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Mafia Infiltration and Ownership Dynamics in Italian Companies during Covid-19

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Abstract

We examine how government-mandated Covid-19 business closures impacted on the ownership structure of Italian private companies and investigate the mechanisms whereby the mafia infiltrates the legal economy during crises. Using a novel dataset tracking monthly shareholder changes, we show that an increase in the days of closure reduced the number of firms undergoing ownership changes, although significantly less so in provinces with strong mafia presence. This is especially true in the sectors that are historically prone to mafia infiltration and those more severely affected by the Covid-19 liquidity crisis, and in micro-firms, which tend to be more financially vulnerable.

JEL Classification: D22; G32; K42.

Keywords: Mafia Infiltration, Covid-19, Firm ownership.

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”Organized crime has assumed new but equally frightful forms. It has spread into the boards of companies, both in the North and in the South of the country [...] It pollutes the economy, ranging from real estate to wholesale trade.”

Mario Draghi (Former Italian Prime Minister, May 2022).

1 Introduction

The Covid-19 pandemic hit the world unexpectedly and triggered a major global recession. Social distancing, government-mandated business closures, and a severe drop in demand drove countless businesses worldwide to the brink of default and required unprecedented public policy interventions.¹ As struggling firms may have found it hard to obtain credit from formal markets and so became more inclined to seek liquidity from organized crime, the pandemic also created opportunities for criminal organizations to infiltrate the legal economy (Europol, 2024b, UNODC, 2020). Previous evidence has shown that organized crime takes advantage of economic crises (Le Moglie and Sorrenti, 2022), and Europol (2024a) documents that 86% of most threatening criminal networks make use of legal business structures, largely by infiltrating firms at a high level or set up their own ones.²

In this paper, we study mafia infiltration of legal businesses during the Covid-19 crisis in Italy and conduct novel analyses of the nature of corporate changes most closely associated with criminal infiltration of the legitimate economy. We identify the impact of social restrictions — specifically, government-mandated business closures — on different types of corporate ownership changes, and assess how far this impact may depend on the action of organized crime. Additionally, we study how mafia infiltration varies by sector of activity and firm size. Knowledge of the mechanism of mafia penetration and of the sectors most at risk is essential to the timely detection of organized criminal activity and the prevention of infiltration.

¹Many studies have documented the magnitude and the consequences of the Covid-induced liquidity crisis, especially for the most highly exposed sectors, such as accommodation and food services, transportation, and wholesale and retail trade (Banerjee et al., 2020, Carletti et al., 2020, Gourinchas et al., 2020, Stephany et al., 2020, Wang et al., 2020).

²Over 70% of organized crime’s global criminal proceeds (equivalent to 2.7% of world GDP in 2009) is laundered through the legal economy (UNODC, 2011); in the EU, organized crime’s proceeds of the nine main criminal markets amount to about 1% of EU’s GDP (139 billions in 2019; Hulme et al., 2021).

We build a unique, detailed monthly dataset, from March 2020 to July 2021, combining different sources of information on Italian private enterprises. We exploit data on shareholder-firm pairs from the Italian Chambers of Commerce and identify three different types of change in ownership structure: (i) the (sole) entry of new owners, (ii) the (sole) exit of incumbent owners, and (iii) replacement, i.e. the entry of new owners who take over part or all of the stake of at least one incumbent owner. These data are then combined with data on the number of days of government-mandated closure of the businesses' activities in each month during the pandemic, specific to each region and sector of activity, which we collected by hand from national government decrees, together with an index of the mafia presence in Italian provinces prior to the pandemic.

Historically, Italy has been marked by the significant presence of organized crime, including its infiltration of the legal economy. Italy was also one of the first countries to be hit by the coronavirus and experimented with some of the extraordinary social restrictions that were later applied throughout the world. This makes Italy a perfect setting to consider Covid-19 as an unexpected, severe economic shock and to study its effect on the likelihood of criminal infiltration of distressed firms.

We find that the response of ownership changes to days of mandated closure depends on the ex-ante mafia presence in the province. That is, while closures trigger less changes in ownership on average, this impact is smaller in provinces with stronger mafia presence. We interpret this differential impact as indirect evidence of mafia infiltration of the legitimate economy. Indeed, judging by their past actions, mafia organizations are likely to use their liquidity to support distressed companies before taking them over through share purchases (Bosisio et al., 2021, De Martiis, 2020, Naím, 2012, Savona et al., 2017).

We also find novel evidence on the mechanism of mafia infiltration: the effect of business closures on ownership changes appears to be driven mostly by the exit of incumbent owners, who either sell shares to other incumbents (sole exit of owners) or, above all, to new shareholders (replacement of owners).³ Our results are consistent with the thesis that infiltration

³In the case of sole exit, the company may already be subject to usury or previous infiltration. Anecdotal evidence of such cases was gathered by the Lombardy-based business association, Assolombarda, prior to the Covid-19 crisis and is documented in the following report: *Rischi di infiltrazione mafiose delle imprese nel Nord Italia*, <https://toolkit-rischi-di-infiltrazione-mafiosa.assolombarda.it/file/report>.

proceeds mainly through the acquisition of shares from owners in distress.

Further, we study the extent of mafia infiltration according to economic sector. Some sectors were presumably more susceptible than others to criminal infiltration during the pandemic for two different reasons: either they faced more severe financial distress, making firms accordingly “cheaper” to buy out, or else they were especially attractive to organized crime because they benefited from the health emergency and/or the subsequent government support measures. The first category includes passenger transportation and tourism-related activities, such as hotels, bars and restaurants; the second comprises the supply chain of pharmaceutical and medical devices, logistics and e-commerce, construction, and some business and personal services (e.g. cleaning and funeral services). Consistently, our results indicate that mafia infiltration during the pandemic mainly occurred in food and accommodation services, construction, real estate, retail and wholesale trade, and transportation. Interestingly, these are the same sectors identified by [Europol \(2024a,b\)](#), [Hulme et al. \(2021\)](#) as those particularly affected by criminal infiltration or abuse.

Additionally, we find that the effect uncovered is due mainly to the micro-firms in our sample, suggesting that organized crime is more likely to infiltrate financially vulnerable companies: throughout Europe, micro-firms are more leveraged and financially fragile than larger ones ([Fatica and Rancan, 2022](#)), and [Albanese et al. \(2021\)](#) show that this class of firms is the least able to access government support during the Covid-19 crisis.

