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"DO CRIMINAL CONNECTED FIRMS SURVIVE AFTER POLICE OPERATIONS? AN ANALYSIS OF THE ITALIAN CASE"

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Abstract

The thesis aims to analyse whether a criminal firm, after a police operation that exposes its criminal connection, can survive or not the following years. The first part of the thesis is dedicated to a historical analysis of the patrimonial prevention measures, to develop an overview of the legislative framework and its concrete results. The second part presents an empirical analysis focused on a sample of criminal firms. The financial results and ratios related to the years before the police operation are analysed to assess whether they are relevant to determine the survival probabilities of firms.

1. *Introduction*

Currently, in Italy, 2796 firms have been definitely confiscated from organised crime[1]. This data takes into consideration only definitive confiscations and destinated firms, therefore, all seizure procedures, not definitive confiscations, firms under anti-mafia disqualification *("interdittiva antimafia")* and all possible firms connected with organised crime are not included. This number, even if incomplete, is useful to understand the evolution of organised crime over years. Organised crime has always been looking for profitable business opportunities since its origin: remarkable examples are contained in the works of *Buonanno et al.*[2]*,* relative to the development of organised crime in Sicily favoured by weak institutions and abundance of natural resources, and of *Dimico et al.*[3], relative to the production of citrus fruits and the origin of the Mafia. Organised crime has transformed and reinvented itself in order to penetrate and pollute all economic sectors throughout its history. Violent activities performed by these types of organizations, which have characterized the history of our country, have been gradually substituted by a more subtle type of territory control. Now, the use of violence is the last resource to affirm supremacy in a determined area. In fact, these methods would attract the attention of society toward a phenomenon that, from a criminal point of view, should remain hidden from all possible forms of notice. These adjustments should not instil the wrong conviction that criminal organizations are weaker than past decades, during which horrific bomb attacks shocked civil society. Infiltrations into the economic system represent a huge damage from several points of view. They reduce fair competition, even-handed allocation of resources and growth opportunities in a country already characterized by uncompetitive markets and business possibilities. According to the *World Bank 2020 Report*[4], Italy occupies the 58th place in the *Ease of doing business ranking*. In addition to institutional and bureaucratic difficulties, the negative impact attributed to organised crime must be noted. Ultimately, gaining control of firms and entrepreneurial realities is one of organised crime's major goals. In fact, through the management of companies, criminal organisations can increase the positive conception regarding organised crime, they can ensure workplaces, welfare, and well-being while at the same time, with various modalities, performing a legal or semi-legal activity. This phenomenon is dangerously undervalued in all Italy but particularly in the North area. The major risk is that a criminal organization could assume, in the eyes of society, the role of an

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[1] ANBSC, "Open Data Aziende Confiscate."
[2] Buonanno et al., "Poor Institutions, Rich Mines."
[3] Dimico, Isopi, and Olsson, "Origins of the Sicilian Mafia."
[4] World Bank Group, *Economy Profile of Central African Republic*.

alternative and legitimate institution. Therefore, in absence of alternatives, rather than as a criminal opponent to contrast, it could be seen as a benefactor. The legislation, through the years, has evolved together with the classification of the phenomenon and the development of organised crime. The historical legislative analysis is a clear indicator of how organised crime was and is considered and how this very consideration has evolved. Since the Italian entrepreneurial tissue is a perfect habitat for organized crime, firms will be the main focus of this thesis. A typical Italian firm is micro or small[5], it is often undercapitalised[6] and it presents generational and managerial problems[7] [8]. Bank lines are the first and most used form of financing[9]. It is quite intuitive to understand why and how a criminal organization can infiltrate into a legal company. Even a small alteration in the status quo is sufficient to suddenly bring a firm into a period of financial crisis, the perfect moment for organised crime to finance and take the control of the firm. This is only one among many examples of criminal takeover. These characteristics are exacerbated by the current global crisis related to the pandemic and the war. The effort put into place by the authorities to contrast this phenomenon is constant and every year several firms connected to criminal organisations are discovered. Based on the outcome of investigations and trials, the destiny of these firms can take various directions, from the liquidation to the prosecution of the activities. Obviously, the latter option should represent the ultimate objective pursued by the State and society, since the liquidation of a functioning firm constitutes a waste of important resources. The most recent legislation[10], *"Codice Antimafia"* and its successive reform[11], is developed toward the perspective of continuation of the activities, to ensure the integrity of the system. With a number of criticalities, the legislation moved from a liquidation perspective to a going-concern approach. According to that, criminal firms are no longer entities to be liquidated as soon as possible. Now, liquidation is one of many viable solutions to end the criminal control phase. Major importance is given to the possibility of continuation of the activities without criminal interference. The transition from a criminal to a legal control is a serious disruption process involving an extremely high effort. If this phase is managed successfully and all the external factors beyond the institutional control allow it, the firm can return to operate in a legal manner. Otherwise, the firm is shut down and liquidated. The process can require years, so the timely assessment of survival possibilities is essential to avoid the waste of time and public funds. The ambition of the thesis is to develop a model useful

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[5] Istat, "Imprese e Addetti."
[6] Orlando and Rodano, "Firm Undercapitalization in Italy."
[7] Poggio, "Sempre più imprese familiari si affidano a manager esterni."
[8] Petrucciani, "Pmi, il problema della successione."
[9] Visco, Baffi Carefin Bocconi, and Equita, "La finanza d'impresa in Italia: recente evoluzione e prospettive."
[10] Gazzetta Ufficiale, Decreto Legislativo 6 settembre 2011, n. 159.
[11] Gazzetta Ufficiale, "Legge 17 Ottobre 2017, n. 161."

for this assessment. The empirical study analyses several fundamental variables to individuate firms for which is highly probable only one exit strategy, liquidation. Financial indicators are the key predictors of liquidation.

Before starting, it is fundamental to clarify the definition of organised crime. Mafia, organised crime, and criminal organisation are not interchangeable terms. Defining organised crime is important because it determines how the legislative framework is shaped. According to *Finckenauer*[12], *"mafia is a social construct. It is an idea. It is a cultural artifact"*, it is one, but not the only, form of organised crime. Italian mafias are different from each other and from foreign criminal organisations, therefore cannot be conceptualized and conceived as a single phenomenon[13]. For the sake of clarity, the general terms "organised crime" and "criminal organisations" are used throughout this document, because the analysis of firms does not include as a principal purpose to make a distinction between different types of criminal organisations. Instead, the phenomenon is analysed from a unitary point of view.

The first part of the thesis presents the legislative evolution culminated with the emanation of the reformed *"Antimafia Code"*. The analysis goes from the first embryonal anti-mafia interventions in the fifties until most recent modifications to the just quoted Code. The successive part is related to principles and models applied by judicial administrators when they need to evaluate a seized or confiscated firm. After that, a section is dedicated to the statistical assessment of the *ANBSC* database relative to definitively confiscated and destined firm, which allows having a clearer numerical conception of the patrimonial prevention measures results. The sixth chapter is completely reserved to the empirical analysis. Firstly, the data sample is described, its characteristics are exposed, and the variables included in the models are presented. Then, in the seventh chapter, a series of empirical studies are performed in order to evaluate the research question. The results are commented keeping into consideration the current legislation and the process of legal transition. The last part of the thesis is dedicated to the conclusions.

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[12] Finckenauer, "Problems of Definition."
[13] Berlusconi, "Italian Mafia."

1.1 Research question

The transition from a criminal control to a legal one is a long and complicated phase in the life of a firm. Every year, thanks to the report of the *"Direzione Investigativa Antimafia"*[14] *(DIA)*, it is possible to appreciate new criminal businesses and related firms discovered by authorities. When the criminal connection is revealed, usually, firms start a complex and highly regulated process of legalisation. This process involves a non-negligible number of resources. Several times this process is successful, therefore a firm returns to operating as a normal one. On many occasions, however, a firm is shut down. The probabilities of a positive outcome are influenced by a lot of subjective factors, such as, the industry in which the firm operates, the territory, its history, the reaction of stakeholders, the ability of the judicial administrator and the list can continue. The thesis tries to answer the following question: is it possible to understand from the very beginning of the exposure of the criminal connection if a firm will surely fail? Are there any indicators able to predict failure probabilities of a former criminal firm?

Being able to answer these questions is very important. First of all, if, from the very beginning of the legalisation process, failure is clearly the only possible outcome, then it is useless to invest time and public resources. The authorities should concentrate their efforts only on those firms with good survival chances and should liquidate the others. Furthermore, it is interesting to assess whether judicial administrators base their valuations on factors that, as a matter of fact, contribute to determine the survival or failure probabilities of a firm.

In order to develop a model coherent with these questions, the indicators chosen must have certain characteristics: they must be available, easy to interpret and universally recognised. Several studies regarding bankruptcy predictive models, indicated in chapters *2* and *6,* constitute the theoretical base of the study. Other important documentation regards the legislative framework and the guidelines adopted by judicial administrators to evaluate a seized or confiscated firm.

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[14] Direzione Investigativa Antimafia, "Relazioni Semestrali."

2. *Literature review*

The works of *Finckenauer* [15], *Berlusconi*[16], *Buonanno et al.*[17], *Dimico et al.*[18] are the chosen tools to examine the definition and origin of organised crime.

Assessing the survival possibilities of a criminal firm is only possible if the relative legislative framework is previously analysed. For this purpose, the papers of *Calamunci[19]*, *Donato et al.*[20] and *Basile*[21] reconstruct the evolution of the legislation and they add a critical dimension to the various legislative interventions. The book of *Salvadori*[22] and *La Spina*[23] and the articles of *Benigno*[24], *Varese*[25], *Buonanno and Pazzona*[26] investigate reasons and problematics related to the mass migration from the South to the North around the sixties and its connection to the *"soggiorno obbligato"* institute.

The application of the legislation brings to an evaluative process. *Koller et al.*[27] provides the necessary methodologies to evaluate a firm. The guidelines developed by *Bauco et al.*[28] and *Bartoli et al.*[29] are essential to understand the criticalities connected with the valuation of a seized or confiscated firm, since they derive from the direct experiences of judicial administrators.

The articles and book of *Altman* (1968[30]), *Altman et al.* (1977[31]), *Altman* (2005[32]), *Altman and Hotchkiss* (2010[33]), *Altman et al.* (2017[34]) have developed models to assess survival possibilities of firms through the use of different financial and market measures. The models, with different success degrees, can predict the bankruptcy of a firm years in advance thanks to

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[15] Finckenauer, "Problems of Definition."
[16] Berlusconi, "Italian Mafia."
[17] Buonanno et al., "Poor Institutions, Rich Mines."
[18] Dimico, Isopi, and Olsson, "Origins of the Sicilian Mafia."
[19] Calamunci, De Benedetto Marco, and Bruno, "Anti-Mafia Law Enforcement and Lending in Mafia Lands. Evidence from Judicial Administration in Italy."
[20] Donato, Saporito, and Scognamiglio, "Aziende Sequestrate Alla Criminalità Organizzata."
[21] Fabio Basile, "Dieci anni di codice antimafia – le misure di prevenzione."
[22] Salvadori, *Storia d'Italia*.
[23] La Spina, *Mafia, legalità debole e sviluppo del Mezzogiorno*.
[24] Benigno, "La Questione Delle Origini."
[25] Varese, "How Mafias Migrate."
[26] Buonanno and Pazzona, "Migrating Mafias."
[27] Koller, Goedhart, and Wessels, *Valuation*.
[28] Bauco et al., "Linee Guida in Materia Di Attestazione Antimafia."
[29] Bartoli et al., "Linee guida per la valutazione di aziende sequestrate e confiscate."
[30] Altman, "Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy."
[31] Altman, Haldeman, and Narayanan, "ZETATM Analysis. A New Model to Identify Bankruptcy Risk of Corporations."
[32] Altman, "An Emerging Market Credit Scoring System for Corporate Bonds."
[33] Altman and Hotchkiss, *Corporate Financial Distress and Bankruptcy*.
[34] Altman et al., "Financial Distress Prediction in an International Context."

the Z-Score indicator and its following modifications. *Altman et al.* (2015[35]) applies the Z"-Score model to Italian companies subject to extraordinary administration.

Regarding the analysis of data relative to confiscated firms, the database of the *ANBSC*[36], *Istat*[37] and reports of the *DIA*[38] have been main sources of information.

Paradigmatic reports regarding the current presence, investments and economic profile of criminal organizations are the *PON Project of Transcrime*[39], *The portfolio of the organised crime in Europe of Savona and Riccardi*[40] and the *ARIEL Project of Savona and Berlusconi*[41]. These extensive documents allow to deeply study quantitative statistics regarding criminal firms.

On an economic geographical level, *Pinotti*[42] quantifies the negative effect produced by organised crime on the GDP per capita (-16%) and he produces evidence about causes and consequences of organised crime[43]. It can prosper where societal demands are not addressed by legal institutions. The same author has developed interesting considerations about the problematics related to empirical analysis of criminal phenomenon[44]. The quality of data is a major problem when the object of the study are organizations that try to hide their trace and conducts. *Ardizzi et al.*[45] estimate the money laundering dimension in Italy (6% of GDP). *Le Moglie and Sorrenti*[46] show that provinces with high organised crime presence suffered less from the impact of the subprime crisis. This lower impact is consistent with the investments of organised crime in the legal economy. *Operti*[47] studies the ambiguous impact of confiscation measures on regional entrepreneurship. On one hand, the elimination of a criminal firm induces new entries, on the other, the institutional vacuum created lowers founding rates.

About entrepreneurial effects of organised crime, *Ravenda et al.*[48] expose the higher labour tax avoidance attributable to criminal firms. After the confiscation, there is no significant difference

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[35] Altman, Danovi, and Falini, "Z-Score Models' Application to Italian Companies Subject to Extraordinary Administration."
[36] ANBSC, "Open Data Aziende Confiscate."
[37] Istat, "Imprese e Addetti."
[38] Direzione Investigativa Antimafia, "Relazioni Semestrali."
[39] Transcrime, "Progetto PON sicurezza 2007-2013."
[40] Savona and Riccardi, "From Illegal Markets to Legitimate Businesses."
[41] Savona and Berlusconi, "Organized Crime Infiltration of Legitimate Businesses in Europe."
[42] Pinotti, "The Economic Costs of Organised Crime."
[43] Pinotti, "The Causes and Consequences of Organised Crime."
[44] Pinotti, "The Credibility Revolution in the Empirical Analysis of Crime."
[45] Ardizzi et al., "Money Laundering as a Financial Sector Crime - A New Approach to Measurement, with an Application to Italy."
[46] Le Moglie and Sorrenti, "Revealing 'Mafia Inc.'?"
[47] Operti, "Tough on Criminal Wealth?"
[48] Ravenda, Argilés-Bosch, and Valencia-Silva, "Labor Tax Avoidance and Its Determinants."

between confiscated and lawful firms. *Chircop et al.*[49] highlight how peer firms reduce their tax avoidance in the time following anti-Mafia police actions. *Calamunci and Drago*[50] analyse the positive spill over effects produced by the entering of a criminal firm into the judicial administration regime. The peer firms' performance increases by 2.2% and the turnover by 0.7% in the first four years after the start of the judicial administration. *Calamunci* (2022[51]) examines the negative impact on profitability (ROA -4.42%, ROI -2.42%) and the higher leverage (+7.21%) attributable to the legal administration. Moreover, she demonstrates a deterioration of survival probabilities of firms under judicial administration.

Albanese and Marinelli[52] display the negative impact of organised crime on firms' productivity. *Fabrizi et al.*[53] propose a distinction of criminal firms based on the role covered within the criminal organisation: support, *"cartiere"* and star. Moreover, the paper reveals how criminal firms are, on average, larger, and have more debt and lower liquidity compared to non-criminal ones. *Fabrizi and Parbonetti*[54] stress the infiltration risks connected with the Covid-19 crisis and the central role that firms have in criminal organisations' infiltration plans.

Bonaccorsi di Patti[55] show that organised crime adversely affects lending conditions. The increased short-term costs and collateral required by banks have important repercussion on firms' economic activities and investment decisions.

Calamunci et al.[56] and *Donato et al.*[57] are two other important papers focused specifically on judicial administration and its relative effects on financing. The first highlights the credit contraction (-19%) suffered by criminal firms after the confiscation and the impact of the judicial administration on the loan supply and demand determinants. The second exposes how banks do not discriminate confiscated firms based on their legal status. The reduction of the credit exposures happens years before the confiscation, following the deterioration of accounting indicators.

Daniele and Geys[58] have assessed the impact of organised crime on the institutional and political quality of Italian municipalities. When a municipality is dissolved, the average

[49] Chircop et al., "Anti-Mafia Police Actions, Criminal Firms, and Peer Firm Tax Avoidance."
[50] Calamunci and Drago, "The Economic Impact of Organized Crime Infiltration in the Legal Economy."
[51] Calamunci, "What Happens in Criminal Firms after Godfather Management Removal?"
[52] Albanese and Marinelli, "Organized Crime and Productivity."
[53] Fabrizi, Malaspina, and Parbonetti, "Caratteristiche e modalità di gestione delle aziende criminali."
[54] Fabrizi and Parbonetti, "Aziende Criminali, Business e Covid-19."
[55] Patti, "Weak Institutions and Credit Availability."
[56] Calamunci, De Benedetto Marco, and Bruno, "Anti-Mafia Law Enforcement and Lending in Mafia Lands. Evidence from Judicial Administration in Italy."
[57] Donato, Saporito, and Scognamiglio, "Aziende Sequestrate Alla Criminalità Organizzata."
[58] Daniele and Geys, "Organised Crime, Institutions and Political Quality."

educational level of local politicians increases. *Dalla Chiesa*[59] describes managerial and environmental problems and critical success factors related to the administration of a seized or confiscated firm. *Cabras and Meli*[60] illustrate the managerial results of ten different seized and confiscated firms. From these case studies is possible to analyse practically some critical success and unsuccess factors. *Vaccaro and Palazzo*[61] evaluate all the necessary micro processes producing an institutional change in societies dominated by organized crime. The organization object of the analysis, *Addiopizzo*[62], has produced significant institutional modifications toward the *"pizzo"* diffused practice. These considerations are valid also for the social integration process of previously seized and confiscated firms.

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[59] Chiesa, "La sfida delle aziende confiscate. Tra sistemi locali e modelli imprenditoriali."
[60] Cabras and Meli, "La gestione delle imprese confiscate alla criminalità organizzata. Dieci casi di studio a confronto."
[61] Vaccaro and Palazzo, "Value against Violence: Institutional Change in Societies Dominated by Organized Crime."
[62] "Addiopizzo.Org."

3. *Historical analysis of the patrimonial prevention legislation*

It is necessary to analyse the evolution of the legislation to understand its current state. It allows to comprehend why certain dispositions were created and the continuous developments made over the years. The historical and synthetic reconstruction is based mainly on the *Donato et al.* paper[63]. The development of entrepreneurial criminal organizations is perceptible especially through more frequent references to firms and their relative administration problems with the passing of years.

3.1 The first "antimafia" law

The first legislative intervention properly defined as *"antimafia"* was *law number 575 of 1965*[64]. The origin of organised crime dates back to around half of the nineteenth century[65] but only after a century the phenomenon was formalized within the legislation. The legislative measure was applicable toward suspected of belonging to mafia associations, however, no definition was provided about the suspected, nor about the mafia associations. This phenomenon, despite being present for decades, was not correctly definable at the time because the dimensions and implications for the society were not completely crystal clear. The results were definitions without marked borders, which allowed not to narrow the extent of the act. For the first time, a special discipline was dedicated to organised crime. An example is *article 10*, which contained prevention measures regarding licences and concessions. This law also contained the "*soggiorno obbligato*" institute *("obliged stay", art. 3)*, originally comprised in *law number 1423 of 1956*[66]. Criminal organization associates moved to North Italian regions, and, at the same time, millions of people emigrated from the South to the North driven by the industrialization process and by the greater possibilities of improving their living conditions. Integrations problems and racist hostilities faced by migrants contributed to increase the appealing of the possibilities offered by organised crime[67]. The expertise embedded and represented by confined mafia-men was used to take advantage of the labour offered by migrants. The "*soggiorno obbligato*" policy did not obtain the desired objective, but it contributed to obtain the opposite[68]. The legislator thought that virgin territories, not yet

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[63] Donato, Saporito, and Scognamiglio, "Aziende Sequestrate Alla Criminalità Organizzata."
[64] Gazzetta Ufficiale, "Legge 31 Maggio 1965, n. 575."
[65] Benigno, "La Questione Delle Origini."
[66] Gazzetta Ufficiale, "Legge 27 Dicembre 1956, n. 1423."
[67] Salvadori, *Storia d'Italia*.
[68] Buonanno and Pazzona, "Migrating Mafias."

infected by organised crime, constituted a hostile environment for confined mafia associates. Since the first recognition of the mafia as an association is dated 1965, all the non-traditional regions associated with the phenomena of organised crime did not connect the policy with dangers of organised crime infiltrations. These territories were the perfect habitat to develop the associations outside their historical territories. The economic potential and the entrepreneurial tissue were used to strengthen organised crime, involving inevitably firms. Already in 1976, six years before the homonymous law, deputies La Torre and Terranova exposed this trend: *"there have been changes in the territorial dimension of the Mafia phenomenon -its export to the North -in the enlargement of the sectors and fields of action of the Mafia, in its way of being and its behaviour"*[69]. Migrations and the obliged stay institute surely contributed to the eradication of organised crime, but they were factors and not the only causes. A successful integration was and is possible only when the State fail to meet required needs and when it does not offer legal protection[70] [71] [72]. Infiltrations were clearly not mechanical events. They were essential trigger factors (migrations and legislative institute), inattention to the phenomenon, accommodating social, political, and economic circumstances.

