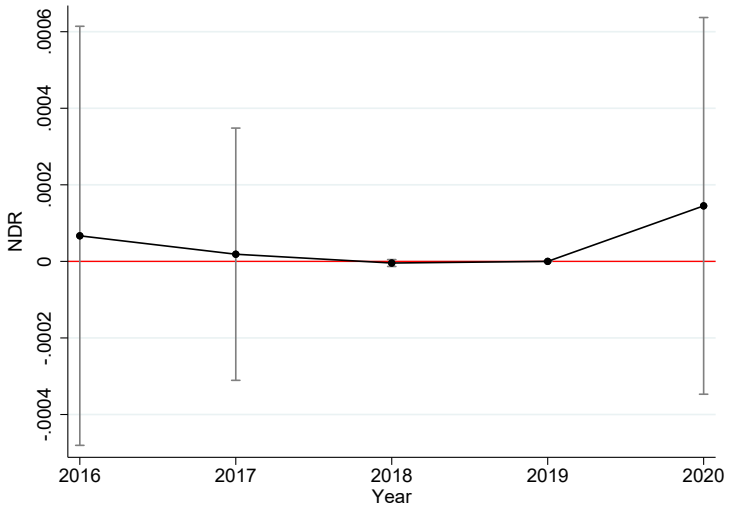
Table 10: Additional Robustness Checks

	(1)	(2)	(3)	(4)
Dependent variable:	NDR			
Panel A: 2SLS				
(log) Revenues	-0.00184	-0.00221*	-0.00389**	-0.00381**
	(0.00113)	(0.00134)	(0.00186)	(0.00181)
Panel B: First-Stage				
Closing	-0.0938***	-0.0933***	-0.0922***	-0.0931***
	(0.00845)	(0.00899)	(0.00838)	(0.00838)
N	1495219	1292006	1475123	1514599
Firm FE	Yes	Yes	Yes	Yes
Sector-Year FE	Yes	Yes	Yes	
Province-Year FE	Yes	Yes	Yes	Yes
Sector-Region-Year FE				Yes
Excluding	Calabria	All Origin	Other Infiltr	
Mean of Dep Var	0.503	0.559	0.773	0.805
F-Stat	123.4	107.8	120.9	123.4

Notes: MWFE estimator. HDFE Linear regression. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level. Kleibergen-Paap Wald rk F-Statistic reported. Robust standard errors clustered at firm level in parentheses. Sector-Year fixed effects are at ATECO 4 digit level. Coefficient estimates have been produced by restricting the sample dropping firms which: are not located in Calabria (1), are not located in any mafia region – Calabria, Campania, Puglia and Basilicata – (2), are not infiltrated at any point in time by other mafias (3). In column (4) we add sector-region-province fixed effects to take into account local restrictions that took place in the *second phase* of the pandemic (Fall 2020).

