

UNIVERSITÀ DEGLI STUDI DI MESSINA

PHD IN ECONOMICS, STATISTICS AND MANAGEMENT

XXXII CICLO

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**Essays on the Economics of Organized  
Crime: Evidence from Italy**

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*A thesis submitted in fulfillment of the requirements  
for the degree of Doctor of Philosophy*

*in the*

Department of Economics

November 25, 2019



## Declaration of Authorship

I, Francesca Maria CALAMUNCI, declare that this thesis titled, "Essays on the Economics of Organized Crime: Evidence from Italy" and the work presented in it are my own. I confirm that:

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- Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated.
- Where I have consulted the published work of others, this is always clearly attributed.
- Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work.
- I have acknowledged all main sources of help.
- Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself.

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*“Follow the trail of money - and you will find the Mafia.”*

Giovanni Falcone



UNIVERSITÀ DEGLI STUDI DI MESSINA

*Abstract*

Department of Economics

Doctor of Philosophy

**Essays on the Economics of Organized Crime: Evidence from Italy**

by Francesca Maria CALAMUNCI

With the change of organized crime activities in legitimate business through the creation of legitimate companies, most of the countries, among which Italy, introduced specific regulation to fight and weaken the financial basis of OC. However, despite the growing literature on the OC economic impact and the OC companies' characteristics, some aspects are still not investigated. The present Ph.D.'s thesis reviews the evolution of OC and the law, focusing of literature effort in *Chapter 1* and identifying the research questions, drawn up in the following chapters. In *Chapter 2*, applying a micro-economic theory, I study how the OC infiltration in legal business makes the operation of such companies more profitable, establishing a comparison with legal ones. The theoretical model developed focuses on OC effort during productive activities.

In *Chapter 3* I evaluate the causal effect of judicial administration on a sample of Italian criminal firms in the period 2004-2016 to shed light on the dynamic path of the firm's performance from pre-seizure to post-seizure phase. The results reveal that being under measure has adverse effects on the profitability and efficiency level with an increment in the leverage level. The evidence suggests that removing criminal ties makes challenging for the new administrator to maintain profitability and efficiency level.

In *Chapter 4*, I analyze the indirect economic effects of an enforcement law targeting firms affiliated to criminal organizations in the four regions in the South of Italy. The experimental design allows the control for confounding effects at the firm, market, and year level. The results indicate that there are significant positive spillovers from the enforcement law. Legal firms' performance and turnover rise by 2.2 and 0.7 percent, respectively, in the first four years after an organized crime firm is placed under judicial administration. Investments measured by tangible and intangible assets increase with the number of firms entering into judicial administration by 0.75 percent.





## *Acknowledgements*

During my Ph.D. studies, I own a debt of gratitude to many people who provided their time, guidance, encouragement, inspiration, and invaluable advice to produce this dissertation. I am also indebted to institutions whose financial and organizational resources were indispensable to the development and success of my academic growth.

My first thank goes to my advisor Prof. Francesco Drago who has provided me with invaluable guidance and constant support. Throughout these years, he encouraged me to develop independent thinking and research skills. I would also like to thank Prof. Fabio Forgione for being an ever-present person in my academic life with his tireless dedication and for encouraging and helping me to take on this new challenge. I want to express my deepest gratitude to Prof. Antonio Miralles for questioning me about my ideas, continually stimulating my analytical thinking and even for hearing my doubts, whose advice and insight were invaluable to me. I am deeply indebted to them for all I learned from their outstanding supervision and support in all stages of my Ph.D. studies. Their attitude to research always inspired me to develop research questions.

Thanks also to all the other professors of the Ph.D. program for useful comments and moral support during the challenge faced during the route. Special thanks go to Prof. Edoardo Otranto and Mrs. Rosamaria Alibrandi for their organizational support and the precious contribution to the arrangements of the Ph.D. Program.

My deepest gratitude goes to the Fulbright-Falcone-Niaf who provided me a scholarship to gain more considerable experience both academically and socially in the U.S.A. This experience has been incredibly valuable for my future career and my personal development. I had the possibility to be part of the big community life of CUNY areas and the other university institutions. A special thanks go to Prof. Yuliya Zabyelina for hosting and introducing me to the research community at John Jay College of Criminal Justice in New York. My sincere appreciation also goes to Prof. Theodore Joyce of the GC for our numerous talks that provided me valuable comments and enthusiasm.

Thanks to many friends and colleagues I met on my way. In particular, thanks to my fellow adventurers Alessia, Simona, and Alessandra for their collaboration and for making my days at department enjoyable and even fun. All my gratitude also goes to all other Ph.D. colleagues, especially Francesco, Carmelo, Cinzia, and Luca who have enriched my academic experience and have made easier this route.

Thanks to who made my Fulbright program in NYC special and impossible to forget, especially all the Ph.D. colleagues in the Graduate Center and JJ Writing Center. I am grateful to all the colleagues I met during all my experience abroad and Italy. Most importantly, this dissertation would not have been possible without the constant sustenance, understanding, and support of my family, especially of my sisters. They were always there bearing my ups and downs during these Ph.D. years.

Thank you to all the lovely people that enormous and constant trust in me, and for helping me believe in my projects and keep an open mind. This dissertation is dedicated to every person for being always there to show me the bright spots during the hardest moments of this path!



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# List of Abbreviations

<b>ANBSC</b>	<b>National Agency for Administration and Destination of Assets Seized and Confiscated</b>
<b>DIA</b>	<b>Anti-Mafia Investigative Direction</b>
<b>FATF</b>	<b>Financial Action Task Force</b>
<b>JA</b>	<b>Judicial Administration</b>
<b>OC</b>	<b>Organized Crime</b>
<b>OCGs</b>	<b>Organized Crime Groups</b>



*To my Family...*



## Chapter 1

# Organized Crime, Preventive Measures and Literature

### 1.1 Introduction

Organized Crime (OC) in Italy is an old phenomenon, and it is particularly prevalent in four regions in the South (Sicily, Calabria, Campania, and Apulia), taking different names (Cosa Nostra, Camorra 'Ndragheta and Sacra Corona Unita), generally called with the generic terms of Mafia. For about a century, the Italian Mafia-type has been regarded as the prototype of organized crime, so that its definition was associated with the understanding of organized crime (Paoli, 2004). Representing an operational model for the other criminal organizations, most of research focuses on Italian cases, and hence, the different analyses carried out offer insights about criminal organizations at global level (Pinotti, 2015a).

Organized crime groups (OCGs) have been operating in illegal activities and across several legal economic sectors, investing their illicit proceeds. Estimating the total organized crime income is not easy; indeed, there have been several attempts. In Italy, the Italian Anti-Mafia Board has assessed that the organized crime's total financial flow accounted for 150EUR billion in 2012 (UNICRI, 2016). Furthermore, the US Department of State (2015) evaluated Italy's black market to be top 12.4% of the nation's GDP, roughly \$250 billion.

In the last two decades, the infiltration of organized crime in the legitimate economy has grown with social and economic consequences around the world. Given the strong interconnection between economic and criminal activity, it is difficult to identify the border between legal and illegal activities. Indeed, the link between organized crime and legitimate business can take distinct shapes such as direct or indirect control of legal enterprises. The legitimate business can be the target or the tool of criminal activity, representing a way to achieve several goals and to establish a prestigious role in society. The need to preserve power and importance in society, linked to increase profits and make money, has affected the evolution of Italian OCGs. Organized crime groups's interest in penetrating legitimate economy causes the necessity to reform the anti-Mafia legislation, that has some limitations in fighting it. The legislative revolution started with the implementation of the Rognoni-La Torre law. The most important achievement was the acknowledgment of the unlawful mafia-type association and the introduction of personal prevention measures, as well as of patrimonial nature. With the following legislative packages, patrimonial preventive measures gain a remarkable function with respect to criminal prosecution. Today, the measures are reaching excellent results in terms of weakening the patrimonial component of Mafia assets.

Starting from the several specifications of organized crime shared in literature,

because of its nature of “umbrella term,” the chapter focuses on the specific connotations of the Italian case and its activities in both illegal and legal market. The provided analysis helps disentangle and clarify the definitions and some of the features in view of its empirical applications. Then, the chapter will provide the key definitions of OC infiltration in legitimate business, and it describes the critical features of the penetration through legal companies.

Understanding how, over time, organized groups have undergone an entrepreneurial evolution is essential to analyze all the features and aspects. Indeed, the OCG’s relevance in legitimate business through companies has played a predominant role in the Italian economy. There are several contributions, adopting a sociological, political or economic perspective, focused on these aspects. Also, how the phenomenon impacts productivity and economic growth and how it affects society are very discussed issues.

In consequence of OC evolution, different interventions have been approved by several jurisdictions, and in particular, the section highlights the Italian institutional background and changes in the Italian anti-Mafia law. The current judicial framework is efficient in attacking the financial bases of OCGs; indeed, the chapter also analyzes the numerical effects of the law on fighting the phenomenon of the infiltration. Given the meaning of OC companies, their characteristics are of particular attention to the scientific community, and this has developed a new line of investigation. Lastly, I will conclude and present the goals of the dissertation.

## 1.2 Organized Crime and Activities

Organized crime represents a relevant economic issue both in developed and in developing countries. Historically, Italian organized crime is one of the most developed criminal organizations in the world with the American Mafia, Russian Mafia, Mexican Narcos, and Colombian Cartels.

Despite the relevance of the phenomenon, for long time doubts have been cast over a single universally shared definition. For this reason, clarifying the concept and the meaning of organized crime may be helpful to develop the analysis. In international literature, the definition of organized crime groups agrees with Article 2 of 2000 UNTOC, United Nations Conventions against Transnational Organized Crime (so-called Palermo Convention). According to this convention, organized crime is: *“a structured group of three or more persons, existing for a period of time and acting in concert with the aim of committing one or more serious crimes or offenses (...), in order to obtain, directly or indirectly, a financial or other material benefit”*. This definition implies that an OCG must match four criteria:

- A collective element through a significant group of criminals working together;
- A structure defined with definite roles or in the collective hierarchy;
- Constant and perpetual criminal activities over a considerable period;
- Considerable benefit: criminal activity allows to make economic profits or also to achieve personal interests.

Coherently, criminologist literature (Kenney and Finckenauer, 1995; Levi, 2002) defines the profile of organized crime paying attention to the use of extreme intimidation, bribery of public authority, infiltration in the legitimate economy and obstruction in the political process.

All the elements, defined in the definitions, are considered in anti-Mafia laws in some countries, like Italy and US, and also used as the “operational definition” by the international police community. Indeed, the definition provided by FBI describes organized crime as a perpetual criminal conspiracy with an organized structure that is successful because of its use of fear, corruption, and violence. Looking at the Italian organized crime involvement, according to Europol (2013), other central and interconnected tenets have to be considered: family, power, respect, and territory. These elements have represented the strength of its roots in the society, the achievement of the control and prestige, and the propulsive thrust of the OC evolution in a legitimate economic business.

According to the Department of Justice (2008), organized crime and all crime associations can manipulate financial markets and bank institutions and penetrate in some legal activities. Globalization and the new financial instruments have changed the OC interference in the economic and political sphere and have facilitated the concealment and dissimulation of reality.

Nowadays, the Italian organized crime portfolio is made up of different kinds of activities. On the one hand, it maintains a parasitic relationship with legitimate economy, through the usual activities like intimidation, extortion, and racketeering. On the other hand, the involvement of OC groups plays a central role in running business in the legal market. So, the series of activities include not only murder, loan-sharking, racketeering, drugs smuggling, human trafficking, products counterfeit, prostitution, money laundering, gambling, but also investments in the legal sector such as construction and quarrying, investments in hotels and restaurants, and toxic waste disposal. The mentioned activities serve not only as investments for speculative purposes but also for personal use and as a reward for the organization members. In the Italian context, since the 60's organized crime groups have modified their interests in other types of services, such as infiltration in private and public business; vote process supporting politicians, enforcement of cartels, control of firm market competition. Particularly relevant is the spread of the infiltration in legitimate business, with the creation of legal companies, managed by crime members.

### 1.2.1 Preliminaries: Key Definition and Features

Analyzing the evolution of OC infiltration in legitimate business and the presence of OC company requires the clarification of some concepts. One crucial explanation concerns the concept of legitimate private economy. To define the concept, it is useful to use the framework proposed by Gurciullo (2014).

In figure 1.1, the blue part expresses the extensive picture of economic activities, defined as a “network of actors that deal with the management of human, natural and technological resources for the production, manufacture, trade and distribution of goods and services in a given territory”(Mankiw and Taylor, 2006). Within this environment, all types of economic activities, from informal ones (i.e., not registered by any authority), to illicit ones (i.e., the buying and selling of stolen goods) are included. Legitimate economy, therefore, is the orange subset, and it is defined as the aggregation of economic activities that implicates actions that are not punishable by the law, and are formally recorded by an authority (ISTAT, 2006). This kind of activity might be carried out by the government or by organizations owned by private individuals (or, exceptionally, by both of them). This last case is the legitimate private economy. A criminal group penetrating private legal economy can be imagined as an agent working in the surrounding area of the blue set, moving into the core of the larger green subset.

FIGURE 1.1: Classification of the Concept of Economy



Notes. Source: (Gurciullo, 2014)

Another necessary focus is on the definition of OC infiltration in legal economy. It is defined as: *"any case where one physical person, belonging to an organized crime group or agent in its name, or one physical person previously linked, invests financial or human resources in order to participate in the decisional process of a legal company"* (Savona and Berlusconi, 2015).

Regarding the definition of OC companies shared in specialized criminologist literature (Champeyrache, 2004), they are defined as: *"Legally registered Mafia firms (LMF) are those apparently engaged in carrying out legitimate activities, but owned by Mafia Families"*. From both definitions, four common characteristic elements of OC infiltration result:

- Presence of organized crime;
- Presence of a physical person;
- The employment of resource;
- The involvement in corporate decision-making process.

Moreover, the level of OCGs involvement in legitimate business varies from a limited interaction to complete ownership control, and simultaneously, the degree to which the integrity of the legal economy is compromised changes (Von Lampe, 2015). The interference of organized crime in the decision-making process can be shown in different forms, not necessarily having a similar pattern. The nature and the extent of criminal involvement in legitimate businesses vary, as the implications of this involvement do. It can be exercised by a member of the criminal organization (direct internal control), figureheads operating on behalf of the organization (internal indirect control), or through the implementation of coercive measures on managers or supervisors employed by an existing business (external monitor). The choice of the degree of infiltration depends on OCGs goals and interests: on the one hand, legitimate business represents the target of criminal activity; on the other hand, it is the tool of illegal ones.

On a phenomenological level, it is possible to distinguish:

- OC companies in strictly speaking that are: those set up (or acquired) on the initiative of a criminal organization managing them; and those led (directly or indirectly) by a single person, linked with OCG, in his exclusive interest.



- The “OC infiltration enterprises,” in which the entrepreneur, even if not part of the criminal organization, establishes a stable relationship of cohabitation, accepting the services offered and exchanging them with other services and complementary activities. In this last case, the OC companies enter into more or less stable relationships with criminal organizations, even without being included or “contiguous,” only to make lucrative deals.

In both cases, the success of these firms on the market is guaranteed by the occurrence of informal rules in corporate decision-making capacity.

Santino (2006) identifies five types of companies, 4 of which in connection with organized crime:

- a) Companies engaging in illicit manufacturing and using violent methods of discouragement of competition.
- b) Companies carrying out unlawful production activities and using peaceful formal methods.
- c) Companies carrying out legitimate production activities and using violent means of discouragement of competition.
- d) Companies carrying out lawful production activities and using formally peaceful means.
- e) Screen companies that do not perform at all, or only to a minimal extent productive activity, but they are instead used for the money laundering of illicit origin.

The first three categories are companies linked to organized crime, or at least they include criminal methods in their business. Instead, the fourth category corresponds to one lawful company operating correctly. The last definition corresponds to companies operating through a dense network of other companies to avoid controls and tracking of money flows. Those are companies that appear to be of the fourth category, but which play the role of support for the first three categories.

### 1.3 Background: OC Infiltration of into Legitimate Business and Evidence

OCG importance of in legitimate business through companies has played, over time, a predominant role in Italian economy. So, understanding how mafia-type organizations have undergone a deep evolution is helpful to analyze all their features and aspects.

Since the 1970s, criminal associations features, which mainly were incorporated into the behavior of the member and in the typical actions, have been replaced with structures capable of interacting with the legal and economic system in its many features, integrating perfectly into national and international production circuits. In particular, until that moment, defining Mafia as an association was not possible, because the main feature was recognized in criminal behavior. Between the end of the 19th century and the beginning of the 20th century its role of mafia member was in an intermediate state between the lawless moment (from the Greek a *nòmos*, without laws, violent affirmation without statute) and the legal one, institutionalization and approach to men and to organs of the State. Mafia institutionalizes its presence in society by placing itself as a mediator, increasing and affirming its role in the community.

However, after World War II, Mafia power has lost its legitimacy, considered only as an ordinary criminal. At this point, in order to increase the prestige on society, a change took place through state delegating to mafia: many of mafia elements entered

the public administration; relatives were included in the most influential administrative apparatus (the so-called “manipulation of relationship”), and the criminal groups established strong relations with representatives of political, regulatory and business environments. The outlined context allowed criminal groups to influence the new legal framework in the country and develop favorable rules to their interests.

Thanks to this significant relation and the increasing success in the society, from the seventies the mafia has evolved towards forms of entrepreneurship: fundings granted to subjects affiliated with organized crime have increased, the building market has become the field where OCGs easily speculate and earn, competition is eradicated, income and the possibilities for growth have increased. The OC company guarantees unparalleled efficiency (neither trade unions, nor any strikes, are foreseen). These results allow OC companies to carry out work with large companies. In this way, organized crime associations were able to take roots in the society in which they operated, creating a real class.

In this regard, a growing literature focused on OC infiltration in legitimate business, by looking at reasons and opportunities explaining why OCGs has undertaken this evolution. According to sociological studies, OC infiltration in legitimate business represents the primary means through which to achieve several goals and may provide a useful channel for illicit purposes. OCGs may decide to invest, for example, in retail activities, characterized by a high cash turnover. This new activity increases the possibility to hide, through falsification of accounts, fictitious certification and invoicing, and a variety of strategies, incomes from illegal activities that cannot be justified (Anderson, 1979; Fiorentini, 1999; Savona and Riccardi, 2011). Running legitimate business promotes the image of OC members respectability and allows to hide criminal profits. In this way, the entrepreneur can gain social support and get access to the world of economics and politics, allowing an extension of network of contacts of organized crime’s beyond the criminal underworld (Savona, Calderoni, et al., 2011). Social visibility and partnership with officials’ State and private sector might be a source of security and greater access to public and/or private funding and a lower cost of credit (Transcrime, 2013). In sum, OC infiltration in legal businesses allows them to pursue and consolidate more profit.

Criminal organizations, therefore, try to act like corporations, getting characteristics similar to legal business models such as specialization, growth, and development of network-relationships with other economic agents. Legal and illegal activities are closely intertwined: legal activity is helpful for pursuing illegal ones, and this allows money laundering of illegal profits (Fantò, 1999). They are often companies born according to law and with a reputation of respectability in the market, which establishes relationships of joint interest and partnership with OC representatives. Therefore, OC companies typical features are not located in their business, which can be lawful, but in the accumulation process that has led to their set up as well as to the power of intimidation on which they rested (Fantò, 1999). The intimidation is a precondition that allows the domain of the territory by the company. Meanwhile, it represents a plus-value that is added to the one that generally produces the capital invested in the same area and under the same conditions. The business tool allows mafia organizations to invest the proceeds of their illicit activity to increase profits, extend their influence, and exercise their power more forcefully.

The influence exercised by organized crime’s legal activities in the market is the focus of a growing literature analyzing it using several approaches and perspectives. There are several contributions focusing on infiltrated-firm characteristics. Also, how the phenomenon impacts productivity and economic growth and how

it affects society are very discussed issues.

With a sociologic perspective, Arlacchi (1983, 2010), analyzing the OC infiltration, defined as "Mafia entrepreneur," stresses several qualitative aspects that can be sources of competitive advantages for OC-infiltrated firms in comparison to the legal counterpart:

- Discouragement of market competition (ensuring goods and raw materials at favorable prices, as well as orders and contracts using criminal intimidation acting like a real trade barrier);
- Wage compression (negation of rights of trade unions, social security contributions and insurance avoidance, non-payment of overtime);
- Accessibility of financial funds (investment of significant proceeds coming from illegal business) and consequently, the possibility of not bearing the cost of credit.