Our identification strategy depends on three elements. First is the timely registration of ownership changes in the firm registry, which is mandatory by law. Second is the exogeneity of the restriction measures (i.e. the number of government-mandated days of closure), which is guaranteed by the criteria used to determine the closures. These criteria were based on a nationwide classification of economic sectors into essential and non-essential and on the severity of local contagion; the latter was not anticipated by firms. Third is the assumption that the provincial presence of the mafia captures the propensity of organized crime to operate in that specific area. Mafia infiltration may take different forms. The most direct one is the presence of mafia-connected people among shareholder, but judicial evidence has shown

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that infiltration can also occur through shares detained by straw men or corporate shareholders. Our measure has the advantage of capturing all these different forms of infiltration into firm ownership. In robustness analyses, we rule out the possibility that our findings should be ascribed to provincial differences in other dimensions such as judicial efficiency, social capital and financial development rather than to the strength of the local mafia presence.

The variations in our setting relate to the ex-ante presence of mafia, which differs from province to province, and to the intensity of mandated business closures, which is sector-, region-, and month-specific; thus, we can account for fixed effects both at the geographical and sector level. In most saturated versions of the model, sector-region-time fixed effects also absorb the variation due to Italian government interventions to relieve financial distress through liquidity support to private firms (credit guarantee schemes or cash transfers). This indicates that these supports to firms during Covid-19 were, on average, uncorrelated with the extent of mafia presence.

Overall, we confirm that economic shocks pave the way to mafia infiltration of legitimate economic activities. This substantiates the concerns expressed by the Italian Anti-mafia Investigation Directorate, whose 2020 report highlighted the consequences of the Covid-19 emergency in terms of possible infiltration by organized crime ([DIA, 2020](#)). Our results are also in line with the descriptive evidence presented in [Bosisio et al. \(2021\)](#) regarding ownership changes in Italian firms between April and September 2020. They document anomalies in new corporate structures that hint at the potential risks of money laundering and criminal infiltration: while the number of ownership transfers decreased compared with the previous year, anomalies among the new owners (including connections to high-risk jurisdictions, corporate opacity, involvement of politically exposed persons, and owners from regions with a substantial mafia presence) were more common than in the universe of firm owners or among new owners before the pandemic.

The rest of the paper is organized as follows. Section [2](#) discusses the literature on mafia infiltration of the legal economy in Italy and our contribution to the research in this field. Section [3](#) describes the construction of the dataset and the summary statistics. Section [4](#) shows the estimation results. Section [5](#) provides additional analysis and robustness tests,

and Section 6 concludes.

2 The literature

A growing body of research has examined the impact and detrimental effects of the presence of mafia organizations both for political competition ([Acemoglu et al., 2020](#), [Alesina et al., 2019](#), [Baraldi et al., 2022](#), [Buonanno et al., 2016](#), [Daniele and Dipoppa, 2017](#), [Daniele and Geys, 2015](#), [De Feo and De Luca, 2017](#), [Di Cataldo and Mastrorocco, 2022](#)) and for the economy in general ([Fenizia and Saggio, 2020](#), [Peri, 2004](#), [Pinotti, 2015](#)).

Our study adds to the literature on the infiltration of legitimate businesses by organized crime. A first strand in this literature looks at the effects of mafia infiltration of firms and its motivations, as well as the externalities it entails. [Mirenda et al. \(2022\)](#) exploit the peculiar structure of 'ndrangheta clans, with their extremely strong family ties. Defining a firm as infiltrated if, in a given year, it has at least one director or owner whose last name is the same as that of an 'ndrangheta clan, they show that the clans target weaker (i.e. younger and less efficient) firms and generate a rise in firms' revenues after infiltration. According to [Arellano-Bover et al. \(2024\)](#), who use data from the Italian Financial Intelligence Unit, criminal organizations infiltrate legal businesses for various motives. On the one hand, small businesses established by criminal groups ("born-infiltrated") are engaged primarily in illegal activity. On the other hand, the already established businesses that are infiltrated either benefit directly from such activity (medium-sized firms) or are exploited for financial and non-financial gain, including the formation of political alliances (large firms). [De Simoni \(2022\)](#) analyses the financial profile of infiltrated firms according to the motives of infiltration. He finds that, on average, mafia-connected firms display higher revenues, lower profitability, and higher cash holdings than legal businesses. However, investment firms (used for money laundering) and competition firms (run to gain control of the market of interest) differ in financing costs and in the share of tangible assets. [Piemontese \(2023\)](#) looks at how criminal organizations affect the legal economy by hampering rather than financing firms. Specifically, she studies mafia racketeering in Northern Italy, showing that acts of extortion imposed on

certain firms are linked to resource misallocation. The presence of mafia organizations also generates externalities on non-infiltrated firms. For instance, [Ganau and Rodríguez-Pose \(2018\)](#) gauge the impact of the presence of organized crime in the territory where a firm operates on the firm's total factor productivity. They find that in addition to a direct negative effect on productivity, the mafia presence diminishes any positive externality that may arise from industrial clustering in an area.

Some papers focus on the spillover effects of law enforcement on the economy. [Calamunci and Drago \(2020\)](#) evaluate the impact on firms' profitability, performance and investment of being in a market where at least one firm is subject to judicial administration (the assumption being that such firms are affiliated with organized crime). Examining the spillover effects of a policy that imposes external managers on those firms, they show that the more firms are under judicial administration, the greater the positive impact on other competitors (see also [Ferrante et al., 2021](#)).

Our paper relates most closely to the strand of the literature that studies how economic shocks affect the extent of mafia infiltration of legal businesses. [Le Moglie and Sorrenti \(2022\)](#) exploit the onset of the subprime mortgage crisis of 2007, which depressed the supply of legal credit available to entrepreneurs by about the same extent in provinces with greater and lesser mafia presence. They find that in provinces with a strong mafia presence, the number of established enterprises decreases less sharply, which jibes with the hypothesis of mafia investment in the legal economy. Our analysis differs from this study in two significant ways. First, our exogenous shock to firms' financial resources is not common to all firms but uses the government classification of essential and non-essential sectors and the risk level associated with each region over time; accordingly, the shock differs by region, sector and time, enabling us to provide estimates for the firms in the sectors directly affected. Second, we go beyond births and deaths of firms to examine ownership transfers and so study the mechanisms whereby mafias can enter the legal economy.⁴ [Castelluccio and Rizzica \(2023\)](#) define infiltration by 'ndrangheta clans as in [Mirenda et al. \(2022\)](#) and find that the deterioration of firms' financial conditions during the Covid-19 crisis increased the likelihood

⁴Of course, criminal agents can infiltrate the legal economy by means other than ownership transfers, such as founding new businesses, utilizing hidden financing methods, and fraudulently obtaining public support.

of infiltration by entrepreneurs linked to organized crime. Our approach complements their findings in that: (i) our identification strategy can be extended beyond the 'ndrangheta to other Italian criminal organizations, and (ii) we provide a distinctive analysis of the types of ownership change that are most closely associated with criminal infiltration. Such an analysis offers a new perspective and insights into how mafias establish their presence in the legal economy.