3.2 "Rognoni La Torre" law

The first introduction in the penal code *(article 416-bis[73])* of the felony of mafia association is contained in *law number 646* of 13th September 1982, better known as *"Rognoni La torre"*, by the names of its proponents. Article 1 defined an association as Mafia *"quando coloro che ne fanno parte si avvalgono della forza di intimidazione del vincolo associativo e della condizione di assoggettamento e di omertà che ne deriva per commettere delitti, per acquisire in modo diretto o indiretto la gestione o comunque il controllo di attività economiche, di concessioni, di autorizzazioni, appalti e servizi pubblici o per realizzare profitti o vantaggi ingiusti per se' o per altri"*. Members of the association use the force of intimidation of the associative bond and the condition of subjection and conspiracy of silence to commit crimes, to acquire directly or indirectly the management or control of economic activities, concessions, authorisations, contracts, and public services or to make profits or unfair advantages for themselves or for others[74]. This given definition was much more punctual and structured compared to the *act of*

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[69] Mazzenzana, "Commissione parlamentare di inchiesta sul fenomeno della mafia in Sicilia 1976."
[70] Varese, "How Mafias Migrate."
[71] Buonanno et al., "Poor Institutions, Rich Mines."
[72] Dimico, Isopi, and Olsson, "Origins of the Sicilian Mafia."
[73] Gazzetta Ufficiale, "Regio Decreto 19 Ottobre 1930, n. 1398."
[74] Gazzetta Ufficiale, "Legge 13 Settembre 1982, n. 646."

1965[75]. The same article specified that the dispositions were applicable also to the *"camorra"* and to all the others local associations coherent with the given definition of mafia. The intention to cover all the possible associations assimilable to the Mafia, even outside traditional areas, signalled an improved consciousness about the pervasiveness of organised crime across the Peninsula. The impact of this intervention is amplified by the murder of Pio La Torre on 30th April 1982. The contrast activities toward organised crime and the innovative legislation culminated with the assassination[76]. With this crime, instead of slowing the legislative process, criminal organizations had speeded up the approval of the law. In the definition, the association is the main element that, from the origin, is embedded and non-separable from organised crime. Only when the members can feel themselves active parts of a specific association, the intimidation is effective. Inevitable consequence of the intimidation is the omerta, especially when the State is incapable of offering a sufficient level of protection. The omerta coupled with intimidation can be enough to ensure partial or total control of firms and economic activities, from which is possible to extract profits or illegal advantages.

The law was pioneering also for the introduction of seizure and confiscation measures against goods belonging to organised crime. In *article 14*, the law attributes to the Public Minister and to the questor power to indagate the life, income and patrimony of suspected organised crime exponents, their families, and their employees[77]. The article also included seizures and confiscations institutes, applicable if the clues were sufficient (like huge discrepancies between the life tenor and the declared income) to determine the illegal origin of the person's wealth. The Procurator of the Republic and the questor, through the tributary police, could request to the Public Administration and to private and public credit institutes all the possible information and documentation useful for the investigation. If any type of asset derived, directly or indirectly, from illegal activities, the Court, with a motivated decree, could proceed with the seizure of the goods, even if they were indirectly under the control of the suspect. This passage is crucial to understand the paradigmatic change occurred to the legislation: the availability of sufficient clues is enough to proceed with the application of patrimonial prevention measures. A criticality was the absence of any reference regarding the administration of assets. The possibility that the object of the patrimonial measures could have been a firm or simply an economic activity was not considered, and all the implications derived from the confiscation of

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[75] Gazzetta Ufficiale, "Legge 31 Maggio 1965, n. 575."
[76] Librizzi, "Una biografia politica di Pio La Torre."
[77] La Spina, *Mafia, legalità debole e sviluppo del Mezzogiorno*.

these types of activities were not addressed. This absence constituted the basis for successive legislative interventions.

3.3 Introduction of the concept of administration of assets

Law decree number 230 of 1989[78] then converted into law[79] introduced several fundamental novelties concerning confiscated and seized goods. After the seizure provision, the court had to nominee a delegated judge and a judicial administrator. This figure, chosen from recognised professional orders, had the role of conservator and custodian of the seized goods under the direction of the delegated judge. Technicians could help an administrator to increase the profitability of the assets. Preventive measures no longer had only a punishment and passive approach, but they must have, whenever the condition made it possible, a proactive approach aimed to increase the value of seized assets. The administrator had to produce initial and periodic relations regarding the management and the consistency of goods, another step toward an active approach in the administration. The powers attributed to the administrator, however, were extremely limited: *article 2* specified that it could not borrow money, stipulate transactions, sell properties and make acts of extraordinary administration. If weak signals regarding the concept of profitability and documentability were made by the legislator, the few powers attributed to the administrator did not allow an efficient administration of the assets, because their productive or unproductive nature was not considered[80]. *Fifth comma of article 4* regarded the destination of goods, real estate, and firms. After the valuation made by the exchequer and after the consultancies with the Prefect and other institutional figures, the intendant of finance had to formulate a proposal directed to the Treasury. If the confiscation involved a firm, the proposal could have been:

- Conservation and utilization of the assets within the State patrimony
- Free of charge transfer to public participated society in order to maintain the occupational level

And, in case of greater public interest for the society:

- Sale of the firm
- Liquidation of the firm

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[78] Gazzetta Ufficiale, "Decreto-Legge 14 Giugno 1989, n. 230."
[79] Gazzetta Ufficiale, "Legge 4 Agosto 1989, n. 282."
[80] Donato, Saporito, and Scognamiglio, "Aziende Sequestrate Alla Criminalità Organizzata."

The significant discriminant was the public interest of society. Particular emphasis regarding the simplification of procedures was present in the *eighth comma*. Public entities, which acquired in their patrimony confiscated goods, could derogate from their respective regulations, and adopt immediately executive acts. The legislator tried to speed up the process and allowed to derogate from normal legislation.

3.4 Social use of goods

Law number 109 of 1996[81] introduced the concept of social use of confiscated goods. *Article 1* stated that if the object of the seizure is a firm, the administrator could be chosen by the court from professionals with administration experience in distressed companies. This possibility was related to the massive shock and environmental turbulence provoked by the legal procedure, which did not allow the normal prosecution of business activities.

A specific section, contained in *article 3*, dedicated to the destination of firms, provided three different scenarios:

- Onerous or free of charge rent when the prospect of continuation of the activity was likely. The choice of the tenant was based on the perspective of maintenance of the occupational levels.
- Sale, when the public interest utility was greater with respect to the previous case.
- Liquidation, when the public interest utility was greater with respect to the previous cases.

The order in which the possible destinations were presented was all but casual. The auspicated solution was the rent. This modality could be free of charge when the tenant was a cooperative formed by former employees of the confiscated firm. There were two main criteria to determine the likelihood of this choice: the first, and most important, was the perspective of continuation of the activity. The second, the maintenance of occupational levels, was a discriminant to select the tenant from different nominations. For the first time, particular emphasis was put into the preservation of firms to ensure stability. This legislative act, together with *1989 law*, clarifies the social finalities pursued by the patrimonial prevention legislation. In fact, the liquidation possibility has a residual role, and it is historically opposed by anti-mafia associations. Organised crime members could regain the possession of the firm, and, moreover, it is not in

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[81] Gazzetta Ufficiale, "Legge 7 Marzo 1996, n. 109."

accord to the requalification role of the confiscation[82]. An effective deterrent strategy towards criminal organizations should not be based only on repressive actions, but also on the restitution to the community of criminal goods. In addition, the possibility that the confiscated asset is a functioning firm was considered by the legislator. The State should return to the economic system a legal firm, which is able again to operate in the market. That is why a greater number of professionals could be involved and the liquidation constitutes the last-resort possibility. It represents a defeat for the State, and it should be considered only when other options are not applicable.

3.5 Successive interventions

Law Decree number 92 of 2008[83] concerned prevention measures in *article 10*. If the person subjected to these types of measures tries to hide and disperse his or her wealth, the prevention can be exercised on liquid or other types of assets available to that person. The disposal transaction, put in place to hide goods, is considered null and therefore not valid. These amendments tried to contrast apposite fake transactions, organised only with the purpose of safeguarding organised crime exponents' wealth. This measure is important also for the time dimension intended by the legislator: the onerous or free-of-charge transfers made in the two years before the proposal of the preventive measure are considered null as well.

A novelty toward an economic management of seized firms was introduced in *law number 94 of 2009*[84] on *article 2*: a judicial administrator must, within 6 months from the nomination, present a detailed relation about the current state and consistency of seized assets. Moreover, she or he must also include in the relation the state of firm activities. The court, if the possibilities of recovery are concrete, must approve the program with a motivated decree and must impose management directives. The documents must be developed in an optic of continuation of the activities. An embryonal strategic dimension was introduced in the legislation.

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[82] Pedretti, "Il riutilizzo sociale dei beni confiscati come strategia di non cooperazione economica contro la criminalità organizzata."
[83] Gazzetta Ufficiale, "Decreto-Legge 23 Maggio 2008, n. 92."
[84] Gazzetta Ufficiale, "Legge 15 Luglio 2009, n. 94."

3.6 Creation of the "Agenzia Nazionale per l'amministrazione e la destinazione dei beni sequestrati e confiscati alla criminalità organizzata"

Law decree number 4 of 2010[85] instituted the *"Agenzia Nazionale per l'amministrazione e la destinazione dei Beni Sequestrati e Confiscati alla criminalità organizzata" (National Agency for administration and destination of Seized and Confiscated goods from organised crime, ANBSC).* Both the administration and the destination of confiscated and seized goods were part of its competencies. These two parts of the process, previously performed by two different subjects, were reunited into a singular organ. The detailed duties of the Agency were: the collection and analysis of information regarding seized and confiscated assets, their destinations, and the relative procedures; the administration and custody of seized assets during preventive procedures; administration and destination of confiscated assets; adoption of initiatives to timely assign and destinate confiscated goods. The *"consiglio direttivo" (board of directors)* had to discuss and fix guidelines relative to the administration, assignation, and destination of seized and confiscated assets. The Agency must follow the approved guidelines and act coherently with the social and institutional finalities. The substitution of all the legislative references relative to the judicial administrators and contained in *act 575/65* with the figure of *ANBSC*, highlighted the massive impact that the foundation of the Agency had. The extensive list of competencies attributed to the Agency aimed to reduce any possible time loss, since the time dimension is one of the most important aspects to consider when a company is the object of a prevention procedure. The centralization of these competencies could surely improve the efficiency and effectiveness of the actions but, at the same time, could be the root of rigidity. This was evident especially with the introduction of an additional bureaucratic layer during the preventive procedures: before the creation of the Agency, the Court had to directly nominate a judicial administrator. After that, the Agency may avail themselves of the collaboration of judicial administrators or professionals with proven experience.

The conversion law[86] addressed partially all the criticalities exposed before. In particular, the law attributes administration power to the Agency only after the conclusion of the preliminary court or after the first-grade sentence (currently second-degree sentence) of confiscation and not during preventive procedures. Before these passages, the Agency must help and collaborate with the judicial authority[87] and the judicial administrator. Moreover, the court must nominate the delegated judge and the judicial administrator. The Agency must ensure the correspondence

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[85] Gazzetta Ufficiale, "Decreto-Legge 4 Febbraio 2010, n. 4."
[86] Gazzetta Ufficiale, "Legge 31 Marzo 2010, n. 50."
[87] Donato, Saporito, and Scognamiglio, "Aziende Sequestrate Alla Criminalità Organizzata."

between professional backgrounds of administrators and seized assets. *ANBSC* regains the administration after the confiscation and the judicial administrator, if confirmed, can continue to operate. The law resized the power given to the Agency especially during the first part of the preventive process. The risk of overattributing too many competencies was real and entrusting to only one organ the management of a complex process could have negative consequences relative to the primary social objective of the legislation.

Exhibit 3.1: ANBSC roles during the patrimonial preventive procedure
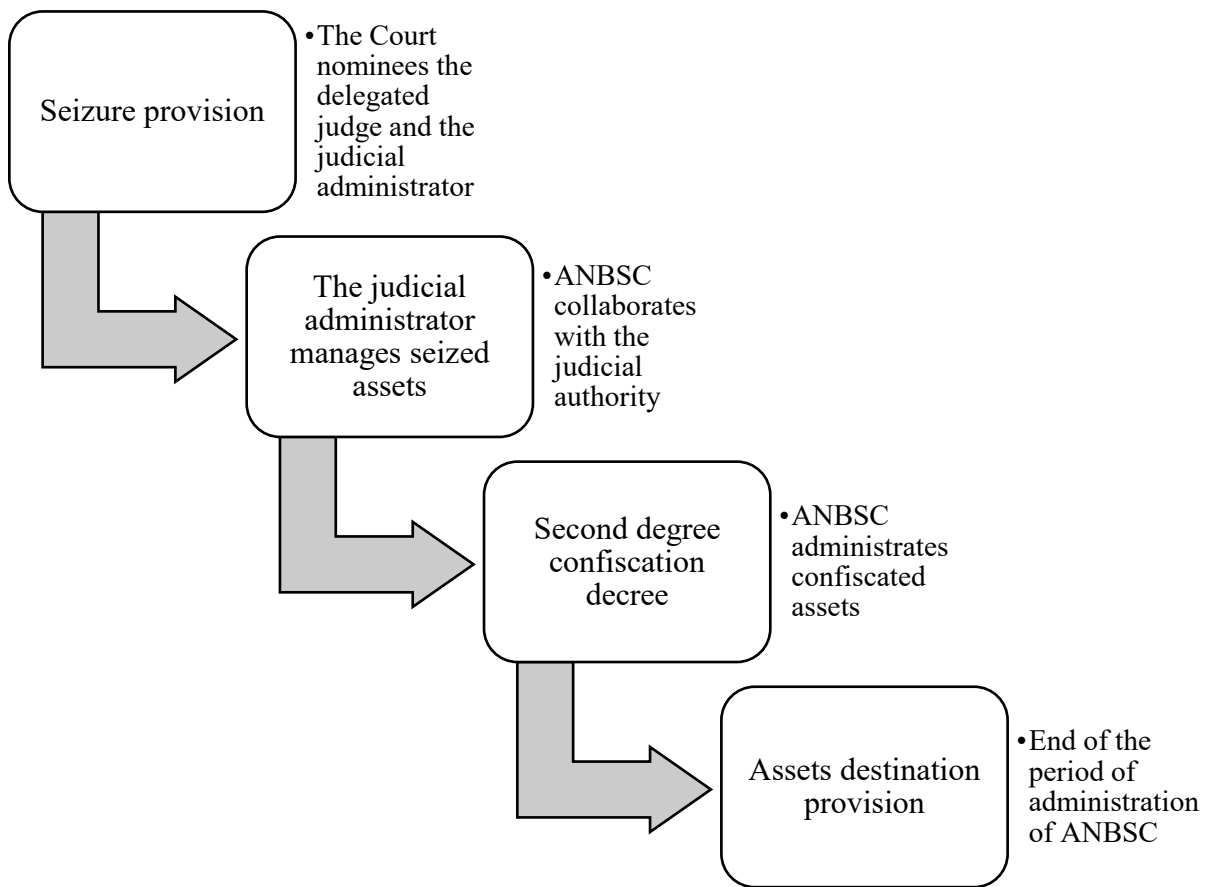
3.7 The Antimafia Code

All the aforementioned legislative acts were disjointed and fragmented, even if the central core was represented by *law 575/65*. Therefore, the legislator tried to make order in the existing legislation. The intervention originated from the delegated *law of 2010*[88]: Italian Parliament delegated to the Government a complete recognition, harmonisation and coordination of the

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[88] Gazzetta Ufficiale, "Legge 13 Agosto 2010, n. 136."

criminal, procedural and administrative legislation in the field of contrast of organised crime. The intent was ambitious, but the so-called *"Antimafia Code"*[89] did not address the criminal and procedural parts of the legislation. Despite these deficiencies, the Code facilitates the access and consultancy of various stratified laws, making the application of the regulation easier for the judges[90]. Critical articles about firms are *number 36*, regarding the relation of the judicial administrator and *number 41*, regarding the management of the seized firm. The report mentioned in *article 36* must contain: the consistency of assets, their probable market value, and the identification of concrete possibilities of recovery for the firm. The deadline of thirty days to present the report was extended to six months if the object of the seizure was a firm.

3.8 Reformed Antimafia Code and current legislation

In 2017 a reform of the *Code*[91] was created and now it constitutes the base of the existing legislation. For five years, until 2022, other modifications amended the law, therefore it is useful to analyse the current prevention patrimonial measures.

First of all, the recipients of patrimonial measures *(Article 16)* are not only subjects affiliated with criminal organizations, but also, for example, elements that have tried to reconstitute the Fascist party. The *"Antimafia Code"* is not only specifically addressed to the mafia, but it comprehends various and broader recipients. This feature could constitute a problem because provisions originally ideated toward organised crime are extensively directed to a lot of possible different subjects.

During the patrimonial investigation, authorities must check the existence of licences, authorisations, and concessions regarding the exercise of entrepreneurial activities, the subscription to public registers or professional orders, and, if the subject under investigation benefits from public contributions or financing. These investigations are propaedeutic to the seizure of assets when they are disproportioned to the income or wealth or when derive from illegal activities. If the asset is a firm participation, the seizure involves only the assets connected with that participation and not the entire firm. When the assets in question constitute a firm a special discipline, the judicial administration, could be applied.

If the subject under investigation, during the judicial procedure, cannot justify the provenience of seized goods, the assets in question are confiscated *(article 24)*. The seizure, if the Court

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[89] Gazzetta Ufficiale, Decreto Legislativo 6 settembre 2011, n. 159.
[90] Fabio Basile, "Dieci anni di codice antimafia – le misure di prevenzione."
[91] Gazzetta Ufficiale, Legge 17 ottobre 2017, n. 161.

does not apply the confiscation provision within one year and six months after the possession of the assets by the judicial administrator, is no longer applicable. If the investigation is particularly complex, the deadline is postponed by six months, and are present several cases of suspension of the passage of time. The hypothetical timeframe, in the worst-case scenario, is two years. If the goods have been transferred or are no longer available, patrimonial measures can involve assets of equivalent value. Instead, the fictional disposition transactions, put in place to hide availability, are considered null.

A*rticles 34 and 34 bis* refer to the judicial administration of firms, an alternative measure to confiscation. These articles are applicable when a firm is subject to intimidation attributable to previously mentioned *article 416-bis* or when a subject already invested by a patrimonial or personal prevention measure conditions the activities. A firm under the judicial administration regime must respect the same deadlines exposed before for the seizure. After that, the court can renovate the procedure, can either apply *article 34-bis*, regarding the judicial control of the firm, or can confiscate the firm. Judicial control can be applied when the risk of infiltration by organised crime within a firm is concrete. This control, exercised by the delegated judge and the judicial administrator, involves obligations and prohibitions regarding the activities performed by the firm and by the owners. The period of control cannot be less than one year and more than three years.

The rules regarding the nomination of the judicial administrator have not changed significantly compared to older provisions. The content of the relation predicted by *article 36* remains unchanged with only one important exception: the indication of the most idoneous and profitable ways of management. The debate could gravitate around the time dimension provided by the Act. Thirty days, in some cases, are simply not enough to draft a comprehensive strategic report.

Article 41 regards the management of seized firms. The judicial administrator must draft another relation within three months from the nomination (extendable to six), transmitted also to the *ANBSC*, that contains:

- Any other data acquired useful to integrate the relation of *article 36.*
- Analytical and quantitative exposition of patrimonial, economic, and financial situations.
- Detailed analysis of recovery possibilities of the activity. This analysis must include the assessment regarding the nature and operating modalities of the activity, the environment, and the market in which the firm operates, the current workforce and the

necessary one, the costs related to the legalization process. If the prosecution possibility is tangible, the administrator must include analytical modalities and timeframes to implement the plan. Otherwise, the firm is liquidated.

- Estimation of the market value of the firm, comprehensive of costs related to the legalization.
- Indication of activities exercisable only with public authorisations and concessions.

The administrator must attach to the prosecution plan the list of creditors and workers specifying the nature of the working relationships. The recovery plan must be approved by the Court that imparts the directives relative to the implementation. As mentioned before, the administrator must perform only act of ordinary administration.

The prefect can institute a provincial table regarding seized and confiscated firms, involving various associations, like trade unions, with the objective of favouring the recovery of firms, supplying useful advice and opinions to the administrator. The latter can also be technically supported by entrepreneurs operating in the same or similar sector of the seized firm.

The reporting duties are also contained in *article 43*: at the end of the prevention procedure, after the first-degree and second-degree confiscation decree and within sixty days from the deposit of the aforementioned acts, the judicial administrator presents to the delegated judge the *"rendiconto di gestione" (management report)*. The report must contain modalities and results of the management, sums paid and collected, detailed analysis of the assets and the final balance.

After the definitive confiscation, the assets are devolved into the State patrimony. The *ANBSC*, within 90 days, extendable to 180 days for justified reasons, adopts a destination provision. The viable solutions adopted are exposed in *paragraph 3.4* of the thesis.

To assess the survival chances of a seized firm is necessary to disclose also the fiscal treatment predicted by the law. Executive procedures are suspended, and, in case of confiscation, tax payables are extinguished by confusion *(article 1253 of Civil Code[92])* within certain limits. The fiscal treatment does not change for income included in *article 6* of the *TUIR (Income Tax Code)*, which comprehends the firm's income. A special treatment is instead provided for immobilizations.

A long section of the Code is dedicated to third-party rights and to pending contractual relations. The confiscation does not constitute a prejudice for creditors if the credit was born before the

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[92] Gazzetta Ufficiale, "Regio Decreto 16 Marzo 1942, n. 262."

prevention measures. Of course, a creditor must not, in any case, be related to organised crime. The judicial administrator, authorised by the delegated judge, can proceed with the payments of certain credits if related to services essential for the prosecution of activities. Another important measure to facilitate the prosecution is *article 55*: after the seizure, executive procedures cannot be initiated or prosecuted.