Instead, strategic management literature (Duplat et al., 2012) with a principal-agency view, identifies four aspects, typical of legally registered Mafia firms, in the governance mechanisms such as violence and intimidation, corruption, affiliates' turnover, and firm turnover. All these mechanisms help in mitigating agency's risks (adverse selection and moral hazard) and monitoring agents' behavior.

Researchers have studied how OC infiltration impacts the economy. The pervasive OC presence influences institutional systems and violates democratic civil standards. A complete illustration is present in the documents of the Financial Action Task Force (FATF): "Organized crime can infiltrate financial institutions, gain control of large sectors of the economy through investment, or offer bribes to public officials and indeed governments. The economic and political influence of criminal organizations can weaken the social fabric, collective ethical standards, and lastly the democratic institutions of society" (FATF, 1999, 2014). Empirical studies highlight how organized crime influences government efficiency (Allum and Siebert, 2004), and on electoral competition (G. Daniele and Geys, 2015; De Feo and De Luca, 2017). As a result, corruption increases, the quality of the institution is weakened, resource allocations are distorted, and public spending is misused (La Spina and Lo Forte, 2006). Following, a strand of literature studies the distortive effects on FDI (V. Daniele and Marani, 2011) and public transfer (Barone, Narciso, et al., 2012; Galletta, 2017) finding that the embezzlement of public resources generates adverse political and economic effects (G. Daniele and Dipoppa, 2018).

Most economic studies have described organized crime as an obstacle to economic development, focusing on its economic consequences. Empirical evidence reveals a negative effect of criminal presence on economy discouraging legal performance. It lowers GDP growth (Detotto and Otranto, 2010; Peri, 2004; Pinotti, 2015b; Tullio and Quarella, 1999), reduces investments (Enders and Sandler, 1996; Pellegrini and Gerlagh, 2004) and affects employment rate (Peri, 2004).

The literature on organized crime micro-effects is piecemeal: only a few studies investigate the effect of crime on firms' activity, examining the different economic aspects and their impact on the growth-crime relation for SMEs (Islam, 2014). Also, Albanese and Marinelli (2013) highlight negative consequences of operating criminal groups on corporate productivity, due in particular to its ability to control on the territory. Additionally, the organized crime interference may cause an adverse selection on financial condition terms. It distorts the perception of investments, increasing uncertainty associated with weaker law enforcement. Bonaccorsi di Patti

(2009) analyzes the effect of OC on pricing Italian bank lending: risks related to crime affect the short-term cost of credit and increase the demand for guarantees by banks and the composition of credit among different categories of loans. Businesses operating in high crime domains use relatively fewer financial receivables, and of these more frequently in discovery and revolving credit lines.

## 1.4 Evolution of the Law: from the Rognoni-La Torre Law to the Anti-Mafia Package

The evolution of OC from an organization with “agrarian” connotations to an organization capable of infiltrating legal markets, has also led to a change of legislation since it faced some limitations treating the phenomenon as a crime of a single individual. There was no legislative instrument to pursue the mafia phenomenon as an association. Lawyers recognized the need to attack criminal organizations in their economic and financial components, connected to the exercise of criminal activities, money laundering, and the investment of illicit proceeds, through measures aimed at seizing and confiscating the illicit assets obtained.

The legislative change took place with Rognoni-La Torre (law on 13th September 1982, No. 646). This law established fundamental elements that defined the shift in strategy in fighting organized crime, substantially modifying the countenance of the law by preventive measures. The establishment of this law involved the introduction of art 416-bis<sup>1</sup> in the Italian criminal code, which, for the first time in the national legal experience, sanctioned the mafia as an association. This article recognized mafia association with independent criminal relevance, identifying the operating methods, and specific purposes. The effective techniques are represented by the intimidation force of the association bond and the condition of subjection and consequent omission. The particular objectives refer to committing crimes, managing or controlling (directly or indirectly) economic activities, the concessions, the authorizations, public tenders and services, unfair profits or advantages for themselves or others. From this moment on, mafia has been framed in the judicial system as an association, and finally, individual people or individual criminal acts are no longer pursued.

Another significant change provided by “Rognoni-La Torre” law is the introduction, alongside with personal prevention measures, of those of patrimonial nature. The law provides the seizure and confiscation of the assets of which the lawful source has not been proven, found in direct or indirect availability of suspects belonging to a mafia-type association. The purpose of these preventive measures is the impoverishment of criminal organizations and people involved in criminal events. The action of the State is thus shown in terms of patrimonial investigations, seizure, and confiscation of assets, and economic isolation from the context in which the accused person operates. The definition provided by the penal code in the article 416-bis states that committing crimes does not constitute the primary purpose or the ultimate purpose of mafia association, indicating several goals. In this way, the objectives of the law suit the need to research and control the crime association economic power and highlight how it is characterized by mechanisms and dynamics

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<sup>1</sup>A mafia type association consists of three or more individuals and those who belong to it use power or intimidation afforded by the associative bond and the state of subjugation and criminal silence which derives from it to commit crimes, to acquire directly or indirectly the management or control of economic activities, concessions, authorizations or public contracts and services, either to gain unjust profits or advantages for themselves or for others, or to prevent or obstruct the free exercise of the vote, or to get votes for themselves or to others at a time of electoral consultation

allowing the infiltration in the legal economy. In this sense, the law does not make a distinction between criminal profits and formally licit profits because they derive from the simple existence and popularity of the associative bond and all equally pursued through intimidation and violence as conventional instruments. (Cass. Pen., sez. I, 27.11.2008, n. 6930; Cass. Pen., 11.01.2000; Cass. pen., 16.03.2000).

The aforementioned article establishes that *“anyone who is part of a mafia-type association, formed by three or more persons”* is subject to the sanction indicated. So, the agent subject could be anyone. The minimum participatory threshold is identified in the activity of those who make a conscious contribution to the life of the association, knowing its characteristics and using the intimidation force and the conditions of subjection and the *“silence code”* deriving from it. The second paragraph of art. 416-bis identifies, in addition to the participation, further expressive behaviors that are the promoter, director, and administrator<sup>2</sup>.

In sum, Rognoni-La Torre law has relevant importance not only for OC identification, cataloging the phenomenon and the role but also for the introduction of preventive measures. Legal action has affected the criminal organization, chipping away the capital accumulation, feeding OC influence on the territory, and in parallel, increasing social control and intimidation power.

#### 1.4.1 Preventive Measures and Judicial Administration

Law 646/1982 represents the legislative turning point to fight against organized crime. It provides the implementation of preventive measures by the Court, on the proposal of the Public Prosecutor's Office or the Police Authority, on the assets under *“the suspected belonging to mafia association.”* These preventive measures have the aim to take the assets away from the criminal circuit and allocate them to other purposes, exempt from illicit conditioning. In particular, measures consist of seizure (applicable where, *“on the basis of sufficient clues, such as the noticeable inequality between the standard of living and the amount of apparent or declared income, there is reason to believe [that the assets] are the result of illicit activities or constitute their re-employment”*) and in confiscation (ablative instrument *“of the seized assets of which legitimate origin has been demonstrated”*). However, at this stage, the function of these preventive measures was entirely *“accessory”* in comparison to those of personal nature, and could not be applied in absence of the latter.

Other changes arrived with the following legislative packages:

- Law 55/1990. The legislator introduced art 23-bis in law 646/1982, making independent relevance to the patrimonial and personal measures.
- Law 356/1992. The legislator introduced, in art. 12 sexies, a new type of confiscation supporting criminal and preventive ones. It is envisaged that in cases of conviction or *“plea bargain”* ex-art. 444 c.p.p. for certain crimes, including mafia-type association, the confiscation of money, assets, and other benefits are always arranged<sup>3</sup>.

<sup>2</sup>The more a person is involved in these roles, the more severe the sanction is.

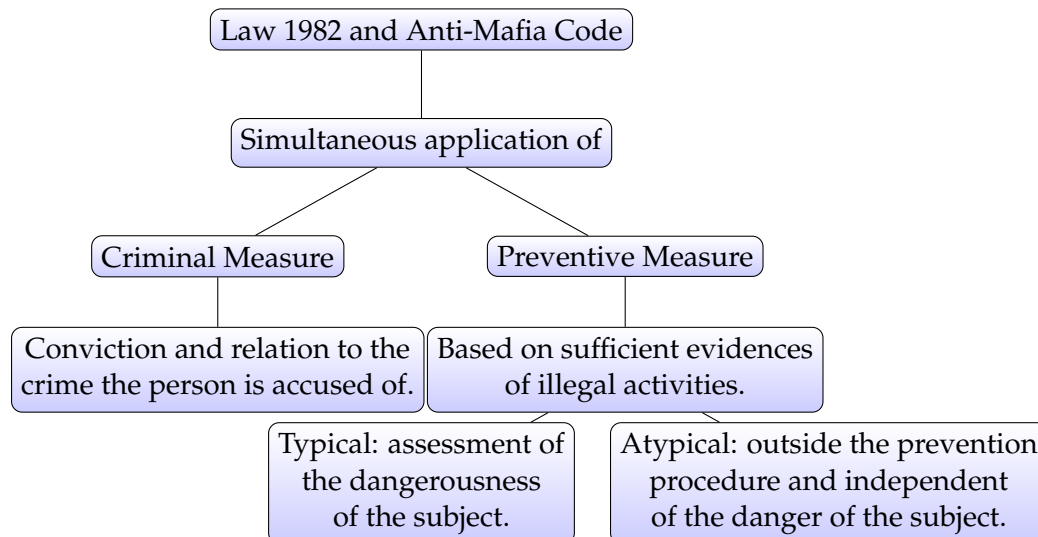
<sup>3</sup>Also in this case, it is applicable when the condemned cannot justify their origin or when he is the owner or has the availability in disproportionate value in comparison to his income or his economic activity. The same article (paragraph 4-bis) provides that even in these cases of confiscation, the measures concerning the management and destination of the seized and confiscated assets envisaged by law 31 May 1965 n. 575 and subsequent modifications are applied.

- Decree-Law 92/2008, Conv by Law 125/2008 (the so-called “Security Package”). The main reform is constituted by the reversal of the “ancillary principle” introduced by Rognoni-La Torre law, with the possibility of separate application of financial measures from those of a personal nature;
- Law 94/2009 which, in addition to extending the categories of people subject to anti-mafia measures, acts again on the principle of accessories, providing the possibility of applying financial measures *regardless of the social danger of the proposed [...] person at the time of the prevention request*;
- The DL 4/2010, Conv. by Law 50/2010, which sets up the National Agency for Administration and Destination of Assets Seized and Confiscated from Organized Crime (ANBSC).
- The fragmentation and lack of systematic harmonization have led the legislator to carry out a complete reorganization of the regulations with the Antimafia Code (Legislative Decree 159 of 2011).

Law 646/1982 and, currently, the Anti-Mafia Code (Legislative Decree 159 of 2011), provide that, in presence of a situation of a person belonging to a mafia association, both the procedure for ascertaining the associated crime and the process for the application of the prevention measure must be activated simultaneously. The preventive measure has a distinct function and nature concerning criminal prosecution. The criminal prosecution law tends to punish the violation of criminal law (and its application is subject to the establishment of a crime and the guilt of the accused). The prevention measure does not imply a crime and aims to prevent subjects from committing dangerous deeds; it is one of those necessary and adequate measures to preserve the public interest.

Once the procedure for the offense relative to in Article 416-bis has been activated, the public prosecutor shall notify the Prosecutor of the Republic to implement the patrimonial preventive measures (art. 23-bis). The prevention action is independent from criminal prosecution: through the separate development of the two trials, there is the possibility to use preventive measures of assets already subjected to criminal seizure. However, the effects of the measures provided by the anti-mafia law remain suspended, pending the outcome of the criminal trial, and can only be revoked if the criminal seizure is revoked. Hence, the principle of a formal priority of criminal seizure and possible confiscation concerning the measures of asset prevention, since the penal trial offers more substantial and formal guarantees. During the prevention procedure, precautionary measures of patrimonial nature are envisaged.

Preventive measures can be divided into two categories: the first, defined as “typical,” requires that the people subjected to the prevention procedure are assessed regarding their degree of danger; the second, “atypical,” are applicable outside the prevention procedure and therefore they are independent from the danger of the subject. Among the typical precautionary measures, there is the seizure, which the court can order with a deliberate reason against that person who, subjected to prevention procedure, might directly or indirectly arrange the assets. In particular, it is applied when the value of current income is disproportionate in comparison to the declared income or the economic activity carried out, or when, based on sufficient evidence, authorities believe that they are the result of illegal activities or represent re-investment of funds. The diagram below summarizes the main points.



Once the seizure has been decided, the Court appoints the delegated judge and the administrator who are responsible for managing the seized assets. The appointed judge manages the administration, in the sense that he dictates the inspiring guidelines and supervises the behavior of the judicial administrator, exercising control over management on behalf of the Court, which has exclusive and functional competence in relation to the adoption of all the measures concerning the custody, conservation, and management of the seized or confiscated assets. He has also to authorize, in advance, acts of extraordinary administration. The administrator, instead, has the task of keeping the seized property intact, he must accomplish his duties using *the diligence of the good father of the family*.

The legal framework, in addition to the conservation and custody of the seized assets, hopes for an increase in the profitability of these assets as applied in art.35 comma 5 of the anti-Mafia code; the administrator managing the assets has to guarantee the achievement of the same benefit as the real owner had kept the direct management. To pursue these objectives, the administrator must be a professional registered in a special register of judicial administrators who are experts in business management, ensuring maximum competence, and adequate management skills. With judicial administration, the objective of the company changes: it is not the optimization of profits and the accumulation of mafia clans wealth or other criminal stakeholders, but the search for a new organizational structure, in line with the law, but still able to operate efficiently. It has to be functional to the efficient management of the company and, therefore, directed to guarantee the survival of the company and the growth of social welfare. Seizure and confiscation, because of their preventive functions, are not intended to enrich the Treasury, but rather to eradicate a tool to commit crimes and to pollute the market.

The judicial administration has two distinct phases:

1. The first one, which goes from the issuing of the seizure decree to the confiscation decree of the first degree;
2. The second, administrative one going from the confiscation of the first degree to the definitive one.

The administrator's first task is to check in advance whether there are positive margins to renew asset management: he submits to the judge a detailed report, indicating the status of the assets, their possible market value, the rights of third parties,

and a suggestion about the most profitable forms of management. Once the situation has been ascertained, the Court approves the project and issues guidelines for the management of the company. At the end of the administrative procedure and, in any case, after the confiscation of the first instance, the judicial administrator shows the appointed judge the management report, which sets out the ways it will be managed, and similarly the evidence of the sums paid and collected, the analytical description of the assets, and the final balance. The judge goes on with his controls and, if there are no objections, approves the report.

With the first-level confiscation decree, a second phase is opened in which there is a “*transfer of power*”: the whole administration of the asset moves from the judicial body to the National Agency. Like the judicial administrator, during the entire proceeding, the Agency has to provide the custody, the preservation and the administration of the assets seized. Following the “definitive” confiscation of prevention, assets are acquired to the State property, free of charges and burdens. The definitive confiscation consists of the destination of the assets to the community. At this time, the National Agency administers the confiscated assets and the allocation of them for institutional and social purposes, according to the specific procedures indicated in the Code.

## 1.5 Effects of the Law: Confiscation, Seizure and Firm Characteristics

The introduction of the anti-organized crime package has had a remarkable impact on legal economy, because of the considerable increase in the amount of assets under the preventive measure, i.e., seizure and confiscation. The system developed, from Rognoni-La Torre law and following modifications, has been directed to weaken the economic profile of criminal associations. In particular, according to the analysis provided by the DIA (Anti-Mafia Investigative Direction), from 1992 to 2018, the number of confiscations and seizures has increased considerably. The study carried out reflects the impact of the different laws that over time the Italian law system has introduced. In this period, as reported in table 1.1, the Anti-Mafia Section has seized 17 billion euros and confiscated 10 billion to different criminal groups active in Italy.

TABLE 1.1: DIA Number: Seized and Confiscated Assets

Organizations	Seizure (Art. 321 cpp)	Confiscations (D.L. 306/1992 art.12 sexies)	Seizure (DLgs 159/2011)	Confiscations (DLgs 159/2011)
Cosa Nostra	1.954.344.288	95.790.822	11.403.545.515	7.130.752.034
Camorra	3.046.821.510	438.806.856	2.794.105.257	1.082.322.443
Ndrangheta	1.092.931.375	341.730.878	2.408.650.903	1.787.305.011
Apulian Criminal Organizations	103.314.615	39.530.129	147.707.259	117.287.634
Other Groups	851.542.287	31.392.427	531.240.142	437.459.156
<b>Total</b>	<b>7.048.954.075</b>	<b>947.251.112</b>	<b>17.285.249.076</b>	<b>10.555.126.278</b>

Sources: DIA Rilevazioni Statistiche. Values of seized and confiscated assets are expressed in euro

Another analysis can be provided through the use of the ANBSC statistics. According to this organ, indeed, in 2018, the number of goods confiscated and given back to the community is equal to 16,526. The assets are represented by 15,573 properties and 953 companies; to these amounts, also 19,958 units, of which about 16,979



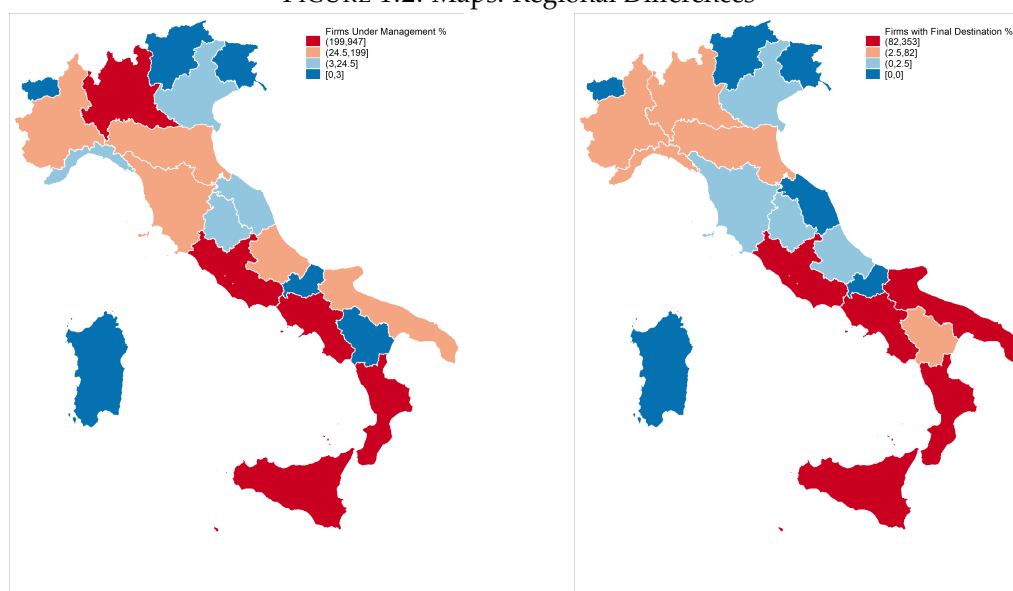
properties and 2,979 companies are listed as seized, or confiscated with the final sentence but which are still pending destination. Here there is a detailed table about companies:

TABLE 1.2: ANBSC Statistics: Focus on Companies

Region	Under Management	Final Destination
North Area	447	115
Central Area	452	114
South Area	2080	724
Total	2979	953

Notes. Personally elaborate ANBSC data.

FIGURE 1.2: Maps: Regional Differences



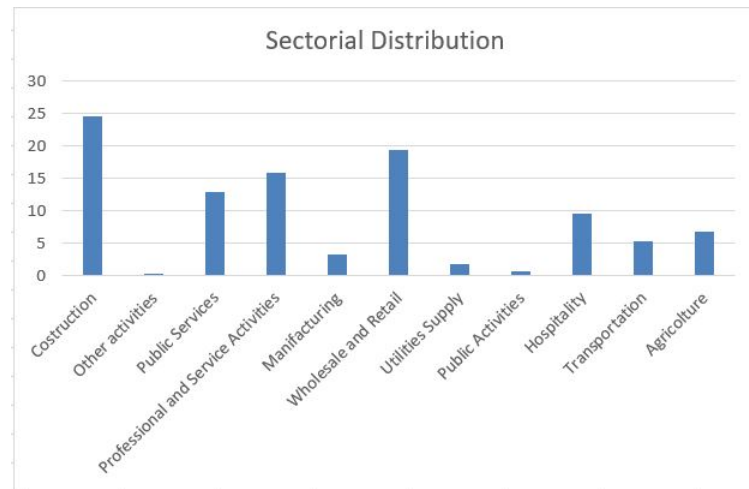
Notes. Personally elaborate ANBSC data.