3 Data

Firm registry. In Italy firms must register with the provincial Chamber of Commerce. They must also promptly communicate any subsequent modification of their state of activity or their main characteristics (e.g., legal form or location). The Infocamere database is the collection of registry data from all Chambers of Commerce in Italy and includes records on the universe of Italian firms, including dates of birth and death, as well as information on ownership structure for a subset of firms, namely partnerships (*società di persone*, with unlimited liability) and corporations (*società di capitali*, with limited liability).

Using the Infocamere database, we construct a dataset on the ownership of partnerships and corporations from March 2020 to July 2021.^{5,6} For each province-month-sector, we compute the number of firms experiencing the following (mutually exclusive) changes: (i) entry of new shareholders, with no exit (hereafter labeled *Entry*); (ii) exit of incumbent shareholders, with no entry (hereafter *Exit*); (iii) entry of new shareholders who buy some or all the shares of exiting shareholders (hereafter *Replacement*).

Ownership changes, defined as the sum of *Entry*, *Exit* and *Replacement* involve, on average, about 0.5% of active firms every month, and a total of 8.7% of firms over the entire sample period. We define the variable *Entry* as the logarithm of one plus the total number of firms that had an entry of new shareholders in a given province-sector-month, and do the same for *Exit* and *Replacement*. Table 1 reports the means and standard deviations of the

⁵We exclude listed corporations and firms with more than 300 shareholders, since small shareholders in these firms are recorded as a single “dummy” shareholder.

⁶We also build a dataset with demographic information on all types of firm (such as sole proprietorships, partnerships and corporations), calculating the number of business births and deaths for each month and province. We use this dataset in the ancillary analysis on business dynamism.

dependent variables.

Insert Table 1 here

Covid-19 days of closures. With the prime minister’s decree of March 11, 2020 (Decree of the President of the Council of Ministers, DPCM), the government enacted the first widespread restrictions on economic activities throughout the national territory, in response to the Covid-19 pandemic emergency. Four main periods can be identified on the basis of the government-imposed closures: (i) March 12, 2020 - May 17, 2020; (ii) May 18, 2020 - November 5, 2020; (iii) November 6, 2020 - April 25, 2021; and (iv) April 26, 2021 - March 31, 2022.

In the first period, the government identified the businesses that could keep operating (the so-called essential sectors).⁷ In the second period, the majority of economic activities were operational. In the third period, regions were ranked on a 4-level scale of health risk (white, yellow, orange, red), each associated with a list of suspended economic activities; the color assigned to each region was re-evaluated at one- or two-week intervals. Finally, in the fourth period, almost all economic activities were permitted, but access to workplaces and to many services was restricted to people with a *green pass*, certifying either that they had been vaccinated or that they had low risk of contagion (those recently recovered from or having tested negative for Covid-19).

We collect data for the March 2020-July 2021 period and build a dataset containing the number of days in which a sector’s activity was suspended in each month-region.⁸ Sector closures are identified at the 6-digit Ateco level and then aggregated at 2-digit.⁹ Appendix A describes the government-mandated closures and the methodology we used to construct the dataset in greater detail. Days of closure are measured at sector-region-month and vary from a high of 30 days in non-essential sectors in April 2020 to zero for essential sectors

⁷Essential sectors comprise the following NACE codes: D (electricity, gas, steam and air conditioning supply), E (water supply, sewerage, waste management and remediation activities), K (financial and insurance activities), O (public administration and defense; compulsory social security), P (education), Q (human health and social work activities).

⁸Although our dataset runs through July 2021, suspensions ceased for most sectors with the introduction of the *green pass* in April 2021, as mentioned above.

⁹The Ateco classification is the Italian declination of NACE. The two classifications overlap perfectly at the 1- and 2-digit levels.

and for non-essential sectors in months of low contagion, especially after April 2021, as outlined above. Given the number of zeros, we define the variable *Log (Closure days)* as the logarithm of one plus the weighted average number of closure days in each (2-digit) sector-region-month. Table 1 reports the summary statistics of days of closure, both in absolute and in log values. The mean value of *Closure days*, calculated including all months and sectors (including essential sectors), for the entire sample period shows 1.8 mandated days of closure per sector-region-month.

The Mafia Index. The literature offers various indices to measure the presence of organized crime in Italy. Typically, they are at province level (see, for instance [Calderoni, 2011](#), [Ganau and Rodríguez-Pose, 2018](#), [De Martiis, 2020](#)) and measure the incidence of certain criminal activities associated with mafia-style organizations.

Our own measure (“Mafia Index (MI) rate”) extends that developed by [Calderoni \(2011\)](#), which comprises the crimes of mafia association, mafia murders, city councils dissolved due to mafia infiltration, and the presence of assets confiscated from mafia members in each municipality. We add a series of other mafia-related phenomena (“sentinel” crimes) and update the index to the period 2010-2019 with data from the Italian National Institute of Statistics (Istat) on crimes reported by law enforcement agencies and Ministry of Interior.¹⁰

In detail, the methodology is as follows: (i) for each individual crime, we calculate the incidence rate in each province and year;¹¹ (ii) for each province, we compute the average incidence of each crime in 2010-2019; (iii) for each crime, we normalize the average incidence, assigning a score of 100 to the province with the highest incidence; (iv) we aggregate crimes at province level, calculating the average index for all crimes to produce a single indicator for each province.

Table 1 gives the summary statistics of this mafia index: the mean for the 107 Italian

¹⁰The list of sentinel crimes includes: sale and purchase of slaves, criminal association, criminal association aimed at smuggling foreign manufactured tobacco, organized activities for illegal waste trafficking and disposal, introduction and commerce in products with counterfeit trademarks, enslavement, kidnapping for purposes of extortion, drug trafficking, criminal association for trafficking in narcotics, fraudulent transfer of assets, trafficking and trading of minors for prostitution, trafficking and trading of slaves, fraud in order to obtain public funds, auction rigging, and illicit distortion of contractor selection. The list is drawn from Decree Law 159 of 06/09/2011, art. 84, para. 4a.

¹¹Incidence of municipal governments dissolved for mafia infiltration is per 100 municipalities; incidence of all other crimes is per 100,000 inhabitants.

provinces comes to 8.20, standard deviation to 7.24.¹² Figure 1 displays its geographical distribution. As expected, mafia-related crimes are more common in the South and where there are large cities, but significant variations are also found within every region. Our analysis exploits the variation of the standardized MI rate across provinces, within a given region. To enhance the comparison across specifications, in the regressions we always measure mafia presence as the MI rate, normalized by its standard deviation.