The management of pending contractual relationships is essential to avoid the complete stoppage of activities. As soon as the seizure is executed, contractual relationships are suspended. If this suspension can determine severe damage to the firm, the delegated judge can authorise, within thirty days from the execution of the seizure, the provisory execution of pending contracts. This part of the Code is based on Bankruptcy Law, and it entails a number of criticalities. From one side, the aim of the Code is to protect creditors, even if *article 53* ambiguously puts a limit (60%) on the patrimonial guarantee based on the estimation of assets value or on proceeds from the sale. From the other side, important objectives are the prosecution of activities and social finalities of the legislation. These two different profiles of the *"Antimafia Code"* are inevitably at odds. As repeated many times, the time frame is the most important element that affects the result of a recovery procedure. Thirty days are a prolonged amount of time, especially if we consider that, with the same deadline, the judicial administrator must draft the first detailed report regarding seized assets.

Exhibit 3.2: timeline of required documentation produced by the judicial administrator

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┌─────────────────────────────┐
│   Appointment of judicial   │
│        administrator        │
└─────────────────────────────┘
               ▼
┌─────────────────────────────┐
│      Within 30 days:        │
│       first report          │
└─────────────────────────────┘
               ▼
┌─────────────────────────────┐
│ Within 60 days from the first and │
│ second decree of confiscation:    │
│       management report           │
└─────────────────────────────┘
               ▼
┌─────────────────────────────┐
│      Within 3 months:       │
│   update of the first report│
│     • Business plan or      │
│       • Liquidation         │
└─────────────────────────────┘
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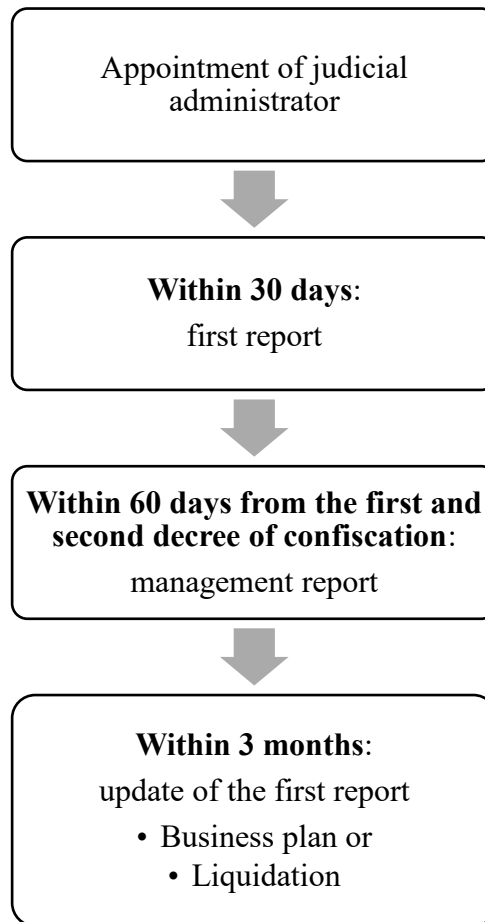
3.9 Considerations

The evolution of the legislation and of organised crime is constant. From the *"Rognoni-La Torre" law* the economical profile of criminal organizations has assumed greater and greater importance. The introduction of social finalities, of the concept of profitability of assets and of the figure of the judicial administrator, the creation of the *ANBSC* are elements coherent with this evolution. A leading role in the legislator's mind has been assumed by the economic activities related to organised crime. Through the years the references to firms have been multiplied in the acts, together with the presence of organised crime inside the economic sectors. Maintaining the occupational level is one of the major concerns of the legislator, especially because unemployed people coming from failed criminal firms face the risk of getting back in touch with organised crime. Organised crime ensures stability where stability is absent, it ensures rules and rigour when rules are blurred. Therefore, the restitution of a criminal firm to society assumed a symbolic effect. The liquidation should be the last resort option to conclude the legalisation process of a former criminal firm. A firm directly or indirectly

connected with organised crime faces an immense shock. The shock is amplified if it operates in an extremely competitive sector, if its margins are narrow, or if its profitability depends totally on the support supplied by the criminal organization. The turbulence starts already when the news of the investigation becomes public, much before an eventual prevention measure. The judicial administrator, when she or he gains the direction of the company, faces a challenging task. Evaluating a distressed company is never easy. Evaluating a distressed company connected with organised crime it is even worse. The toughest part is to estimate the extension of organised crime support. According to *Fabrizi et al.*[93], a firm can assume distinct roles within the organization: support, money laundering vehicle, healthy and profitable company. In the first two cases, the firm should be immediately liquidated (according to *article 41* of the *"Antimafia Code"*) because it does not represent a proper and functioning firm. Only in the latter case, when a firm is a *"Star",* so when performances are positive, it makes sense to consider a legalisation process. The role of the judicial administrator at this point assumes the centrality in the action. She or he evaluates the probable market value of the assets and eventually creates a recovery path. There are several criticalities in doing that: the major is to estimate the support given by organised crime to the firm. Quantifying how much the performance, the competitive position, the market, competitors, suppliers, and clients are influenced by the criminal organisation is crucial to assess the survival possibilities. This assessment requires time, and it is influenced by many subjective factors. Another fundamental quantification, required by the law, is related to the cost of the legalization process. After the emersion of the criminal connection, all the stakeholders could change their approach and their judgments of the firm. A supplier could interrupt the contractual relationship, a client could avoid the criminal firm. Or they could support the legal reorganisation. The outcome of the transition phase is never predictable because the legislation does not pursue only one clear objective. It must safeguard several interests, as exposed before with pending contracts and creditors. All these factors contribute to increasing the coefficient of difficulty related to the recovery process. Since all the persons and institutions involved in patrimonial prevention measures face a challenging task and the commitment of resources is burdensome for the State, liquidating all the companies not having any chance of survival is a necessary action.

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[93] Fabrizi, Malaspina, and Parbonetti, "Caratteristiche e modalità di gestione delle aziende criminali."

4. *Valuation of seized and confiscated firms*

The empirical analysis contained in the thesis does not only involve specifically seized or confiscated firms. However, it is useful to expose the evaluation practices to develop a broader overview of the universe of criminal firms.

The framework developed by the *CNDCEC*[94] (*"Consiglio Nazionale dei Dottori Commercialisti e degli Esperti Contabili"*) together with the *SIDREA* (*"Società Italiana dei Docenti di Ragioneria e di Economia Aziendale"*) relative to the valuation of seized and confiscated firms highlights immediately two critical elements. The first is the information base available to the judicial administrator: the informative patrimony could be unreliable and the historical and current accounting information, if they are present, must be corrected to reconstruct the current and true situation. This activity is time-consuming but crucial, considering the strict deadlines required for reporting activities. The second criticality is the different evaluations adopted in separate phases of the patrimonial prevention process. The first evaluation, executed within the first 30 days of activity of the judicial administrator, will inevitably differ from the evaluation executed after the confiscation, when more data are available, and more circumstances are assessed. The support offered by the legislation, including the access to apposite funds for the prosecution of activities *(article 41-bis[95])* and the exemption from civil liabilities attributed to the judicial administrator *(article 35-bis)*, is often lower than the required legalisation costs. Some of these costs are related to the liquidity shortage since, on average, criminal firms are less liquid than non-criminal ones[96]. Other examples are costs related to the correction and legalisation of workforce's contracts, difficulties linked to the supply chain and the diffidence of suppliers, clients, and financial institutions[97].

To evaluate a seized firm the starting point is the patrimonial analysis. Assets and liabilities could be over or underestimated, or simply not recognised in the balance sheet. One of the first duties of the judicial administrator is to reconstruct the current value of patrimonial voices. Important valuations involve the financial activities of the criminal firm and particularly investments in other firms. It is essential to understand if they are legit or represent investments in other criminal firms, sometimes already subjected to patrimonial prevention measures. All

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[94] Bartoli et al., "Linee guida per la valutazione di aziende sequestrate e confiscate."
[95] Gazzetta Ufficiale, Decreto Legislativo 6 settembre 2011, n. 159.
[96] Fabrizi, Malaspina, and Parbonetti, "Caratteristiche e modalità di gestione delle aziende criminali."
[97] Bauco et al., "Linee Guida in Materia Di Attestazione Antimafia."

the accounting items connected to the value chain have to be analysed carefully: inventory, receivables, payables, and loans must be re-evaluated to consider possible reactions of stakeholders. The contractual relationship could have been forced by organised crime and could not prosecute with the legal management.

The evaluation of the indebtment toward the banking system represents another bullet point: the research has shown that criminal firms have a similar indebtment ratio as non-criminal firms[98], an economic problem for all the legal companies. Financial resources are directed to organised crime and subtracted from the legal universe of firms. Banks do not reduce arbitrarily the financing to firms under seizure decree provisions, if compared to non-criminal firms[99]. The deterioration of financial indicators and the consequent prudential reduction of the exposition happened much before the application of prevention measures. Therefore, it is crucial to study the evolution of financial ratios and accounting items as soon as the investigation begins.

After the confiscation, the most suitable methods used to evaluate a firm are those based on flows: the discounted cash flow model and the economic-profit model. These models are not mutually exclusive, and it is useful to develop together the frameworks to have a more comprehensive and complete valuation. Both these models are based on the use of the Weighted Average Cost of Capital *(WACC)*, which returns the best results when the financial structure of a company remains stable. The application of the *WACC* to seized and confiscated firms is always an approximation since the formula is conceived for quoted companies. When a distressed or restructured firm faces major changes for what concerns the debt-to-equity ratio, other models *(Adjusted Present Value)* are more indicated. One of the key phases of these methods is the historical analysis of the performance: in this phase, the judicial administrator has to understand the nature and the modality of the criminal interference. If the criminal organization acted only as a lender of capital, the historical data could be utilizable if the borrowing costs are corrected (the rate applied could be much higher if compared to the market one). If instead, the criminal organization actively managed the firm, the past data and indicators of performance need to be deeply modified to consider criminal distortions. Another problem in the application of these models is the peer analysis phase. Building a peer group to validate the valuation assumptions is crucial but difficult when one of the firms in question is criminal. Competitors and their performance could be negatively influenced by the criminal firm: not only the correction should be applied to the seized or confiscated firm, but also to all the competitors directly influenced. The difficulties related to the estimation of these effects,

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[98] Fabrizi, Malaspina, and Parbonetti, "Caratteristiche e modalità di gestione delle aziende criminali."
[99] Donato, Saporito, and Scognamiglio, "Aziende Sequestrate Alla Criminalità Organizzata."

however, are sometimes too high considering the restricted number of available resources and time.

The estimation of the WACC is another critical step in evaluating the confiscated company[100].

$$WACC = \frac{D}{V}k_d(1 - T_m) + \frac{E}{V}k_e$$

D/V = target level of debt to value using market-based values

E/V = target level of equity to value using market-based values

k_d = cost of debt

k_e = cost of equity

T_m = company's marginal tax rate on income

To correctly estimate the WACC is essential to use market values of debt and equity, therefore the judicial administrator has to carefully evaluate these two measures considering all the adjustments made to accounting items and their probable market value. Is the *WACC* estimation adopted by judicial administrators suitable for non-quoted companies? It certainly is not, without deep adjustments. Moreover, since the DCF involves the estimation of future cash flows, the level of indebtedness must be the future estimated one and not the current one. The real challenge is the estimation of the cost of equity. The most famous model used to calculate it is the Capital Asset Pricing Model *(CAPM)[101]*.

$$E(R_i) = r_f + \beta_i\big[E(R_m) - r_f\big]$$

$E(R_i)$ = expected return of security i

r_f = risk-free rate

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[100] Koller, Goedhart, and Wessels, *Valuation*.
[101] Koller, Goedhart, and Wessels.

β_i = security i's sensitivity to the market portfolio

$E(R_m)$ = expected return of the market portfolio

The formula exposed above is the standard applicable to firms operating under normal conditions. A confiscated firm faces peculiarities that need to be included in the model. An important error to avoid is the overestimation of the discount factor when the reference market is deeply infiltrated by organised crime. In this case, this condition should be reflected in the β, since all the participants face the same conditions[102]. All the risks already embedded in the flows should not be included in the cost of equity, to avoid double counting and the consequent underestimation of results. The expected return should be increased if the threat represented by organised crime is still solid after the confiscation. The danger of retaliations towards the firm itself, its clients, or its suppliers, constitutes an element that needs to be included in the calculation. Since all the components of the formula must be estimated, it is necessary to construct a peer companies' group and estimate their relative betas. Again, the comparability between companies, achieved by accounting data correction, is the most important and delicate part of the whole evaluation process.

Together with the financial analysis, the judicial administrator has to couple her or his results with a more comprehensive environmental and stakeholder examination. The financial assumptions made could be useless if society and the market will not accept the former criminal firm as a new member of the competition. The number of stakeholders involved is relevant: starting from the Public Administration (court, judges, judicial administrators, *ANBSC*), competitors, clients, suppliers, employees, managers, associations, trade unions, banks and the list is not exhaustive. Balancing all the conflictual interests is the key factor of success, keeping in mind the economic feasibility of the restructuring plan. The judicial administrator obviously cannot forecast the psychological reactions of the actors, one of the main elements of uncertainty that could determine the financial and economic performance. Even if complex, an effort should be made in trying to imperfectly take into account the environmental issues and considerations.

The behaviour of organised crime after a seizure or confiscation of a criminal firm must be considered as well. In a territory deeply infected by organised crime the survival possibilities of a confiscated firm could be lower with respect to a firm embedded in an apparently healthy

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[102] Bartoli et al., "Linee guida per la valutazione di aziende sequestrate e confiscate."

economic tissue. If the chain value in which a confiscated firm is inserted is totally or partially controlled by organised crime, its contractual and coercive power could be even higher than public authorities. When organised crime ensures jobs and salaries, a confiscation could not assume the appearance of a positive result, but rather the opposite. The most difficult objective for the State is the creation of a legal network around a confiscated firm, because, otherwise, the intervention is an isolated case condemned to liquidation. If instead, this network exists and offers a sufficient degree of safeness against criminal infiltration, a firm could undertake a recovery path. For example, the judicial administrator should prefer already seized or confiscated firms for ordinary and extraordinary maintenance suppliers (*article 41* of the *"Antimafia Code"*).

In addition to all the considerations made before and valid for the seizure and confiscation phases, it is necessary to highlight the role covered by investigations in the valuation process. As soon as the investigation begins and eventually leads to a seizure decree, important emphasis should be put into the analysis of financial information. If a firm is non-operating already from the preliminary evaluations, all the necessary procedures after the seizure and performed by the judicial administrator could be avoided.

After having completed the valuation, during the seizure phase, judicial administrators have to indicate eventual survival chances of the seized firm and they have to draft a business plan. As stated before, liquidation is desirable and unavoidable when a firm is clearly non-operating. In other cases, the company could be in a period of crisis or in equilibrium. The estimation of the legalisation costs, after the valuation, assumes a critical role in terms of importance. The quantification could imply the unfeasibility of certain solutions. If the costs are too high, even a financially healthy firm could not survive. Instead, a distressed company could overcome the seizure and confiscation phase if the recovery path is reasonable, and the legalisation costs are not prohibitive.

5. *Definitively confiscated and destinated firms*

5.1 Data overview

The *ANBSC* through the portal *"Aziende Confiscate"*[103] provides a series of useful data related to definitively confiscated and destinated firms. The analysis of these data allows improving awareness and knowledge about the results of the patrimonial prevention legislation. This examination is useful to assess differences and similarities with firms included in the data sample of the empirical analysis. The first interesting typology of information is the legal form of firms in question *(Exhibit 5.1)*.

Exhibit 5.1: juridical forms of definitively confiscated and destinated firms

■ Sole proprietorships   ■ Partnerships   ■ Limited Companies
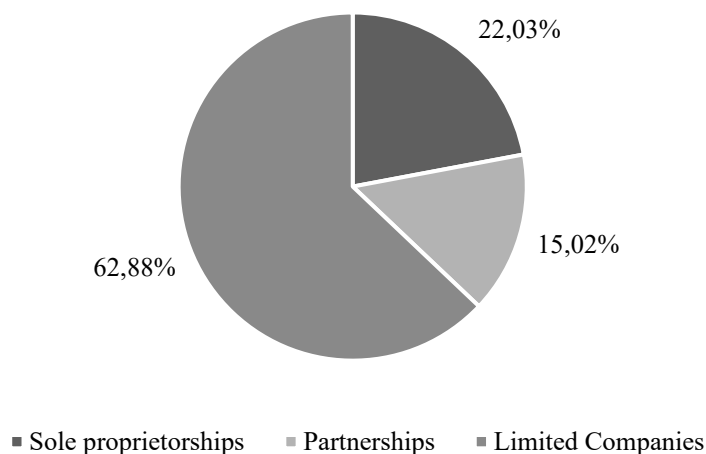
The 37,05% of definitively confiscated and destinated firms are companies that are not obliged to produce public financial statements and are subjected to less stringent accounting requirements. In fact, only the *"società di capitali"* must respect the structure of financial statements defined by the law. Missing, manipulated and incomplete information makes the judgment of judicial administrators harder, if not impossible. Most firms are limited companies: the fragmentation of the capital drives the choice of the legal form[104]. In this way, it is easy to protect criminal organisations from seizures and confiscations. Instead, when exponents of

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[103] ANBSC, "Open Data Aziende Confiscate."
[104] Savona and Berlusconi, "Organized Crime Infiltration of Legitimate Businesses in Europe."

organised crime want to directly control economic activities, partnership and individual forms are indicated choices.

The following graph *(Exhibit 5.2)* regards the industry distribution *(ATECO classification[105])* of firms. The results are not a surprise and are coherent with the findings of the *PON[106]* and *ARIEL[107]* reports: constructions and wholesale and retail trade are sectors in which the presence of confiscated firms is stronger. The construction sector exhibits low technology levels, high labour intensity and territorial specificity, all these characteristics favour money laundering and infiltrations. The same considerations can be applied to the wholesale and retail trade. In absolute terms, more than 50% of definitively confiscated firms belong to only three economic sectors. The third place is occupied by food and accommodation sector. What should constitute a major concern is the number of sectors infiltrated by organised crime. In almost all the sectors at least one confiscation was made, a tangible sign of the pervasion of criminal organizations. Absolute values should be compared with the number of operating firms, to increase the descriptive power. Thanks to the *Project PON* developed by *Transcrime*[108] and to *Istat* data[109], it is possible to evaluate the number of definitively confiscated and destinated firms for every ten thousand active firms *(Exhibit 5.3)*. In this way, the obtained results differ significantly from absolute values. The first place is occupied by mining activities, a particular case, especially in terms of synergies. Abandoned caves are ideal places to hide illegal and toxic wastes[110], moreover, it is a sector characterized by the usual ideal traits: high capital-intensive investments, low technological content, and high labour intensity. The most meaningful change from the *PON* report of 2013 is the increased importance of water and electric energy supply and waste management sectors. Numerous are the evidence contained in the reports of the *DIA[111]* regarding the significant role assumed by all the phases of waste cycle management in the investment decisions of criminal organizations. In particular, the disposal of special and dangerous types of waste constitutes an incredible risk for the population health's since recycling and treatment operations are often only fictional[112]. The green economy is not exempted from infiltrations and, considering the important amount of funds derived by the *"Next Generation EU"* program (40% of Italian funds will be destinated to the so-called

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[105] Ateco, "Classificazione delle attività economiche Ateco."
[106] Transcrime, "Progetto PON sicurezza 2007-2013."
[107] Savona and Berlusconi, "Organized Crime Infiltration of Legitimate Businesses in Europe."
[108] Transcrime, "Progetto PON sicurezza 2007-2013."
[109] Istat, "Imprese e Addetti."
[110] Savona and Berlusconi, "Organized Crime Infiltration of Legitimate Businesses in Europe."
[111] Direzione Investigativa Antimafia, "Relazione I Semestre 2021."
[112] Pergolizzi, "L'economia avvelenata del crimine ambientale."

"ecological transition"[113]), the prevention and controlling role of public institutions will be simply fundamental. According to the findings of the *PON* project, and confirmed by the most recent available data, some of heavily regulated and controlled sectors (Financial and Insurance activities) and sectors with high entry barriers (Manufacturing activities) present lower rates of confiscated firms. The sub-composition of *ATECO* sectors is interesting: sector E is totally composed of dangerous waste disposal activities *(Exhibit 5.4)* and in sector R half of confiscated firms are related to gambling, slot machines and betting centres.

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[113] Magnani, "Next Generation EU, cos'è e come funziona."