As illustrated in map 1.2, regions with the highest level of Mafia infiltration in companies are Sicily, Campania, Lazio, Calabria, Lombardia, and Apulia. Among the 953 companies definitively destined, limited liability companies represent 62%, followed by individual companies (16%), limited partnerships and general partnerships (15%) and only marginally public limited companies (2, 17%).

The preference for the limited liability form is due to the fact that it allows a compromise between the creation of a company and the concealment of criminal identity (thanks to the splitting of capital among different subjects); this latter objective is also pursued thanks to the use of nominees and corporate control structures for cross-shareholdings.

Furthermore, the same data contain also an indication of the sector affected by the infiltration. The favorite sectors of economic activity are those of low technology. In particular, the construction sector (24, 54%) stands out and the wholesale/retail follows (19, 39%). Significant presence, also, in the professional and service activities (15, 81%), education, health and social assistance (12, 95%) and hotels and restaurants (9, 47%).

TABLE 1.3: ANBSC: Sectorial Distribution



Notes. Personally elaborate ANBSC data.

The growing enforcement of activities and the unique jurisdictional framework, offer the possibility to collect significative firm-level data and use the exogeneous shocks to employ quasi-experimental design. Indeed, these companies are of particular interest to the scientific community, given their social responsibility and the importance of market competition.

In literature, an emerging line of research is aimed to study the characteristics of OC companies. Most of them are based on accounting information, even if the reliability of accounting data can be questioned. However, although in criminal business, accounting needs to help hiding the crime, it maintains all the necessary features and the impression of rationality and credibility (Compin, 2008). According to this line, OC companies accounting information incorporates some significant differences in management from those of similar companies, for which there is no organized crime association. Fabrizi et al. (2017) provide a first attempt to investigate financial characteristics and management of criminal companies located in Central and Northern of Italy. The analysis reveals that criminal connected firms are on average bigger in size, have more debts and lower liquidity than legal ones. Moreover, the study shows the existence of three different types of criminal firms, helpful in several needs of criminal organizations.

Another critical study is carried out by Transcrime (2013) with the goal of identifying and understanding why organized crime invests in companies, the sector and territories target of infiltration and the difference in terms of investment strategies between criminal organizations and how OC companies are managed and controlled. This study allows to identify differences in companies' sources and method of use. Looking at the sources, companies show limited levels of bank debt compared to legal ones in the same sector because they can draw from the revenues of criminal activities to finance the investment. However, social consensus, control of the territory, and partnership with manager or politicians might be a source of security for greater access to public/private funds. In sum, the total debt level is higher. The causes could be accounting reasons (to mask contributions) or as sufficient exposure to suppliers (intimidation as a means of pressure and delay). On the other side, for the employment methods, for active OC companies, the assets are constituted by tangible and intangible type, for OC companies with little activities, the assets are held in current asset and only in residual in capital asset. Overall, these companies

are characterized by a compression of costs: lower costs to suppliers, lower labor cost, and lower production costs.

This strand of literature was followed by Ravenda et al. (2015a,b) with two studies: the first study examined earnings management and labor tax avoidance in Mafia companies; the second one focused on how it is possible to use accounting data, through the development of a logistic model to predict the probability that a firm is connected to organized crime. This last detecting model has been taken over by Castellano et al. (2017) who has made some improvements regarding the parsimony of the number of variables.

Using accounting data, several scholars studied how criminal organizations operating in the legitimate business in both input and output market impact the economy. Among them, Fabrizi et al. (2018) provide empirical evidence of the economic consequences due to the presence of firms connected with a mafia-type organization located in North and Central Italy, verifying how the competitive arena is affected by adverse distortive effects. Bianchi et al. (2017) assess the consequences of organized crime presence on private firms (working on financial policies and performances) from region Lombardy, clarifying the influence of having a board member linked with crime.

## 1.6 Conclusions and Objectives

The infiltration of criminal groups in legal business has been extensively investigated by several perspectives. Although literature review is aimed to give an extensive knowledge about the phenomenon of OC infiltration in the legitimate market and its influence on economic and social aspects, some aspects are still not explored. This literature is a bonanza of insight on OC behavior and capacities that help to understand how they impact economy. It is also a source of knowledge about the way criminal organizations infiltrate in legitimate business, feeding on their weaknesses and fragility.

The literature review on this topic allows the identification of some specific features of OC firms. In comparison with legitimate companies, these hidden categories show differences in performance, relation mechanisms, and ownership governance. The OC firms' character is not merely related to illegal activities, but their dark side can also concern their ability to coercively coordinate production factors (Albanese and Marinelli, 2013; Transcrime, 2013) and to create agreements and trust relationship with other companies and organizations. Moreover, the competitive scenario in which OC firms operate is polluted. In sum, the nature of OC companies and their economic processes require a more in-depth analysis.

The thesis does not study the phenomenon of OC infiltration. On the contrary the focus is on the analysis of OC firm's behavior and on directly consequences of adopted policy (as OC firms' performance) and indirectly ones (spillover effects on legal competitors). The idea of consequences is particularly useful to explain some of the externalities (negative and positive) of judicial policies. The theory of organized crime and infiltration into legal business has produced an essential contribution in understanding why specific environments encourage crime more than others.

Hence, the goal of this dissertation is threefold. Firstly, I have built a theoretical model to study OC companies behavior and their dynamics in the market with legal companies. Secondly, I would like to verify the causal effect of judicial administration on OC firm aspects. Thirdly, I ongoing to analyze the spillover effects on

the firm's legal performance after anti-Mafia enforcement actions. I can summarize these research questions in these ways:

1. Organized Crime Firm Behavior and Market Dynamics.
2. What Happens in Criminal Firms after Godfather Management Removal? Effects of Judicial Administration.
3. Confiscation of Criminal Productive Assets: Spillover Effects on Legal Firms in the South of Italy.

These aforementioned studies are organized in three chapters organized as standalone paper. However, all chapters are closely related because of the main object of the study, represented by OC firms and their nature.

## Chapter 2

# OC Firm Behavior and Market Dynamics

### Abstract

The main purpose of this article is to analyze how the infiltration in legal business by organized crime groups (OCGs) make the operation of such companies more profitable, establishing a comparison with legal companies. The article applies microeconomic theory to study OC-infiltrated businesses focusing on OC effort during the productive activity. By using the framework discussed in the literature, I show with an economic perspective that OC firms, given their features, are able to support a lower cost of effort to reduce the cost of their inputs. These particular features can help to reach a higher level of capital to labor ratio. In the same way, under *ceteris paribus* conditions, OC companies achieve a higher level of profitability. Consequently, the OC firms manager can devote more efforts into the organization activity, which may increase efficiency in the productive process. OC management also affects the market dynamics, causing a sort of economic discrimination for legal companies in some markets.

The findings suggest that OC ownership offers some opportunities for criminal organizations. OC ownerships are characterized by particular features that allow them to control labor costs and to reach higher levels of capital intensity. As consequent, this increases the companies' market power and causes discrimination effects against legal firms in the market, that should improve the productivity to enter the market and compete in it. The article contributes to the existing literature on the organized crime-business nexus and sheds light on OC business management practices and their impact on the market.

## 2.1 Introduction

This chapter investigates how organized crime (OC) infiltration affects mechanisms of operations inside controlled firms. Organized crime firms behavior is a barely studied phenomenon. What is the influence of OC on mechanisms inside infiltrated companies? Why does one company, when infiltrated by OC, invest more than its legal counterpart? Do illicit mechanisms offer economic advantages? What are the factors behind OC-infiltration of legal businesses? What are the dynamics in the market? In sum, how OC infiltration shapes the operation of controlled firms and how firms act within an environment polluted by criminal groups are crucially important in understanding the behavior of such companies. Despite the increasing interest in quantifying the effect of criminal organizations infiltration in economy, economists have not stylized yet a model to study the behavior of such companies. For example, a line of studies (e.g. Cowan and Century, 2002; Jacobs, 2007; Kelly,

1999) have analyzed companies, only considering OC presence in terms of racketeering activities in legitimate industries.

The study draws on the microeconomic theory that helps to explain how OC features incorporated in the mechanisms of governance influence the behavior of those companies. In the economic framework, the theoretical model of a firm is based on economic variables in the construction of the objective functions of its profit maximization and cost minimization process. Companies decide to enter the market when they can reach higher profit and to exit the market when they experience a financial loss. However, a company is a system in constant evolution, whose mechanisms and rules also concern the ability to respond to external and internal changes. As a result, companies, when framing their objective function should include, besides economic identities, also social, cultural, and ethical ones (Morrison, 2000). Additionally, the concept of transaction and agency cost helps to analyze how OC control influences firms in managing the minimization cost process. The opaqueness of organized crime groups (OCGs) mechanisms and influence affect the infiltrated companies economic results. Within this environment, investment uncertainty investment is reduced, transaction, agency, and organizational costs are minimized thanks to the closer boards among participant and agents. The features of OC entrepreneurs and all OC elements should be included in the maximization process of controlled firms.

The profile of criminal organizations has included substantial entrepreneurial features in the business, to the point of infiltrating the legal economy. According to the Department of Justice (2008), in the last two decades, OCGs have been involved and have gained the ability to manipulate financial markets and bank institutions and to infiltrate some legal activities. In several countries, OCGs are capable of infiltrating enterprises and the markets where companies are established (Savona, Calderoni, et al., 2011). Hence, it is crucial to analyze the characteristics and profiles of these companies and how OC features affect companies' behavior. The presence of organized crime in the economic reality increases the uncertainty of the business environment, and distorts the system and the allocation of resources, menacing the economy (Bianchi et al., 2017). OC infiltration in legitimate companies and industries can systematically disrupt legitimate markets with significant impacts on society and directly and indirectly on economic activity. When criminal groups operate in legal businesses, they maintain criminal characteristics with consequences on the competitive market and the same company.

Overall, the nature of OC companies and their economic process require a more in-depth analysis. Business is oriented by their dark side to coordinate the internal economic process and to create a network with other economic agents. Consequently, ever, the competitive market dynamics are managed by these actions.

This article contributes to the study of the organized criminal-legitimate business nexus and sheds light on OC business management practices through a microeconomic perspective. Transaction and agency cost theories allowed the development of a theoretical design with both mathematical and graphical model. The examination is mostly theoretical and points out that OC ownership plays a crucial role in shaping profit market opportunity.

The chapter has two main goals. First, I extend the existing literature on OC infiltration. Although a large body of research has looked at the characteristics of OC infiltration, the OC firm's economic behavior is an understudied phenomenon. In particular, my model incorporates observations and findings coming from several perspectives, especially criminological and sociological, to draw a theoretical model to study OC behavior through an economic perspective. In doing so, it outlines two

lines of research: (1) the micro-economic theory on corporate crime, in which criminal connotations are essential in shaping profit decisions and firm behavior and (2) the business theory which considers ownership and the governance mechanisms as critical elements in leading to different forms of control and organization.

Consequently, the second goal is to study how OC ownership shapes firms output, capital intensity, and competition in relation to legal companies. The model produces an analytical solution that characterizes the optimal behavior for both firms. The results show that criminal characteristics change the conduct of such companies, especially allowing them to control labor cost and the possibility to reach a higher level of capital intensity. Under OC control, firms acquire market power, and the allocation of financial resources leads to new investment. When these presences pollute the market, and legal firms forgo to enter or compete in the market, suffering a sort of economics of discrimination. As a consequence, the model also describes that legal companies should improve productivity to enter the market and compete in it. The contribution is theoretical and represents the first attempt to model the behavior of this class of companies that are so hidden, capturing the essential predictions offering additional insights.

The rest of the chapter proceeds with the review of the literature and some preliminaries on which the model is built. Next, I develop a simple model that captures the main difference between the two types of companies in the stationary state. Then, introducing new assumptions, I capture the market equilibrium and the dynamic. Finally, I draw some observations and conclusion.

## 2.2 Theoretical framework: Literature Review and Preliminaries

The study of OC firms' behavior needs a review of microeconomic theories to understand the nature and channels through which this hidden category of firms operates. Starting from classical microeconomic theory, a firm is considered as an entity born with the primary goal of maximizing profit. In doing so, it manages the production factors, choosing the amount of labor and capital to be used for production, as well as the quantities of goods to be produced based on price systems established in the market. This framework provides for complete information, lack of uncertainty, absence of agency costs and transaction costs, with the consequence that firms optimally allocate their resources, reaching equilibrium.

The transaction<sup>1</sup> cost economy, theorized by Coase (1960) and Williamson (1975), has renewed the economists thinking about the nature and dimensions of economic and legal relationships. Economic actors are opportunistic and want to have an advantage over those with whom they deal. Additionally, because economic actors are rational, they cannot write a contract covering all contingencies that might happen.

In modern times, firms gain a role of a central economic institution in the market. The enterprise is portrayed as a form of economic organization whose purpose is to deal with uncertainty, through processes guided by collective learning and efficient skills and routines. The nature of a company, as a system in continuous evolution, requires analysis to move from a static to dynamic perspective, to comprehend mechanisms, rules, and all variables considered in the decision-making process the

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<sup>1</sup>Transactions involve various actors such as partners, suppliers, and customers that are part of the same network, amplifying the uncertainty and negotiation circumstances.

different types of ownership translate into several mechanisms. The variables considered do not only respond to an economic logic but include a vast number of aspects, such as social, ethical factors, etc. Furthermore, companies need to have the ability to adapt to internal and external changes. A group of economists (for example, Hodgson, 1988, 2012) develops a pluralistic approach to business problems to understand the complexity of economic organizations and the essential characteristics of companies.

Drawing on this background, the study of OC firms' behavior and all the variables influencing the economic process requires a more in-depth analysis. Criminal organizations try to conform to the model of legal business enterprises and to follow the same trends: specialization, growth, and relationships with other economic realities. OC firms, unlike legal companies, apparently act with purposes established by the law, but hide a dark side, due to the management that refers to criminal principles and ways of acting. Legal and illegal activities are closely intertwined: because the legal business is helpful for illegal ones, allowing money laundering of illegal profits (Fantò, 1999). Indeed, the nature of a company inserted in a criminal circuit is not merely related to illegal activities, but its dark side can also concern its ability to coercively coordinate production factors such as capital and labor (Albanese and Marinelli, 2013; Transcrime, 2013) and its ability to create agreements and trust relationships with other economic entities and corporations in order to increase profits or other benefits mutually. The typical connotation of OC companies refers to the accumulation process that has led to their formation as well to the intimidation feature with which they act.

OCGs do not perform in a perfect environment, and the real nature of OC firms is characterized by complex relational and institutional systems, making hard the identification and the analysis of all variables, in a rational way, to pursue the optimal choice. The profile of these companies is characterized by specific functions that allow the establishment of multiple relationships with economic operators. For the legal system, OC companies are regularly registered with a lawful purpose, although they hide the illegal accumulation of economic and non-economic resources (coming for example from smuggling, drug trafficking, extortion, usury, fraud, etc.) and also use unlawful means such as intimidation and violence. Moreover, OC firms, working independently, establish multiple relations with economic stakeholders and consent to carry out efficient economic exchanges spreading a culture of reciprocity that can be positive or negative, based on the willingness to cooperate (Di Maria et al., 2014). Companies' transactions are not only managed by criminal enforcement operations (e.g., coercive appropriation of assets), but they are, also, dependent on other alternative persuasion techniques such as those pointing out parasitic behavior or trigger strategies (Green and Porter, 1984). The nature of the enterprise, therefore, does not end only in the minimization of transaction costs and control of opportunism, but it also concerns the ability to respond to external and internal changes through established routines, rules, and procedures. Consequently, at the time of formulating their objective function, companies incorporate also OC features in addition to economic factors. Nevertheless, in the market characterized by OC presence, the entrepreneur can take into consideration only the opportunity to make money, instead of investing in the analysis of all other variables.

In sum, governance and coordination of the organizational system within OC companies are characterized by particular practices, such as codes of behavior, routines, and relational mechanism (loyalty, power, control). The use of opaque rules allows the application of methods that have effects on these firms' life. Given the



OCGs stronger contractual power in the market, the investments uncertainty is reduced. Also, criminal connections strengthen controlled firms in managing transaction costs, agency costs, and organizational costs. Indeed, as Jensen and Meckling (1979) argue, the corporate management structure of the firm is part of the production function, together with productive resources and process, implying different production possibilities set. Following the same line of thinking, Fama and Jensen (1983) referring to agency theory, emphasizes how contractual costs (writing and enforcing contracts) represent a crucial part of the firms cost function and, therefore, determinant variables in shaping the efficiency and possibilities of the different organizations of the firms.

Researchers have studied the OC infiltration phenomenon in companies from several perspectives. A line of research concentrates on the geographical and sectoral distribution of OC infiltration. The majority of this research is focused on Italian cases; it represents the prototype for other criminal organizations in other countries (Pinotti, 2015a) and the analysis carried out could offer insights about the criminal organization at a global level. However, also other countries, among which United States, Japan, and Russia, have experienced the infiltration of OC in legal businesses (Asmundo and Lisciandra, 2008; Calderoni and Caneppele, 2009; Caneppele et al., 2009; Hill, 2003; Jacobs et al., 2001; Kaplan and Dubro, 2012; Varese, 2006). A study carried out by Transcrime (2013), in the Italian context, highlighted that usually OCGs are interested in “protected sectors” such as construction, health care, and public services, transportation; monopolistic or oligopolistic sectors, sectors marked by low levels of openness to foreign international competition; low level of technology and moderate entrepreneurial risk; inelasticity of demand. Focusing on a smaller context, Sicily, these features are still valid (Lavezzi, 2014), especially for the traditional/low-tech sectors. Anderson (1979) has found similar results in the US case, exploring the sectors interested by infiltration such as: bars and restaurants form the largest group, followed by other retail trade and services, finance, insurance, real estate, vending machines and related business, casinos, food, trucking and transportation, construction and building services, waste, and garbage disposal. Recently, the business of renewable energies, also, has been a new target of infiltration; a combination of elements such as profit and high price, public funds, lack of regulation makes this type of energy attractive to criminals (Savona, Calderoni, et al., 2011). In sum, organized crime groups operate mainly in sectors and markets that guarantee the highest profit margins and higher rates of return of investment.

A growing strand of literature, however, is interested more in finding the reasons and opportunities that guarantee the OCGs infiltration in the legal business. Penetration has allowed criminal groups to reach a prestigious position in society, and also their benefits, among which the achievement of the power market. For example, criminologists and sociologists have focused on identifying OC firm main features. In particular, Arlacchi (1983, 2010), analyzing OC infiltration has defined the “Mafia entrepreneur”, stressing several qualitative aspects that can be sources of competitive advantages for OC-infiltrated firms in comparison to their legal counterpart, providing many examples referred to the situations in Sicily and Calabria:

- Wage compression and higher fluidity of the workforce (denial of trade union rights, non-payment of overtime, evasion of social security contributions and insurance), also suggested by other studies (Fantò, 1999; Lo Bello, 2011), according to which OCGs significantly reduce labor costs of controlled companies;

- Attainability to financial resources (investment of enormous income stemming from illegal business and favorable relation with financial institutions);
- Discouragement of competition through the formation of a protectionist threshold around the market about the OC company (securing goods and raw materials at favorable prices, as well as orders, contracts and commercial outlets using criminal intimidation acting like a real trade barrier). Also Riccardi (2014) and Transcrime (2013), analyzing a sample of companies confiscated, prove the existence of this OC power advantage. Additionally, OC companies have greater facilitations in permits, concessions, authorizations, and other favorable administrative measures obtained easily and without problems in comparison to other firms. This is confirmed by investigations by the Anti-mafia Parliamentary Commission.

The criminal network offers, therefore, advantages and wealth for the members, causing distortive effects in the market and increasing costs and negative externalities for their legal counterparts. For example, OCGs may force legal firms to purchase over-priced inputs (Pinotti, 2015a). The competitive scenario in which OC firms operate is polluted, hampering the economic results.