Insert Figure 1 here

Other variables. Table 1 also includes summary statistics for other variables at province level, which we use in robustness checks. In line with the strategy first adopted by Guiso et al. (2004), we take the participation rate in the 1974 referendum on the divorce law as a proxy for the level of social capital. Furthermore, to gauge judicial efficiency we consider the average clearance rate of civil justice in each province in the period 2010-2019, from the Justice Dataset, whose construction is described in Biele et al. (2023), Nifo and Vecchione (2014).¹³ Finally, as a homogeneous measure of the degree of local financial development, we use the number of bank branches per 100,000 inhabitants.¹⁴

4 Empirical analysis

The hypothesis tested is that negative shocks – in this case, Covid-19-related closures – affect the ownership structure of Italian firms, and that the impact differs between areas with high and low mafia intensity. The idea is that mafia infiltration of the legal economy during Covid-19 may have been facilitated by the liquidity shock of mandatory closures and propitiated by preexisting mafia-related activity in the province.

In order to make sure that the effect is really driven by mafia infiltration, we control for a battery of fixed effects, in order to exclude the possibility of it being driven instead by

¹²Two of the 107 provinces are excluded for missing data on ownership changes.

¹³The dataset is open source and available at: <https://sites.google.com/site/institutionalqualityindex/dataset/justice-dataset?authuser=0>.

¹⁴This open source dataset is provided by the Bank of Italy.

unobserved characteristics correlated both with mafia presence and with the severity of the Covid-19 shock.

In our main analysis, we take advantage of different degrees of granularity in our data. Specifically, in Section 4.1, we present results when all the variables are aggregated at province-month level. The advantage here is the ability to consider the effects of days of closure on the overall changes in firms' ownership province by province, including both the direct effect of days of closure on the relevant sectors and the potential spillover on sectors not subject to forced closures. Indeed, the liquidity crisis in the sectors directly affected may have caused a decline in local economic activity that could have spread to the other sectors.

We then exploit a more granular disaggregation, analyzing ownership changes at sector-province-month level. This more highly disaggregated analysis allows us to control for unobserved factors that might bias our province-level results. A caveat here is that the sectors never hit by mandatory closures (i.e. the essential sectors, for which closure days are always zero), are *de facto* excluded. The results of this more granular approach are presented in Section 4.2.

4.1 Empirical analysis: province level

In this section we aggregate ownership data at province-month level; that is, we construct aggregate variables for our measures of ownership change, discarding the sector dimension.

The baseline specification is the following:

$$y_{p,t} = \beta_1 Covid_{r,t} + \beta_2 Covid_{r,t} \cdot mafia_p + \delta_t + \gamma_p + \epsilon_{p,t} \quad (1)$$

where $y_{p,t}$ are the logarithms of the dependent variables (i.e. changes in ownership: Entry, Exit, or Replacement), while $Covid_{r,t}$ is the logarithm of the average number of days of closure in each region (r) and month (t).¹⁵

Accordingly, β_1 measures the elasticity of firm ownership changes to closure days. The coefficient of interest is β_2 : if positive, it indicates that, as the severity of the Covid-19 shock

¹⁵Days of closure at region-month level are constructed as the average number of days in the sector-region-month, as described above.

increases, the number of ownership changes increases more (or decreases less, depending on the sign of β_1) in territories with stronger preexisting mafia presence. We can interpret such a result as indirect evidence of mafia infiltration. The model includes province fixed effects (γ_p), which absorb all time-invariant change at province level (and naturally also the direct impact of the mafia index), and time fixed effects (δ_t), which absorb the monthly variation in ownership changes common to all provinces.

Insert Table 2 here

Table 2 shows the estimated regression coefficients where the dependent variables are: *Entry* of new shareholders (column 1); *Exit* of existing shareholders (column 2); *Replacement* of incumbent owners (column 3). Ownership changes decline with the number of closure days; that is, β_1 is estimated to be negative in all specifications (although statistically significant only in columns 2 and 3).

More importantly, the β_2 estimates are positive and statistically significant, indicating that the reaction of ownership changes to closure days varies according to the pervasiveness of mafia organizations. With reference to column (3), for instance, the estimates can be read as follows: in provinces where the mafia index is zero, a 1 percent increase in closure days implies a 0.235 percent decline in the number of firms undergoing shareholder replacements;; however, a one standard deviation increase in the mafia index would decrease this elasticity by about a third (from -0.235 to -0.17 for a 1 percent increase in closure days).

Our dataset structure allows us to include in specification (1) region-time fixed effects that account for region-specific economic cycles, linked, for instance, to the intensity of the pandemic, but not well captured by the number of closure days. In such a specification, we can only estimate the coefficient β_2 , because the entire variation in closure days is absorbed by these finer fixed effects. The results are presented in Table 3.

Insert Table 3 here

Once we account for region-specific factors, the β_2 estimate remains statistically significant only in the case of replacement of shareholders (column 3).

This evidence at province level offers new insight into whether and how the mafia infiltrates the real economy in times of crisis. Our results confirm that organized crime does indeed exploit times of crises to infiltrate legal firms, most commonly by taking over the stakes of existing shareholders. Notably, these results account both for the direct effect of Covid-related closures on the businesses affected and for spillover effects on other firms in the province.

Apart from share ownership, there are other possible channels of mafia infiltration of legitimate businesses: direct establishment of new businesses or acquisition of informal control through financial support in times of distress, enabling firms to avoid bankruptcy. To explore these possibilities, we look at the effect of the Covid-19 shock on business demographics. Table 4 reports the estimation of equation (1), where the dependent variables are the logarithms of the number of firms going out of business each month (column 1) or newly registered (column 2). The specification includes the most demanding set of fixed effects: region-time fixed effects together with province fixed effects. Estimates of the β_2 coefficient show no correlation of closure days and mafia presence with business births or deaths. This result may appear in contrast with the evidence in [Le Moglie and Sorrenti \(2022\)](#), which exploits the time variation around the 2007-2009 credit crisis and finds an increasing number of new firms in provinces with greater mafia presence. But unlike the financial crisis, the Covid-19 crisis was characterized by historically low business dynamics in all European countries ([Criscuolo, 2021](#)). Hence, we did not expect significant results from this dimension of the analysis.

Insert Table 4 here

4.2 Empirical analysis: sector-province

This section exploits a more granular variation both in the outcome variables and in number of closure days; that is, we aggregate the variables by sector-province-month. The advantage of this level of disaggregation consists in the possibility of more direct linkage of the intensity of the Covid-19 shock (measured by closure days), which is essentially sector-specific, to ownership changes in the sectors affected. The drawback is the inevitable exclusion of all

firms in sectors not directly affected (for which mandatory closure days are always zero), but still possibly influenced indirectly via spillover effects.