Exhibit 5.2: Industry distribution of definitively confiscated and destinated firms
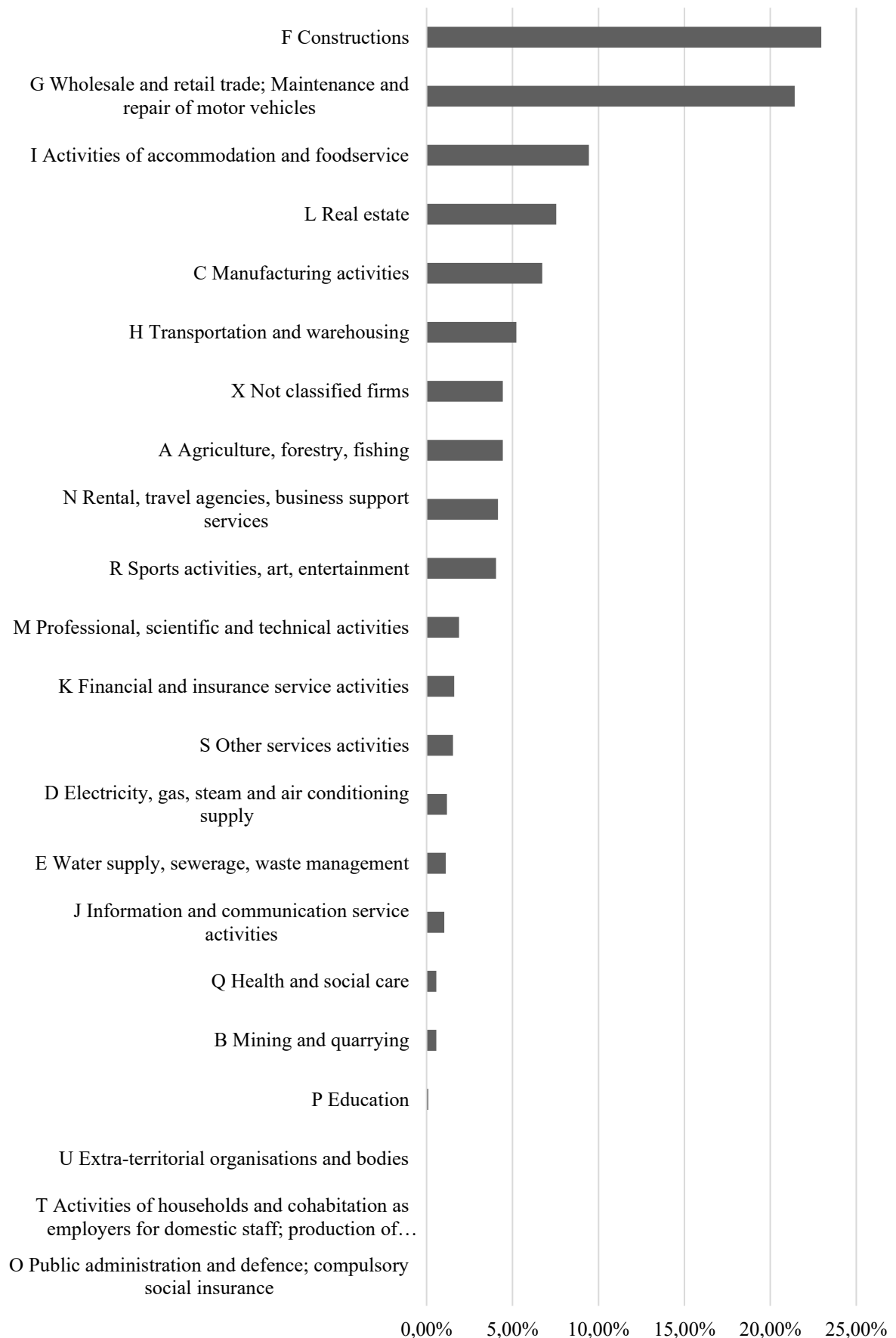
Exhibit 5.3: Industry distribution of definitively confiscated and destinated firms every 10000 registered firms

Industry	Value
B Mining and quarrying	84
E Water supply, sewerage, waste management	31
D Electricity, gas, steam and air conditioning supply	26
R Sports activities, art, entertainment	16
F Constructions	13
H Transportation and warehousing	12
L Real estate	9
I Activities of accommodation and foodservice	8
N Rental, travel agencies, business support services	7
G Wholesale and retail trade; Maintenance and repair of motor vehicles	6
C Manufacturing activities	5
K Financial and insurance service activities	4
J Information and communication service activities	3
S Other services activities	2
A Agriculture, forestry, fishing	2
P Education	1
M Professional, scientific and technical activities	1
Q Health and social care	0

Exhibit 5.4: two examples of sub-sector composition of definitively confiscated and destinated firms every 10000 registered firms
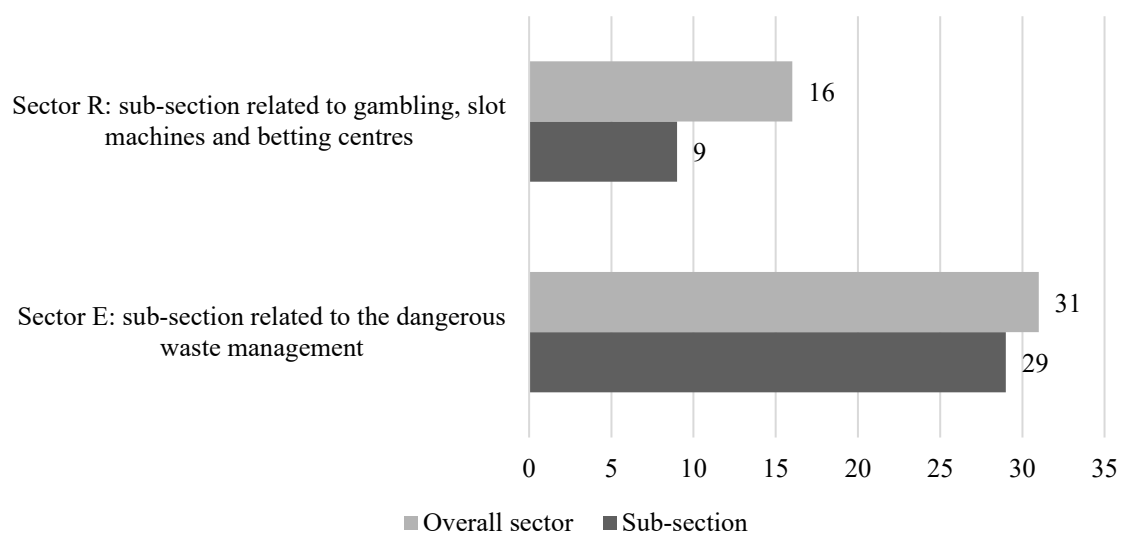
In the regional distribution of confiscated firms *(Exhibit 5.5)*, the first two positions are occupied respectively by Sicily and Campania. In third and fifth place are present two regions, Lazio and Lombardy, not traditionally associated with organised crime. The number of confiscated firms in Lazio is even greater than in Calabria. When the number of confiscated firms is compared to the regional population, Calabria overtakes Sicilia and occupies first place. Valle D'Aosta should be considered an outlier since only one confiscation is located in its territory. At a first glance, the North and the Centre (with the exclusion of Lombardy, the financial and industrial hub of the country, and Lazio, the political and institutional heart) could appear quite immune to the infiltration phenomenon. In reality, the problem is far more complex. First of all, the data are referred only to definitively confiscated and destinated firms. Many other firms are still only seized or not definitively confiscated. *Exhibit 5.7* exposes the greater value dimension of seizures with respect to confiscations. Moreover, a firm could be connected to organised crime only through an administrator, an investor, or a member of the board. In these cases, only the ownership quota attributable to the shareholder/partner is confiscated, and not the entire firm. Especially if the firm is only a pure investment and not an active part of the criminal organization, the control of the firm could not be in the hand of organised crime. Therefore, the number of confiscated firms is only an underestimated proxy to comprehend the nature and the dimension of the entrepreneurial ambition of organised crime.

After having investigated the juridical form, the industry and regional distribution, *Exhibit 5.8* exposes the current activities state of definitively confiscated and destinated firms. Less than half of firms under examination (42.89%) are currently active while more than 30% are inactive

or ceased. The 24.33% of firms subject to bankruptcy procedures constitute a big question mark. The available data do not allow to have more details about specific situations, so these firms should be considered not properly operating firms. Therefore, only 4 firms out of 10 have returned to operating normally. And this proportion does not take into consideration all the firms failed during the seizure phase.

Exhibit 5.5: Regional distribution of definitively confiscated and destinated firms

Region	Percentage
Sicilia	30,58%
Campania	18,53%
Lazio	14,63%
Calabria	12,16%
Lombardia	8,19%
Puglia	6,19%
Emilia Romagna	2,72%
Toscana	1,75%
Piemonte	1,61%
Veneto	0,86%
Abruzzo	0,82%
Liguria	0,82%
Sardegna	0,61%
Umbria	0,14%
Marche	0,11%
Molise	0,07%
Friuli Venezia Giulia	0,07%
Trentino Alto Adige	0,07%
Basilicata	0,04%
Valle D'Aosta	0,04%
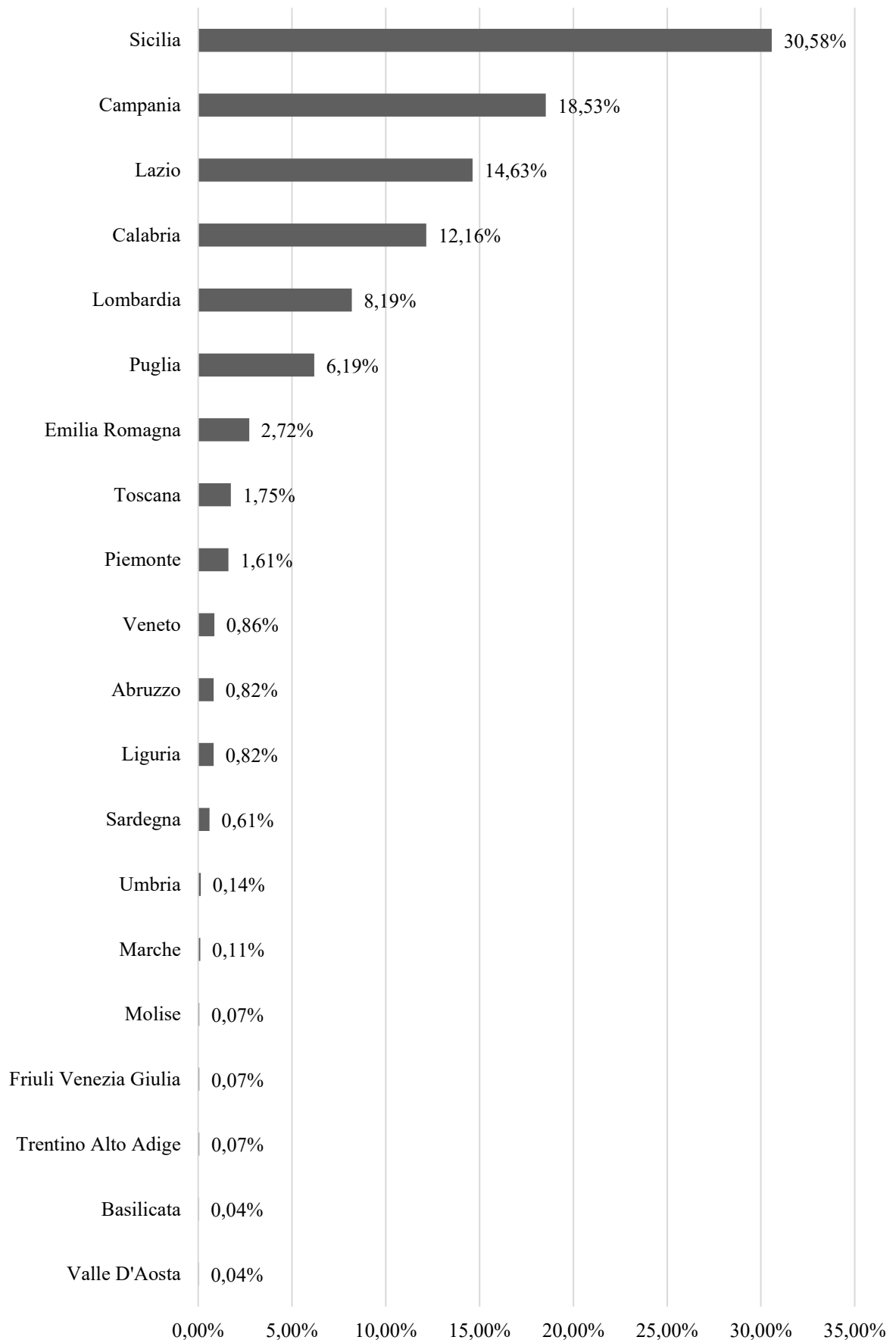
Exhibit 5.6: Regional distribution of definitively confiscated and destinated firms every 10000 inhabitants

Region	Value
Calabria	1,84
Sicilia	1,78
Campania	0,93
Valle D'Aosta	0,81
Lazio	0,72
Puglia	0,44
Lombardia	0,23
Abruzzo	0,18
Emilia Romagna	0,17
Liguria	0,15
Toscana	0,13
Sardegna	0,11
Piemonte	0,11
Molise	0,07
Veneto	0,05
Umbria	0,05
Marche	0,02
Trentino Alto Adige	0,02
Basilicata	0,02
Friuli Venezia Giulia	0,02
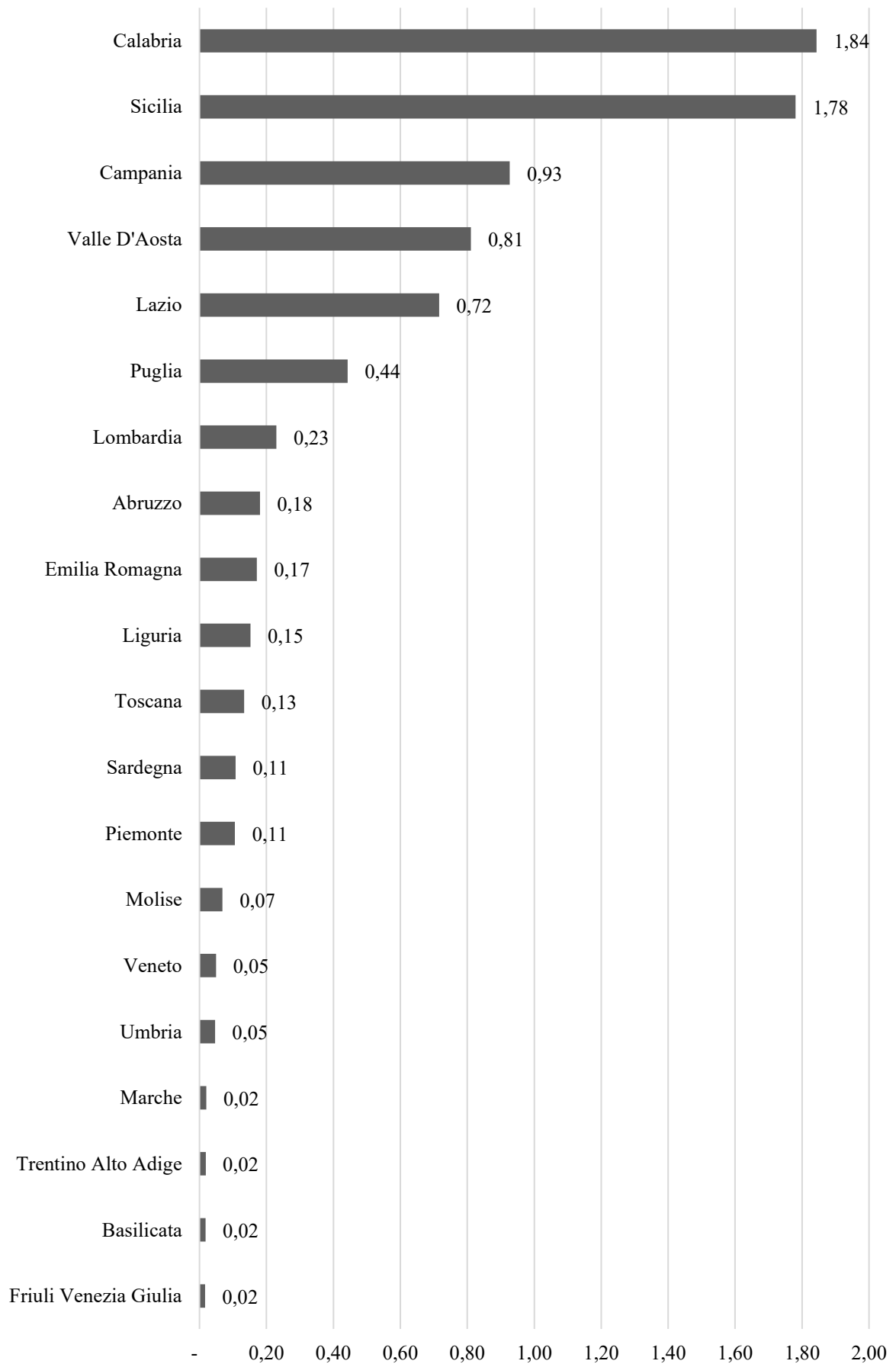
Exhibit 5.7: Total value of seizures and confiscations[114] divided by different type of criminal organizations[115]
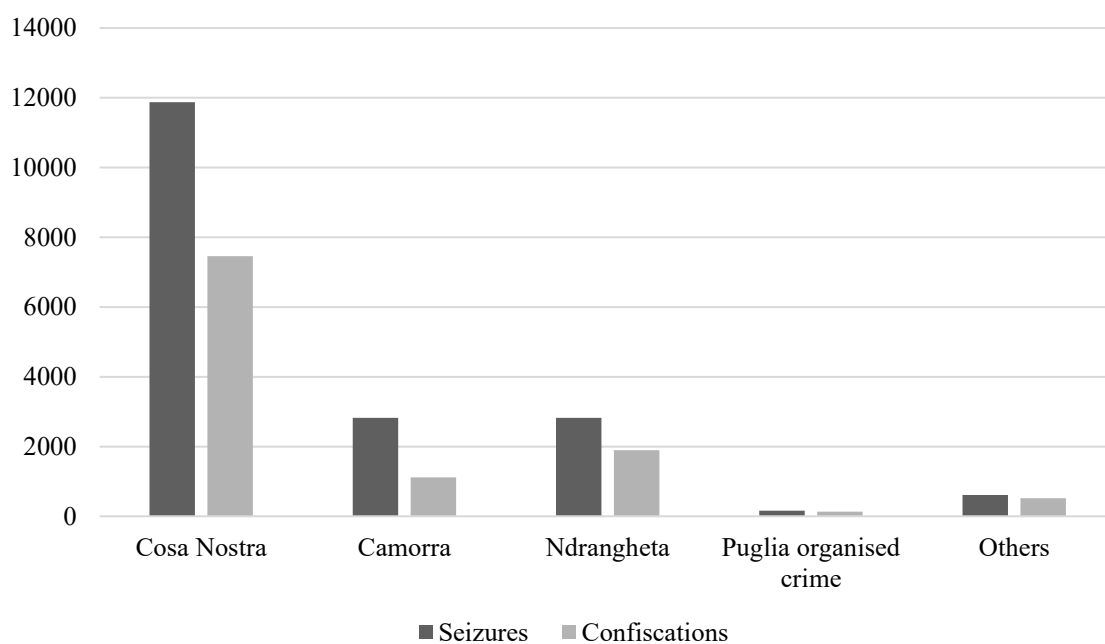
Exhibit 5.8: Current state of definitively confiscated and destinated firms

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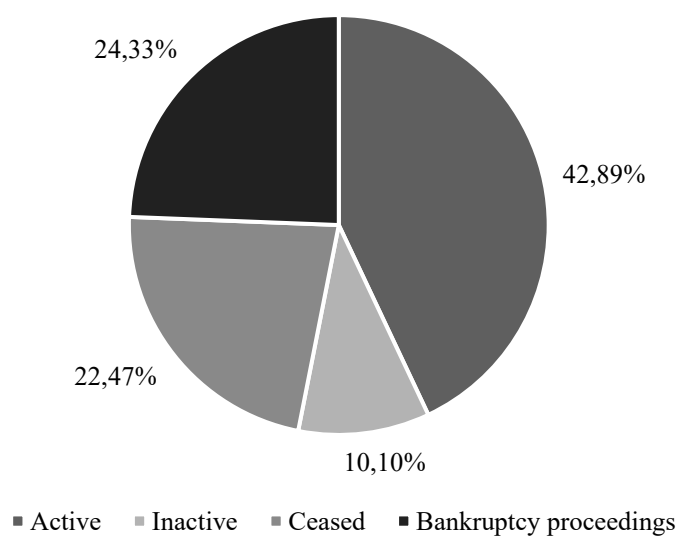
[114] Seizures and confiscations do not comprehend only firms. The data refers to patrimonial prevention measures conducted after and in accordance with the introduction of the "*Antimafia Code" (2011)*.
[115] Direzione Investigativa Antimafia, "Valore dei sequestri e delle confische dal 1992 – al 31/12/2021."

6. Data sample

6.1 Description of data sample

The data presented in the previous section are useful to build a preliminary idea about the characteristics of criminal firms. However, the descriptive power of the data is undermined by the typologies of firms included in the *ANBSC* database. For this reason, the empirical analysis cannot be based only on that dataset. The data of the sample have been made available by the *Professor Parbonetti*. The identification criteria applied to individuate criminal firms are the same used in the paper of *Fabrizi et al.[116]*. A firm is defined as criminal if:

- It was seized or confiscated because connected with a criminal organization
- A member of the administration board was arrested or condemned for mafia-related felonies
- A shareholder with a stake of at least 10% was arrested or condemned for mafia-related felonies

With this definition, the criticalities expressed before are eliminated, since the survival analysis involves only firms for which the link with organised crime is exposed. Only when the criminal connection is revealed, and therefore the firm experiments a shock, it makes sense to evaluate its survival possibilities.

The overall dataset is constituted of 6252 firms. The police operations that revealed the contaminations date from 2004 to 2022. Year 2017 accounts for 10.40% of the total, 2019 for 25.03%, 2020 for 17.93% and 2021 for 15.16%. All the other years account for less than ten percent. Not all the companies of the database can be included in the empirical analysis for several reasons. Naming the year of operation *t*, the time frame analysed goes to *t-2* to *t+2*. An observation, to be included in the sample, must have accounting data available at least in *year t-1*. Year *t* should not be considered to evaluate the survival probabilities, because financial statements could be heavily influenced by the month in which the operation took place. If the operation occurred before or after the publication of financial statements, accounting figures could still describe a criminal firm or not. All the firms that are not obliged by law to publish financial statements are eliminated from the sample.