Consequently, legal firms wishing to enter the market are affected by a sort of economic discrimination. The literature about economic discrimination is widely developed, starting from the seminal work by Becker (1957) with its taste-based theory according to which employers do not behave efficiently: they hire and pay workers according to their taste, not based on production potential. Aigner and Cain (1977), Arrow (1973), and Phelps (1972) and this statistical theory focus on gender/race discrimination, identifying discrimination in the alleged information on individuals' productivity. A recent line of research (De la Rica et al., 2008; Lang and Manove, 2011; Lang, Manove, and Dickens, 2005) analyzes how discriminated group are probabilistically more productive than the "preferred" groups. For example, if women have to work harder to achieve the same level of promotion, then, if this affects productivity, it should increase it. Despite this, discrimination is reabsorbed very slowly because of several mechanisms in the market, such as conservative values and auto-discrimination. A similar approach can be used to explain the dynamics in the market in presence of OC infiltration.

Premised on this framework, this article focuses on the mechanisms implemented by OC ownership in controlled companies. The goal of the article is to stylize the OC firms behavior to capture internal dynamics of OC governance mechanisms, affecting the firm's performance. As a consequence, the internal dynamics also cause external effects on market dynamics, determining externalities, and entry barrier. Hence, the model concerns how OC infiltration of legal business makes their activities more profitable and has an effect on the market competition dynamics.

### 2.3 Illustrative Behavioral Model: Legal companies and OC companies

The economic and managerial research (Ben-Amar and André, 2006; Hansmann et al., 2013; Himmelberg et al., 1999; Milgrom and Roberts, 1992; Rajan and Zingales, 1998) has pointed out that ownership and consequently, alternative types of governance mechanisms lead to several forms of managements and control designs. Therefore, the model aims to describe the specific ways through which OC and legal companies seek to attain optimal levels of organization concerning their production

processes. OC firms can gain higher or equal profit to legal companies if ownership decisions provide an advantage. This competitive advantage could be represented by lower agency/transaction and organizational costs, thanks to the possibility to use informal social rules and criminal network interactions.

Reducing the two type of firms to a representative company, the model uses the following assumptions. Firstly, the two types of companies operate in a market economy and compete. Both types of firms want to maximize their expected profits (total revenue-total costs). Secondly, the output of each of the two types of firms is the quantity (Q) of a given good, which is the only one produced in the economic system and it is sold at the market price p.

To start its production process, companies hold two inputs- capital K and labor L- which are purchased at price r and w, respectively. The input prices change for two types of firms. OC companies can use or "borrow" capital (possibly also using the illegal market or illegal means of connections). Instead, the legal company has to buy it in the legal market. Also, OC firm can organize and manage the firm, monitoring employees' work, and influence labor cost through specific criminal means of persuasion. As strategic management literature (Duplat et al., 2012) pointed out, referring to the principal-agent theory, the governance of legally registered Mafia firms is characterized by four governance mechanisms: violence and intimidation, corruption, affiliates' turnover, and firms' turnover. Each of these mechanisms indirectly contributes to the mitigation of agency risks and the monitoring of agents' behaviors within OC companies.

The production function assumes Cobb-Douglas formulation for both kinds of firms:

$$Q = AK^aL^b \quad (2.1)$$

where output Q depends on quantities of labor L and capital K with decreasing return of scale ( $a+b < 1$ ); A is a parameter that measures the level of productive efficiency at a given moment in time. Capital factor evolves, according to the following law of motion:

$$K' = \delta K + \sigma_j i \quad (2.2)$$

where  $\delta$  represents the depreciation rate and  $\sigma_j$  is the effective conversion of monetary investment into new capital for the generic firm  $j \in [OC, Legal]$ .

The present value of the profit, under the Bellman formulation, of each of the two firms is equal to:

$$V = \pi - \frac{(K' - \delta K)}{\sigma_j} + \beta V' \quad (2.3)$$

Where  $\pi$  represents the profit (i.e. the difference between total revenue and total costs),  $\frac{(K' - \delta K)}{\sigma_j}$  is the investment cost, and  $V'$  is the profit in future periods.  $\beta$  is the discount factor.

### 2.3.1 Legal Firms Behavior

Given the framework outlined, it is possible to solve the maximization problems which express the corresponding objective function of the two types of firms considered. Using equation 2.3, the associated Bellman equation to describe the profit

maximization of legal companies can be stated as:

$$V_{Legal} = pAK^aL^b - rK - wL - \frac{(K' - \delta K)}{\sigma_{Legal}} + \beta V' \quad (2.4)$$

Where the firm's profit depends on its capital and labor cost parameter (respectively  $r$  and  $w$ ) and a specific parameter  $\sigma_{legal}$ , expressive of the ability of this type of firm in converting monetary investment into capital. The state variable is capital stock  $K$ , and the control variable is labor  $L$ . This maximization delivers to the following optimum by taking the partial derivative concerning the control variable and setting this partial equal to zero:

$$\frac{\delta V}{\delta L} = bpAK^aL^{b-1} - w = 0 \quad (2.5)$$

To solve for the state variable, it is necessary to use the Envelope Theorem that states as follow:

$$\frac{dV}{dK} = \frac{\delta V}{\delta K} + \frac{\delta V}{\delta K'} * \frac{\delta K'}{\delta K}$$

So, solving through the Envelope Theorem, at the stationary state I have:

$$K^* = \left( \frac{r\sigma_{legal}\beta + 1 - \beta\delta}{\beta\sigma_{legal}apA \left(\frac{w}{bpA}\right)^{\frac{b}{b-1}}} \right)^{\frac{b-1}{1-a-b}} \quad (2.6)$$

And,  $L$  is equal to:

$$L^* = \left(\frac{w}{bpA}\right)^{\frac{1}{b-1}} \left( \frac{r\sigma_{legal}\beta + 1 - \beta\delta}{\beta\sigma_{legal}apA \left(\frac{w}{bpA}\right)^{\frac{b}{b-1}}} \right)^{\frac{-a}{1-a-b}} \quad (2.7)$$

In conclusion, the present value for legal firms assumes the following formulation:

$$V_{legal} = \frac{1}{1-\beta} * pA \left[ \left( \frac{r\sigma_{legal} + 1 - \beta\delta}{\beta\sigma_{legal}apA} \right)^{-a} \left( \frac{\beta pA}{w} \right)^b \right]^{\frac{1}{1-a-b}} - \left( r + \frac{1-\delta}{\sigma_{legal}} \right) \left( \frac{r\sigma_{legal}\beta + 1 - \beta\delta}{\beta\sigma_{legal}apA \left(\frac{w}{bpA}\right)^{\frac{b}{b-1}}} \right)^{\frac{b-1}{1-a-b}} - w \left( \frac{w}{bpA} \right)^{\frac{1}{b-1}} \left( \frac{r\sigma_{legal}\beta + 1 - \beta\delta}{\beta\sigma_{legal}apA \left(\frac{w}{bpA}\right)^{\frac{b}{b-1}}} \right)^{\frac{-a}{1-a-b}} \quad (2.8)$$

### 2.3.2 OC Firms Behavior

As discussed above, criminal organizations play a crucial role in defining governance mechanisms within the subjected firms, providing a competitive advantage, and influencing their economic results. The main objective of OC entrepreneurs is based on several goals, not just related to legal business. All the culture, belief, value besides the economic ones, are included in the formulation of their objective function to maximize profit. The concept of criminal effort is used as a comprehensive

definition of all OC advantages in terms of power, network, respect, trust and loyalty.

By exerting criminal effort, firms can control (reducing) cost and increase their profit  $\Pi(e)$ . It can be assumed that the owner can choose  $e, \in [0, 1]$  at cost  $\varepsilon$ . The OC owner's effort increases, with  $e, \Pi'(e) > 0$ , at an increasing rate,  $\Pi''(e) < 0$ , with  $\Pi(0) = \Pi'(0) = 0$  and  $\lim_{e \rightarrow 1} \Pi(e) = \infty$ . As literature pointed out, criminal organizations can reduce market costs, implementing unfair competition. The advantages given by criminal connections expressed through effort in the productive process include ideologies, systems of belief, cultures that could help in monopolize and select information, transaction, and manage input factors. The firm profit function is continuously differentiable and satisfies the following conditions:

1. if the owner is successful in controlling costs, then the firm's profit increase;
2. if the owner was successful, then profits are always non-negative, no matter how intense competition is:  $V > 0$ ;
3. if the degree of competition increases, profits go down.

In this case, a firm that is under organized crime control solves the following maximization problem:

$$V_{OC} = pAK^aL^b - rK - \frac{w}{1+\varepsilon}L - \varepsilon e - \frac{(K' - \delta K)}{\sigma_{OC}} + \beta V' \quad (2.9)$$

Where the firm's profits depend on its cost parameter ( $r, w, \varepsilon$ ) and a parameter  $\sigma_{OC}$ . In particular, the model is based on the following assumption:  $\varepsilon < w$  and  $\sigma_{OC} > \sigma_{legal}$  that will be explained more in detail.

Given that the firm's profits depend on its cost parameter, OC firms can alleviate costs using their criminal network and methods. If firm  $j$ , connected with criminal groups, uses special characteristics, methods and means, it can avoid paying  $w$  and pay only a reduced amount  $\frac{w}{(1+\varepsilon)}$ . The cost of OC effort is cheaper than wage costs. As Arlacchi (2010) pointed out, OC method assuring labor market control allows wage compression, causing an elastic and regular supply of work-force. This method also incorporates interventions on firms' employees extra-work life, by using "specialized personnel," actively discouraging any protest form. The use of OC power within the firm's relationship increases firm productivity, creating a more effective pressure on workers and allowing a higher quantity of surplus. However, for the object of wage compression, mobility, and workforce productivity, repression forms are not always necessary. Indeed, often, employees of OC firms have relations of strict co-interest, very intense clientelist relationships, experienced in terms of "loyalty," "trust," and "respect" towards the OC owner. The interest of these solidarity-orientated employees is the mutual support within social networks, more than monetary gain. OC ownership could choose to hire these workers since the criminal system assumes the roles of "muscles" out to check and assure the correct execution of business operations. OC firm, therefore, is a cohesive group, participate in the competition struggle on the market, being able to have market power and the elasticity of the labor input. On the supply side, within populations that are restricted from entering the labor market through regular employment, due to the macroeconomic context or due to severe economic conditions, are pushed workers to accept the terms offered. Criminal entrepreneurs use the means of wage compression as an instrument to obtain the control of territory, offering a job position to personnel that otherwise would have been unemployed, providing an alternative

source of income.

At the same time, OC can attract at higher rate  $\sigma_{OC}$ , increasing productive capacity and profits in the future. OC firms can take advantage thanks to the availability of financial sources, but it is not just the circuit of illegal financial supply that stresses the OC firms economic superiority. Indeed, OC firms count also on privileged access to the legal bank system, which allows entrepreneurs to have cash easily in comparison to another businessmen. Credit access is not guaranteed only by a network of business relationships with small local credit institutions, but also by complicated "friendships" with managerial staff in commercial banks. Moreover, partnerships with management subjects of political, administrative, and financial systems could be a source of security for greater public access and private financing and a lower credit cost. In sum, it is one of the critical elements of identification and advantage of OC companies, succeeding in gathering more financial resources and avoiding problems of liquidity.

The solution of the maximization problem requires simultaneously solving first-order conditions with respect to control variables L and e:

$$\frac{\delta V}{\delta e} = \frac{w}{1+e} - \varepsilon = 0; \quad \frac{\delta V}{\delta L} = bpAK^a L^{b-1} - \frac{w}{1+e} = 0 \quad (2.10)$$

Using the envelope theorem, I solve for the state variable K at the stationary state:

$$K_{OC}^* = \left( \frac{r\sigma_{OC}\beta + 1 - \beta\delta}{\beta\sigma_{OC}apA \left(\frac{w}{bpA}\right)^{\frac{b}{b-1}}} \right)^{\frac{b-1}{1-a-b}} \quad (2.11)$$

Solving the equation system:

$$L_{OC}^* = \left( \frac{\sqrt{w\varepsilon}}{bpA} \right)^{\frac{1}{b-1}} \left( \frac{r\sigma_{OC}\beta + 1 - \beta\delta}{\beta\sigma_{OC}apA \left(\frac{\sqrt{w\varepsilon}}{bpA}\right)^{\frac{b}{b-1}}} \right)^{\frac{-a}{1-a-b}} \quad (2.12)$$

$$e^* = \sqrt{\frac{w}{\varepsilon}} - 1 \quad (2.13)$$

The conclusion of the analysis about the channel through which OC infiltration affects economic firms' performance, shows that under ceteris paribus conditions:

$$\begin{aligned} V_{OC} = & \frac{1}{1-\beta} * pA \left[ \left( \frac{r\sigma_{oc} + 1 - \beta\delta}{\beta\sigma_{oc}apA} \right)^{-a} \left( \frac{\beta pA}{\sqrt{w\varepsilon}} \right)^b \right]^{\frac{1}{1-a-b}} - \left( r + \frac{1-\delta}{\sigma_{oc}} \right) \\ & \left( \frac{r\sigma_{OC}\beta + 1 - \beta\delta}{\beta\sigma_{OC}apA \left(\frac{\sqrt{w\varepsilon}}{bpA}\right)^{\frac{b}{b-1}}} \right)^{\frac{b-1}{1-a-b}} - \sqrt{w\varepsilon} \left( \frac{\sqrt{w\varepsilon}}{bpA} \right)^{\frac{1}{b-1}} \left( \frac{r\sigma_{OC}\beta + 1 - \beta\delta}{\beta\sigma_{OC}apA \left(\frac{\sqrt{w\varepsilon}}{bpA}\right)^{\frac{b}{b-1}}} \right)^{\frac{-a}{1-a-b}} + \\ & - \varepsilon \left( \sqrt{\frac{w}{\varepsilon}} - 1 \right) \end{aligned} \quad (2.14)$$

From equations 2.14 and 2.8 the differences between the two companies appear clearer. In the model illustrated above, OC firms using intimidation and other criminal advantages can impose a power market and a more controlled management. Indeed, assumptions about effort cost ( $\epsilon$ ) and  $\sigma_{OC,legal}$  influence both capital and input factors. Criminal methods manage a contraction of costs, an alignment of interests between the involved agents and bargaining power, maximizing multiple benefits. In addition, the higher attraction of capital increases productive capacity and profits in future. Given the main difference between capital and labor, the profit value function is obviously different. All these criminal tools available for OC firms allow them to reach a higher level of production, affecting their present value of profit, with the obvious consequence that:

$$V_{OC} \geq V_{Legal} \quad (2.15)$$

## 2.4 A comparison between the two types of firms: Stationary State

The analysis, developed in the previous section, shows that a comparison between OC firms and legal firms in pursuing their specific objective functions cannot be immediately established. The preliminaries and the model presented above show the OC companies features, that allow their advantage on the market and the creation of a series of competitive advantages, also establishing the power of monopoly in some economic sectors.

It may be helpful to describe the influence exercised by some variables for both the ownership types. To compare both, it may be useful to examine the implication of the different ownership form and how they make their production and investment decisions. In particular, the section wants to observe the implication for the equilibrium profit-maximizing choices of firms. Comparing and analyzing these optimal decisions, I can now state the first results.

The capital to labor ratio alone offers some insights into productivity and is more a measure of how production is undertaken, that is allocation of labor and capital inputs. Considering that:

$$\frac{K}{L_{OC}} = \left( \frac{\beta\sigma_{OCA}a}{r\sigma_{OC}\beta + 1 - \beta\delta} \right) \left( \frac{\sqrt{w\epsilon}}{b} \right) \quad (2.16)$$

and

$$\frac{K}{L_{Legal}} = \left( \frac{\beta\sigma_{Legal}a}{r\sigma_{legal}\beta + 1 - \beta\delta} \right) \left( \frac{w}{b} \right) \quad (2.17)$$

The profit-maximizing capital to labor ratios of OC and legal firms satisfy the following frontier condition at their optimal value:

$$\frac{K}{L_{OC}} \geq \frac{K}{L_{Legal}} \quad (2.18)$$

if and only if:

$$\left( \frac{\beta\sigma_{OCA}a}{r\sigma_{OC}\beta + 1 - \beta\delta} \right) \left( \frac{\sqrt{w\epsilon}}{b} \right) \geq \left( \frac{\beta\sigma_{Legal}a}{r\sigma_{legal}\beta + 1 - \beta\delta} \right) \left( \frac{w}{b} \right) \quad (2.19)$$

Or equally expressed as:

$$\frac{r\beta + \frac{1-\beta\delta}{\sigma_{oc}}}{r\beta + \frac{1-\beta\delta}{\sigma_{legal}}} \geq \sqrt{\frac{w}{\varepsilon}} \quad (2.20)$$

The relation shows that the difference between the optimal amount of capital to labor ratio for the two types of ownership depends on the following factors:  $\sigma_{OC}, \sigma_{legal}, w$ , and  $\varepsilon$ . To study the difference, it is appropriate to focus on the analysis of these parameters. Indeed, to explain the condition, it is necessary to provide graphical evidence. With an easy step, I obtain the following equation:

$$\frac{1}{\sigma_{legal}} > \sqrt{\frac{w}{\varepsilon}} \frac{1}{\sigma_{oc}} + \frac{r\beta (\sqrt{\frac{w}{\varepsilon}} - 1)}{1 - \beta\delta} \quad (2.21)$$

Where  $\frac{1}{\sigma_j}$  can be considered as the cost of 1\$ of effective investment. Considering the Cartesian plane portion characterized by  $\frac{1}{\sigma_{OC}} > 0$  and  $\frac{1}{\sigma_{legal}} > 0$  and keeping all the variables constant as parameters and treating  $\sigma_{OC}, \sigma_{legal}, w$ , and  $\varepsilon$  as variable terms, it is possible to show the dynamics. As the first condition, for the domain existence, I should impose  $\beta\delta \neq 1$ . The line varies depending on its parameters  $\sqrt{\frac{w}{\varepsilon}}$ . Since I assumed that  $\varepsilon < w \rightarrow 1 < \frac{w}{\varepsilon} \rightarrow \sqrt{\frac{w}{\varepsilon}} > 1$ . However, the slope of the line is not only positive but considering that it is related to its angle of incline  $\theta$  by the tangent function, I can conclude that  $\frac{\pi}{4} < \theta < \frac{\pi}{2}$  in a half period, upward 45 line. Solving the system between the last equation and the condition  $\frac{1}{\sigma_{legal}}, \frac{1}{\sigma_{oc}}$  under the constraint that  $\sigma_{OC}$  and  $\sigma_{legal} > 0$ , I obtain Figure 2.1

The area above the line represents outcomes where  $\sigma_{OC} > \sigma_{legal}$  and  $\varepsilon < w$ . OC firms are characterized by higher investment-specific productivity and attract more capital than their legal counterparts. This more significant attraction of investment increases the productive capacity and hence should increase profit in the future. In this situation OC firms attract capital with a higher rate so that  $K_{OC} > K_{legal}$ . This inequality will be very large when the difference between the two rates is. The possibility for OC firms to use financial resources coming from illegal activities increases the opportunity to gain social and territory control, in terms of the possibility to employ personnel that will accept OC firms' conditions. The advantage provided by a higher rate in new investments has a complementary effect on the labor input, despite being minor. Indeed, this additional mechanism implies that  $L_{OC} > L_{legal}$ . In the same area,  $\varepsilon < w$ , employing OC effort in firm management is cheaper than supporting the cost of labor. Indeed, the use of OC effort reduces the amount of wages, because OC firms apply wage compression and have with workforce a relation of loyalty, trust, and respect, presenting a regular and elastic supply of labor. If the assumptions of the model are satisfied, they translate into higher labor to capital ratio, output, and added value per employee. Instead, along the line, the two ratios are equivalent, because the opposing forces between the two types of firms can obtain benefits on labor and capital that compensate each other. If the condition for capital-to-labor ratios  $\frac{K}{L}_{OC}$  and  $\frac{K}{L}_{legal}$  holds, then it is possible to estimate the cost of OC effort:

$$\varepsilon > \frac{\sqrt{w} \left( r\beta + \frac{1-\beta\delta}{\sigma_{legal}} \right)}{r\beta + \frac{1-\beta\delta}{\sigma_{oc}}} \quad (2.22)$$

The effort cost depends on all the other parameters that are known. Indeed, I can observe the capital-to labor ratio, and I can estimate  $\varepsilon$  as a reverse generating method. The estimation of the parameter offers some insights about OC infiltration



in legal businesses, expanding our knowledge.