In keeping with the foregoing empirical strategy, we estimate the following regression model:

$$y_{s,p,t} = \beta_1 Covid_{s,r,t} + \beta_2 Covid_{s,r,t} \cdot mafia_p + \gamma_{p,t} + \delta_{s,t} + \epsilon_{s,p,t} \quad (2)$$

where outcomes $y_{s,p,t}$ are defined as above, but at the 2-digit Ateco sector level s , $Covid_{s,r,t}$ is the logarithm of the number of closure days in each sector-region-month, $\gamma_{p,t}$ are province-time fixed effects and $\delta_{s,t}$ are sector-time fixed effects. The first set of fixed effects enables us to control for changes in economic conditions at province level, while the second absorbs part of the variation in closure days linked to sectors at national level, and accounts for systematic inter-sectoral differences in ownership dynamism.

The estimates of equation (2) are reported in Table 5. There is no significant correlation between changes in ownership and closure days (β_1 coefficients are close to zero in all the specifications, except in column 3). However, the β_2 estimates are positive and statistically significant in columns (1) to (3), a result in line with the province-level evidence in Table 2. Quantitatively, with reference to column (3), a 1 percent increase in closure days implies a 0.023 percent decline in ownership replacement in provinces with no mafia presence, but a 1 standard deviation increase in the mafia index halves this elasticity.

Insert Table 5 here

In the most highly saturated version of this specification, we include sector-region-time fixed effects, which absorb the entire variation in $Covid_{s,r,t}$, allowing us to control for factors that are specific to each sector and vary with region and time during the Covid-19 crisis, such as support to firms at local level. In fact, the set of government aid measures and initiatives in the wake of the crisis varied mostly by sector and time, and only to a lesser extent by region as well.¹⁶ The estimation results are given in Table 6. In this case, the β_2

¹⁶Covid-19 aid from central and local governments took a variety of forms (grants, tax breaks, guarantees, etc.) and it is hard to account for all of them consistently. Taking data from the Italian National State Aid

estimates remain positive and are statistically significant in columns (2) and (3). The effect for replacements is twice as large as for sole exits.

Insert Table 6 here

Overall, this more highly disaggregated analysis confirms the earlier province-level findings; namely, changes in ownership structure due to local ex-ante mafia presence consist mainly in shareholder replacements. For this analysis too we report the effects on business demographics, this time considering only the sectors impacted by the crisis. Consistent with the province-level analysis, we find no differences in the response to Covid-19 closures that can be traced back to the intensity of local mafia presence (Table 7).

Insert Table 7 here

5 Additional results and robustness

Robustness checks. Our main identifying hypothesis is that mafias infiltrate private firms in areas where they are already present, and do so by exploiting the liquidity crisis generated by the pandemic. The foregoing analyses have identified this channel by using the exogeneity of pandemic crisis intensity and regressions featuring highly granular fixed effects (province-time and region-sector-time) to control for time-varying variables, both observable and unobservable, that could confound the impact detected. The only residual variation that could still influence our estimates is at province-sector-time level, which might be correlated with the mafia presence and cannot be ruled out by means of fixed effects.

The results could be confounded also by other features of the local economic and social system. For instance, the apparent correlation between mafia presence and ownership changes could be spurious, mediated by other unobservable factors. We consider three potential sources of variation that could be correlated with the mafia presence at province level and, at the same time, could affect the dynamics of ownership changes: i) social capital,

Registry (*Registro Nazionale Aiuti*, RNA), which includes the universe of aid granted by all public authorities in Italy, and identifying all Covid-19-related aid by text analysis, we verified that, when the extent of state aid received by firms is included as additional control in specification 2, the entire variation in this aid is absorbed by sector-region-time fixed effects.

2) judicial efficiency, and 3) level of local financial development. As described in Section 3, we proxy social capital with voter participation in the referendum on divorce in 1974; judicial efficiency is gauged as the average clearance rate of the local civil courts in 2010-2019; and financial development is the number of bank branches per 100,000 inhabitants. These variables also serve as additional regressors, interacted with the (log of) closure days. To enhance comparability across estimates, and in line with the strategy adopted for the mafia index, we normalize these additional variables by their standard deviation. We then replicate the province-level analysis and the province-sector-level analysis with the most granular fixed effects. The results are displayed, respectively, in Tables 8 and 9.

Insert Tables 8 and 9 here

The Panels in A include social capital as an additional control. There are some missing observations, but the baseline results stand confirmed. Importantly, the inclusion of this variable does not alter the point estimates of our main parameter at either at province or sector level, reassuring us that social capital is not a spurious driver of the results. Similar conclusions are drawn from the estimates in Panels B and C, which control respectively for judicial efficiency and local financial development. In Panel C of Table 9, we find that financial development also correlates with ownership replacement when interacted with the number of mandatory closure days. However, this still does not affect the point estimate of our coefficient of interest.

Heterogeneity by sector. Exploiting inter-sectoral variation, we can determine which sectors are driving our results. We estimate a regression model as in specification 2 for each macro-sector (1-digit Ateco).¹⁷ Estimates of the interaction term between the log of closure days and mafia presence are given in Figure 2. The estimates refer only to the sectors affected by the Covid-19 closures. The figure shows that the overall results are driven chiefly by sectors that are either historically prone to mafia infiltration or racketeering or that had

¹⁷The macro-sectors considered are those with some closure days in at least one month: A (agriculture, forestry and fishing), B (mining and quarrying), C (manufacturing), F (construction), G (wholesale and retail trade; repair of motor vehicles), H (transportation and storage), I (accommodation and food services), J (information and communication), L (real estate), M (professional, scientific and technical activities), N (administrative and support services), R (arts, entertainment and recreation), S (other services).

become more attractive during the Covid-19 crisis. For instance, construction (F) and real estate (L) have long been shown to be especially prone to mafia infiltration in Italy (Ferrante et al., 2021, Scognamiglio, 2018). What is more, since the onset of the Covid-19 crisis these sectors have been subsidized enormously (the so-called *Superbonus 110%* was one of the biggest government support policies during Covid-19, with the objective of prompting the renovation of private buildings for energy efficiency). Conversely, trade (G), transport (H) and accommodation and food services (I) were severely affected by the social distancing measures and were thus more readily taken over by criminal organizations, which could leverage on their deeper pockets.

Insert Figure 2 here

Heterogeneity by firm size. The sample companies undergoing ownership changes during the Covid-19 crisis differ significantly in size. Consistent with the aggregate evidence for Italy, micro-firms (under 10 employees) account for 86% of all firms that had any type of ownership change; small firms (10-49 employees) and medium-sized firms (50-249 employees) jointly account for 13% of the changes observed. Finally, large firms (250 employees and up) represent about 1% of the changes. This section replicates the baseline analysis separately for ownership changes in micro- and small-to-medium sized firms (SMEs). We exclude large firms, for which the sector-province-month cells of observations are practically empty. Tables 10 and 11 show the results at province and province-sector levels. The A Panels refer to micro firms, B to SMEs.