The second condition regards the relationship between the year in which the police operation

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[116] Fabrizi, Malaspina, and Parbonetti, "Caratteristiche e modalità di gestione delle aziende criminali."

happened (therefore when the criminal connection was discovered) and the year in which the criminal contamination ended. A company is included in the data sample only if the connection with organised crime ended in *t* or *t-1*. This condition is necessary to exclude from the sample all the firms for which the gap between the end of the connection and the police operation is too extended. For example, if a society was connected with a criminal organisation until 2010 and the link was discovered in 2015, analysing the accounting data for the years immediately before the operation would be useless, since they would not be financial statements of a criminal firm. It is necessary to analyse the accounting figures of firms still connected to organised crime at the time of the police intervention or in the year immediately before. Also, as described by *Calamunci and Drago* (2020a[117] ; 2020b[118]), it can be considered the exogeneity of the year in which a criminal firm enters into the judicial administration to its performance, after controlling for fixed effects. Even if this analysis does not involve exclusively seized and confiscated firms, a similar assumption could be made for the exposure of the connection.

Exhibit 6.1 summarizes the evolution of the dimension of the sample after having applied the conditions described above.

Exhibit 6.1: Dimensionsional evolution of the data sample
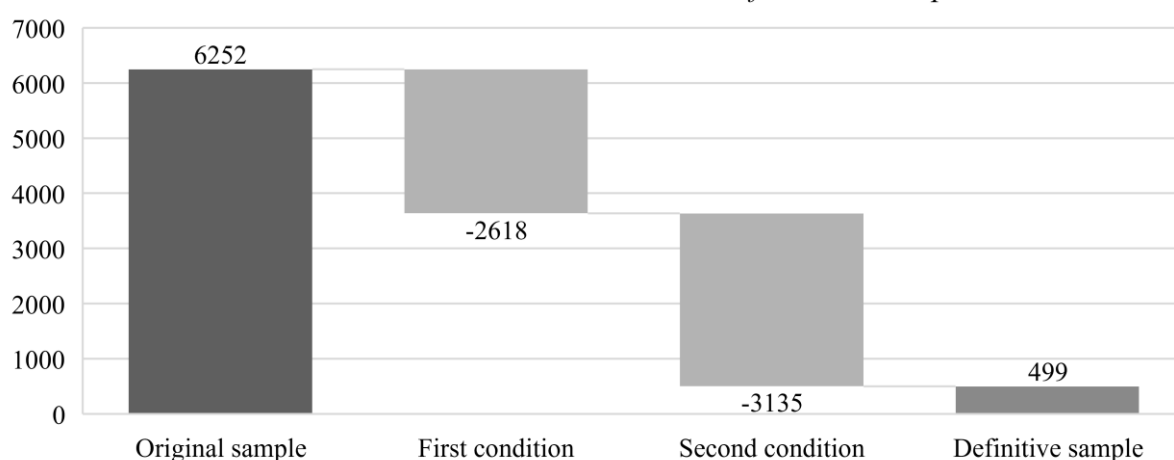
After the application of the conditions, the size of the dataset is reduced to 499 observations. For all the observations definitively included in the data sample the financial statements from *t-2* to *t+2* have been analysed. For this reason, operations relative to the year 2022, 2021 and 2020 cannot be considered. The accounting data have been made available by the platform *Orbis by Bureau Van Dijk*[119]. With the definitive composition of the data sample every firm

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[117] Calamunci, "What Happens in Criminal Firms after Godfather Management Removal?"
[118] Calamunci and Drago, "The Economic Impact of Organized Crime Infiltration in the Legal Economy."
[119] "Orbis | Dati comparabili sulle società | Bureau van Dijk."

must be classified as active or inactive[120]. Since all the companies included must present annually legal financial statements, a firm is considered inactive if in any of the three years from and including *t* to *t+2* the accounting data are not available. Two years after the operation are enough to analyse which type of company fails within a short period of time, the major objective of the thesis. Moreover, the higher the number of years considered, the higher the subjective factors embedded in the management and in the specific company situation that can confound the results of the analysis. *Exhibit 6.2* exposes all the possible classification cases. The definitive data sample is composed by 252 active firms and 247 inactive ones.

Exhibit 6.2: Classification cases of active firms

	Availability of financial statements				
Year	*t-2*	*t-1*	*t*	*t+1*	*t+2*
	Yes	Yes	Yes	Yes	Yes
	No	Yes	Yes	Yes	Yes
Active	Yes	No	Yes	Yes	Yes
	No	No	Yes	Yes	Yes

6.2 Characteristics overview of the definitive dataset

Exhibit 6.3 shows the dimension of the data sample firms. The classes considered are:

- Micro: revenues <= 2 million

- Small: revenues <= 10 million

- Medium: revenues <=50 million

- Large: revenues > 50 million

The prevalent class representing almost the totality of observations, not surprisingly, is the micro one. The percentage of active firms is always higher for the small, medium, and large classes, while for the micro class inactive firms prevail. About half of firms do not have any data about employees, for the remaining part the class between zero and nine employees is prevalent. Moreover, the number of inactive firms in this class outweighs the number of active ones.

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[120] The generic term used indicates a firm that did not published the mandatory accounting statements required by law in any of the years highlighted in *Exhibit 6.2*. Since the state of activities can take a number of different directions, the publication of financial statements is taken as an indicator to evaluate the inactivity of a firm.

The limited liability legal form is predominant, followed by the stock corporation and other several types of forms, like consortium or cooperative society *(Exhibit 6.4)*.

Exhibits 6.3: Revenues classes of firms included in the dataset
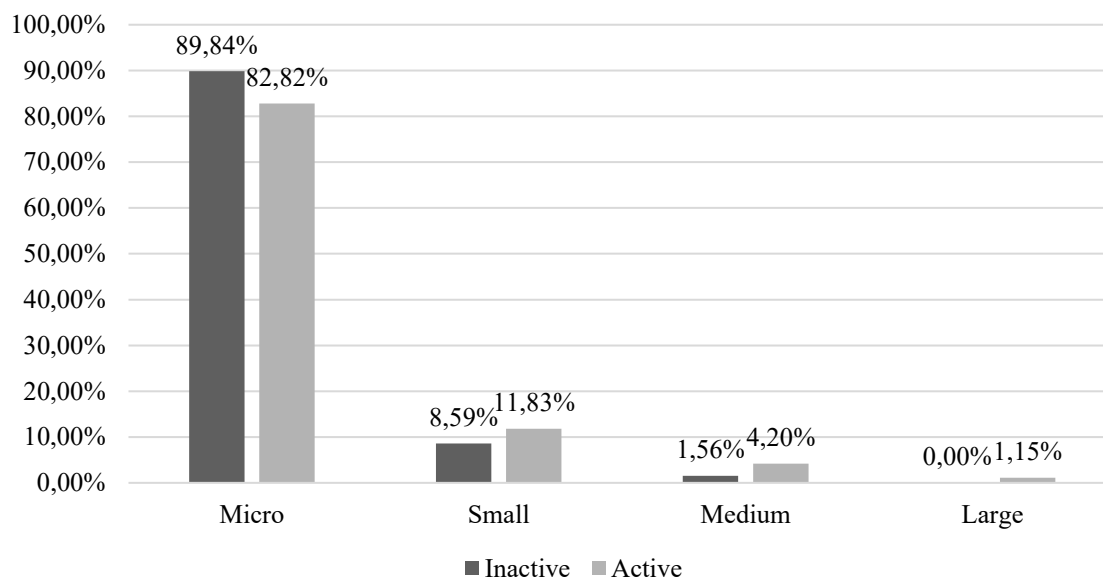
Exhibit 6.4: Legal forms of firms included in the data set
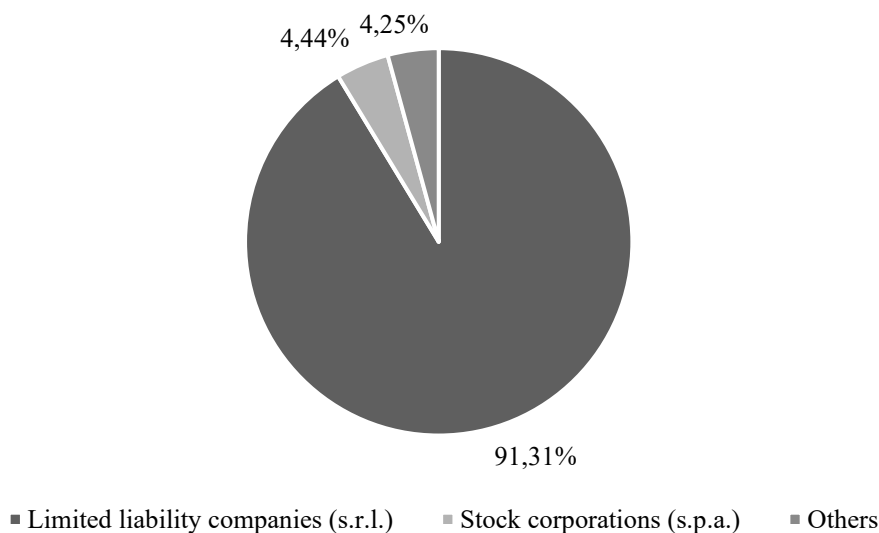
Almost the totality of companies is located in Calabria, Lombardy, Lazio, Veneto, Emilia-Romagna, and Piemonte *(Exhibit 6.5)*. Three of the first five places are occupied by Northern regions. It is difficult to identify a clear pattern of data. In many regions the number of active and inactive firms does not differ significantly. Only in Calabria and Lazio there is a clear distinction between the prevalence of active firms (Lazio) and inactive ones (Calabria).

Surprisingly the traditional home regions of organised crime (with the exception of *'Ndrangheta*) are underrepresented in the sample. The results do not change even if the entire original data set is considered without any condition applied. This peculiarity does not constitute a major concern. A firm, to be included in the observations, must have a discovered link with a criminal organisation. Surely the phenomenon in Campania, Sicily and Puglia could be misrepresented if the analysis involves the current presence of organised crime within the entrepreneurial tissue, but it is not the case for this empirical analysis.

Exhibit 6.6 exposes the industry distribution of the companies. The Construction sector dominates the distribution, and it does not exhibit a significant difference between active and inactive firms. The second and third place, respectively Real Estate and Wholesale and Retail, present opposite values. Active companies prevail in the first while inactive ones in the second. All the other sectors do not expose particular dissimilarities.

Exhibit 6.5: Regional distribution of firms included in the dataset

Region	Active	Inactive
Calabria	24,12%	32,03%
Lombardia	16,34%	15,63%
Lazio	14,79%	10,16%
Veneto	12,45%	13,28%
Emilia - Romagna	8,56%	10,16%
Piemonte	8,56%	6,25%
Sicilia	4,67%	2,73%
Campania	3,11%	1,56%
Liguria	2,33%	1,17%
Trentino Alto Adige	1,95%	1,56%
Toscana	0,78%	0,39%
Abruzzo	0,78%	1,17%
Sardegna	0,39%	0,00%
Puglia	0,39%	2,73%
Marche	0,39%	0,00%
Friuli Venezia Giulia	0,39%	0,00%
Valle d'Aosta	0,00%	0,78%
Umbria	0,00%	0,39%
Molise	0,00%	0,00%
Basilicata	0,00%	0,00%

■ Active ■ Inactive

Exhibit 6.6: Industry distribution of firms included in the dataset

Industry	Active	Inactive
F Constructions	25,95%	27,73%
L Real estate	17,94%	9,77%
G Wholesale and retail trade; Maintenance and repair of motor vehicles	10,31%	19,14%
C Manufacturing activities	8,78%	8,98%
M Professional, scientific and technical activities	8,02%	6,25%
E Water supply, sewerage, waste management	4,20%	1,95%
H Transportation and warehousing	4,20%	2,34%
I Activities of accommodation and foodservice	3,82%	4,69%
D Electricity, gas, steam and air conditioning supply	3,05%	2,34%
R Sports activities, art, entertainment	2,67%	4,30%
N Rental, travel agencies, business support services	2,29%	3,91%
J Information and communication service activities	2,29%	1,56%
n.a.	1,91%	2,73%
A Agriculture, forestry, fishing	1,53%	1,56%
Q Health and social care	1,15%	0,00%
K Financial and insurance service activities	1,15%	1,17%
S Other services activities	0,76%	0,39%
B Mining and quarrying	0,00%	0,00%
P Education	0,00%	0,39%

■ Active   ■ Inactive

6.3 Performance overview of firms included in the dataset

The salient part of the analysis of data regards the financial performance of firms before and after the police operation. The selection of the variables of interest is fundamental. The studies of *Altman*[121] [122] [123] [124] [125] [126], *Ohlson*[127], *Chen and Shimerda*[128] are used to develop an overview of possible financial ratios to include in the analysis. Surely, profitability margins must be included to detect if there is a significant difference between active and inactive firms. The same thought is applied to measures of efficiency (turnover ratio), return on investment (ROA), and liquidity. Another important dimension to consider is the indebtment of companies and their ability to repay the debt, especially considering the cost of financing. Controlling the dimension of companies is another necessary step to evaluate the probability of becoming inactive. The number of indicators chosen is limited to allow a hypothetical judicial administrator to rapidly apply the model.

All the metrics analysed present a consistent number of outliers. Therefore, all the variables are *winsorized* at 3% and 97% levels. This technique is used to reduce the weight of outliers without eliminating observations, as in the case of trimming[129]. This procedure is necessary because of the values assumed by certain observations. For example, close to zero values of denominators lead to infinity values of ratios.

To create a preliminary performance overview, medians of year t_{-1} of the chosen variables are analysed. The first metrics regard the profitability of the company: Revenues, EBIT, and Net Income margins *(Exhibit 6.7)*. Median revenues are sensibly higher for active companies. Considering both groups, margins are very weak, even if active companies perform better.

Exhibit 6.7: Median Revenues, EBIT, and Net Income margins

Median Revenues $_{t-1}$ (Mln €)	Active	Inactive
	0.51	0.28

[121] Altman, Danovi, and Falini, "Z-Score Models' Application to Italian Companies Subject to Extraordinary Administration."
[122] Altman et al., "Financial Distress Prediction in an International Context."
[123] Altman and Hotchkiss, *Corporate Financial Distress and Bankruptcy*.
[124] Altman, "An Emerging Market Credit Scoring System for Corporate Bonds."
[125] Altman, Haldeman, and Narayanan, "ZETATM Analysis. A New Model to Identify Bankruptcy Risk of Corporations."
[126] Altman, "Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy."
[127] Ohlson, "Financial Ratios and the Probabilistic Prediction of Bankruptcy."
[128] Chen and Shimerda, "An Empirical Analysis of Useful Financial Ratios."
[129] Kwak and Kim, "Statistical Data Preparation."

Median EBIT margin $_{t-1}$	Active	Inactive
	5.99%	3.46%

Median Net Income margin $_{t-1}$	Active	Inactive
	1.87%	0.88%

The median inactive firm, before the police operation, presents lower level of profitability.

The liquidity performance is fundamental to ensure concrete survival possibilities, especially in distressed situations. *Exhibit 6.8* highlights the median Current ratio (current assets / current liabilities), the Quick ratio ([trade receivables + liquid assets] / current liabilities) and the Cash ratio (liquid assets / current liabilities). All three median ratios are very similar among the two groups and the quick and cash ratios are slightly higher for inactive firms. What should concern is the bad liquidity performance attributable to the sample: only the current ratio could be considered sufficient, while the other two are extremely depressed.

Exhibit 6.8: Median Current, Quick, and Cash ratios

Median Current ratio $_{t-1}$	Active	Inactive
	1.12	1.09

Median Quick ratio $_{t-1}$	Active	Inactive
	.37	.42

Median Cash ratio $_{t-1}$	Active	Inactive
	.07	.09

The median inactive firm, before the police operation, does not differ from the median active firm in terms of liquidity.

The indebtment ratio is calculated as current and non-current liabilities on total assets. It is

necessary to exclude equity from the calculation because in some cases the value is negative. There is not a concrete difference among the two groups in terms of indebtment. The Interest Coverage ratio, calculated as financial charges on EBIT, exposes a different situation, since active firms have a higher value of coverage. The median interest paid by active firms is higher by 0.75 percentage point with respect to inactive ones.

Exhibit 6.9: Median Debt on Total Assets, Interest Coverage ratio and Interest on Debt

Median Debt on Total Assets $_{t-1}$	Active	Inactive
	88%	87%

Median Interest Coverage $_{t-1}$	Active	Inactive
	2.07	1.81

Median Interest on Debt $_{t-1}$	Active	Inactive
	4.15%	3.40%

The median inactive firm, before the police operation, presents a similar amount of debt, a lower level of interest coverage and a lower interest paid on debt.

Other interesting metrics are the ones exposed in *Exhibit 6.10*: the median natural logarithm of total assets of active firms is higher with respect to the inactive group. The percentage of current assets on total assets is sensibly higher for inactive companies and the metric could be conditioned by the industry composition of the groups. The inactive group contains higher percentage of wholesale and retail firms. What is common in the overall dataset is the low fixed assets investment profile. The asset turnover ratio is higher for inactive firms.

Exhibit 6.10: Median Asset size, CATA, and Asset turnover

Median ln Total Assets $_{t-1}$	Active	Inactive
	13.68	12.82

Median CATA $_{t-1}$	Active	Inactive
	.76	.97

Median Assets turnover $_{t-1}$	Active	Inactive
	.46	.64

The median inactive firm is characterized by a lower assets size, a higher amount of working capital and a higher value of asset turnover.

Finally, *Exhibit 6.11*, contains the median Return on Assets. The Return on Equity is not taken into consideration since many firms, as written before, present negative value of equity. Both active and inactive companies exhibit a zero value of ROA. What is important to underline is the general deficient performance profile attributable to the median active and inactive firms.

Exhibit 6.11: Median ROA

Median ROA $_{t-1}$	Active	Inactive
	.000	.000

The median inactive and active firms are characterized by a similar level of ROA.

All the metrics described until now are useful to portray a hypothetical picture of the differences between active and inactive firms. If from the metrics some weak signals about the healthiness of companies are given (active firms are bigger, performing better in terms of profitability and interest coverage), a more detailed study needs to be executed.

6.4 Testing the assumptions

The next step of the analysis involves testing whether the differences between the groups exposed before are statistically significant. The choice between parametric and non-parametric models is necessary. The *t-test*, to confront the mean of two groups, relies on a series of assumptions, like the normal distribution of the data[130]. This assumption is tested using two

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[130] Kim, "T Test as a Parametric Statistic."

different methods. The first is the *Shapiro-Wilk* test, one of the most known and powerful to test the normality of a distribution[131] based on *Shapiro and Wilk* (1965[132]) and on the approximation of *Royston*[133] [134]. The test is performed for all the metrics presented in the previous section. In *Exhibit 6.12* the results do not support in any case (with the very weak exception of the natural logarithm of total assets) the null hypothesis of normal distribution.

The second test performed is the one developed by *D'Agostino et al.*[135] based on kurtosis, skewness, and an omnibus test (highlighted in *Exhibit 6.13*) able to detect deviations from normality. Even in this case, with again the only exception of the natural logarithm of total assets, the null hypothesis of normality cannot be accepted.

Exhibit 6.12: Shapiro-Wilk normal distribution test for the two groups of observations

	Active		
Variables $_{t-1}$	*Obs.*	*z*	*Prob > z*
ln (Assets)	209	1.360	.087*
Assets Turnover	208	8.055	.000***
EBIT margin	163	10.431	.000***
Net Income margin	163	10.568	.000***
ROA	209	10.792	.000***
Current ratio	207	10.530	.000***
Quick ratio	202	10.783	.000***
Cash ratio	202	11.029	.000***
Debt on total Assets	209	9.532	.000***
Interest on Debt	178	10.813	.000***
Interest Coverage r.	185	10.244	.000***
CATA	209	6.504	.000***

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[131] Mohd Razali and Yap, "Power Comparisons of Shapiro-Wilk, Kolmogorov-Smirnov, Lilliefors and Anderson-Darling Tests."
[132] Shapiro and Wilk, "An Analysis of Variance Test for Normality (Complete Samples)."
[133] Royston, "Approximating the Shapiro-Wilk W-Test for Non-Normality."
[134] Stata 17 Base Reference Manual.
[135] D'Agostino and Belanger, "A Suggestion for Using Powerful and Informative Tests of Normality."

		Inactive	
Variables $_{t-1}$	*Obs.*	*z*	*Prob > z*
ln (Assets)	236	2.193	.014
Assets Turnover	236	8.320	.000***
EBIT margin	183	10.619	.000***
Net Income margin	183	10.670	.000***
ROA	235	11.651	.000***
Current ratio	233	10.980	.000***
Quick ratio	228	11.141	.000***
Cash ratio	228	11.092	.000***
Debt on total Assets	234	10.384	.000***
Interest on Debt	172	10.506	.000***
Interest Coverage r.	196	10.174	.000***
CATA	234	7.295	.000***

Note: *** 1% significance level, ** 5%significance level, * 10% significance level

Exhibit 6.13: D'Agostino et al. test of normality

		Active	
Variables $_{t-1}$	*Obs.*	*Adj. X^2 (2)*	*Prob>X^2*
ln (Assets)	209	2.49	.289
Assets Turnover	208	92.76	.000***
EBIT margin	163	188.67	.000***
Net Income margin	163	197.89	.000***
ROA	209	236.82	.000***
Current ratio	207	206.76	.000***
Quick ratio	202	268.58	.000***
Cash ratio	202	268.54	.000***
Debt on total Assets	209	173.12	.000***

Interest on Debt	178	201.41	.000***
Interest Coverage r.	185	141.71	.000***
CATA	209	55.40	.000***

		Inactive	
Variables $_{t-1}$	*Obs.*	*Adj. X^2* (2)	*Prob> X^2*
ln (Assets)	236	4.60	.100
Assets Turnover	236	78.70	.000***
EBIT margin	183	186.62	.000***
Net Income margin	183	176.22	.000***
ROA	235	344.37	.000***
Current ratio	233	185.44	.000***
Quick ratio	228	208.25	.000***
Cash ratio	228	196.57	.000***
Debt on total Assets	234	160.03	.000***
Interest on Debt	172	175.66	.000***
Interest Coverage r.	196	129.43	.000***
CATA	234	23.81	.000***

Note: *** 1% significance level, ** 5%significance level, * 10% significance level. The table *"presents a test for normality based on skewness and another based on kurtosis and then combines the two tests into an overall test statistic"*[136]. Overall statistics and relative p-values are listed in the third and fourth columns.