To provide some evidence about the theoretical model showed above, I analyze descriptive statistics and the differences in mean between the two groups of firms (criminal and legal). In particular, the identification of OC is made ex-post preventive measure since it is not possible to identify OC firms until legal procedures affect them. Specifically, the sample is a hand-collected dataset on firms connected to the criminal organization located in Southern Italy. The yearly financial information is provided by *AIDA*, through the Italian Bureau Van Dijk database. The database includes the years between 2004 and 2016 and reports, also, a section about legal procedures that can affect firms. Notwithstanding this, not all firms present in *Aida* and effectively under *JA* have this information indicated in the database. To increase the availability of OC-firm data, I used Python programming language and text-analysis, through which I have automated the recovery of information in online newspapers that was cross-checked with official legal documents.

The table 2.1 reports the descriptive statistics for each variable considered in the theoretical model. The winsorization is applied to all the variables at 1% considering the large variation and possible outliers' value. Differently from the stylized model, in real data, I cannot control the ceteris paribus conditions so that in the interpretation, it is needed to be taken into account. These statistics do not, however, necessarily imply any causality of the treatment effect. It is a simple exercise to offer some preliminary differences between the two groups.

As regard to inputs factor capital and labor, it is noteworthy that, as modeled, they are significantly higher ( $p < 0.001$ ) for OC firms relative to legal firms. Consequently, the production output, measured by their added value, is significantly higher ( $p < 0.001$ ) for OC firms than their legal counterpart. In line with the model developed above, the capital to labor ratio provides evidence about the capital intensity of OC firms, confirming the assumption. The ratio is significantly higher ( $p < 0.001$ ) for OC firms in comparison to legal ones. The meaning of this results comes from the fact that OC firms have relatively more access to cost savings in capital input than in labor, so that  $\frac{w}{\epsilon}$  is relatively close to 1.

The assumption about the labor inputs cost, according to which OC owners can reduce the cost of an employee, is significantly lower for OC firms ( $p < 0.05$ ). Also, the assumption about  $\sigma$  holds, indeed the rate of investment in new capital is significantly higher for OC firms ( $p < 0.01$ ). The difference regarding the depreciation rate does not show a significant difference between the two groups.

## 2.5 Market equilibrium and dynamics

The following analysis considers how the number and the organization of firms in a market and potential competitors affect competition and firm profits. The competition between firms in the market requires that they have to be capable of entering it. Many markets present some obstacles that make entry more difficult. Consequently, it is interesting how the dynamics between OC firms and legal firms evolve.

In the presence of heterogeneous firms, it is difficult to model and identify the multiple equilibria, also considering that firms can make decisions simultaneously or sequentially. Following Berry and Reiss (2006) framework, in the two-stage sequential - move game, the most profitable entrant can always move first, and hence, it is the assumption that inefficient entry never happens. In the two- firm model outline, entrepreneurs who move first can decide whether they will be firm 1 or firm 2,

and then whether they will enter. The first entrepreneur will choose to be the entrant with the maximum level of profits. For example, if there is a situation of monopoly for firm 1, it is possible to conclude that the first-mover chose to be firm 1 because it was the more profitable of the two cases. Given that, the main advantages of this model are the resolution of multiplicity problem and the need to observe which firm moved first.

The first results showed before evidence that under the established assumption, the condition  $V_{OC} \geq V_{legal}$  is always satisfied under ceteris paribus conditions. Hence, within multiple equilibria, the firms that ever decide to enter the market will be the ones with criminal connections. The market will be characterized by OC firms' entrants, competing between them or creating a monopoly situation. The real scenario is a bit more complicated, and the mere presence of OC firms is always guaranteed. From the review of literature, the infiltration of OCGs in the legal business, through companies, characterizes a multiplicity of markets from monopoly to competitive arena.

To complicate the analysis, I introduce in the model assumptions about the productive efficiency of the two types of firms. The theory discussed in the literature section postulates that among other variables, the level of efficiency may vary with the different ownership management of the firms.

Given their cost advantages and discouragement of competition means, OC companies act as an economical entry barrier in the market, even if their behavior is not always efficient-oriented. If I assume that:

1. The level of productive efficiency for OC companies is uniformly distributed  $A_{oc} \sim U[\bar{A}, A]$ . There exists a specific threshold  $\bar{a}_{oc}$  defining the threshold to enter the market. If the firm's productivity is higher than this point, OC firms are able to enter the market.
2. The level of productive efficiency for legal companies is uniformly distributed  $A_{legal} \sim U[\bar{A}, A]$ . The threshold value is represented by a specific cut-off  $\bar{a}_{legal}$  defining the possibility for legal firms to enter the market. Also, in this case, legal firms can enter it only if their productivity is higher than this value.

However, the decision to enter the market is more complicated. Indeed, companies face a cost to enter the market. Firms decide to enter the market if the profit value is higher than entry costs. The following equilibrium characterizes the stationary state for both types of companies:

$$V_{Legal}(\bar{a}_{legal}) - C_{Legal} = V_{OC}(\bar{a}_{OC}) - C_{OC} \quad (2.23)$$

I know that  $V_{OC} \geq V_{legal}$  and I assume that  $C_{legal} \geq C_{OC}$ , given the favorable conditions of OC firms such as economies of scale (favorable input price, easy orders, contracts, and sales market) and network effects (facilitation in permits, concessions, advantageous administrative measures). Legal companies that can enter the market satisfy the following:

$$\bar{a}_{legal} \geq \bar{a}_{OC}. \quad (2.24)$$

The relation means that legal firms entering the market are more productive. As economics literature about discrimination pointed out, minorities parties are probabilistically more productive than majorities ones. The case of wage discrimination between women and man in the labor market shows a similar mechanism. In particular, considering the wage distribution, there is a large gender wage gap on the

upper tail (Albrecht et al., 2003). That is the called glass ceiling effects that, constituting an invisible barrier, prevents women from reaching higher job positions. In particular, women, to gain the promotion, have to be more productive than men, due to a higher probability of departure and less training consequently of discrimination (De la Rica et al., 2008). Similar results are concluded by Grout et al. (2009): if women have to work harder to achieve the same level of promotion, then, if this affects productivity, it should increase it.

In the same way, in specific sectors, OC firms have easy entry even if their level of productivity is less than other competitors. Indeed, legal firms suffer from an effect of discrimination. Those firms able to enter the market have on average a higher level of productivity. In the case of market dynamics, the discrimination effect represents an invisible barrier for legal companies to enter the market given the polluted competition environment. The distortive effect imposes a sort of "hidden tax" on outsiders, they will sustain considerable costs, suffering negative externalities. Following the same line of thinking, legal companies in order to overcome this discrimination, have to reach a higher level of productivity. However, the composition in the market will be characterized by a lower presence of legal companies where organized crime infiltrates the business. Moreover, other aspects increase market discrimination too, such as conservative values, more significant costs, and sense of auto-discrimination (fear of suffering from physical and material damage).

Based on this framework, in a market characterized by OC presence, the entry rate for legal firms will be lower and the probability to replace the OC incumbent is lower too. In the market, legal firms are discriminated, and legal entrants should tolerate criminal interferences, coming to "favorable terms." Legal companies can overcome the invisible barrier, only improving the level of productivity. Overall, OC firm's presence hinders competition, benefiting inefficient or less productive companies and hampering entry of new firms.

## 2.6 Observation after OC firms' removal

Markets infiltrated by criminal organizations are complex and dynamic because of the presence of informal rules. It is challenging to distinguish agents regularly acting from their other illegal counterparts. Over time, criminal organizations are able to interweave advantageous collaborations, for example, in the participation in public procurement systems or other profitable businesses. Therefore, the market will be characterized by "parasitic" companies spreading challenges to trigger reactions from other companies. The disappearance of competition and the restriction of the entry of entrepreneurial energies mean that mafia circuit is distorted in the sense of well-being and offers employment that replaces what is no longer supported by market mechanisms. Therefore, the mafia circuit reduces the effects of competition.

The regulator's intervention in restoring a situation of legality affects market dynamics. Indeed, in specific systems, i.e., Italy, there are legislative instruments to pursue criminal organizations infiltrating legal businesses. This intervention has a remarkable effect on market competition. With the judicial administration, the administrator re-establishes according to sound management principles, firms' organization and turnaround of firms.

To guarantee the establishment of market competition, the State takes action, restoring legality and competitive mechanisms. At the moment of legislative intervention, OC firms operate under new management. Hence, I can affirm that the "criminal" characteristics are out of the market:

1. The number of criminal enterprises on the market is reduced. Firms can compete, taking into account the same objective to maximize profits. The judicial intervention allows companies to compete with the same tools.
2. The allocation of production factors will be more efficient and according to market rules. Indeed, labor costs are unconstrained to organized crime groups and all workers re-allocated efficiently. Companies need to use the same sources to draw capital and bear the same financial conditions.
3. Legal competitors can take advantage, improving their performances in terms of revenues and market power. They can attract customers who can decide to move from a polluted company to legal ones. At the same time, efficient legal companies can acquire bargaining power in the market.
4. New companies can now be interested in investing in the sector before being polluted by OC firms, eliminating the barrier to entry in the market. Restoring legality plays a crucial role in attracting competitors in the strategic industry infiltrated by a criminal organization.

## 2.7 Conclusion

The behavior of organized crime firms is an understudied phenomenon, although OC infiltration in the legal economy has social and economic consequences. Understanding the behavior of these companies and how OC infiltration shapes the operation of controlled firms is a crucial matter.

This article develops a basic model to stylize how OC ownership makes companies operation more profitable. The outcome of the analysis points out that the OC presence affects governance mechanisms, plays a crucial role in shaping profit-market opportunity and consequently, influencing the efficiency level of companies. To sum up the results, OC infiltration of legal businesses offers some lucrative opportunities to criminal groups. OC ownerships are characterized by particular characteristics allowing them to control labor costs and to reach a higher level of capital intensity. As a consequence, this increases companies' economic advantages and causes discrimination effects for legal firms in the market, that should improve the productivity to enter the market and compete in it.

The creation of OC opaque rules can give rise to a network of companies that feeds efficient mechanisms but are not always transparent; within this network, uncertainty is reduced, transaction costs (ex-ante and ex-post), agency costs, and organization costs are minimized. Furthermore, in the circuit, a tight trust spreads which guarantees the control of their members and their transactions. Nevertheless, OC infiltration is a source of weakness. On the one hand, this network offers positive benefits to insiders and distributes wealth to all its stakeholders. On the other hand, it causes distorting effects on the market and imposes a "hidden tax" on outsiders if they decide to stay out of this circuit and not to be contaminated by them, sustain substantial costs and suffer high negative externalities.

The model offers a flexible theoretical framework, using very general assumptions. The review of literature helps to identify the source of sustainable competitive advantages for OC firms. The solution is analytically tractable and captures the essential predictions, also offering additional insights. The contribution of the article is mostly theoretical and represents a first attempt to model the behavior of these hidden and particular companies. The study shows the existence of a nexus between organized crime and running a business. The implication is that using criminal effort,

that is costly for their legal counterparts, OC ownerships affect hidden actions that have economic consequences. The understanding of OC companies mechanisms and aspects, combined with the prosecutors skills and knowledge, can be a valid instrument as a screening system. Indeed, given the negative consequences of OC presence in the market, it is essential to understand these companies characteristics and profiles.

However, the model presents its limitations, that could be taken as a suggestion for further research. The theoretical approach used to investigate the organized crime firms behavior, poorly studied in this perspective, could offer insights for the development of other hypotheses and propositions regarding how OCGs run legal businesses. I propose several extensions for further investigations. Firstly, the analysis can consider the difference between criminal labor costs for OCGs and costs for innocent and naive employees working for an OC company. Sometimes, workers can be ignorant and naive about the firm's true nature or because under the loyalty and protection of OC; they trust the relationship. Anyway, this kind of employees, given the possibility of higher capital intensity, will work with more capital than their fellows in purely legal work. Secondly, another extension of the model can concern the introduction of a third element, raw materials, in the production function. OC company succeeds in securing goods and raw materials at favorable prices, without being exposed to the same competitive pressure that other companies must take into account. Thirdly, the existence of other types of OC firms could be considered in future extensions of the model, playing with the variable criminal effort. For example, the category of OC lawful companies operating "correctly" represents a role of support for other types; in this case a variable capturing illegal products (specifically two  $Q$ =illegal and legal) can be introduced to study how the criminal effort is now characterized.

## Figures and Tables

FIGURE 2.1: Graphical Evidence: Stationary State

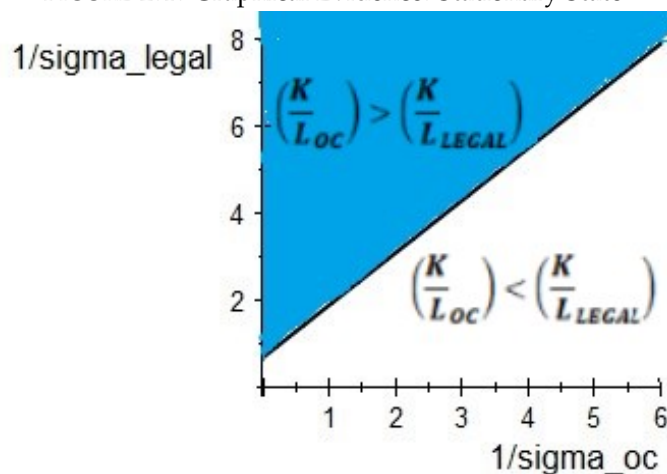


TABLE 2.1: OC firms and Legal firms: a comparison

Variables	Description	Legal Firms	OC Firms	Difference
		Mean	Mean	
Production Output	Ln (Added Value)	3.9236	4.7431	-0.819*** (-16.91)
Capital Input	ln(Total Assets)	5.7137	6.6712	-0.958*** (-24.32)
Labor Input	Ln(Number of Employees)	1.07091	1.4394	-0.368*** (-13.61)
Ln(K/L)	Ln(Total Assets/Number of Employees)	4.6633	5.4514	-0.788*** (-17.83)
w	Personal Costs/Total Production Costs	0.2824	0.2336	0.0488** (2.78)
$\sigma$	Change in Depreciation and Amortization	28.8998	122.0213	-93.12*** (-16.58)
$\delta$	Change in Total Assets	0.6404	2.6922	-2.052 (-8.36)

Notes. T-statistics of the difference between the variables in parenthesis. Significance at the 10% level is represented by \*, at the 5% level by \*\*, and at the 1% level by \*\*\*.

Sources: Aida (Italian Bureau Van Dijk) database

## Chapter 3

# What Happens in Criminal Firms after Godfather Management Removal? Effects of Judicial Administration

### Abstract

In this paper, I assess the causal effect of judicial administration on a sample of Italian criminal firms in the period 2004-2016 to shed light on the dynamic path of the firm's performance from pre-seizure to post-entry judicial administration phase. By using exogenous enforcement law decisions imposed by authorities for each case, I highlight how the consequences of having new legal governance, aimed to establish legality and the perpetual of activities, have been severe. The results display that there are adverse effects on profitability and efficiency with an increase in the leverage level. Evidence shows how OC firms are intrinsically managed by the dark side. By removing criminal ties, it makes it challenging to maintain profitability and efficiency level. Overall, negative results are due to difficulty in establishing a new economic framework for (ex criminal) firms, able to operate efficiently and according to market rules.

### 3.1 Introduction

Organized crime is a widespread phenomenon across the globe. Criminal organizations expanded in a range of activities both in illicit market and in legal business. In particular, OC infiltration through companies has taken a predominant role in the Italian economy. Specifically, 8.7% of Italian Mafia's investments consist of companies and stocks in the period of analysis 1983-2011 (Transcrime, 2013). Through firms, criminal organizations invest an enormous amount of capital, widen their influence, and strengthen relationships. Indeed, enterprises represent a powerful means to integrate into the country's economy, favoring a profitable network. Criminal organizations use their power to control competition, acting as a barrier to market entry and intimidating existing competitors, to provide competitive advantages, for example, purchasing from protected suppliers and other input benefits. Moreover, criminal groups are involved in the allocation of investment funds and public procurement contracts.

Several interventions have been adopted by jurisdictions to fight the burden that these activities pose on economy. With confiscation and the seizure of productive criminal assets, the Italian law has the purpose of preventing the penetration of organized crime in productive economy and fighting criminal organizations in their

patrimonial aspects. As of July 2019, the Italian government had seized more than 3,000 companies and over 17,000 properties (ANBSC). Rognoni-La Torre law was introduced in 1982, establishing for the first time in the penal framework the *mafia-type association* with art 416-bis and introducing a patrimonial measure orientated to the asset's confiscation. Following legislative packages have modified and extended the discipline, providing a definite framework of application concerning criminal prosecution. As regards of firms connected to a criminal organization, the law provides the implementation of preventive measures through an administrator, appointed by the judge that has to manage the assets, searching a new legal organization and able to operate efficiently. The law aims to guarantee the conservation and the continuity of the productive process, breaking all the links with the criminal network.

In this paper, I depart from the analysis of this institutional setting to study some aspects related to the application of a new business organization on criminal seized firms. I investigate what the corporate consequences are in terms of firms' performances after the establishment of a situation of legality, having a new administrator, appointed by authorities, in leading the business. Hence, I estimate the causal effect of the judicial administration on firms' aspects, enlightening the dynamic path of firms' performances from pre-seizure to post-entry judicial administration phase. I expect a change in criminal firms' performances, given that these firms also incorporate criminal characteristics in addition to the economic ones that are causes of competitive advantages in comparison to their legal counterparts (Arlacchi, 1983, 2010). About this point, strategic management literature (Duplat et al., 2012), referring to the principal-agent theory, has increased the insights into the governance of Mafia firms (LMF) identifying specific OC governance mechanisms. Each of these mechanisms indirectly contributes to the mitigation of agency risks and the monitoring of agents' behaviors within OC companies.

This paper relates to the literature on the governance structure of criminal organizations, studying what happens to a business when judicial administration (JA) is implemented by authorities, changing the "ecosystem" where the firm operates and consequently, governance and ownership mechanisms. In particular, it contributes to emerging literature on this topic that has made it possible to identify some specific features of OC firms (Castellano et al., 2017; Fabrizi et al., 2017; Ravenda et al., 2015a; Transcrime, 2013) showing differences in the governance structure, performance, and mechanisms. As presented by accounting literature, OC companies offer differences concerning companies' sources and methods of use such as different payment-collection cycle; costs compression (suppliers, labor and production); prevalence of current assets; positive growth in total assets and greater level of debt, also due to higher access to funds. Bianchi et al. (2017) empirically assess, focusing on financial policies and performances, the corporate consequences of having a board member linked with organized crime.

Since OC companies management is different from running a "legitimate" business, when the business is placed under preventive measures, the new governance has to re-define the economic relationship from an illegal to legal ones. However, few academics have investigated the dynamic changes occurring when corporate organizations have to re-define how to run their business. The present analysis is an attempt to fill this gap. As organized crime groups own and manage firms without respect of legal constraints and rules, one may wonder what the effect in redefining the legal side is.

To investigate the research question, I use financial data- provided by AIDA,



the Italian Bureau Van Dijk database <sup>1</sup> – for the period 2004-2016<sup>2</sup> on Italian criminal firms. Over the analyzed period, I have detected 413 firms under preventive measures. As primary sources, to identify criminal companies, I have used AIDA, that contains a section of information about legal procedures affecting firms. However, information about judicial administration status is not collected systematically, and the section does not include all criminal firms that are under proceedings. For this reason, I have automated the recovery of information in online newspapers, matched with other legal sources and, finally, crossed with financial statements available in AIDA.

The empirical design exploits the change in firms' performances, controlling for firm time-invariant characteristics (firm fixed effects) and common shocks affecting all firms (year fixed effect). In particular, I have estimated the causal effect of having a judicial administrator across three different profiles, that are profitability, debt, and efficiency. The focus is posed on ROA (return of assets), ROI (return on investment), debt (total debt on total assets), profit, and cost-efficiency. The identification strategy rests on the assumption that the entry year in judicial administration is exogenous to its performance. Investigations have been conducted for several years, and then the seizure decree and the forfeiture are decided by the collegiate court evaluating the specific case and based on the penal code. The decree also establishes the detail of the measures and appoints the delegated judge and the judicial administrator.