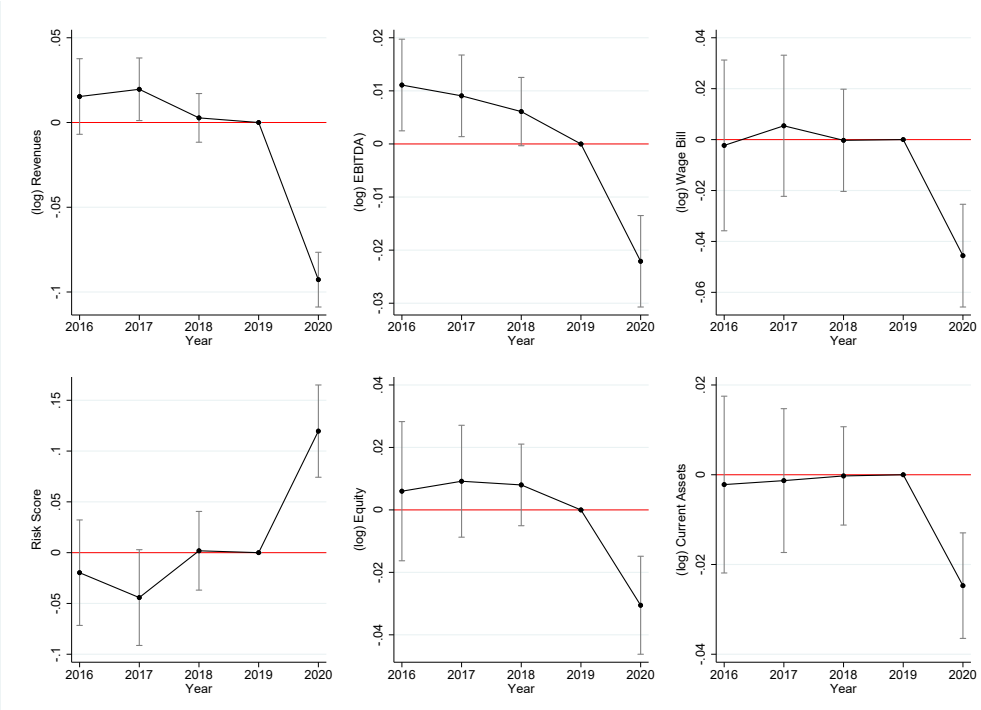
A Additional Figures and Tables

Figure A1: NDR Trend, difference between treated and control firms



Notes: Event study estimates for the infiltration dummy among treated and control units.

Figure A2: Balance Sheet Variables Trends, difference between treated and control firms



Notes: Event study estimates for several balance sheet variables among treated and control units.

Table A1: Robustness: Reduced Form

	(1)	(2)	(3)
Dependent variable:		NDR	
Panel A: Closing dummy			
Closing	0.000526	0.000582	0.000357**
	(0.00148)	(0.00139)	(0.000144)
Panel B: Number of Days			
Closing days	0.0000187	0.0000187	0.00000590**
	(0.0000288)	(0.0000266)	(0.00000295)
N	1518090	1518090	1518090
Firm FE			Yes
Sector-Year FE	Yes	Yes	Yes
Province-Year FE		Yes	Yes
Mean of Dep Var	0.807	0.807	0.807

Notes: MWFE estimator. HDFE Linear regression. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level. Robust standard errors in parentheses. Sector-Year fixed effects are at ATECO 4 digit level.

Table A2: Robustness: DDIV

	(1)	(2)	(3)	(4)
Dependent variable:		NDR		
Panel A: OLS				
(log) Revenues	0.0000923***			
	(0.0000349)			
Panel B: 2SLS				
(log) Revenues		-0.00535	-0.00601	-0.00388**
		(0.0152)	(0.0145)	(0.00160)
Panel C: First-Stage				
Closing		-0.0983***	-0.0968***	-0.0918***
		(0.0289)	(0.0285)	(0.00776)
N	1518090	1518090	1518090	1518090
Firm FE	Yes			Yes
Sector-Year FE	Yes	Yes	Yes	Yes
Province-Year FE	Yes		Yes	Yes
Mean of Dep Var	0.807	0.807	0.807	0.807
F-Stat		11.58	11.52	140.1

Notes: MWFE estimator. HDFE Linear regression. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level. Kleibergen-Paap Wald rk F-Statistic reported. Robust standard errors in parentheses. Sector-Year fixed effects are at ATECO 4 digit level.

Table A3: Government Intervention

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable:				NDR			
(log) Revenues	-0.00519*	-0.00410*	-0.00537**	-0.00518*	-0.00504*	-0.00554*	-0.00554**
	(0.00267)	(0.00220)	(0.00272)	(0.00265)	(0.00257)	(0.00284)	(0.00280)
(log) Revenues × Moratorium	-0.00135						
	(0.00207)						
(log) Revenues × Guaranteed Loans		-0.00798**					
		(0.00390)					
(log) Revenues × Grants			0.00195**				
			(0.000912)				
(log) Revenues × (Moratorium+Grants)				0.00266***			
				(0.000864)			
(log) Revenues × (Moratorium+Guar Loans)					-0.00208		
					(0.00144)		
(log) Revenues × (Guar Loans+Grants)						0.000989	
						(0.000675)	
(log) Revenues × All							0.00161**
							(0.000760)
N	910836	910836	910836	910836	910836	910836	910836
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean of Dep Var (%)	0.81	0.81	0.81	0.810	0.810	0.810	
F-Stat	54.59	43.86	55.66	56.73	54.81	51.62	52.31

Notes: MWFE estimator. HDFE Linear regression. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level. Cragg-Donald F-Statistic reported. Robust standard errors clustered at firm level in parentheses. Sector-Year fixed effects are at ATECO 4 digit level. Second-stage regression, obtained interacting revenues with a dummy if the firm obtained exactly moratorium (1), guaranteed loans (2), grants (3), moratorium and grants (4), moratorium and guaranteed loans (5), guaranteed loans and grants (6), all three (7).