The same authors suggested completing the analysis with a normal probability plot. The *probit plotting* to detect nonnormality is highly recommended by *Miller* (1997[137]). If the graphical representation of observations follows a straight line, the distribution could be assumed as normal. Again, the graphical analysis suggests nonnormality distributions of the variables taken into exam. Therefore, the non-parametric *Wilcoxon-Rank Sum test*[138]*,* also known as *Mann-*

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[136] *Stata 17 Base Reference Manual*.
[137] Miller, *Beyond ANOVA*.
[138] Wilcoxon, "Individual Comparisons by Ranking Methods."

Whitney U test[139], is used to test if two independent samples belong to populations characterized by the same distribution. This test is based on ranks, and it can be used when the shape of the distribution is not known. It requires the existence of only two groups as in the case of this empirical analysis. The conditions required by the test do not involve any constraints regarding the distribution of samples. They involve, instead, that the observations are randomly drawn from the population, the independence within and between groups, and the ordinal or continuous measurement scale[140]. The first condition is respected since there is no a priori possibility to know if the firm will be the object of an investigation. The second is the most critical to evaluate: certain firms can cooperate with each other and therefore cannot be classified as completely independent. A detailed data analysis has been executed in order to assess this assumption. The only way, allowed by the typologies of information available, to evaluate possible correlations between observations is to individuate when the same person is the condemned subject in more than one observation. Moreover, it is evaluated if firms sharing a mutual condemned person belong to the same industry sector. If these two conditions are met, the observation is considered critical. 68 observations respect the conditions, however, in these cases, the role of the condemned subjects becomes crucial. Only in one case the person is an organizer. In all the others the person is a facilitator or a participant. The control of the firms, therefore, did not belong to these subjects. The other criticality connected with the *Mann-Whitney U* is the assumption of homoscedasticity. It has been demonstrated by *Ruxton*[141], *Neuhäuser*[142], *Kasuya*[143] that the type 1 error rate of the test is much higher under heteroscedasticity. Since the purpose of the test is to verify if the distributions of the groups are different (two-tailed test) and if the variables from one group are stochastically larger than those from the other group[144] (one-tailed test), the homoscedasticity assessment turns out to be fundamental. Otherwise, one can wrongly conclude the existence of a statistically significant different distribution when this conclusion is derived from a type 1 error. It is necessary then to test the equality of variances. To do so, since an imperative requirement to perform the *test F* is the normality of the distribution[145], a robust test is necessary. The *Brown and Forsythe*[146] test of equality of variances is executed. The null hypothesis is relative to the equality of variances.

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[139] Mann and Whitney, "On a Test of Whether One of Two Random Variables Is Stochastically Larger than the Other."
[140] Nachar, "The Mann-Whitney U."
[141] Ruxton, "The Unequal Variance T-Test Is an Underused Alternative to Student's t-Test and the Mann–Whitney U Test."
[142] Neuhäuser, "Two-Sample Tests When Variances Are Unequal."
[143] Kasuya, "Mann–Whitney U Test When Variances Are Unequal."
[144] Nachar, "The Mann-Whitney U."
[145] Lix, Keselman, and Keselman, "Consequences of Assumption Violations Revisited."
[146] Brown and Forsythe, "Robust Tests for the Equality of Variances."

The test is significant for the Asset Turnover, the Cash Ratio, the Debt on Total Assets, and the CATA.

Exhibit 6.14: Brown and Forsythe robust test of equality of variances

Variables $_{t-1}$	Obs.	W_{50}	Prob > F	W_{10}	Prob > F
ln (Assets)	445	.334	.564	.335	.563
Assets Turnover	444	10.337	.001***	11.049	.001***
EBIT margin	346	.189	.664	.179	.672
Net Income margin	346	.668	.414	.700	.403
ROA	444	2.405	.121	2.446	.118
Current ratio	440	1.408	.236	1.443	.230
Quick ratio	430	1.825	.177	1.834	.176
Cash ratio	430	4.146	.042**	4.396	.037**
Debt on total Assets	443	8.737	.003***	8.578	.004***
Interest on Debt	350	.605	.437	.699	.404
Interest Coverage r.	381	.669	.414	.648	.421
CATA	443	3.740	.054*	5.457	.020**

Note: *** 1% significance level, ** 5%significance level, * 10% significance level. W_{50} refers to the median used in the formula, W_{10} to the 10% trimmed mean.

The standard deviation, for every variable whose test is significative (with the only exception of CATA), is higher for inactive firms. The financial results, without considering their values, are more variable when inactive firms are taken into exam. Once the heterogeneity is evaluated, the *Mann-Whitney U* is performed on the basis of the considerations made by *Zimmermann* (1987[147]) and (1998[148]). The author sustained the superiority of the *t-test* even when the assumptions of normality and homogeneity of variance are violated but the sample sizes are equal. This is not the case for many variables: one example is when a firm exhibits zero revenues and, therefore, is impossible to calculate the turnover and profitability margins. The same author studied the impact on the *t-test* and *MWU* error probabilities when both the conditions of normality and homoscedasticity are violated. When the sample sizes are unequal,

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[147] Zimmerman, "Comparative Power of Student T Test and Mann-Whitney U Test for Unequal Sample Sizes and Variances."
[148] Zimmerman, "Invalidation of Parametric and Nonparametric Statistical Tests by Concurrent Violation of Two Assumptions."

if the smaller sample presents a higher variance, the type 1 error probabilities of the *MWU* are more severely affected than the *t-test*. This is never the case for the variables in question, with the only weak exception of CATA. Once having analysed possible advantages and disadvantages, the *MWU* is performed taking into consideration another aspect. The *MWU* test can be seen as more appropriately for this analysis because it is important to evaluate if the observations belonging to a certain group have a better outcome[149]. The results of the *MWU* test are expressed in *Exhibit 6.15*: the test is significant for the Assets size, Assets turnover, EBIT and Net Income margin, ROA, and CATA. The last column of the table expresses, after having compared all the pairs, the probability that an inactive observation has a higher value than an observation in the group of active firms. Therefore, if a random pair is picked is more probable that the active firm is bigger (higher amount of assets), more profitable (higher margins), has a higher return on investment, is less efficient (lower turnover) and presents lower investments in working capital.

Exhibit 6.15: Wilcoxon rank-sum (Mann–Whitney U) test

Variables $_{t-1}$	z	Prob > |z|	Prob i > a
ln (Assets)	-5.932	.000***	.337
Assets Turnover	1.802	.071*	.549
EBIT margin	-3.144	.002***	.402
Net Income margin	-2.325	.020**	.428
ROA	-1.970	.048**	.446
Current ratio	-.027	.978	.499
Quick ratio	.582	.561	.516
Cash ratio	1.444	.149	.540
Debt on total Assets	.231	.817	.506
Interest on Debt	.111	.912	.503
Interest Coverage r.	-1.531	.126	.455
CATA	1.795	.073*	.549

Note: *** 1% significance level, ** 5%significance level, * 10% significance level. It is tested "*the hypothesis that two independent samples (that is, unmatched data) are from populations with the same distribution by using*

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[149] Conroy, "What Hypotheses Do 'Nonparametric' Two-Group Tests Actually Test?"

Before starting to draft the econometric regression is necessary to perform another preliminary step related to multicollinearity. This phenomenon consists of a linear relationship among two or more variables[151]. One of the most common (but not exhaustive) indicators to detect multicollinearity is a simple variables correlation matrix *(Exhibit 6.16)*. From the matrix, unsurprisingly, the highest correlations derive from EBIT and Net Income margin and from liquidity ratios (Current, Quick and Cash). Another and more detailed indicator, the variance inflation factor *(VIF)*, is used to address more specifically this problem. This test complements the correlation matrix, and it is a method to assess the variances inflation attributable to multicollinearity[152]. Although the results of these tests are misjudged and are evaluated based on arbitrary cut-off values[153], it is evident that liquidity and profitability ratios are strongly correlated. One variable between the Net Income and EBIT margin and two between the Current, Quick, and Cash ratios need to be eliminated from the regression to reduce drastically the variances inflation. The choice has fallen on the Net Income Margin and on the Current and Quick ratio. The EBIT is included because is a good approximation of the operating profitability of a firm, therefore all non-operating sources of income are excluded. Moreover, the Net Income is already present in the calculation of ROA. The other two liquidity ratios are excluded for essentially the same reason: the amount of current assets is already present in the calculation of the CATA ratio.

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[150] *Stata 17 Base Reference Manual*.
[151] Alin, "Multicollinearity."
[152] Daoud, "Multicollinearity and Regression Analysis."
[153] O'brien, "A Caution Regarding Rules of Thumb for Variance Inflation Factors."

Exhibit 6.16: Correlations matrix

Variables t-1	In (Assets)	Assets Turnover	EBIT margin	Net Income margin	ROA	Current ratio	Quick ratio	Cash ratio	Debt on total Assets	Interest on Debt	Interest Coverage R.	CATA
CATA.	-.041	.286	-.135	-.121	-.067	.142	.097	.042	.116	.126	.042	1.000
Interest Coverage R.	.083	.044	.371	.367	.164	-.003	-.013	-.001	-.275	.001	1.000	
Interest on Debt	.072	.127	-.052	-.041	.012	-.133	-.132	-.138	.032	1.000		
Debt on total Assets	-.191	.105	-.342	-.372	-.350	-.268	-.267	-.265	1.000			
Cash ratio	-.151	-.088	.017	.017	.019	.700	.854	1.000				
Quick ratio	-.016	-.047	-.003	-.011	.009	.684	1.000					
Current ratio	.069	-.141	-.021	-.042	.036	1.000						
ROA	.044	-.195	.340	.340	1.000							
Net Income margin	.054	.078	.818	1.000								
EBIT margin	.096	.001	1.000									
Assets Turnover	-.045	1.000										
In (Assets)	1.000											

Exhibit 6.17: Variance Inflation Factors table

Variables $_{t-1}$	VIF
ln (Assets)	1.14
Assets Turnover	1.42
EBIT margin	4.24
Net Income margin	4.32
ROA	1.34
Current ratio	3.53
Quick ratio	3.16
Cash ratio	4.23
Debt on total Assets	1.74
Interest on Debt	1.06
Interest Coverage r.	1.16
CATA	1.20

7. *Empirical analysis*

7.1 Logit regression

The first empirical question to verify is if the financial ratios, included in previous tests, contribute to increasing or reducing the probability to become an active or inactive firm. Data are referred to year *t-1*, the year before the police operation. The dependent variable is the activity status of the firm after the operation, as described before. It can assume only two values: 0 if the firm is inactive, and 1 if it is active (for an explanation of this categorization please refer to *Exhibit 6.2*). The most suitable model to adopt is the logit, in which the dependent variable is dichotomous. The model highlights the contribution of independent variables to the odds of an observation being classified in one of the two binary outcomes. The article of *Stoltzfus*[154] is used to methodically address all the assumptions related to the implementation of this type of regression.

The first step is related to the selection of independent variables. As exposed by *Mood*[155], the evaluation of omitted variables is crucial to develop a proper model. Unobserved heterogeneity (the variation of independent variables caused by omitted variables) can influence the results obtained. However, unobserved heterogeneity does not modify the direction of the effects attributable to the variables included in the model. Clearly, only few financial variables are not enough to completely assess the survival or default probabilities of a firm, a massive number of factors contribute to this probability. The collectable and reliable ones are related to financial statements and to the identity of firms. These are the reasons for the inclusion of these variables in the model. The first important assumption to respect in order to apply a logit model is the independence of error terms. In other words, observations must not be correlated and must be independent. In this case, the financial results of a company must not influence the results of another company. The assumption is common with the *MWU* test performed above. For the analysis of the assumption please refer to the previous chapter in which is also highlighted the assumption of absence of multicollinearity. The second assumption is the linearity of the logit, *"meaning there should be a linear relationship between these variables and their respective logit-transformed outcomes"*[156]. To test this assumption, the *link* test[157] [158] and the *Box-Tidwell* test are executed[159]. The former is a test of specification of the dependent variable but *"it is*

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[154] Stoltzfus, "Logistic Regression."
[155] Mood, "Logistic Regression."
[156] Stoltzfus, "Logistic Regression."
[157] Tukey, "One Degree of Freedom for Non-Additivity."
[158] Pregibon, "Goodness of Link Tests for Generalized Linear Models."
[159] Box and Tidwell, "Transformation of the Independent Variables."

often interpreted as a test that, conditional on the specification, the independent variables are specified incorrectly"[160]. The dependent variable is regressed on the predicted value and the predicted value squared. If the model is specified correctly the first independent variable should be significant, while the second not significant. If the null hypothesis of linearity is rejected, *Box-Tidwell* test, through the maximal likelihood estimate, calculates the best power transformation of the variable. It suggests what transformation should be made to achieve linearity. The *link* test is never significant as well as the *Box-Tidwell*. The last assumption, related to the weights of outliers, is addressed with the *winsorization* technique. For the construction of this model, all the variables previously exposed are included, with the exception of the ones eliminated for multicollinearity reasons (Net Income Margin, Current and Quick Ratio). Even with these eliminations, the dimension, efficiency, profitability, liquidity, leverage, solvency, and investment composition measures are present. The number of observations per variable is higher than 30 and the bias caused by a small number of events per variable should be avoided[161]. The pseudo statistic R^2, presented at the bottom of regression tables, does not have the same interpretation as the normal R^2. It ranges from 0 to 1 and it describes the quality of fit[162] [163].

Exhibit 7.1 shows the results of logit models based on data of year t_{-1}. Model *(1)* does not include any fixed effects while model *(2)* includes three different series of fixed effects related to the industries in which the firms operate, their collocation in the country (North-West, North-East, Centre, South, Islands) and the time frame (periods of five years) in which the police operation happened. Keeping into consideration the second model, with the highest pseudo R^2, two variables are significant: natural logarithm of assets and interest paid on debt. The coefficients of the regression are expressed in log-odds units [$\log(\frac{p}{1-p})$]. An odd ratio is the ratio

"of the probability that the event of interest occurs to the probability that it does not"[164]. In this case, a ratio between the probability for a firm to remain active versus the probability to become inactive. The exponential transformation of coefficients in the exhibits returns odd ratios. For example, the exponential transformation of the cost of debt, returns .551. When an odd ratio is greater than one, the probability of being active is greater than that of being inactive. The coefficients are clear in expressing these results since the signs of these two significant variables are coherent with expectations. A bigger firm paying lower interest on its debt is expected to have higher survival probabilities with respect to a smaller one, with higher interest paid. For

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[160] *Stata 17 Base Reference Manual*.
[161] Peduzzi et al., "A Simulation Study of the Number of Events per Variable in Logistic Regression Analysis."
[162] Aldrich and Nelson, *Linear Probability, Logit, and Probit Models*.
[163] Walsh, "Teaching Understanding and Interpretation of Logit Regression."
[164] Bland and Altman, "The Odds Ratio."

example, a 10% increase in the assets base determines an increase of .135 in the odd ratio.

These changes are not very explicative if the dependent variable variations are not examined. It is thus necessary to apply the model on a series of examples to understand its utility and functioning. Two random firms, one active and one inactive, are picked and model *(2)* is applied. The following formula is utilised to calculate the probability for a firm to remain active, using logit coefficients. The cut-off point considered is 0.5.

$$\mathbb{E}[Y|X] = Pr(Y = 1|X_1, \dots, X_k) = \frac{e^{\beta_0 + \beta_1 X_1 + \dots + \beta_k X_k}}{1 + e^{\beta_0 + \beta_1 X_1 + \dots + \beta_k X_k}} = p$$

The application of the model to an active firm is the following:

$$\mathbb{E}[Y|X] = Pr(Y = 1|X_1, \dots, X_k) = \frac{e^{-4.150 + .351 \times 16.642 - \dots + .000 \times 22.052 + .486 \times .958 + FE}}{1 + e^{-4.150 + .351 \times 16.642 - \dots + .000 \times 22.052 + .486 \times .958 + FE}} = 0.80$$

The model classified the firm correctly as active. Another example with an inactive firm is reported below. The model classifies again the firm correctly.

$$\mathbb{E}[Y|X] = Pr(Y = 1|X_1, \dots, X_k) = \frac{e^{-4.150 + .351 \times 13.269 - \dots + .000 \times 2.578 + .486 \times .706 + FE}}{1 + e^{-4.150 + .351 \times 13.269 - \dots + .000 \times 2.578 + .486 \times .706 + FE}} = 0.48$$

Exhibit 7.1: Logit regression models with data of year t-1

t-1	Active (1)	Active (2)
Constant	-4.424***	-4.150**
	(1.475)	(1.781)
ln (Assets)	.349***	.351***
	(.087)	(.099)
Assets Turnover	-.208	-.086
	(.142)	(.162)
EBIT margin	.536	.431
	(.339)	(.402)
ROA	.059	.054
	(.080)	(.084)
Cash ratio	-.107	-.202
	(.188)	(.213)
Debt on total Assets	-.167	-.385
	(.509)	(.625)
Interest on Debt	-.531*	-.595**
	(.272)	(.286)
Interest Coverage	-.000	.000
	(.001)	(.001)
CATA	.257	.486
	(.485)	(.606)
Industry FE	NO	YES
Area FE	NO	YES
Years Op. FE	NO	YES
Pseudo R^2	.092	.140
Obs.	284	284

Note: *** 1% significance level, ** 5%significance level, * 10% significance level. The robust standard errors are reported in parenthesis.

After the estimation of the models, a series of diagnostic tests are executed to evaluate the results obtained. The *Wald* test is characterized by a null hypothesis in which the independent variables are zero[165]. The tests are significant for both the models highlighted before. Despite the *Hosmer-Lemeshow* goodness-of-fit test is not exempted from criticalities[166], it is executed to completeness. The models fit the data well, as indicated by non-significant results.

Exhibit 7.2: Logit regression tests

Test	X^2	d. f.	$Prob> X^2$
Overall model			
Wald (1)	20.03	9	.000***
Wald (2)	46.58	27	.011**
Goodness of fit			
Hosmer & Lemeshow (1)	20.13	18	.325
Hosmer & Lemeshow (2)	20.97	18	.281

Another important element in the diagnostic is the Receiver Operating Characteristic Curve *(ROC)*. Before describing this curve, it is essential to define the concept of sensitivity and specificity[167] [168]. Sensitivity is the ability of the test to correctly categorized a firm as active when it is truly active after the police operation. Specificity instead, is the ability of the test to correctly categorized a firm as inactive when it is truly inactive after the police operation. The *ROC* curve *"is a plot of the sensitivity versus 1 - specificity of a diagnostic test"*[169]. The measure reported in the graph, Area under the *ROC* curve or *AUC*, assesses the accuracy of the model. It expresses the ability of the test to correctly classified firms as active or inactive. More specifically, if a random pair of one active and one inactive firm is picked, the *AUC* is the probability that the discriminant factor (in this case the dummy dependent variable, named active) is higher for the active firm[170].

[165] Forthofer, Lee, and Hernandez, "14 - Logistic and Proportional Hazards Regression."
[166] Hosmer et al., "A Comparison of Goodness-of-Fit Tests for the Logistic Regression Model."
[167] Mandrekar, "Simple Statistical Measures for Diagnostic Accuracy Assessment."
[168] Altman and Bland, "Diagnostic Tests. 1."
[169] Mandrekar, "Receiver Operating Characteristic Curve in Diagnostic Test Assessment."
[170] Faraggi and Reiser, "Estimation of the Area under the ROC Curve."

Exhibit 7.3: ROC curve graph of model (1)
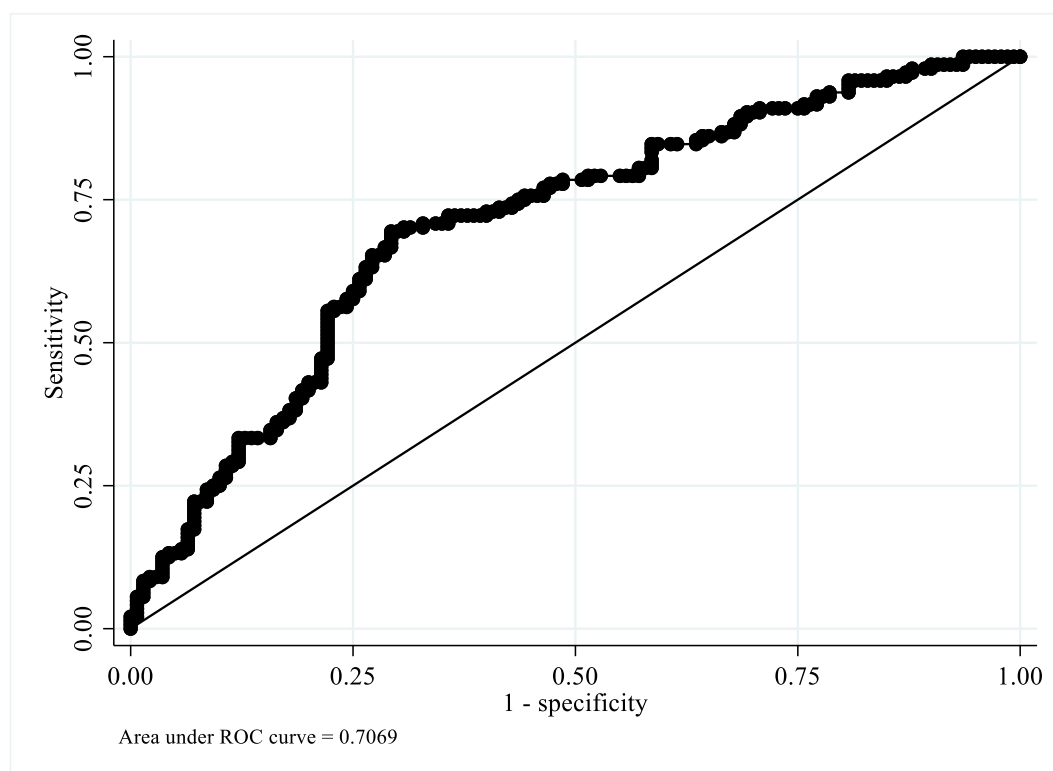

Area under ROC curve = 0.7069

Exhibit 7.3 is the plot of the *ROC* curve and reported the *AUC* for *model (1)* without fixed effects. Since the value of .50 implies no discrimination power of the test, the *AUC* value of .71 can be considered slightly acceptable. *Exhibit 7.4* is referred to *model (2)*. In this case, the *AUC* is higher, .75. *Exhibit 7.5* graph plots sensitivity and specificity versus the probability cut-off of the model. As visible from the graph, the higher the cut-off value chosen, the higher the specificity. The contrary is true for sensitivity. The dependent variable included in the models can assume values from 0 to 1. The cut-off point is the particular value of the dependent variable that discriminates between active and inactive firms. The choice of the cut-off value is crucial, and it depends on the type of acceptable predictive errors[171]. If a very high cut-off point is selected, the model will be characterized by very high specificity. Therefore, it will detect the totality of inactive firms, but the false negative rate will be huge. On the other hand, a very low cut-off point implies the probable detection of all true active firms. But, in this case, the false positive rate for inactive firms will be close to 100%.