Insert Tables 10 and 11 here

The results from both regressions consistently indicate that the impact of organized crime on ownership replacement during the Covid-19 crisis is due entirely to micro-firms. This is in keeping with the idea that organized crime exploits the financial vulnerability of companies: micro-firms are not only inherently more vulnerable (Fatica and Rancan, 2022) but also have less probability of receiving government aid, as documented extensively by Albanese et al. (2021) for the pre-Covid-19 period.¹⁸

¹⁸On data from the Italian National State Aid Registry, we verified that this holds true also for Covid-19-

6 Conclusions

The global economic downturn triggered by the Covid-19 pandemic drove numerous firms in many sectors to the brink of default, necessitating unprecedented public intervention. Beyond the immediate challenges that economic crises pose to businesses, they also create opportunities for criminal organizations to exploit intensified vulnerabilities.

Our study looks into the impact of social restrictions on changes in the corporate ownership of Italian firms – in particular, potential mafia infiltration. Our findings indicate that, in distressed sectors and in provinces with more pronounced pre-existing mafia presence, companies underwent more significant ownership changes, driven by the exit of incumbent owners, who either sell shares to other incumbents (sole exit of owners) or, above all, to new shareholders (replacement of owners). Notably, mafia infiltration was observed prominently in certain sectors – hotels, restaurants, construction, real estate, retail and wholesale trade, and transportation – and in micro firms.

To counteract such infiltration, prompt detection of organized criminal activity is crucial. Notwithstanding the success of the substantial government liquidity support measures, which prevented widespread defaults, mafia infiltration persisted. This underscores the need for targeted strategies to safeguard the legitimate economy from criminal influence. Recognizing which sectors and firm size classes are at greatest risk is vital for timely intervention and prevention efforts.

related aid.

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A Construction of Covid-19 days of closures

With the prime minister’s decree of March 4, 2020 (Decree of the President of the Council of Ministers, DPCM), the Italian government imposed the first nation-wide restrictions in response to the Covid-19 pandemic emergency. In a crescendo of more and more restrictive measures, economic activities were progressively suspended; on March 11 the government issued a list of activities deemed essential and ordered the suspension of all non-essential industrial and trade activity.¹⁹ As the public health emergency evolved, nationwide closures were succeeded by regional measures, and the list of economic sectors allowed to operate evolved and adapted to the severity of the health risk. The closures can be divided into four main periods:

(i) March 12, 2020 - May 17, 2020: All industrial and trade activities were suspended, except those deemed “essential”, which were specified in government acts.²⁰

(ii) May 18, 2020 - November 5, 2020: Most of the national suspensions were lifted in May or June.²¹ At the same time, regions and local authorities were empowered to suspend economic activities in accordance with the development of local contagion risk. Although the lists of authorized Ateco codes for each region during this period are not available, for most of the summer of 2020 and at least until September, the epidemiological situation remained low-risk in almost all of Italy, and most economic activities can be presumed to have been operational. As contagion risk turned back up, some restrictions were applied beginning in August, addressed to dance halls, nightclubs, and a few other categories.²²

(iii) November 6, 2020 - April 25, 2021: As Covid-19 cases kept increasing, the national government issued new restrictions, to be applied differentially on a regional basis according to risk level. Beginning November 6, 2020, the Ministry of Health instituted weekly monitoring of regions, classifying them into three risk categories (yellow, orange, red), each

¹⁹Professional services were not suspended, but workers were required to work from home wherever possible.

²⁰Decrees published within this timeframe: DPCM of March 11, 2020 (valid from March 12 to March 22), Decree of the Ministry of Economic Development of March 25, 2020, supplementing DPCM of March 22, 2020 (valid from March 23 to April 13), DPCM of April 10, 2020 (valid from April 14 to May 3), and DPCM of April 26, 2020 (valid from May 4 to May 17).

²¹DPCM of May 17, 2020, and DPCM of June 11, 2020.

²²Decree of the Ministry of Health of August 17, 2020.

associated with a list of suspended activities.^{23,24} Combining the regional risk classification data over time with the lists of non-authorized Ateco codes for each risk category, one can determine the authorized activities for each territory.²⁵ It is assumed that the risk categories established by the Ministry of Health are a good indicator of risk perception by regional administrators during each period and hence of the resulting regional restrictions.

(iv) April 26, 2021 - May 31, 2022: The Decree Law of April 22, 2021, introduced the “green pass”. Almost all economic activities were now open, but access to workplaces and to many services was limited to people with the so-called *green pass*, a certification that they had been vaccinated or were at low risk of contagion (either recently recovered from Covid-19 or tested negative).

In summary, the objective of this part of the study was to create a single dataset that specifies, for each month and each region, the number of days that each type of company – identified by the Ateco code – was required to remain closed due to the government restrictions. Depending on the period considered, different methodologies were followed. In the first period, the government lists identified the businesses that remained open; for the second, it could be assumed that the majority of economic activities were operational. In the third period – with the assignment of risk categories by region – the information related to the risk of contagion was combined with the lists of non-authorized Ateco codes for each risk level. The dataset was constructed so as to include all months from March 2020 to July 2021, all regions of Italy, and all Ateco codes.

Sectoral closures in each region-month were defined at the 6-digit Ateco level. We aggregated them up to the 2-digit level with an average weighted by the sectoral share of employment in 2019. The sectoral employment data are available at the 5-digit Ateco level. Closures at the 6-digit level were first aggregated at the 5-digit level by simple averages.

²³DPCM of November 3, 2020. The DPCM of January 14, 2021, included a fourth category (white), for the lowest risk level and the mildest restrictions.

²⁴The data on monitoring come from an elaboration by Andrea Cattaneo available at https://github.com/imcatta/restrizioni_regionali_Covid/blob/main/dataset.csv.

²⁵The lists of non-authorized Ateco codes for each risk category were retrieved from legal annexes to national DPCMs and regional decrees (source: *Gazzetta Ufficiale*).