The main results indicate that when firms are subtracted by OC ownership and posed under legal control, they experience a loss in profitability: in the analyzed firms ROA and ROI have decreased by 4.42% and 2.42% respectively. Besides, OC firms lose out in both profit and cost efficiency level; the impact of judicial administration is equal to 0.5284 and 0.8333. Contrarily, with the new administrator, companies are significantly leveraged, with an increase equal to 7.21%. Overall, I have provided evidence that criminal firms undergo negative consequences having a legal administrator who re-define the legal side. Thus, the deterioration of firm performance highlights how OC firms are intrinsically managed by the dark side. By cutting these ties, it makes it challenging to maintain profitability and efficiency level.

Therefore, the paper explores three main findings. Firstly, criminal firms worsen their performance; this can have some implications for the judicial administrator, who can orientate the management to the establishment of a new economic relationship and the definition of new legal competitive advantages. Secondly, this setting allows the first evaluation of direct effects of this policy. Finally, I provide evidence of a new mechanism to explain adverse economic effects of organized crime, given the social consequences deriving from the OC firms tough survival.

The next section briefly discusses the legal background and the institutional setting of the analysis. Then, I present the data and empirical strategy employed. The main results are outlined in the penultimate section. The last section provides a conclusion.

## 3.2 Legal Background and Institutional Setting

In this section, I briefly describe the process by which the Italian system has put into practice an evolution in its legislation to face the growing and severe organized crime infiltration in legal businesses.

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<sup>1</sup><https://aida.bvdinfo.com>

<sup>2</sup>Financial information was not available before 2004 and 2016 is the last available period.

### 3.2.1 The Italian Criminal Law: from Rognoni-La Torre to the AntiMafia Package

The legislative change to fight organized criminal groups in Italy took place with Rognoni-La Torre law (13th September 1982, No. 646), substantially modifying the physiognomy of the law on the basis on preventive measures. The establishment of this law involved the introduction of art 416-bis in the Italian criminal code, which, for the first time in the national legal experience, sanctioned Mafia as an association. Another significant change provided by this law was the introduction, alongside with personal prevention measures, of those of a patrimonial nature, fighting ex-ante criminals' economic profit and properties.

Another change arrived with Law 356/1992; wherewith legislators introduced a new type of confiscation supporting criminal and preventive ones in case of conviction and "plea agreement." The "Security Package" (Law 125/2008) overcame the "ancillary principle" introduced by Rognoni-La Torre law, with the possibility of separate application of financial measures from those of personal nature. Afterwards, Law 50/2010 established the *National Agency* for the management and use of *assets seized and confiscated* to organized crime (ANBSC). The fragmentation and lack of systematic harmonization has led the legislator to implement a complete reorganization of the regulation with the Anti-Mafia Code (Legislative Decree 159 in 2011).

The Anti-Mafia Code provides that, in the presence of a situation of belonging to Mafia association, both the procedure for ascertaining the associated crime and the process for the application of the preventive measure must be activated simultaneously (art. 2-ter l. 575/65- now art. 20-22 Codice Antimafia). The preventive proceeding has a distinct function and nature in comparison to a criminal one. The criminal measure requires a conviction and a relation to the crime the person is accused of; the preventive one does not imply a crime and tends to prevent the commission by subjects deemed dangerous.

### 3.2.2 Patrimonial Preventive Measure: Judicial Administration

The judicial administration (JA) is a long term management that has two distinct phases: a first one, judicial, which goes from the issuing of the seizure decree to the confiscation decree of the first degree; the second one, administrative, that goes from the confiscation of the first degree to the definitive one (D'Orsi, 2013). The seizure decree and the forfeiture are decided by the collegiate court, which establishes the detail of the measures and appoints the delegated judge and the judicial administrator. The judge has to supervise the administrator management who in turn must perform his duties using the outmost diligence (*diligence of the good father of the family*). The legislation, along with the conservation and custody of the seized asset, hopes for an increase in the profitability of these assets. Administrator assets management has to guarantee the achievement of the same benefit as the real owner had kept the direct administration.

However, it should be pointed out that with judicial administration the objective of the company changes: it is not the maximization of profits and the accumulation of mafia clans or the other criminal stakeholders wealth, but the search for a new organizational structure, in line with the law, but still able to operate efficiently (Di Maria et al., 2014). It has to be functional to the efficient management of the company and, therefore, directed to guarantee the survival of the company and the growth of social welfare. Judicial administration, thus, must sever all those relationships and

advantages that the previous mafia management had given to entrepreneurial activity.

The first task of the administrator is to check in advance whether there are positive margins to renew the management of the asset: he submits to the judge a detailed report, indicating the status of the assets, their possible market value, the rights of the third parties, and an indication of the most profitable forms of management. Once the situation has been ascertained, the Court approves the project and issues guidelines for the control of the company. At the end of the administrative procedure and, in any case, after the confiscation of first instance, the judicial administrator shows to the appointed judge the management report, which sets out the modalities of the management itself, as well as the evidence of the sums paid and collected, the analytical description of the assets, and the final balance. The judge proceeds to the appropriate checks and, if there are no objections, approves the report.

With the first-level confiscation decree, a second phase is opened in which there is a “*transfer of power*”: the whole administration of the asset goes from the judicial authority to the National Agency. Like the judicial administrator, during the entire proceeding, the Agency has to provide the custody, the preservation and the administration of the assets seized, and also to increase, if possible, the profitability of the assets<sup>3</sup>. Following the “definitive” confiscation of prevention, assets are acquired to the State property, free of charges and burdens. The definitive confiscation consists of the destination of assets to the community. In this case, the National Agency administers the confiscated assets and their allocation for institutional and social purposes, according to specific procedures indicated in the Code.

### 3.3 Data

To empirically investigate the research question, I have assembled a new panel dataset about OC firms that have entered the status of judicial administration from 2004 to 2016. The Italian legal framework offers the possibility of univocal identification of criminal firms connected with organized crime groups. Each preventive measure is distinctively and autonomously decided by authorities after investigations proving the belonging of the assets to an illegal plan. The higher concentration of mafia-type organizations combined with the OC infiltration in the legal business and the favorable setting gives the possibility to collect a significant sample. The results could have a global meaning also about other organizations, considering that Italian Mafia represents the “prototype” for other criminal organizations in different countries (Pinotti, 2015a).

Data released by ANBSC do not allow a univocal identification of the companies and do not present information on their personal profile. Further investigations with DIA (*Anti-Mafia Investigative Direction*) and the national anti-mafia prosecutors confirm that this information is not systematically collected in any database.

The possible identification of OC firms is made ex-post preventive measures since it is not possible the identification until legal procedures affect them. Aida, the Italian Bureau Van Dijk database<sup>4</sup>, contains full information for all the Italian companies that are required to deposit the balance sheets. It covers financial statements and also a section about the legal procedure that affects companies, including the indication for some of them of the confiscation date and status. Notwithstanding

<sup>3</sup>The arrangement was included in a clear framework in art.35 of the legislative decree n. 159 (2011)

<sup>4</sup><https://aida.bvdinfo.com>

this, not all firms present in the Aida and effectively under a legal measure have this information indicated in the database. This lack derived from the difficulties of the Italian Chamber of Commerce (Aida source) in systematically collecting from the tribunal the registration that is often in the text field which is difficult to read.

To increase the availability of data about companies linked with organized crime and subjected to preventive measures, I used Python programming language and text-analysis, through which I have automated the recovery of information in online newspapers. Also, taking advantage of some Python libraries, I made sure that the data were saved and updated several times. To reduce proxy noise, the information collected was checked with other official legal data. Finally, I crossed this list of data with the financial information available in AIDA for a total of 185 companies. Some companies were deleted from the sample for the lack of data available or discrepancy in terms of years analyzed. Additionally, the number of observations is reduced because of some missing data on AIDA, necessary for the computation of the used variables. Overall, the analyzed sample of organized crime companies consists of 413 firms under the preventive measure.

Table 3.1 reports the geographical distribution of OC companies and data sources. The legal procedures are spread in every region, although it is possible to observe that the Southern region experienced a significant number of measures. In particular, the areas of Calabria and Sicilia are over-represented. This distribution is not surprising given that the South represents the original stronghold of organized crime groups and the intense effort of anti-mafia authority against criminal organizations in these regions has lasted over twenty years (Arlacchi, 2010). The geographical distribution of the collected sample confirms the results of Transcrime (2013) and Ravenda et al. (2015b). The heterogeneity in infiltration area suggests several organized groups are involved.

In same Table 3.1, descriptive statistics are presented for each variable considered in the regression models comparing pre and post preventive measures. To weaken outliers influence, all variables are winsorized at 1 percentile. Applying this method, it is possible to limit the effect of outliers and abnormal extreme values on the estimation. The status of JA reduces firm performance and increases debt level. As it can be noticed, the judicial administration status decreases profitability level and efficiency level of the treated firms. Indeed, on average, sample firms are statistically more profitable ( $p < 0.001$ ) before the treatment: the differences in mean are 2.57 and 1.95, respectively. Conversely, after the treatment, companies are leveraged. Also, in terms of efficiency, there is a significant ( $p < 0.001$ ) reduction in mean of 0.0697 and 0.0776 in both profit and cost.

Figure 3.1 summarizes OC companies by the temporal distribution of the confiscation year. It can be seen that 2014 and 2015 are the years with the most significant number of companies under judicial administration.

Finally, Figure 3.2 presents the industry distribution by two-digit of ATECO2007 code for the sample of OC companies, considered in the analysis. The distribution gives an overview of the sector and of the markets infiltrated by organized crime. Mostly, the infiltration regards “protected sectors,” in the sense that they are characterized by the presence of public funds or the public administration management. Indeed, mainly, they are manufacturing, construction, transportation, waste trade, health care, or public service sectors but also scientific and professional activities. This finding is supported by Savona and Berlusconi (2015) and Savona and Riccardi (2011, 2015).

### 3.4 Empirical Strategy

#### 3.4.1 Profitability and Leverage

Let  $y$  be the outcome variable considered across three different profiles,  $i$  the firm, and  $t$  the year. The following regression model is used to estimate the causal effect of preventive measures on OC firms' aspects:

$$y_{it} = \alpha_i + \lambda_t + \beta JA_{it} + \varepsilon_{it} \quad (3.1)$$

Where  $\alpha_i$  are firm fixed effects,  $\lambda_t$  year fixed effects, and  $\varepsilon_{it}$  is an error term. In all estimations, errors are clustered at the firm level. The estimated coefficient  $\beta$  measures the causal effect of interest.  $JA_{it}$  is a dummy variable that has value 1 from the year of judicial administration<sup>5</sup>. The identification strategy rests on the assumption that the entry year of treated firms is exogenous to its performance. Indeed, the judicial administrator enters in the firms after several years of investigations, and the JA decision depends on the involvement of the firm in a criminal plan. The status of JA is decided by a committee of judges on the basis of the penal code and the evaluation of the specific case. The year effects are coefficients on time dummies while the unobserved specific effects are coefficients on dummies for each firm. The main point is that FE estimation does not infer the causal effect from a comparison of different firms, but by comparing within-firm change that is induced by a plausibly random (with respect to the year of implementation) treatment event. The inclusion of time dummies in addition to firm dummy contributes to FE estimation by providing an estimate of the time trend. Then, the time trend is then differentiated from the within comparison of the treatment group.

In addition to model 3.1 I estimated regressions that include firm level time varying control. The selection of profile and explanatory variables is carried out by following the emerging literature cited above and taking into account organized crime firms' characteristics. The first profile captures the profitability aspect, computed in two ways: ROA (that takes into account firms' amount of debt) and ROI, that express the firm's attitude to remunerate its uses. I choose these two ratios because they are not affected by firms' accounting policies (Sostero et al., 2014), especially for the kind of companies investigated. The regression model includes a vector of control variables: SalesTa (that is the turnover rate of capital) expresses the speed with which these cycles are repeated during the year, i.e., how many times the invested capital has turned into financial resources through the sale of the products; Debt controls for the firm's capital structure (only for ROA case) and Size is the log transformation of the firm's annual revenues, to control for differences in size that might drive operating performances:

$$ROA_{it} = \alpha_i + \lambda_t + \beta JA_{it} + \beta_2 SalesTA_{it} + \beta_3 Debt_{it} + \beta_4 Size_{it} + \varepsilon_{it} \quad (3.2)$$

and

$$ROI_{it} = \alpha_i + \lambda_t + \beta JA_{it} + \beta_2 SalesTA_{it} + \beta_3 Size_{it} + \varepsilon_{it} \quad (3.3)$$

The second profile captures debt aspects through the leverage:

$$TD|TA_{it} = \alpha_i + \lambda_t + \beta JA_{it} + \beta_2 Profit_{it} + \beta_3 Size_{it} + \beta_4 Fixasset_{it} + \varepsilon_{it} \quad (3.4)$$

<sup>5</sup>If the event has happened in the last four months, the year of the event is the following one, because some of the business operations are already done

Leverage can be measured by using different financial ratios; it can be defined as either the ratio of total debt to total equity or the ratio of total debt to total assets, which is the variable used in the current study. As control variables, I selected determinants, namely: profitability, determined by Earnings before interest and tax (EBIT) to total assets ratio that indicates a proportion between the measure that shows the company's profitability and the company's assets; firm size, using the difference of logarithm of sales and Fixed Asset that is generally accepted as an indicator of capital structure composition (Lemmon et al., 2008; Rajan and Zingales, 1995).

### 3.4.2 Efficiency

The last profile evaluates efficiency performance by considering profit efficiency and cost-efficiency. The concepts of production and cost frontier can be studied because production and cost functions of economic theory are functions of the maximum and minimum value of the optimization problem. Indeed, if I consider an output  $y$  obtained combining a set of inputs  $x$ , then the production function  $y=f(x)$  indicates the map that matches a combination of inputs with the maximum output obtainable using that combination. Similarly, the cost function matches a combination of quantity output  $y$ , and the vector of input prices, with the minimum expense necessary to produce  $y$  at that price. Hence, the profit frontier is specified, looking at the maximum profit possible, and profit efficiency is determined as the ratio of actual to the maximum possible (Kumbhakar et al., 2015). Similarly, the cost frontier is set by the relation between the potential minimum cost, and the actual cost that resides above the minimum frontier owing to inefficiency. Therefore, in both cases, the frontier is unobserved and is determined by the optimal level (i.e., the maximum level for profit, and the minimum level for cost).

The analysis of profit efficiency allows a better evaluation of company performance than cost efficiency because it catches both the wrong choice of inputs and outputs (Berger and Mester, 1997). More specifically, profit efficiency constitutes a more comprehensive source of information than the partial insight provided by analyzing cost efficiency. If firms are efficient along the profit side, also their cost and scale of production will be efficient (Fitzpatrick and McQuinn, 2008). Consequently, profit efficiency is viewed as overall efficiency.

Using a stochastic production frontier approach, provided by Greene (2005), explained in detail in the Appendix, I measured technical efficiency. To account for non-standard characteristics of the firms considered, I used a flexible translog production function. The translog function is non-homogeneous and belongs to the class of flexible functional forms that provide a second-order local approximation to any functional form. Considering that firms produce output using inputs in natural log value, the translog function can be written as:

$$\begin{aligned} \ln Y_{it} = & \alpha_i + \lambda_t + \beta_k \ln K_{it} + \beta_L \ln L_{it} + \frac{1}{2} [\beta_{kk} (\ln K_{it})^2 + \\ & \beta_{LL} (\ln L_{it})^2] + \frac{1}{2} \beta_{KL} \ln K_{it} \ln L_{it} + v_{it} - u_{it} \end{aligned} \quad (3.5)$$

where  $Y_{it}$  is the added value (output),  $K_{it}$  and  $L_{it}$  are the capital (total assets) and labor (number of employees) inputs used in the production,  $\lambda_t$  includes year fixed effects;  $v_{it}$  is the statistical noise term with zero mean and constant variance, and  $u_{it} \geq 0$  is a nonnegative one-sided inefficiency term which follows a half-normal distribution so that  $u_{it} \sim iidN + (0, \sigma_u^2)$ .

Unlike profit efficiency, following Greene (2005) cost efficiency is computed using this equation that requires the use of input price:

$$\begin{aligned} \ln CT_{it} = & \alpha_i + \lambda_t + \beta_k \ln PK_{it} + \beta_L \ln PL_{it} + \beta_Y \ln Y_{it} + \frac{1}{2} [\beta_{kk} (\ln PK_{it})^2 + \\ & \beta_{LL} (\ln PL_{it})^2 + \beta_{YY} (\ln Y_{it})^2] + \frac{1}{2} \beta_{KL} \ln PK_{it} \ln L_{it} + \frac{1}{2} \beta_{KY} \ln PK_{it} \ln Y_{it} + \\ & \frac{1}{2} \beta_{LY} \ln PL_{it} \ln Y_{it} + v_{it} - u_{it} \end{aligned} \quad (3.6)$$

Where  $CT_{it}$  is the logarithm of the total production cost,  $PL_{it}$  and  $PK_{it}$  are input price, and  $Y_{it}$  is the output expressed in added value. In particular, according to Pilar et al. (2018) labor price is computed as personal expenses divided by the total number of employees; capital price as the sum of depreciation and financial charges divided for the total asset.  $\lambda_t$  represents year fixed effects;  $v_{it}$  is the statistical noise term with zero mean and constant variance, and  $u_{it} \geq 0$  is a nonnegative one-sided inefficiency term which follows a half-normal distribution so that  $u_{it} \sim iidN + (0, \sigma_u^2)$ .

The technical efficiency can be outlined as the ratio of observed production over the maximum technical output possible for the firm when inefficiency is not present. Consequently, the efficiency index (TE) of firm  $i$  in year  $t$  could be written as:

$$TE_i = \frac{y_i}{\exp(x_i \beta + v_i)} = \frac{\exp(x_i \beta + v_i - u_i)}{\exp(x_i \beta + v_i)} = \exp(-u_i) \quad (3.7)$$

It is delimited by zero and one. A score near to zero means that the firm is inefficient for the given technology, and it could increase its output level without increasing the level of inputs, while a score of one means full technical efficiency.

Equally, cost efficiency is the ratio of the potentially sustainable minimum cost and the cost-effectively supported by firms so that:

$$CE = \frac{C^{min}}{C} = \frac{C(y, w) \exp(v)}{C(y, w) \exp(u + v)} = \exp(-u_i) \quad (3.8)$$

It is bounded by zero when the actual cost is more significant than the minimum estimated cost and one when the firm system is characterized by full efficiency.

To verify the impact of judicial administration on technical efficiency, I estimate the following inefficiency equation:

$$u_{it} = f(JA_{it}, \text{control variables}, Z_{it}) \quad (3.9)$$

where  $JA$  is the dummy variable that takes 1 when from the year companies are under preventive measures and control variables are related to firms' characteristics and other environmental factors that also affect firm efficiency and are not under the managerial control such as the geographical area of reference. To summarize, technical inefficiency and cost efficiency are estimated from the stochastic frontier and simultaneously explained by a set of institutional and environmental variables (affecting efficiency). This one-step method avoids inconsistency problems in the two-stage approach, where the first stage requires the estimation of a conventional frontier model with environmental variables omitted and the second stage implicates the regression of these predicted technical efficiencies on the environmental variables (Wang and Schmidt, 2002).

### 3.4.3 Graphical Evidence

To provide graphical evidence about the effect of JA on firms' performance, I have reported firms temporal performance for the 13 years around the year in which a firm is subjected to preventive measure. I used the four dependent variables of the model presented above (ROA, ROI, Leverage, Profit, and Cost Efficiency). Graph 3.3 reports the firm's performance effects before and subsequent judicial administration comparing the mean of the variables for each year before and after the event. As it is clear from the graphs, the firms' aspects systematically change after the event, showing a difference before and during the judicial administration.

Analyzing the firm's profitability, ROA and ROI, there is a change in proximity of 0 that represents the year event. For example, ROA declines approximately from 0.68 in  $t-1$  to -2.09 in year  $t$  with a slightly improvement only after eight years of treatment. The same result for ROI, indeed the ratio declines from 0.77 to -0.91 to stay under the pre-phase level. However, after the intervention of the administrator, the level of return will always be lower than in the pre-phase. The result for leverage is slightly different. There is a slight increase (from 0.83 to 0.85 only in that period) in leverage, i.e., on the debt level. In the case of debt, the change in the management shows an increase in the level of debt, as a consequence, considering that this company can have previous liability and have access to new finance thanks to the possibility established by the law. Last aspects concern profit and cost-efficiency. With regards to profit efficiency, near the year event, the level of efficiency suffers a decline. In line, cost efficiency shows a marked decrease after the treatment showing a loss of efficiency in cost management.