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[171] Lennox, "Identifying Failing Companies."

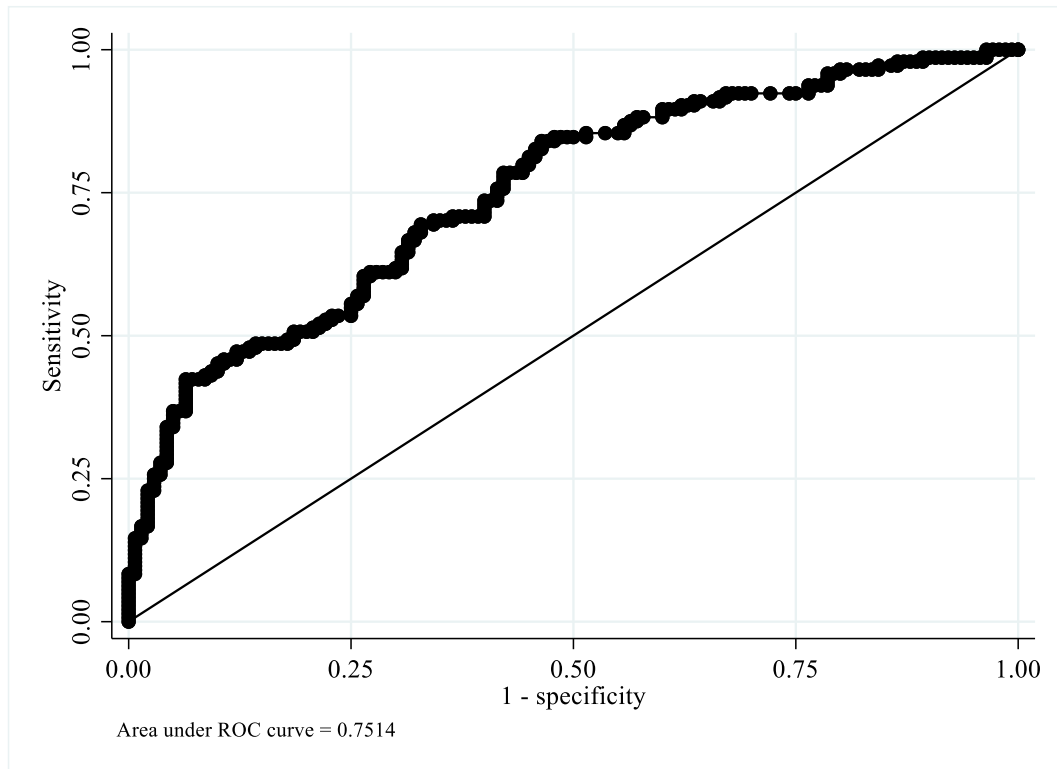*Exhibit 7.4: ROC curve graph of model (2)*

Area under ROC curve = 0.7514

Exhibit 7.5: Graph of sensitivity and specificity versus probability cut-off of model (2)
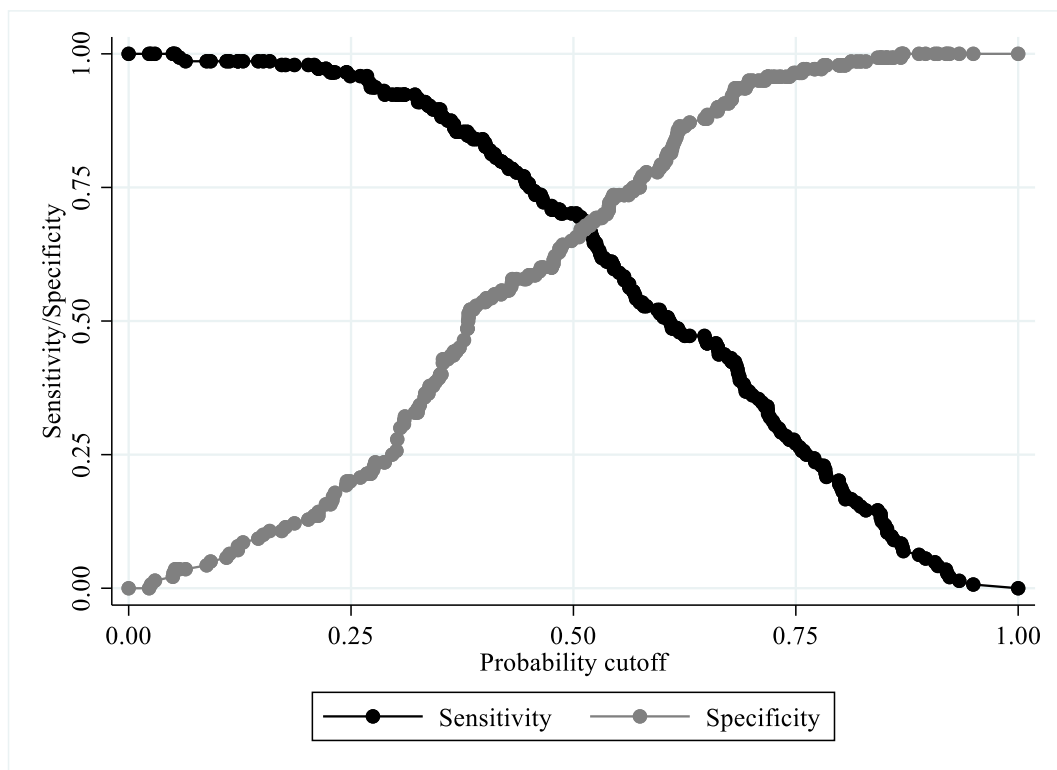
Exhibit 7.6: Classification statistics of model (2)

	True		
Classified	Active	Inactive	Total
Active	98	45	143
Inactive	46	95	141
Total	144	140	284

Sensitivity	68.06%
Specificity	67.86%
Positive predicted value	68.53%
Negative predicted value	67.38%
False + rate for true Inactive	32.14%
False – rate for true Active	31.94%
False + rate for classified Active	31.47%
False - rate for classified Inactive	32.62%

Note: A firm is a True Active if the variable Active is different from 0. A firm is a Classified Active if the predicted probability Pr (Active) is greater than .50.

Exhibit 7.6 reports the classification table with a cut-off value of .50. Focusing on inactive companies, the specificity of the model is 68%. It means that 6.8 out of 10 inactive firms are classified correctly. The sensitivity of the model is comparable. The percentage of the negative predicted value is 67% while for the positive predicted value is 68%. Rounding the percentage, the model is able to predict the inactivity of 7 firms every 10.

7.2 Validation of the model

To validate the previous model, in *Exhibit 7.7* other two models are estimated using data of year t_{-2}. Altman[172] used this type of test to validate the results of its famous corporate bankruptcy model. Ideally, the data from two years before the police operation should be useful, even if less accurate, predictors of the activity status after the operation. If this is not the case, probably, some unconsidered factors, temporally located in t_{-1} and not included in the model, contribute to influencing the results of the analysis. Considering model *(4)* the positive relationship

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[172] Altman, "Financial Ratios, Discriminant Analysis and the Prediction of Corporate Bankruptcy."

between the asset size and survival probabilities is confirmed as well as the negative one between the cost of the debt and survival probabilities. The effects are similar compared to the previous case. The coverage ratio has become significant, although its effect is negligible. It is confirmed that, even with data from two years before the police operation, the dimension of the firms and the interests paid on their debt are still significant predictors of the activity status after the discovery of the criminal connection. These results contribute to validating the results obtained in the previous model. Even in the cases in which the financial data from one year before the operation are not available, the data of t_{-2} have still predictive power and they can be used to conduct a preliminary evaluation. Surprisingly the *AUC* value of model *(4)* is slightly higher with respect model *(2) (Exhibit 7.8)*. The same consideration applies to the value of specificity exposed in *Exhibit 7.10*.

Exhibit 7.7: Logit regression models with data of year t_{-2}

t_{-2}	Active (3)	Active (4)
Constant	-2.493	-3.330
	(1.576)	(2.235)
ln (Assets)	.291***	.333***
	(.099)	(.115)
Assets Turnover	-.234	-.261
	(.149)	(.181)
EBIT margin	-.052	.229
	(.412)	(.460)
ROA	-.020	-.110
	(.395)	(.523)
Cash ratio	-.350	-.503
	(.313)	(.348)
Debt on total Assets	-.712	-.650
	(.631)	(.748)
Interest on Debt	-.567**	-.644**
	(.258)	(.280)
Interest Coverage	.001***	.001**
	(.000)	(.000)
CATA	-.498	.081
	(.510)	(.695)
Industry FE	NO	YES
Area FE	NO	YES
Years Op. FE	NO	YES
Pseudo R^2	.115	.192
Obs.	244	244

Note: *** 1% significance level, ** 5%significance level, * 10% significance level. The robust standard errors are reported in parenthesis.

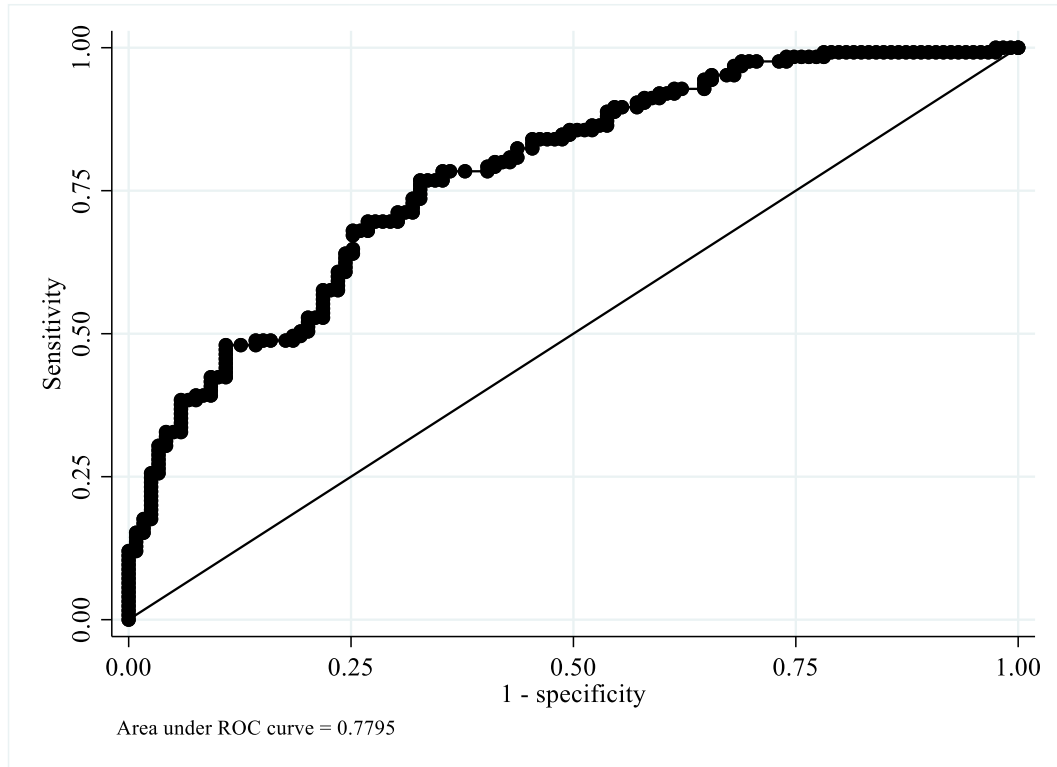*Exhibit 7.8: ROC curve graph of model (4)*

Area under ROC curve = 0.7795

Exhibit 7.9: Graph of sensitivity and specificity versus probability cut-off of model (4)
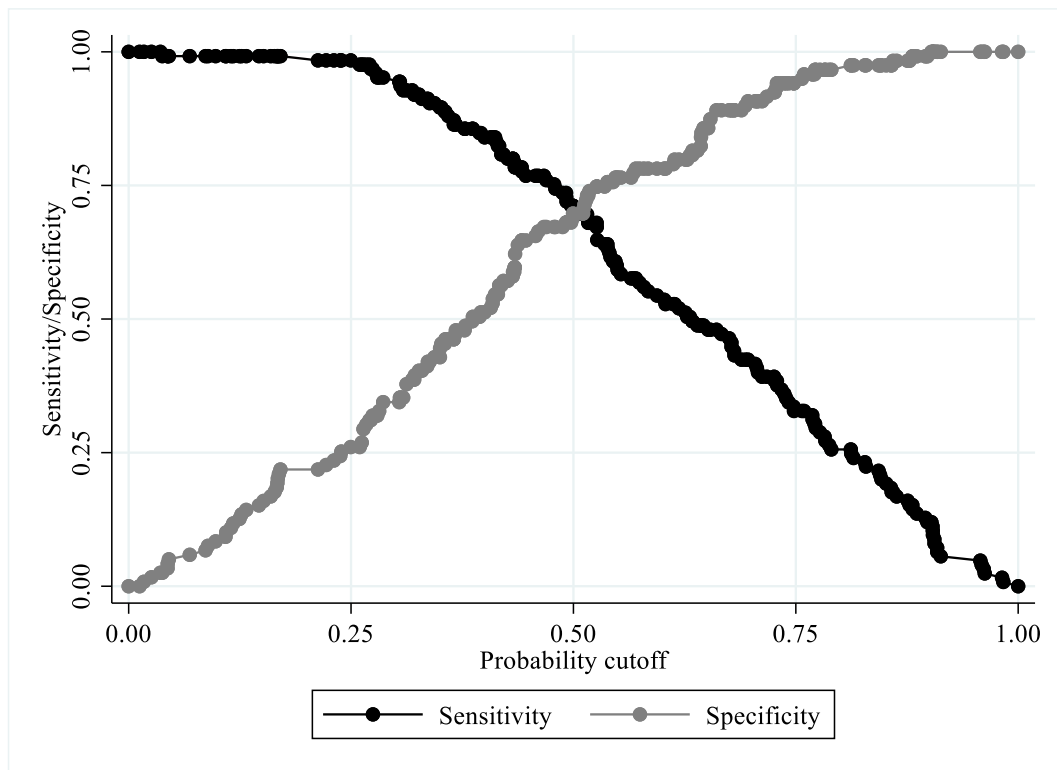
Exhibit 7.10: Classification statistics of model (4)

	True		
Classified	Active	Inactive	Total
Active	90	37	127
Inactive	35	82	117
Total	125	119	244

Sensitivity	72.00%
Specificity	68.91%
Positive predicted value	70.87%
Negative predicted value	70.09%
False + rate for true Inactive	31.09%
False – rate for true active	28.00%
False + rate for classified Active	29.13%
False - rate for classified Inactive	29.91%

Note: A firm is a True Active if the variable Active is different from 0. A firm is a Classified Active if the predicted probability Pr (Active) is greater than .50.

7.3 Comments on the results of the empirical analysis

After having exposed the results of the empirical models, one important question can arise. Are evaluations conducted by judicial administrators coherent with these findings? To answer this question the already cited guidelines[173] [174], developed for the evaluation of seized and confiscated firms, are taken again into exam.

First of all, the variables included in the regression related to the geographical and industrial collocation are obviously evaluated by judicial administrators. Particular attention is placed on the dimension of the firm: the smaller the firm the less reliable and solid is the informative base. This precaution is completely confirmed by the data even if the empirical analysis regards only firms that must publish financial statements. Very often, administrators have to deal with firms that are not obliged to publish their financial documents. In the first guideline, references to the small dimension of firms are multiples. Therefore, size is strongly considered by administrators as a crucial evaluating factor. However, the analysis uses the dimension as a qualitative rather

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[173] Bartoli et al., "Linee guida per la valutazione di aziende sequestrate e confiscate."
[174] Bauco et al., "Linee Guida in Materia Di Attestazione Antimafia."

than quantitative measure to determine the destiny of a firm. In general, the guidelines suggest an evaluative approach to criminal firms and particular emphasis lies on the correction of the accounting values. A criminal firm has to be carefully evaluated, using qualitative and quantitative measures, but the accounting data must be corrected in order to not alter the valuation. The problem with this type of analysis is the time required to perform them. Even a certain candidate for liquidation is deeply analysed. Moreover, the central role of the estimation is occupied by market evaluation of assets and liabilities. It is extremely difficult for certain assets or liabilities to estimate a reliable market value, and, additionally, the difficulty increases if the former criminal support must be considered to correct the values.

The pros of the embryonal model developed in the thesis could be multiple. Firstly, the data used to estimate the model are the ones published by companies before the police operation. They are not corrected to exclude criminal assistance, and, despite this, they have still predictive power. To preliminary evaluate the failure probabilities of a former criminal firm the correction of accounting values could be postponed. In addition, very few variables are needed to run the model. The variables are simple, and their significate is universally understood in the accounting and finance world. Particularly, the model suggests focusing attention on two significant variables: the dimension, but in a quantitative way, and the cost of debt. The application is very fast and can construct a preliminary and in certain cases strong evidence in favour of an immediate liquidation. Another important feature is versatility: the model is still useful even with data from two years before the police operation. One of the major cons is related to the type of firms taken into exam: all companies not legally obliged to publish their financial statements are not included in the analysis. The model is effective and can be applied quickly if financial statements are public and immediately available. The second drawback is relative to the definition of inactivity. To be simple and objective, during the thesis a company is classified as inactive if in any year after the operation it did not publish the mandatory financial statements. This definition of inactivity could be incomplete, but it has allowed to indisputably distinguish between active and inactive firms.

New profitable investments need to be performed and the cost of financing must be reduced in order to increase the survival probabilities of a company. However, the primary objective of the model is not prescriptive, and it does not regard the management of the firm after the criminal connection. The analysis suggests how bigger firms are intrinsically advantaged with respect to small or micro-ones. If a very small firm is classified as criminal, it is already an important red flag. If the same firm pays a lot of interest on its debt, it could be the perfect candidate for liquidation. Does it make sense for this type of firm to invest time and money in trying to overcome the transition phase?

The answer is obviously subordinate to the intentions of the legislator and the choice of the cut-off point is crucial. If the concern is related to the misclassification of inactive firms that could actually survive the cut-off could be lowered. In this case, the false negative rate for true active companies could assume very low values and only real candidates for the liquidation would be classified as inactive. These results do not mean that liquidation should be performed without further analysis. The following evaluations should be executed but the higher the probability of failure, the lower should be the degree of detail of analysis. The approach adopted by the authorities should be variable according to the various survival possibilities. An equal approach to all the former criminal firms does not guarantee the best possible utilisation of public resources.

7.4 How the performance of the active firms varies before the police operation

The financial indicators of years t_{-1} and t_{-2} are used to build the previous models. Two sign tests[175] are executed to assess if from one year and two years before the police operation there are some differences in the performance indicators. Each test refers only to active firms (the first) and to inactive ones (the second). This type of test worked with matched pairs of observations, therefore it is possible to confront firms from one year to another. The null hypothesis of the test is that the median of differences between the indicators of t_{-1} and t_{-2} is zero. The alternative hypothesises are highlighted in the heading of the table. *Exhibit 7.11* presents the results of the first test.

Exhibit 7.11: Sign test for active firms

	Median of		
Variables $_{t-1\ t-2}$	$x_{t-1}-x_{t-2} > 0$	$x_{t-1}-x_{t-2} < 0$	$x_{t-1}-x_{t-2} \mathrel{!=} 0$
ln (Assets)	.529	.529	1.000
Assets Turnover	.030**	.979	.060*
EBIT margin	.171	.869	.342
Net Income margin	.244	.807	.488
ROA	.147	.884	.295
Current ratio	.815	.227	.454
Quick ratio	.088*	.933	.176

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[175] *Stata 17 Base Reference Manual.*

	.087*	.933	.176
Cash ratio	.087*	.933	.176
Debt on total Assets	.909	.117	.234
Interest on Debt	.274	.779	.548
Interest Coverage r.	.128	.902	.257
CATA	.178	.859	.356

The test is significant for three variables: Asset Turnover, Quick and Cash ratio. The median of differences is greater than zero for all three variables. The same test is repeated for inactive firms in *Exhibit 7.12*.

Exhibit 7.12: Sign test for inactive firms

	Median of		
Variables $_{t-1\ t-2}$	x_{t1}-x_{t2} > 0	x_{t1}-x_{t2} < 0	x_{t1}-x_{t2} != 0
ln (Assets)	.066*	.949	.133
Assets Turnover	.651	.408	.816
EBIT margin	.996	.006***	.011**
Net Income margin	.998	.003***	.005***
ROA	640	.414	.829
Current ratio	.902	.124	.249
Quick ratio	.828	.211	.422
Cash ratio	.975	.034**	.068*
Debt on total Assets	.015**	.989	.031**
Interest on Debt	.756	.301	.603
Interest Coverage r.	.835	.207	.415
CATA	.383	.671	.767

In this case the test is significant for five variables: natural logarithm of assets, EBIT and Net Income margin, Cash ratio and Debt on total Assets. If for active firms the median performance tended to improve, for inactive firms the median suggests a general deterioration of many indicators. The significance is stronger for profitability indicators, a sign that, at least on median, inactive firms suffered from a reduction of profitability in addition to a deterioration of the liquidity and indebtment.