B Tables

Table 1: **Summary statistics**

	(1)	(2)	(3)
	Mean	Standard Deviation	Observations
Ownership changes (province-sector-month)			
Entry	0.122	0.347	108,579
Exit	0.230	0.498	108,579
Replacement	0.281	0.570	108,579
Days of closures (region-sector-month)			
Log (Closed days)	0.33	0.86	21,117
Closed days	1.76	5.52	21,117
Province-level observables			
Mafia index	8.20	7.24	107
Divorce (referendum participation) (%)	87.82	7.36	91
Clearance rate (%)	99.50	3.28	106
Bank branches (over 100th people)	48.23	15.90	107

Table 2: **Province-level analysis**

	(1)	(2)	(3)
	Entry	Exit	Replacement
Log(Closed days)	-0.117 (0.082)	-0.112* (0.060)	-0.235*** (0.050)
Log(Closed days) X Mafia	0.039*** (0.014)	0.036*** (0.013)	0.065*** (0.011)
Observations	1785	1785	1785
Adjusted R^2	0.856	0.908	0.923
Province FE	Yes	Yes	Yes
Year-Month FE	Yes	Yes	Yes

Notes: Standard errors clustered at province level are reported in parentheses.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 3: **Province-level analysis (region-time FE)**

	(1)	(2)	(3)
	Entry	Exit	Replacement
Log(Closed days) X Mafia	0.020 (0.026)	0.028 (0.020)	0.063*** (0.018)
Observations	1768	1768	1768
Adjusted R^2	0.856	0.912	0.929
Province FE	Yes	Yes	Yes
Region-Year-Month FE	Yes	Yes	Yes

*Notes:*Standard errors clustered at province level are reported in parentheses.

*** p<0.01, ** p<0.05, * p<0.1.

Table 4: **Registered and closed firms**

	(1)	(2)
	Log(closed companies)	Log(new companies)
Log(Closed days) X Mafia	-0.0005 (0.0141)	-0.0018 (0.0233)
Observations	1768	1768
Adjusted R^2	0.959	0.859
Province FE	Yes	Yes
Region-Year-Month FE	Yes	Yes

*Notes:*Standard errors clustered at province level are reported in parentheses.

*** p<0.01, ** p<0.05, * p<0.1.

Table 5: **Sector-province level analysis**

	(1)	(2)	(3)
	Entry	Exit	Replacement
Log (Closed days)	-0.000 (0.008)	-0.014 (0.011)	-0.023* (0.012)
Log(Closed days) X Mafia	0.005*** (0.001)	0.008*** (0.001)	0.011*** (0.002)
Observations	108579	108579	108579
Adjusted R^2	0.353	0.495	0.538
Province-Year-Month FE	Yes	Yes	Yes
Sector-Year-Month FE	Yes	Yes	Yes

Notes: Standard errors clustered at province-sector level are reported in parentheses.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 6: **Sector-province level analysis (region-sector-time FE)**

	(1)	(2)	(3)
	Entry	Exit	Replacement
Log(Closed days) X Mafia	0.002 (0.002)	0.005* (0.003)	0.010*** (0.003)
Observations	107353	107353	107353
Adjusted R^2	0.355	0.517	0.564
Province-Year-Month FE	Yes	Yes	Yes
Region-Sector-Year-Month FE	Yes	Yes	Yes

Notes: Standard errors clustered at province-sector level are reported in parentheses.

*** p<0.01, ** p<0.05, * p<0.1.

Table 7: **Registered and closed firms (sector-province level analysis)**

	(1)	(2)
	Log(closed companies)	Log(new companies)
Log(Closed days) X Mafia	-0.0002 (0.0037)	-0.0019 (0.0032)
Observations	107353	107353
Adjusted R^2	0.656	0.577
Province-Year-Month FE	Yes	Yes
Region-Sector-Year-Month FE	Yes	Yes

Notes: Standard errors clustered at province-sector level are reported in parentheses.

*** p<0.01, ** p<0.05, * p<0.1.

Table 8: **Province-level analysis - robustness test (additional controls)**

	(1)	(2)	(3)
	Entry	Exit	Replacement
Panel A			
Log(Closed days) X Mafia	0.025 (0.027)	0.034* (0.017)	0.052*** (0.017)
Log(Closed days) X Divorce	0.026 (0.038)	0.021 (0.026)	0.016 (0.029)
Observations	1530	1530	1530
Adjusted R^2	0.855	0.911	0.929
Panel B			
Log(Closed days) X Mafia	0.020 (0.026)	0.028 (0.020)	0.064*** (0.018)
Log(Closed days) X Clearance rate	0.004 (0.018)	-0.002 (0.011)	-0.006 (0.013)
Observations	1768	1768	1768
Adjusted R^2	0.856	0.912	0.929
Panel C			
Log(Closed days) X Mafia	0.018 (0.026)	0.031 (0.020)	0.067*** (0.018)
Log(Closed days) X Bank branches	-0.013 (0.033)	0.017 (0.027)	0.022 (0.023)
Observations	1768	1768	1768
Adjusted R^2	0.856	0.912	0.929
Province FE	Yes	Yes	Yes
Region-Year-Month FE	Yes	Yes	Yes

Notes: Standard errors clustered at province level are reported in parentheses.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 9: **Sector-province level analysis - robustness test (additional controls)**

	(1)	(2)	(3)
	Entry	Exit	Replacement
Panel A			
Log(Closed days) X Mafia	0.003 (0.003)	0.006** (0.003)	0.010*** (0.004)
Log(Closed days) X Divorce	0.003 (0.003)	0.000 (0.004)	0.004 (0.004)
Observations	93207	93207	93207
Adjusted R^2	0.367	0.529	0.576
Panel B			
Log(Closed days) X Mafia	0.002 (0.002)	0.005* (0.003)	0.010*** (0.003)
Log(Closed days) X Clearance rate	0.000 (0.001)	-0.001 (0.001)	-0.000 (0.002)
Observations	107353	107353	107353
Adjusted R^2	0.355	0.517	0.564
Panel C			
Log(Closed days) X Mafia	0.002 (0.002)	0.006** (0.003)	0.011*** (0.003)
Log(Closed days) X Bank branches	0.002 (0.003)	0.005 (0.003)	0.009** (0.004)
Observations	107353	107353	107353
Adjusted R^2	0.355	0.517	0.564
Province-Year-Month FE	Yes	Yes	Yes
Region-Sector-Year-Month FE	Yes	Yes	Yes

Notes: Standard errors clustered at province-sector level are reported in parentheses.