Overall the graphs show preliminary evidence that when firms' governance change, reducing their criminal aspects, businesses modify their results, coherently with literature. The economic results after the treatment are always below the red line that indicates the mean of ratio average. Conversely, for leverage, the ratio is often above the red line.

## 3.5 Results and Discussion

Table 3.2 presents the results using ROA and ROI as a measure of performance. I have looked at what happens when firms are subtracted to OC ownership in the profitability aspects, not absorbing for any fixed effects but year fixed effects, and then by absorbing for firms fixed effects and progressively adding control variables.

As previously stated, the variable of interest for this research is the dummy variable JA, that provides an answer about whether and how companies considered performance changes once criminal characters are eliminated. When controlling only for year fixed effect in column (1) and (4), the judicial treatment administration seems to play an important role. Indeed, as expected from graphical evidence, the treatment is negatively correlated with the firm's profitability. In line, once I control for firms fixed effects in columns(2), (3), (5), and (6) the results remain unchanged. In column (3) and (6), I introduce a set of variables to control for the size and the capital structure. Following literature, I used winsorization technique at 1 percent to eliminate outliers that characterize accounting variables. In line with the analysis presented above,  $\beta_1$  is negative and significant at (5%) in Column 3 and 6 for both ratios, thus after controlling for size, capital structure, and including year fixed effect. The coefficient  $\beta_1$  is always statistically significant and negative (at 1% for ROA and 10% for ROI considering the regression without any control).



Indeed, being under judicial administration is associated with lower profitability. Results might be explained as follows: firstly, the implementation of judicial administration should be re-defining an equilibrium of legality inside the business environment, cutting away all the relation with the criminal organization's network. The re-definition of this equilibrium can be accompanied by a period of uncertainty which depresses investments, due to the loss of credibility in the surrounding environment. Moreover, further mechanisms can play an important role, for example the quality of the appointed administrator in creating economic network and managing the weak balance within firms. Companies living in an illegal circuit can create agreements and fiduciary relationship with other economic agents to increase profit and also to take advantages. This aspect also regards the favorable condition and all the organized pressure on the firm business (Arlacchi, 1983, 2010). After the implementation of legal measures, the companies profitability decreases. In particular, considering ROA and ROI, they respectively fall by 4.42 and 2.42 approximately.

Next, I analyzed the impact of OC removal in terms of debt relation using the leverage ratio. Table 3.3 reports the results. Analyzing column (1), when I control only for year effects, there is no statistically significant effect on the leverage level. When I add control for firms fixed effects in column (2) the treatment effect shows a statically significant impact on the leverage level ( $p < 0.005$ ). In column (3), including control variables, the causal effect of the judicial measure is given as before by  $\beta_1$  coefficient, that is positive and statistically significant (1%)<sup>6</sup>. The effect of judicial administration causes an increase of 0.0721 in the level of debt.

At the moment of judicial administration intervention, the new administrator has to study companies complicated situation and has to cut all the relationships that could be a source of criminal advantage. It is possible that economic agents, after police operation, do not want to continue collaboration with the subjected companies. In compliance with the regulatory aspects and thanks to that, previous debts remain unpaid, and the new administrator continues the activity, contracting new finance. Note that, in the numerator of the ratio, all types of debt that companies can have with banks, suppliers, etc. are included.

The last question concerns the effect on profit and cost-efficiency. Table 3.4 presents the results of the estimation of the stochastic profit and cost frontier. The results of the estimated translog profit frontier (column 1) show that the selection of variables is appropriate, and the fit between the model and the data is good. The estimated output elasticities in comparison to capital are positive and statistically significant at 1%. The output elasticities for capital is equal to 0.46 and it is more significant than that obtained for labor (0.34). The total elasticity of scale, which shows a local measure of returns to scale equals 0.79. Premise that, as explained before, the sectors in which these types of companies operate are multiple, at the sample mean, the decreasing returns to scale are prevalent for the analyzed companies, indicating that increasing all inputs by 1% would raise output by 0.79% only.

The results for the coefficient of efficiency determinants ( $Z_{it}$ ), included in the inefficiency function, are reported below the table. The estimated coefficients of the technical efficiency factors show their direct effect on technical inefficiency, which is the opposite effect on TE. The results of the JA variable always show a statistically significant and positive (5%) impact on inefficiency ( $u_{it}$ ). This implies that with judicial administration, treated companies are less technically efficient than the pre-measure phase. Firms have access to a less profitable business than the criminal

<sup>6</sup>I repeated estimations for three ratio including control for sector-by-year FE. Results are unchanged

stage; indeed, with the same amount of inputs, they obtain a lower level of output. The table also shows the summary statistics of estimated TE scores. The mean of TE score is about 0.69, with a standard deviation of 0.27 approximately.

Table 3.5 presents the results of the estimation of the stochastic cost frontier. Since total cost and all the independent variables are expressed in logarithms, the computed first-order coefficients can be understood as cost elasticities evaluated at the sample median. The cost frontier function is non-decreasing in input prices since both the Capital price coefficient, as well as the Labor price coefficient, are positive. However, the estimation shows the violation of monotonicity against output represented by added value.

The estimated coefficient of efficiency determinants ( $Z_{it}$ ), which are included in inefficiency function, are reported below. In line with the results for the profit frontier, also in the case of cost efficiency, JA has a significant effect ( $p < 0.01$ ) on the change of efficiency level; the sign shows that when judicial administration is implemented, companies became less technically efficient in cost than the pre-measure phase. That means that companies, paying the same price, have less efficiency in cost management. The estimated cost efficiency has a mean of 0.74, with a standard deviation of 0.23.

Overall, the results for both technical and cost efficiency outlined that judicial administrator, restoring the legality in controlled companies according to sound management principles, undergo a loss of efficiency because conservatism in management may prevail. Re-shaping firms' management involves also a change in transnational network and in the cultural background where firms operate. Indeed, criminal companies coercively coordinate production factors such as capital and labor (Albanese and Marinelli, 2013; Transcrime, 2013).

### 3.6 Placebo Test and Robustness Check

To further evaluate the robustness of the results, I have run a placebo experiment, following Belloc et al. (2016) approach. In the sample, the treatment of judicial administration took place in a time range between 2004 and 2016, thirteen years in total. I then assigned the year-event randomly for 10,000 times. I then produce for each fake year, randomly assigned, the corresponding fake JA dummies.

After building the placebo JA dummy variables, I have estimated the model 3.1 replacing real one. The procedure is repeated 10,000 times. Each time I have saved the estimated coefficient. With the generation of random events and the assignation of placebo dummy variables, the test aims to verify how many times these placebo point estimates are closer or lower than the true point estimate. A significant effect of artificial treatment might mean anticipation of preventive measures, which would induce effects on firms' aspect before the policy is implemented. As a result, if estimations are erroneously imputing to judicial administration an impact on the firms' performances that do not exist in reality, I will obtain a placebo coefficient close to the real point estimate. To do so, estimated point coefficients are reported in the probability density function, with the inclusion of a vertical line that indicates the true point estimate of the estimated model without the addition of control variables.

The procedure is repeated for each dependent variable used in the analysis. As shown in Figures 3.4, the point estimates are generally larger than the real value. In the case of ROA and ROI (that have a negative effect), the results of the placebo test are approximately always to the right of the true coefficients except for a small left-tail. Conversely, for the Leverage (that has positive effects), the fake coefficients

are to the left of the true coefficient, with a slight right tail.

In the same way, I have run an experiment also for efficiency aspects (Berenguer et al., 2016). However, given the complexity of estimation for the stochastic frontier, the procedure is repeated only 5,000 times. Hence, I randomly generated 5,000 year-event fake. Generating fake environmental variables, I used these regressors (JA fake) in the equation 3.9 in both cost and profit aspects (3.5 and 3.6). As shown in the Figures fake coefficients are to the left of the true coefficient, with a thin right tail.

Overall, the exercises provide considerable robustness for the variables considered according to which the evaluation of the true JA is not artificial and the year of entry of a treated firm is exogenous to its performance.

### 3.7 Conclusion

In this work, I have analyzed the dynamic change occurring in firms' performances when the judicial administrator, appointed by authorities, has to re-define the businesses and cut all the links with criminal organizations. In this moment, ownership decisions and the system in which companies operate change. Since organized crime companies incorporate particular governance mechanisms, the analysis broadens the knowledge of OC companies features.

The growing enforcement activities and the unique jurisdictional framework, offer the possibility to collect significative firm-level data and use exogeneous shocks to apply the quasi-experimental design. Indeed, these companies are of particular interest to the scientific community, given that their social responsibility and the importance of market competition. Using a new hand-collected panel data, with year firm-level observation from 2004 to 2016 on criminal firms from all regions of Italy, I have assessed the economic consequences of the re-definition of the legal side. In particular, the evaluated measures refer to profitability (ROA and ROI), efficiency (cost and profit), and the debt level (leverage). The empirical strategy is based on the within variation in criminal firms exposure to JA. Specifically, I have not inferred the causal effect from a comparison of different firms, but comparing within-firm change that is induced by a random treatment event and controlling for common yearly shocks that affect all firms and firm time-invariant characteristics.

Starting from graphical evidence, I have provided a series of proofs that overall show a change in firms' aspects. The comparison before and after the event of the preventive measure pinpoints that the re-definition of legal side reduces profitability and efficiency (cost and profit) and increases debt level. One reason why this new form of ownership may underperform persistently is that firms can deviate from profit maximization endangering their survival possibilities. OC firms earn higher performances, because of criminal advantages, while firms enter the JA status, deviate from such behavior and try to survive because of external legal control mechanisms. However, the judicial administrator, restoring the legality in controlled companies according to sound management principles, undergo a loss. Judicial administrator has to manage OC firms not only from an economic perspective, also analyzing what kind of investment relationships previous stakeholders had established.

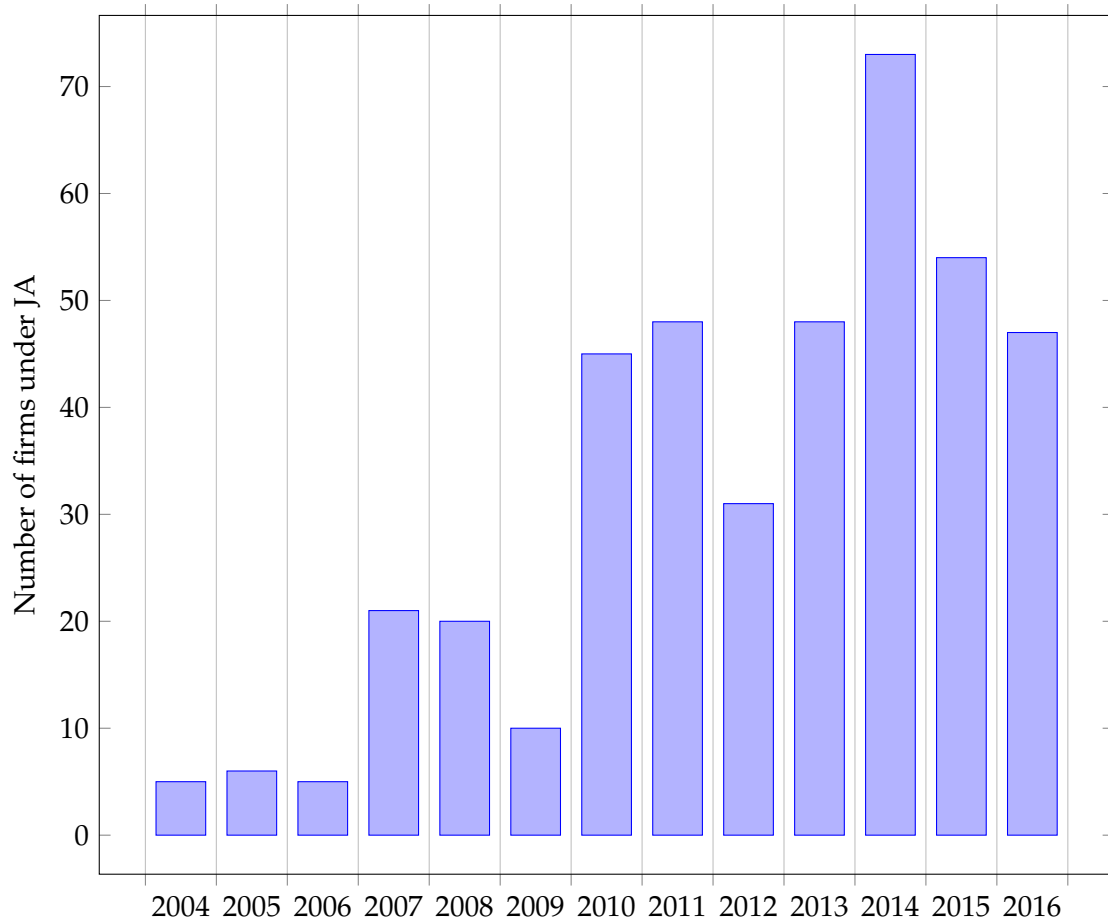
I am not aware of other studies comparing performance aspects, analyzing JA effects. This work is the first attempt to evaluate what has happened to businesses when judicial administration is implemented and analyzes criminal firms. Indeed, the finding suggests how OC firms are intrinsically managed by the dark side. By

cutting these ties, it makes it challenging to maintain profitability and efficiency level. Future studies can focus on the several channels (uncertainty in business environment, administrators' skills, economic agents cultural background) through which judicial administration affects firms' performance.

The contribution of the article could propose several opportunities for future research from different points of view. Firstly, it opens sociological questions given the social cost due to the difficulty in maintaining a sustainable level of profitability. Besides, there are economic implications, especially in the field of labor economics, and if firms under administration fail to survive, there are economic consequences because of job loss. Secondly, the focus could be placed on administrator managerial skills, offering the possibility of investigation through a managerial perspective. Lastly, the paper can have policy implications in terms of managerial "best practice" for the judicial administrator that can orientate the management to the establishment of a new economic relationship and the definition of new legal competitive advantages. This aspect is related to the behavioral dimension in defining measures aimed to prevent opportunistic behavior.

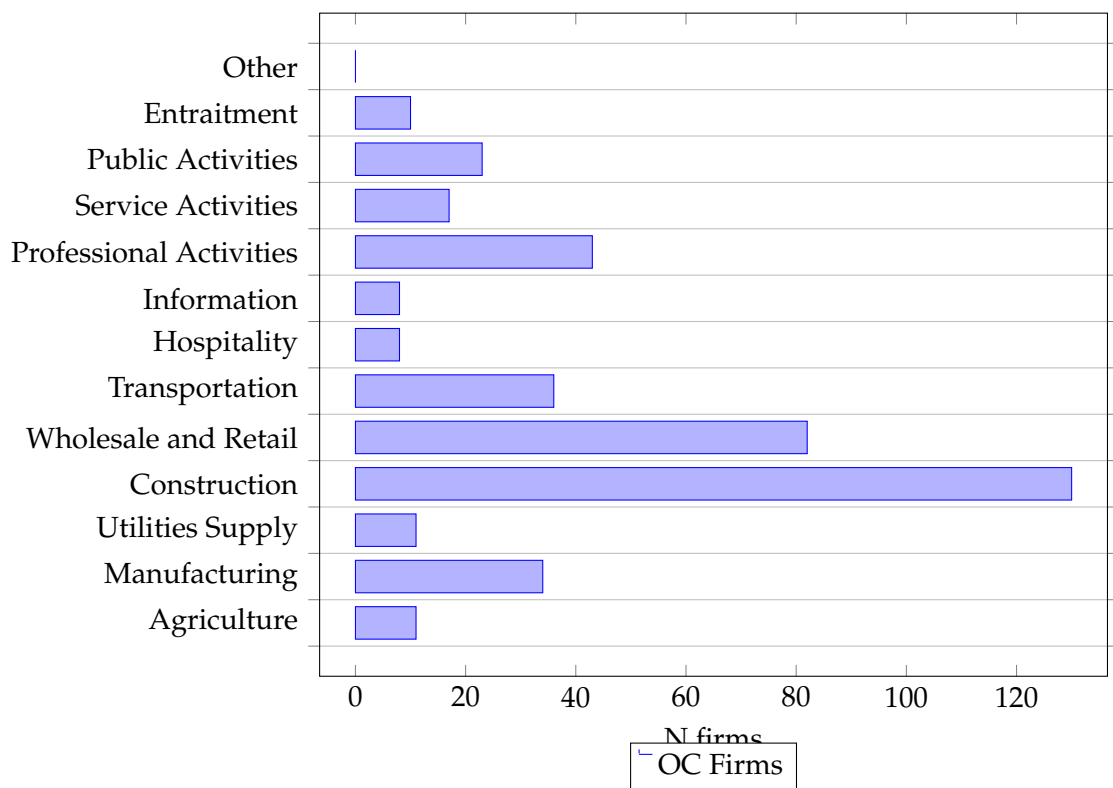
## Figures and Tables

FIGURE 3.1: Number of OC firms subject to JA by year



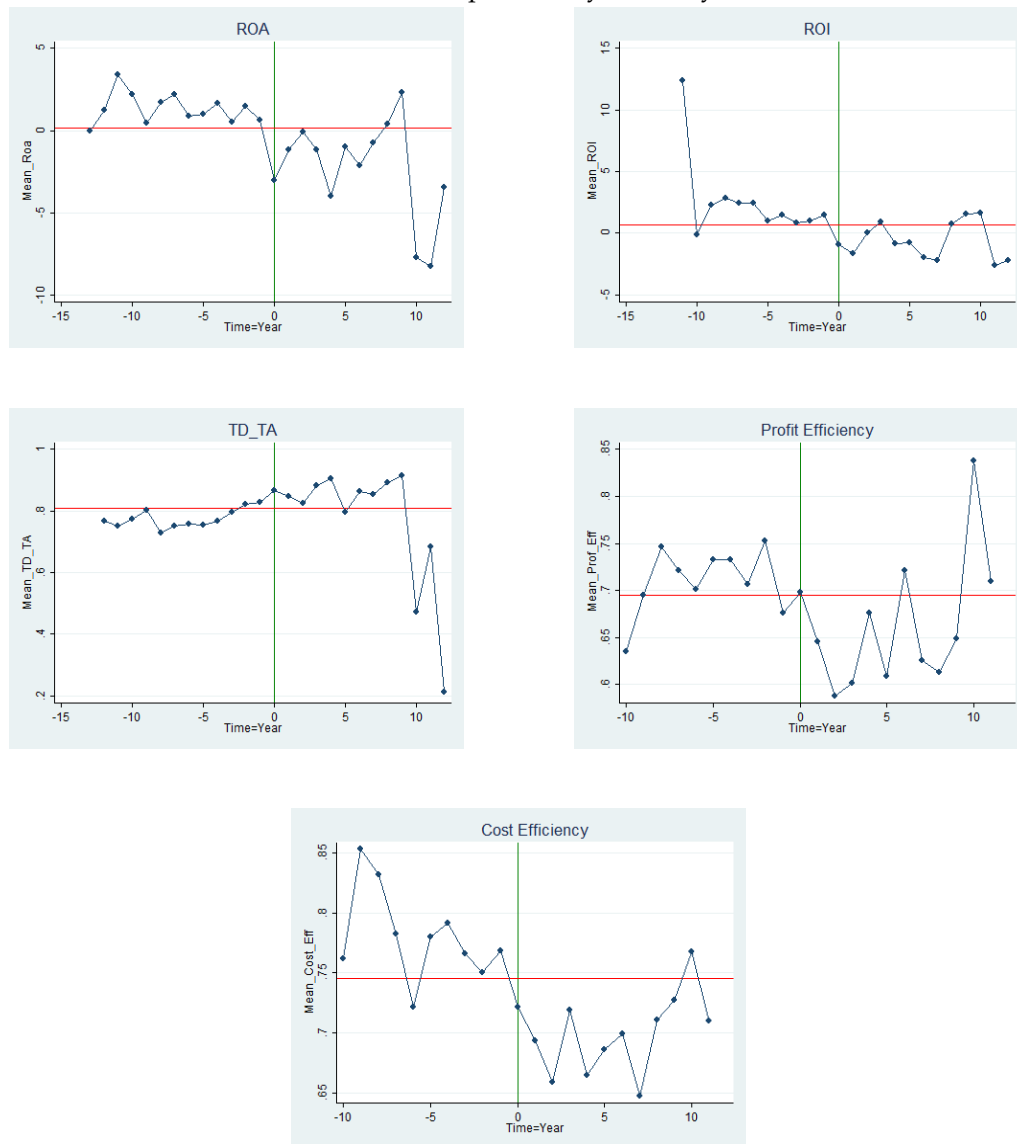
Notes: The figure reports the number of firms subject to judicial administration by year.