After these findings, a new logit model is elaborated to consider the delta of some particular variables between year t_{-2} and t_{-1}. The new model takes into account not only the values of one year before the operation, but also the changes from the previous year (t_{-1} - t_{-2}). The deltas included are the Ebit margin and the cost of debt. The results in terms of significance *(Exhibit 7.13)* confirmed the ones of the previous model: natural logarithm of assets and cost of debt are still significant. However, for the last indicator, its significance has increased to the 1% level. In the case of model *(6)*, with fixed effects, all deltas are significant.

Exhibit 7.13: Logit regression models with data of year t_{-1} and delta between years t_{-1} and t_{-2}

t_{-1}	Active (5)	Active (6)
Constant	-5.680***	-7.738***
	(1.848)	(2.609)
ln (Assets)	.427***	.489***
	(.109)	(.144)
Assets Turnover	-.163	-.087
	(.162)	(.209)
EBIT margin	.209	.242
	(.612)	(.678)
Δ EBIT margin	1.003*	1.026*
	(.533)	(.606)
ROA	-.024	-.085
	(.067)	(.085)
Cash ratio	.076	-.125
	(.212)	(.234)
Debt on total Assets	-.046	-.302
	(.712)	(.874)

Interest on Debt	-.923** (.399)	-1.152*** (.420)
Δ Interest on Debt	.279 (.252)	.571* (.292)
Interest Coverage	.001 (.001)	.001 (.001)
CATA	.247 (.574)	.911 (.767)
Industry FE	NO	YES
Area FE	NO	YES
Years Op. FE	NO	YES
Pseudo R^2	.143	.237
Obs.	229	229

Note: *** 1% significance level, ** 5%significance level, * 10% significance level. The robust standard errors are reported in parenthesis.

The pseudo R^2 of model *(6)* is much higher to the previous cases. The diagnostics tests *(Exhibit 7.14)* are not source of particular concerns since the *Wald* test is highly significant while the *Hosmer & Lemeshow* is not significant. The number of independent variables has increased, but the number of observations per variables is still an acceptable number, 21.

Exhibit 7.14: Logit regression tests

Test	X^2	d. f.	Prob> X^2
Overall model			
Wald (5)	33.69	11	.000***
Wald (6)	52.67	29	.004***
Goodness of fit			
Hosmer & Lemeshow (5)	21.73	18	.241
Hosmer & Lemeshow (6)	12.95	18	.794

For model *(6)* classification statistics have generally improved. In particular the specificity is higher than 74%. The model is able to classify correctly about 7.5 out of 10 inactive firms and

7.2 out of 10 active firms. The false positive and negative rates have improved as well, keeping the same cut-off value (.50). The enhancement of the model is evident also from the measure of the AUC, .816, which describes a good performance in the classification of the observations. The application of the model to the previous active firm is the following:

$$\mathbb{E}[Y|X] = Pr(Y = 1|X_1, \ldots, X_k) = \frac{e^{-7.738+.489\times16.642-\cdots.001\times22.052+.911\times.958+FE}}{1 + e^{-7.738+.489\times16.642-\cdots.001\times22.052+.911\times.958+FE}} = 0.99$$

The model classified again the firm correctly and the probability has increased. For the inactive firm, the probability drops to 35%, therefore the last model is much more precise in classifying this firm as inactive.

$$\mathbb{E}[Y|X] = Pr(Y = 1|X_1, \ldots, X_k) = \frac{e^{-7.738+.489\times13.269-\cdots.001\times2.578+.911\times.706+FE}}{1 + e^{-7.738+.489\times13.269-\cdots.001\times2.578+.911\times.706+FE}} = 0.35$$

Exhibit 7.15: Classification statistics of model (6)

	True		
Classified	*Active*	*Inactive*	*Total*
Active	82	29	111
Inactive	32	86	118
Total	114	114	229

Sensitivity	*71.93%*
Specificity	74.78%
Positive predicted value	73.87%
Negative predicted value	72.88%
False + rate for true Inactive	25.22%
False − rate for true active	28.07%
False + rate for classified Active	26.13%
False - rate for classified Inactive	27.12%

Note: A firm is a True Active if the variable Active is different from 0. A firm is a Classified Active if the predicted probability Pr (Active) is greater than .50.
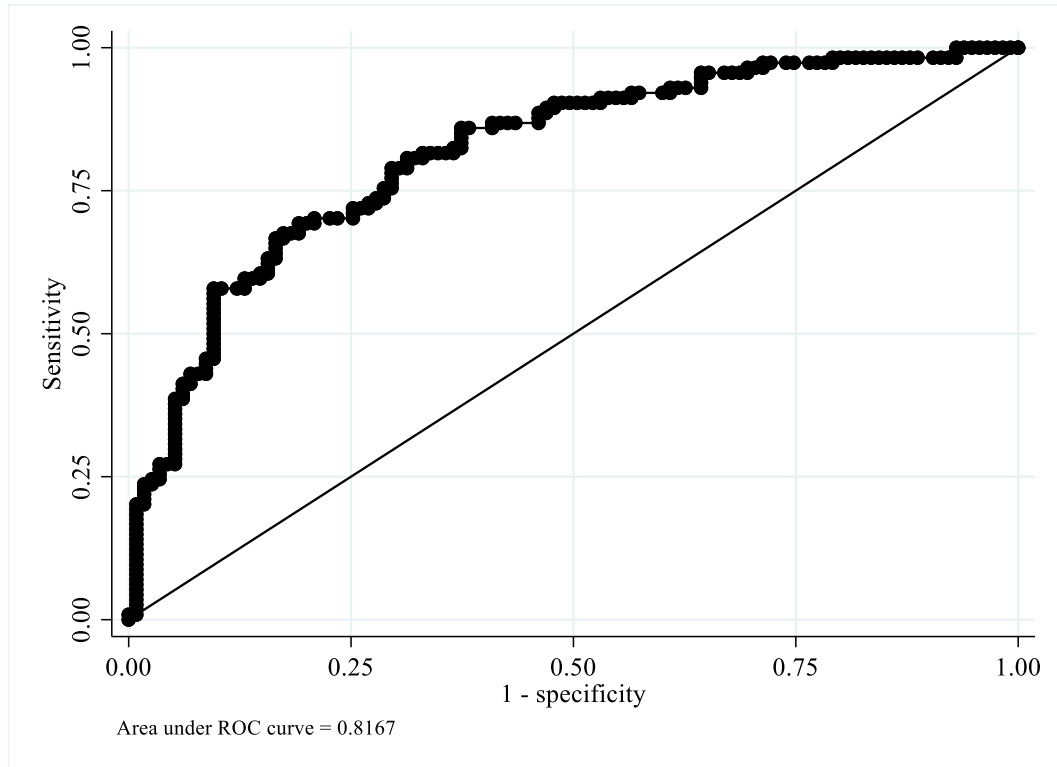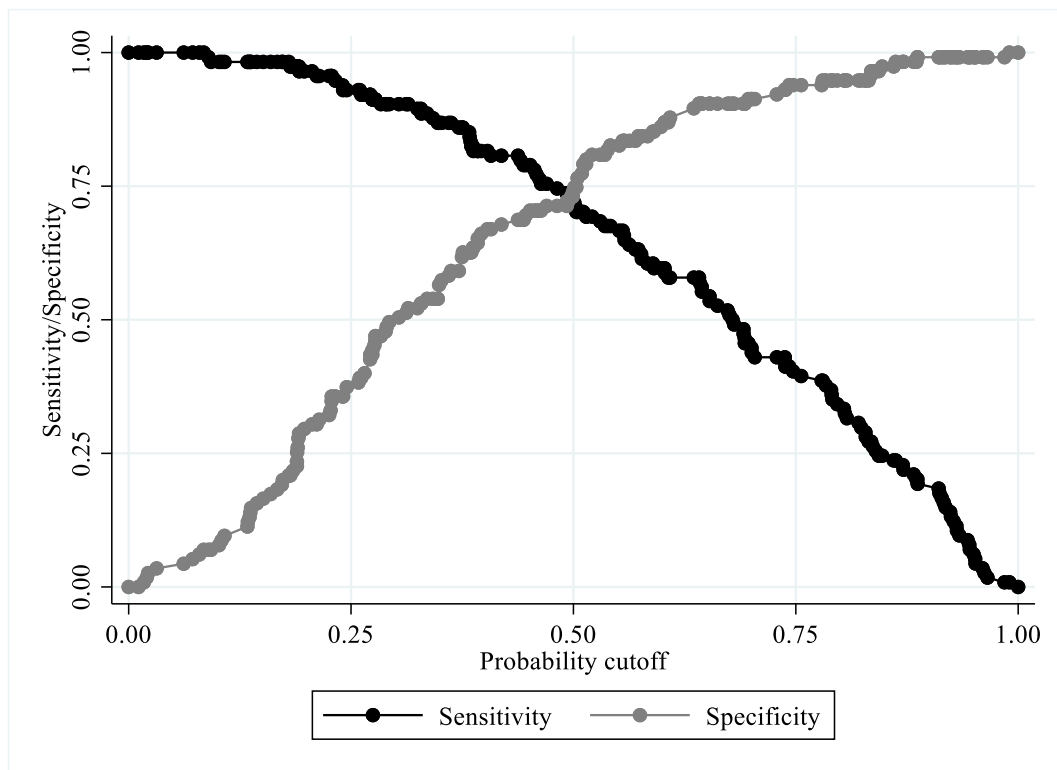
Exhibit 7.16: ROC curve graph of model (6)

Area under ROC curve = 0.8167

Exhibit 7.17: Graph of sensitivity and specificity versus probability cut-off of model (6)

The main novelty of model *(6)* is the significance of the variation in profitability. A positive trend in the operating profitability increases the survival probabilities. Therefore, even data from other years before the police operation could be useful in improving the precision of the model.

7.5 How the performance of active firms varies after the police operation

After having analysed which financial measures contribute the most to the survival probabilities of criminal firms, it is necessary to interrogate ourselves about the destiny of active firms. These firms have survived at least two years after the shock provoked by the police operation and their performance is necessarily influenced. Other two sign tests are executed to assess possible differences. The groups tested earlier were active and inactive firms, while now the typology of firms considered is only the active type but tested in two different moments: before and after the police operation. In *Exhibit 7.18* the test is executed with financial data of firms at time t_{-1} and time t_{+1}, so one year before and after the police operation. In the *same Exhibit* the test is repeated with financial data of years t_{-2} and t_{+2}.

The first comparison is significant for several variables. The median, after one year from the operation, is lower for the assets, the turnover, the profitability margins, and the cost of debt, while is higher for the CATA. The median of two years after the operation, in comparison with the one of two years before the operation, remains lower for the EBIT margin and the cost of debt, while it increases for the asset turnover and for the CATA.

Exhibit 7.18: Sign test for active firms

	Median of		
Variables $_{t-1\ t+1}$	$x_{t-1}\text{-}x_{t+1} > 0$	$x_{t-1}\text{-}x_{t+1} < 0$	$x_{t-1}\text{-}x_{t+1} \mathrel{!}= 0$
ln (Assets)	.001***	.999	.002***
Assets Turnover	.000***	.999	.001***
EBIT margin	.004***	.997	.008***
Net Income margin	.057*	.960	.113
ROA	.244	.797	.487
Current ratio	.733	.314	.627
Quick ratio	.500	.556	1.000
Cash ratio	.196	.840	.392

Debt on total Assets	.685	.365	.730
Interest on Debt	.001***	.999	.002***
Interest Coverage r.	.269	.779	.538
CATA	.989	.016**	.031**

Variables $_{t-2\ t+2}$	$x_{t-2}-x_{t+2} > 0$	$x_{t-2}-x_{t+2} < 0$	$x_{t-2}-x_{t+2} != 0$
ln (Assets)	.111	.913	.222
Assets Turnover	.939	.082*	.165
EBIT margin	.007***	.996	.011**
Net Income margin	.256	.793	.512
ROA	.213	.825	.427
Current ratio	.807	.234	.469
Quick ratio	.670	.384	.768
Cash ratio	.848	.188	.377
Debt on total Assets	.215	.824	.429
Interest on Debt	.000***	1.000	.000***
Interest Coverage r.	.310	.745	.621
CATA	.998	.003***	.006***

Note: *** 1% significance level, ** 5% significance level, * 10% significance level. The equality of matched pairs of observations is tested. The second row exposed the alternative hypothesis of the test. In the columns are listed the p-values.

Two years after the operation the median firm has lower operating profitability and interests paid on debt are lower. It is slightly more efficient, and the weight of current assets is higher. Probably, not profitable fixed investments have been liquidated. As emerged from the logit regression the profitability variation, the cost of debt, and the dimension of a firm are significant factors that modify the survival probabilities. After the police operation, for firms is difficult to maintain the pre-operation level of profitability. The asset base is not significant in the second test. Of course, especially after having analysed the legislative framework, it is difficult for a firm to grow with a number of limitations regarding the possible actions. Even if a criminal-connected firm needs to maximize its profitability and eventually invest to survive in the legal transition phase, the legislation does not act in accordance with these needs. Another important consideration regards the capitalisation of firms. None of the indicators taken into exam regards

capitalisation directly. The reason behind this choice is the particular nature of the firms included in the sample. A consistent number of companies have little to zero capital on the balance sheet. Therefore, an indebtment ratio based on debt over equity leads to an infinite value, less useful with respect to the indebtment ratio used in the models. An increase in the assets base enhanced the survival probabilities of a former criminal firm. In order to enlarge the base two alternative ways are practicable: contract more debt or attract more capital. Since the Italian entrepreneurial tissue is highly based on bank debt and chronically suffers from under-capitalisation, the cost paid on contracted debt plays a crucial role. The tests underline how it is more probable, after the police operation, that there is a reduction of interests paid on debt, with respect to the pre-operation situation. Clearly, the role assumed by banks is essential in the successful legal transition of the former criminal firm. As highlighted by *Bonaccorsi di Patti*[176], organised crime adversely affects lending conditions and opportunities for investments, two of the essential indicators of this empirical analysis. *Calamunci et al.*[177] exposes that criminal firms, when they enter into the judicial administration status, suffer from a bank credit reduction. All the behaviours assumed by the banking industry, private firms that need to be profitable, are perfectly logical. The role of the State becomes fundamental. Only public institutions can ensure, with their own funds or through guarantees, access to credit and a reasonable cost of debt for former criminal firms. Some interventions already took place every year. The Ministry of Economic Development *(MISE)* granted, in 2022, incentives for forty-eight million euros, destinated to already seized or confiscated firms[178]. These incentives do not require any guarantee and they are limited to two million euros for each firm that made a request. The admissible programs are related to financial needs, after a credit crunch, or an investment plan. The grants are perfectly coherent with the necessities of former criminal firms. An evident criticality is the dialogue between institutions and banks. The central question is the following: are funds granted coherent with a long-term perspective of independence of the firm? If, as pointed out by already cited papers, the general approach of the banking sector to former criminal firms is conservative, institutions need to be as careful as possible in selecting only best candidates in terms of survival probabilities. If an explorative model, as the one exposed in this thesis, already highlights the little probability of survival, it does not make sense to grant incentives and start a heavy and long procedure of judicial administration. When the analysis conducted as soon as the police operation is performed is accurate and reliable, the State could save funds and could incentivize the best survival candidates. The evaluation of programs

[176] Patti, "Weak Institutions and Credit Availability."
[177] Calamunci, De Benedetto Marco, and Bruno, "Anti-Mafia Law Enforcement and Lending in Mafia Lands. Evidence from Judicial Administration in Italy."
[178] "Agevolazioni per le imprese già confiscate o sequestrate alla criminalità organizzata."

presented by firms is assessed in accordance with *Legislative Decree number 123 of 1998*[179]. The deadline for the response is six months from the presentation of the demand. During this period, a firm already in a financial crisis can fail very quickly. This timeframe is extremely not compatible with the needs of firms. It can be interesting to investigate how the institutional management approach of former criminal firms affects their profitability. As exposed in the legislative historical analysis, there is not a clear view about what aspect, either the protection of creditors or the continuation of activities, is the most important. The legislation is clearly ambiguous, as emphasized by *Donato et al.*[180]. This ambiguity is not beneficial for actors involved in the process. If the focus, in accordance with the evolution of the legislation, is on the preservation of occupational levels and on the continuation of activities, the judicial administrator must not have the hands tied. She or he needs to be free to operate in the best interests of the firm. Otherwise, all the efforts and monetary funds could be useless especially with a fast-changing demand requiring flexible and fast responses by companies. The current legislation does not address these requirements yet. Creditors need to be protected in a new cooperative optic. The successful transition phase is feasible only if the greatest possible number of stakeholders cooperate in order to achieve this result. If the satisfaction of the credit is partially or totally subordinated to the achievements of certain KPIs, it is in the best interest of creditors to act in favour of the success of this process. This is only one example of how the legislative approach could change in order to really achieve what is the explicit objective of the legislation. The situation is problematic, because, from one side or another, certain interests will be put into crisis. The difficult duty of the legislator is to remove the veil of ambiguity through the adoption of concrete measures.

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[179] Gazzetta Ufficiale, "Decreto Legislativo 31 Marzo 1998, n. 123."
[180] Donato, Saporito, and Scognamiglio, "Aziende Sequestrate Alla Criminalità Organizzata."

8. *Conclusions*

The infiltrations of organised crime within economic sectors are a consolidated reality. As exposed during this thesis, the legislation is not static; it has evolved along with the increasingly widespread phenomenon and our awareness of it. One of the biggest problems arose when the legislator realised that firms were an essential part of criminal business. The repressive approach adopted towards criminal goods was simply no longer suitable. Nowadays, the preservation of firms' activities is, on paper, the most important goal. Many interventions and institutions act in this sense, but criticalities are embedded in the structure of legislative acts. Moreover, certain modalities of execution of legislative acts are not suitable for the needs of former criminal firms, such as the power attributable to judicial administrators, the guaranteed freedom of action, and the imposed deadlines. The legislation has the best ideals, and it is conceived in this direction, but the bureaucratic Italian system remains the traditional one. This system is not compatible with companies that have the necessity of fast execution of various actions. Even if a firm has good chances of survival, the transition phase could kill it. People involved in the process are required to overcome not only subjective difficulties related to each situation, but also threats embedded in the legislation and in the bureaucratic system. Despite this, several firms are able to successfully operate again in the legal market. The resources to manage these processes are limited and there is the necessity to find a more efficient way to utilise them. The models elaborated in the thesis have this major objective in mind. The temporal location of the application is right after the emersion of the criminal connection. Using financial data, related to one year and or two years before the operation, a hypothetical judicial administrator could develop a preliminary evaluation regarding the survival probabilities of the firm. Time, data, and resources required to perform this type of analysis are very limited. With financial statements available, in a few minutes the model can be applied. The application could be more difficult with firms that are not obliged to publish their financial statements, but still possible. In these cases, the time required is longer since the accounting figures need to be reconstructed. According to the models, the dimension of firms (in terms of asset size), the cost of debt, and the profitability variations are significant factors in determining the survival probabilities. A relatively big firm, with low interests paid on its debt and with a positive variation in operating profitability margin has great survival chances after the police operation. The model has given important results; for instance, it is able to classify correctly more than seven firms out of ten. It is a great result from two points of view: the complexity of the phenomenon and the obvious limitations related to available data. The public authorities, with all the possible data available, could elaborate a similar and surely more powerful predictive

model. In this way it can be possible to develop a preliminary overview regarding the destinies of firms and adopt a differentiated approach. Currently, the managerial approach of the transition is not highly differentiated based on preliminary survival analysis. Evaluations are conducted for all the firms even if, in some cases, it is evident a future failure. The choice of cut-off points of the models, points of discrimination between active and inactive firms, is crucial to determine the type of errors associated with the analysis. Lowering the point leads to the probable detection of ideal candidates for liquidation. The application of the legislative framework and the relative valuation should be as tailor-made as possible and not applied uniformly to all former criminal firms. The development of a predictive model goes in this direction. It is important to focus most efforts on the most promising firms through a personalised approach. Indeed, a model like this could be a useful tool in personalisation. Saved resources, in monetary and time terms, can be used for firms seen as valid candidates for a successful transition. This passage is central because of the results obtained by active firms after the police operation. In the median, their profitability has worsened with respect to two years before the operation. So, the analysis of trends before the exposure of connection assumes greater importance. If even active firms present deteriorated indicators after the operation how can firms presenting this declining trend before the exposure survive? Moreover, saved funds can be fundamental in assisting former employees of inactive firms. The median number of employees of inactive firms is five. Considering a gross salary of thirty thousand euro per year, three hundred thousand euro are needed to ensure support to employees for two entire years. Funds saved through this innovative approach can be used to incentivize promising firms and to assist former employees of failed firms. The risk of getting back in touch with organised crime can be deeply reduced through these types of policies. Similar interventions have already been applied, but in this case, the necessary resources would derive from savings related to the new transition process, rather than public funds. The scope of these models is not to brutally liquidate firms without further analysis. The scope is to develop an instrument that helps build preliminary valuations about the destiny of former criminal firms. Obviously, public authorities involved in the process have the final word, but opportunities for a more efficient use of limited resources are many. Authorities should use their immense data patrimony to develop predictive models going in this direction. The predictive powers of the data, together with a necessary collaborative approach of involved stakeholders and an unambiguous legislation, could be the winning ingredients to significantly improve the efficiency and the effectiveness of such a long and complicated transition process.

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