Table A4: Corroborating the Exclusion Restriction: Grants

	(1)	(2)
Dependent variable:	Grants	
NDR	-0.00279	0.00415
	(0.0110)	(0.0113)
Entry NDR	-0.0500	-0.0555
	(0.0407)	(0.0401)
Closing	0.116***	0.116***
	(0.00704)	(0.00701)
Closing × NDR	-0.0116	-0.0106
	(0.0148)	(0.0148)
Closing × Entry NDR	-0.0587	-0.0538
	(0.0658)	(0.0652)
Age	-0.00118***	-0.00112***
	(0.0000306)	(0.0000307)
Δ log(Revenue)	-0.0541***	-0.0546***
	(0.000973)	(0.000967)
Δ log(Wage Bill)	-0.0306***	-0.0305***
	(0.00107)	(0.00107)
N	491529	491529
Sector FE	Yes	Yes
Province FE		Yes
Mean of Dep Var	0.458	0.458

Notes: MWFE estimator. HDFE Linear regression. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level. Robust standard errors clustered at firm level in parentheses. Sector-Year fixed effects are at ATECO 4 digit level.

Table A5: Corroborating the Exclusion Restriction: Moratorium

	(1)	(2)
Dependent variable:	Moratorium	
NDR	0.0360**	0.0379***
	(0.0142)	(0.0146)
Entry NDR	0.0545	0.0489
	(0.0542)	(0.0536)
Closing	0.0151*	0.0141*
	(0.00821)	(0.00819)
Closing × NDR	-0.0157	-0.0132
	(0.0193)	(0.0193)
Closing × Entry NDR	-0.119	-0.108
	(0.0833)	(0.0826)
Age	0.000314***	0.000311***
	(0.0000429)	(0.0000431)
Δ log(Revenue)	-0.0150***	-0.0158***
	(0.00142)	(0.00142)
Δ log(Wage Bill)	-0.0132***	-0.0135***
	(0.00137)	(0.00137)
N	298681	298681
Sector FE	Yes	Yes
Province FE		Yes
Mean of Dep Var	0.331	0.331

Notes: MWFE estimator. HDFE Linear regression. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level. Robust standard errors clustered at firm level in parentheses. Sector-Year fixed effects are at ATECO 4 digit level.

Table A6: Corroborating the Exclusion Restriction: Guaranteed Loans

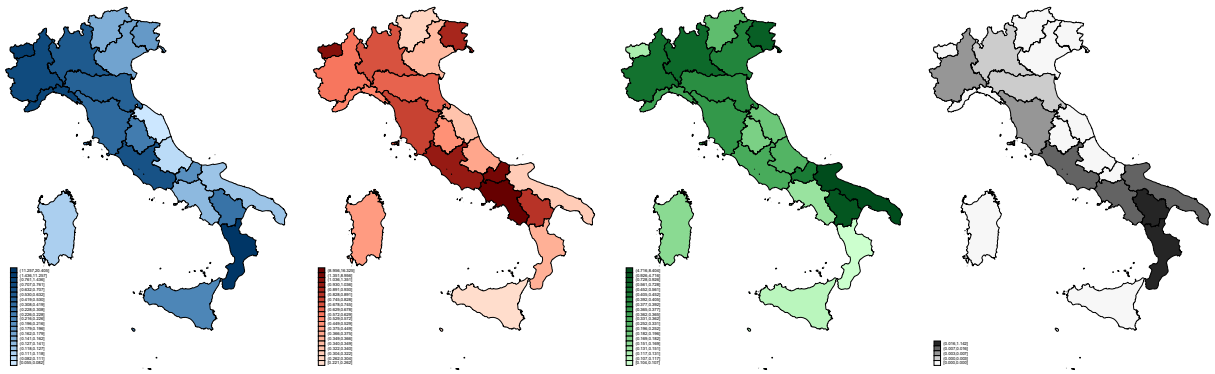
	(1)	(2)
Dependent variable:	Guaranteed Loans	
NDR	0.0528***	0.0455***
	(0.0116)	(0.0119)
Entry NDR	0.0335	0.0370
	(0.0413)	(0.0411)
Closing	0.0174**	0.0187**
	(0.00730)	(0.00728)
Closing × NDR	-0.0234	-0.0195
	(0.0154)	(0.0154)
Closing × Entry NDR	-0.0411	-0.0359
	(0.0672)	(0.0674)
Age	-0.000852***	-0.000771***
	(0.0000311)	(0.0000313)
Δ log(Revenue)	-0.00243***	-0.00264***
	(0.000892)	(0.000891)
Δ log(Wage Bill)	0.00381***	0.00420***
	(0.00106)	(0.00106)
N	491529	491529
Sector FE	Yes	Yes
Province FE		Yes
Mean of Dep Var	0.451	0.451

Notes: MWFE estimator. HDFE Linear regression. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level. Robust standard errors clustered at firm level in parentheses. Sector-Year fixed effects are at ATECO 4 digit level.