*** p<0.01, ** p<0.05, * p<0.1.

Table 10: **Province-level analysis - heterogeneity by firm size**

	(1)	(2)	(3)
	Entry	Exit	Replacement
Panel A: Micro firms			
Log(Closed days) X Mafia	0.024 (0.020)	0.032 (0.022)	0.066*** (0.020)
Observations	1768	1768	1768
Adjusted R^2	0.721	0.777	0.924
Panel B: Small-Medium firms			
Log(Closed days) X Mafia	0.014 (0.022)	0.001 (0.019)	0.016 (0.022)
Observations	1768	1768	1768
Adjusted R^2	0.525	0.588	0.791
Province FE	Yes	Yes	Yes
Region-Year-Month FE	Yes	Yes	Yes

Notes: Standard errors clustered at province level are reported in parentheses.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 11: **Sector-province-level analysis - heterogeneity by firm size**

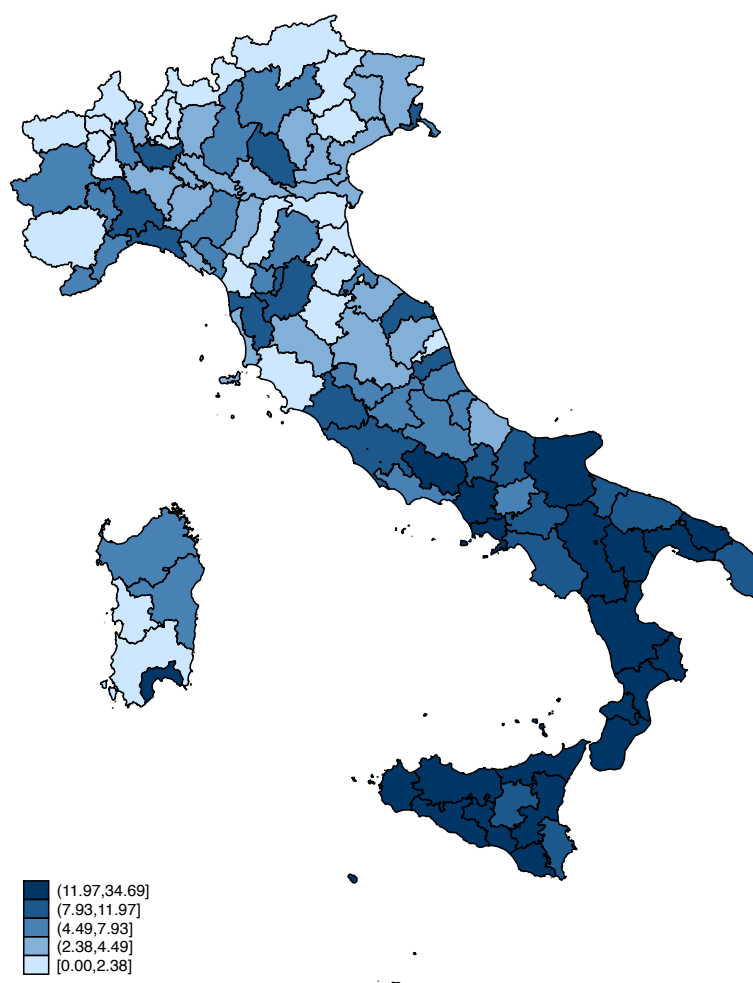
	(1)	(2)	(3)
	Entry	Exit	Replacement
Panel A: Micro firms			
Log(Closed days) X Mafia	0.002 (0.002)	0.001 (0.002)	0.010*** (0.004)
Observations	83581	83581	83581
Adjusted R^2	0.171	0.232	0.549
Panel B: Small-Medium firms			
Log(Closed days) X Mafia	0.001 (0.002)	-0.001 (0.002)	0.002 (0.003)
Observations	52744	52744	52744
Adjusted R^2	0.003	0.031	0.194
Province-Year-Month FE	Yes	Yes	Yes
Region-Sector-Year-Month FE	Yes	Yes	Yes

Notes: Standard errors clustered at province-sector level are reported in parentheses.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

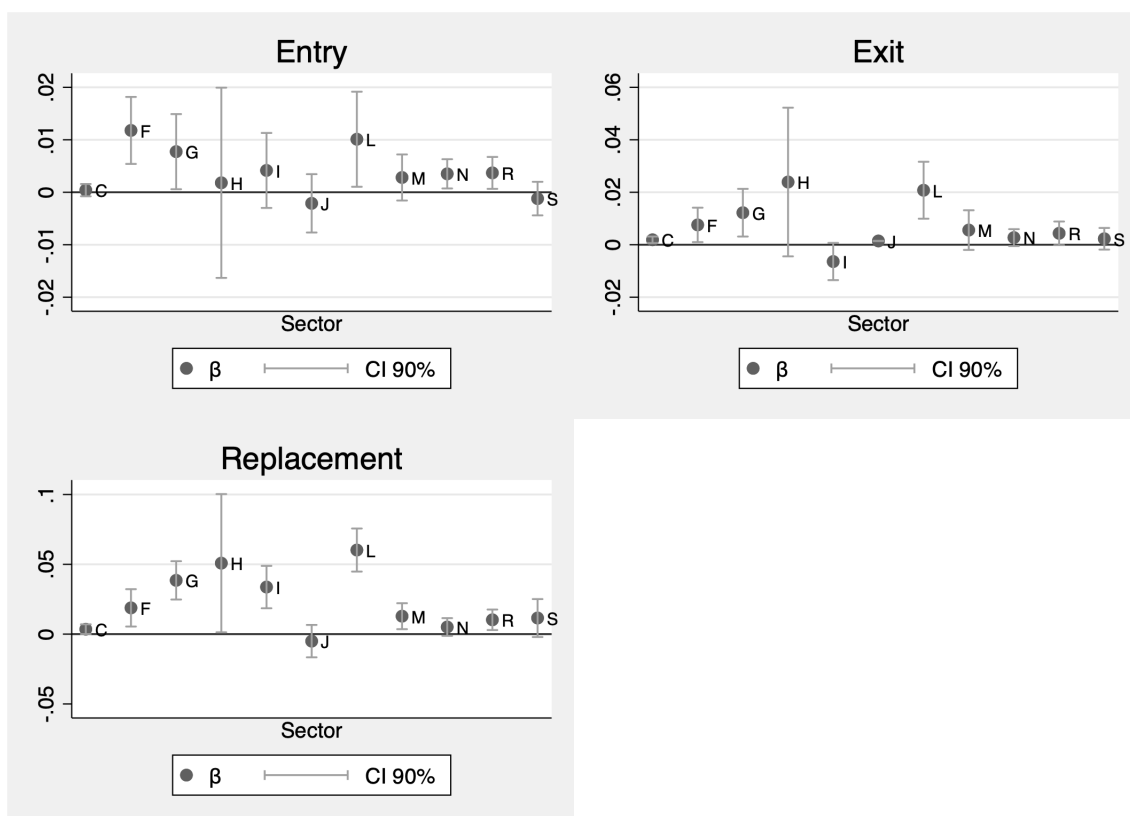
C Figures

Figure 1: Mafia Index



Note: The map is based on the quintiles of the mafia index distribution for the 107 Italian provinces.

Figure 2: Heterogeneity by sector



Notes: The figure plots estimated coefficients of β_2 in equation 2 together with 90% confidence intervals. Estimates refer to each macro-sector (1-digit Ateco) affected by the Covid-19.