B Investigating the infiltration of other mafias

Our data allow us to apply our methodology to identify mafia infiltrated firms also to criminal organisations other than the 'ndrangheta. However, these measures are to be taken with caution because the predictive power of family names in the case of other mafias is sensibly lower, either because clans are more likely to rely on non-family affiliates, or simply because some mafia family names are very frequent in the population. This is, for instance, the case of Camorra, whose affiliates' family names are way more frequent, even outside Campania.[19] When applying our methodology to detect other mafias' infiltration we find that Camorra, Sacra Corona Unita and mafia lucana had infiltrated about 3% of firms of firms in our sample in 2020. This share increased between 2019 and 2020. Looking at the geographical distribution we observe a clear prevalence in the region of origin and little overlap between the different organisations: Camorra tends to focus in its region of origin (Campania) and in Central Italy. Sacra Corona Unita and Mafia Lucana are prevalent in their regions of origin (Puglia and Basilicata, respectively) and in neighbouring regions (Figure B1). We note that the geographical distribution obtained with our methodology largely overlaps with that computed by Transcrime (2017).

Figure B1: Infiltrations of different mafias across regions



Notes: Share of infiltrated firms by region in 2020. From left to right, the panel show, respectively, the share of 'ndrangheta, camorra, sacra corona unita and mafia lucana infiltrations.

Table B1 then shows the results of our DDIV regressions on other mafias and compares them to those for 'ndrangheta. We find no significant effects on the likelihood of other mafias infiltration: for camorra and mafia lucana the estimated coefficients are even positive,

[19] See Mirenda et al. (2022) for a more comprehensive discussion.

whereas in the case of sacra corona unita the estimated coefficient is more similar to the one estimated for 'ndrangheta.

Note that the reported frequency of infiltration for camorra might worry us, since there is no existing evidence on the fact that camorra is infiltrated in more than 2 Italian firms out of 100. A reason for this overestimation is that some camorra's family names (e.g. Esposito), are among the most common in the country. Hence, we attach to each last name its frequency amongst the adult population resident as recorded in the 2005 list of taxpayers. In column (5), we then consider only rare last names – those below the median frequency – to flag infiltrated firms. The estimated 2SLS coefficient is still indistinguishable from zero. We thus conclude that 'ndrangheta has been the best able to exploit the negative shock to firm economic performance to widen its presence in the legal economy. The finding that 'ndrangheta was the organisation which most profited from the Covid crisis to penetrate the legal economy is in line with the evidence provided by Ministero dell'Interno (2021) and with the widespread view that it is the organisation which is most active outside its area of origin.

Table B1: Results on all mafias

	(1)	(2)	(3)	(4)	(5)
Dependent variable:	NDR	CAM	SCU	MAF L	CAM (rare)
Panel A: 2SLS					
(log) Revenues	-0.00388**	0.00523	-0.00259	0.000000535	0.00338
	(0.00184)	(0.00353)	(0.00178)	(0.00000766)	(0.00213)
Panel B: First-Stage					
Closing	-0.0918***	-0.0918***	-0.0918***	-0.0918***	-0.0918***
	(0.00834)	(0.00834)	(0.00834)	(0.00834)	(0.00834)
N	1518090	1518090	1518090	1518090	1518090
Firm FE	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	Yes	Yes	Yes	Yes	Yes
Province-Year FE	Yes	Yes	Yes	Yes	Yes
Mean of Dep Var (%)	0.807	2.06	0.814	0.0122	0.344
F-Stat	121.3	121.3	121.3	121.3	121.3

Notes: MWFE estimator. HDFE Linear regression. ***, **, and * indicate significance at the 1, 5, and 10 percent critical level. Kleibergen-Paap Wald rk F-statistic reported. Robust standard errors clustered at firm level in parentheses. Sector-Year fixed effects are at ATECO 4 digit level.