FIGURE 3.2: Criminal firms under JA by sector



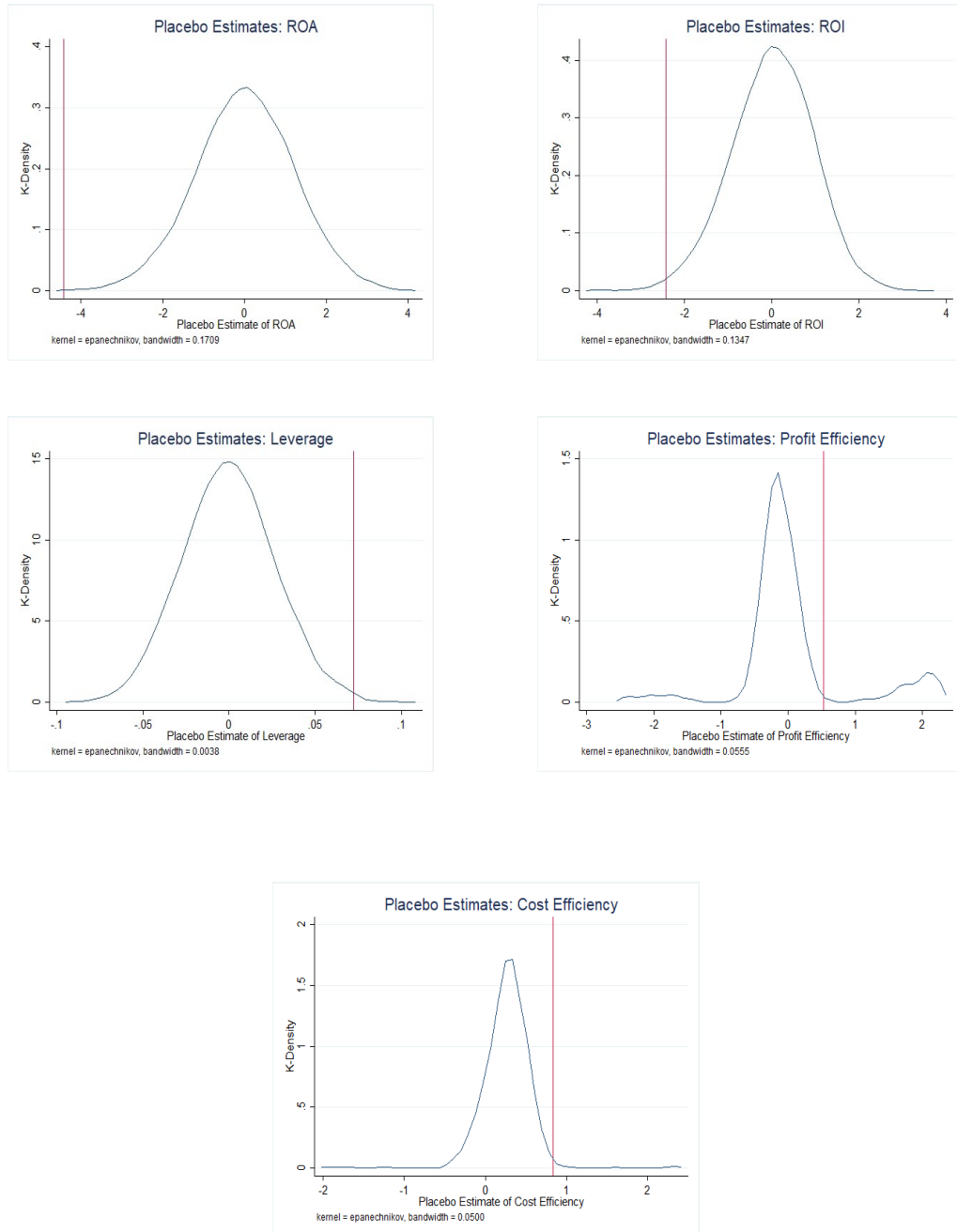
Notes: The figure reports the number of criminal firms subject to judicial administration by sector.

FIGURE 3.3: Inter-temporal analysis of Key variables



Notes: The figure reports the firms' performance variables before and after JA, comparing the variables mean for each year before and after the event.

FIGURE 3.4: Placebo Tests



Notes: Probability density function of the coefficients obtained by estimating regression 3.1, 3.5 and 3.6 with the placebo JA dummies as independent variable



TABLE 3.1: Organized Crime Firms–Geographical distribution and summary statistics

Panel A					
Geographical Area	AIDA Sources	Other sources	Total Number	Final Sample	
North Area	7	47	53	42	
Center Area	21	9	25	20	
South Area	350	129	429	351	
Total	378	185	563	413	
Panel B					
Firm characteristics	Variables definition	(1) Mean	(2) Before JA	(3) After JA	(4) Difference
Dependent Variables					
ROA	Net Income/ Average Total Assets	0.8412 (14.1426)	1.7014 ( 13.6476)	-0.8687 (14.9426)	2.570*** (3.81)
ROI	Net income / Investment	0.8321 (11.7632)	1.4851 (11.2464)	-0.4659 (12.6373)	1.951*** (3.47)
Td/ Ta	Total debt/Total Assets	0.7924 (0.4027)	0.7844 (0.3798)	0.8085 (0.4444)	-0.0241 (-1.25)
Output	Ln Added Value	6.1551 (1.7356)	6.1536 (1.6800)	6.1584 (1.8473)	-0.00483 (-0.05)
Ln Production Cost	Ln Production Cost	7.7797 (1.5385)	7.7999 (1.5145)	7.7381 (1.5881)	0.0618 (0.66)
CE	Cost Efficiency	0.7456 (0.2299)	0.7709 (0.2155)	0.6932 (0.2492)	0.0776*** (5.66)
TE	Profit Efficiency	0.6940 (0.2729)	0.7168 (0.2584)	0.6471 (0.2955)	0.0697*** (4.25)
Independent Variables					
Sales/ Ta	Revenue/ Total Asset	0.9584 (2.8539)	0.9304 (2.7895)	1.0140 (2.9790)	-0.0837 (-0.61)
Size	Log(Revenue)	6.8275 (2.0236)	6.9245 ( 1.9548)	6.6349 (2.1423)	0.290** (2.99)
Profit	EBIT/ Total Asset	-0.0059 (0.3167)	0.0017 (0.3028)	-0.0209 (0.3424)	0.0226 (1.49)
Fix Asset	Tangible+Intangible Assets/ Total Asset	0.2924 (0.4560)	0.2633 (0.3588)	0.3501 (0.6004)	-0.0868*** (-3.98)
Ln L	Ln (N° Employees)	2.4419 (1.3326)	2.4500 (1.3108)	2.4251 (1.3781)	0.0249 (0.31)
Ln K	Ln(Total Asset)	7.9539 (1.8260)	7.9205 (1.8647)	8.0228 (1.7438)	-0.102 (-0.93)
Ln L Price	Personal expenses/ N° Employees	3.2590 (0.7983)	3.2397 (0.8093)	3.2986 (0.7747)	-0.0589 (-1.22)
Ln K Price	Depreciation and Financial Charges/ Total asset	-3.5414 (1.2823)	-3.541978 (1.2491)	-3.5420 (1.3497)	-0.0589 (-1.22)

Notes. Geographical distribution for OC firms in Panel A and Summary statistics in Panel B are reported. In columns (1)-(2)-(3) of Panel B standard deviation in parenthesis. In column (4) of Panel B t-statistics of the difference between the variables in column (2) and (3).

TABLE 3.2: Profitability Aspects

	(1)	(2)	(3)	(4)	(5)	(6)
	ROA	ROA	ROA	ROI	ROI	ROI
JA	-3.7638*** (1.0481)	-4.4218*** (1.5802)	-3.2217** (1.4583)	-2.1459** (0.9811)	-2.4243* (1.3514)	-2.2161* (1.3415)
Sales/TA	-	-	1.6382*** (0.3165)	-	-	2.4535*** (0.8797)
Size	-	-	1.6851*** (0.5514)	-	-	0.9964** (0.4084)
Debt	-	-	16.5173*** (3.2557)	-	-	-
Year FE	YES	YES	YES	YES	YES	YES
Firm FE	NO	YES	YES	NO	YES	YES
Observations	1957	1957	1957	1957	1957	1957
R-squared	0.018	0.5040	0.5985	0.0111	0.4367	0.5051
Number of Firms	413	413	413	413	413	413

Dependent variable are indicated in the first row: ROA (1-3) and ROI (4-6). The estimated coefficients are from model 3.1 in the text. Models estimated are with OLS. Standard errors clustered at the firm level are in parentheses. Significance at the 10% level is represented by \*, at the 5% level by \*\*, and at the 1% level by \*\*\*.

TABLE 3.3: Leverage Aspect

	(1)	(2)	(3)
	TD/TA	TD/TA	TD/TA
JA	-0.0003 (0.0325)	0.0721** (0.0291)	0.0597*** (0.0267)
Profit	-	-	-0.4341*** (0.1183)
Size	-	-	-0.0203* (0.0112)
Fix asset	-	-	0.0866 (0.0955)
Year FE	YES	YES	YES
Firm FE	NO	YES	YES
Observations	1957	1957	1957
R-squared	0.0090	0.7791	0.8053
Number of Firms	413	413	413

Dependent variable are indicated in the first row: Leverage. The estimated coefficients are from model 3.1 in the text. Models estimated are with OLS. Standard errors clustered at the firm level are in parentheses. Significance at the 10% level is represented by \*, at the 5% level by \*\*, and at the 1% level by \*\*\*.

TABLE 3.4: Profit Efficiency

Variables	(1) Profit Efficiency
Translog production function coefficient	
lnK	0.4565*** (0.1325)
lnL	0.3426 (0.2812)
lnK*lnL	-0.0929 (0.0778)
$\ln K^2$	-0.0225 (0.0394)
$\ln L^2$	0.1641* (0.0932)
JA	0.5284** (0.2153)
Constant	-0.5265*** (0.1499)
Year Effect	Yes
Observations	1244
Number of Firms	254
Mean (TE)	0.6940
St. Dev. (TE)	0.2729
Min (TE)	0.0027
Max (TE)	1
Return scale	0.7991

Robust Standard errors are in parentheses. Significance at the 10% level is represented by \*, at the 5% level by \*\*, and at the 1% level by \*\*\*.

TABLE 3.5: Cost Efficiency

(1)	
Variables	Cost Efficiency
Cost Frontier	
$\ln PL$	0.0502 (0.1531)
$\ln PK$	0.1242 (0.1063)
$\ln Y$	-0.1027 (0.1615)
$\ln PL * \ln PK$	0.0597 (0.0534)
$\ln PL * \ln Y$	0.0738 (0.0510)
$\ln PK * \ln Y$	-0,0735** (0.0244)
$\ln PL^2$	-0.0340 (0.0221)
$\ln PK^2$	-0.0076 (0.0136)
$\ln Y^2$	0.0626* (0.0361)
JA	0.8333*** (0.2454)
Constant	-1.4391*** (0.1259)
Year Effect	Yes
Observations	1244
Number of Firms	254
Mean (CE)	0.7456
St. Dev. (CE)	0.2299
Min (CE)	0.0098
Max (CE)	1

Robust Standard errors are in parentheses. Significance at the 10% level is represented by \*, at the 5% level by \*\*, and at the 1% level by \*\*\*.



## Chapter 4

# Confiscation of Criminal Productive Assets: Spillover Effects on Legal Firms in the South of Italy<sup>1</sup>

### Abstract

We analyze the indirect economic effects of an enforcement law targeting firms affiliated to criminal organizations in the south of Italy. This law provides the judicial administration of organized crime firms through the imposition of external managers to guarantee the continuity of production. By using detailed information on more than 180,000 companies, we exploit legal firms yearly variation in the exposure to criminal firms' judicial administration in their province and industry. The empirical design allows us to control for confounding effects at the firm, market and year level. The results show that there are large positive spillovers from the enforcement law. Legal firms' performance and turnover increase by 2.2 and 0.7 percent, respectively, in the first four years after an organized crime firm enters the status of judicial administration. Investments measured by tangible and intangible assets increase with the number of firms entering into judicial administration by 0.75 percent. These results suggest that intensifying confiscation measures against criminal organizations has a strong positive effect on the economy.

**Keywords:** Organized crime; Firm level data; Panel data analysis.

## 4.1 Introduction

Criminal organizations are a major obstacle to social and economic development (Pinotti, 2015b). In the last decades, a number of strategies and interventions have been adopted to combat organized crime (Fijnaut and Paoli, 2006). Some of these interventions target productive assets connected to organized crime and have been deployed in a number of jurisdictions. The aim of these focused-assets interventions is to prevent the organized crime infiltration in the economy and to subtract financial power to criminal organizations (Atkinson et al., 2017).

Despite the common use of these interventions, little is known on the effects of these measures in the economy. In this paper, we evaluate the indirect economic effects of an enforcement law targeting firms connected to criminal organizations in Italy. This law was passed in 1982 and introduced for the first time in the penal code

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<sup>1</sup>The chapter is co-authored with Francesco Drago and submitted to the Italian Economic Journal: Special Issue on the Economics of Crime

the mafia-type unlawful association (art. 416-bis). The law and a number of subsequent modifications allowed the legal authority to confiscate the productive assets of the members affiliated to the mafia. With regard to productive firms, the first step of the expropriation measure is the imposition of external managers, thereby removing the affiliation of the firms with the criminal organization. Under the provision of the law, the organized crime firm enters the status of judicial administration with an external administrator nominated by a judge that manages the firm and guarantees the continuity of the production activities of assets seized in criminal proceedings. In practice, a criminal firm entering the status of judicial administration continues to exist but breaks any link with the criminal organization.

We estimate the spillover effects of judicial administration on legal firms (firms that were not infiltrated or colluded with criminal organizations) that operate in the same relevant market of the criminal ones. From this empirical exercise, we quantify the economic effects of the enforcement law providing judicial administration in the local economy. Hence, we shed light on the burden that organized crime firms impose on legal ones. There are several reasons according to which we expect spillover effects from the judicial administration of a criminal firm on legal ones (Duplat et al., 2012). The presence of an organized crime firm may influence the investment and strategy choices of a legal firm through intimidation and violence. For example, organized crime firms intimidate legal ones of not entering specific sectors or not participating in public procurement procedures. Criminal firms are typically large and together with criminal organizations may exert a disproportionate market power that alters the competitive market. In addition, organized crime firms may corrupt public officials to gain favorable market conditions. Thus, the removal of the criminal nature from a former organized crime firm may have an impact on the performance and investment choices of a legal one.<sup>2</sup>

In this paper, we use yearly financial data from 2004 to 2016 – from *Aida* provided by Bureau Van Dijk – on criminal and legal firms in the fourth largest regions in the south of Italy (Apulia, Campania, Calabria, and Sicily) in which there is a strong presence of organized crime. Under the period of analysis, we detected 429 firms subject to judicial administration. Most of the information on firms under judicial administration comes from *Aida*. Since not all the firms present in *AIDA* and in fact treated by judicial administration have this information reported in the database, we exploited other sources of data. In particular, we exploited news on judicial administration in online newspapers, cross-checked this information with other sources, and finally matched the firms found online with the *Aida* database to recover their financial variables. For each firm, data on turnover, EBITDA, number of employees, revenue, tangible and intangible assets, and total assets are available. In addition, we know the province in which the firm is located and the industry in which it operates. The total number of (legal) firms that were never targeted by judicial administration in our analysis is 183,302. Overall, the richness of the data in terms of observations and information allows us to exploit several margins of variation and the panel structure of the data.

We assume that any potential spillover effect from judicial administration takes place if the criminal and legal firms are located in the same province and operate in the same industry that identify their common relevant market. With this assumption, the empirical design exploits legal firms yearly variation in the exposure to

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<sup>2</sup>An interesting feature of the empirical design is that we estimate the effect of a change of the nature of an organized crime firm rather than the closure of such a firm.



criminal firms' judicial administration, controlling for yearly common shocks affecting all firms (year fixed effects), firm time invariant characteristics (firm fixed effects) and yearly industry-specific shocks (industry-by-year fixed effects). We estimate the impact of criminal firms' judicial administration on legal firms' measures of performance, size, and investments. Specifically, we study the impact on the EBITDA normalized by total assets (a measure of performance), the revenues over total assets (a measure of size) and the sum of tangible and intangible assets over total assets (a measure of investments). Identification is based on the assumption that the year in which a criminal firm enters the status of judicial administration is exogenous to legal firms performances, controlling for the large set of fixed effects. Several diagnostic tests and the institutional background support the identifying assumption.

The main results indicate that the entry into the status of judicial administration of an organized crime firm in the same relevant market implies an average increase of the legal firm's performance by about 2.2 percent in the following four years and an increase in the legal firm's turnover by about 0.7 percent, respectively. We find that this effect increases with the number of firms entering in JA and it is larger in markets characterized by a relatively low number of firms. As for the tangible and intangible assets, we find that the entry into the status of judicial administration of each firm increases investments by 0.75 percent in markets with few firms but only after a critical number of entries into JA. Considering that for each market identified by industry and province the number of firms is in the order of several hundreds, the aggregate effects are very large<sup>3</sup>. The results in this paper imply that the burden that organized crime firms impose in the economy is extremely large. Importantly, this type of results is consistent with aggregate estimates on the cost of organized crime (Detotto and Otranto, 2010; Pinotti, 2015b). An important policy implication emerging from this study is that intensifying confiscation and expropriation measures against criminal organizations has a strong positive effect on the economy.

Our paper contributes to an emerging literature on organized crime (Acemoglu et al., 2017; Alesina et al., 2018; Bandiera, 2003; Buonanno et al., 2015; Fiorentini, 1999; Pinotti, 2015a) and attempts to quantify the effect of the infiltration of criminal organizations in the economy (Albanese and Marinelli, 2013; Bianchi et al., 2017; Fabrizi et al., 2018; Pinotti, 2015b). A distinctive feature of our paper is the focus on the spillover effects of an enforcement law in the economy. The closest paper to ours is by Fabrizi et al., 2018 who analyze, using a difference-in-difference strategy, the economic effects of criminal firms on the performance of legal firms in central and northern Italy. They identify criminal firms exploiting information on board members, police operations and court trials. As we will explain in detail, our paper differs from Fabrizi et al., 2018 for the geographical area that we analyze, the empirical strategy and the identification object (the effect of an enforcement law in our case, the presence of criminal firms in Fabrizi et al., 2018).

The paper is structured as follows. Section 2 introduces the institutional framework and section 3 describes the data. In section 4 we present the empirical strategy and in Section 5 the results. Section 6 concludes.

## 4.2 Institutional Background

In the eighties, in Italy, the infiltration of organized criminal groups into legal economy required the establishment of a new legal framework that allowed to fight the

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<sup>3</sup>Obviously, the loss that a criminal firm experiences through JA is more than offset by the increase in the performance of legal firms

patrimonial components of the organization. The breakthrough legislation was the Rognoni-La Torre law of 1982 with the introduction of the art. 416-bis in the Italian penal code. For the first time in the national penal code, the article recognized the mafia-type unlawful association as a criminal act. The law introduced personal preventive measures attacking criminal organizations and specifically their economic and financial assets.

The law and the subsequent modifications provide that, in any situation in which there is a mafia-type unlawful association, both the criminal procedure (the start of a trial) and preventive measures (judicial administration and eventually confiscation of the productive assets) must be activated simultaneously. The preventive proceeding is independent from the criminal one. The criminal action requires a conviction and a relation to the crime the person is accused of; the preventive one does not imply a crime and tends to prevent the commission of crimes by subjects deemed dangerous. Essential to implementing the judicial administration is that the company must be involved in the criminal organization's broad design. The aim is to break the links between infiltrated companies and criminal organizations, given their rapid integration into the ordinary and lawful economic circuit.

Specifically, judicial administration (JA) is a legal institution designed to guarantee the continuity of the production activities of assets seized in criminal proceedings. The measure aims to subtract the assets from the criminal circuit. Importantly, the productive assets are not eliminated from the market but continue to exist without the link with the criminal organization. The law attacking the criminal productive assets involves two phases: a first one, judicial, from the seizure decree to the confiscation decree of the first degree; the second one, administrative, that goes from the confiscation of the first decree to the definitive one. Article 23-bis in the penal code provides the application of preventive measures by the court, on the proposal of public prosecutor's office. Also, the national anti-mafia prosecutor and the head of the police can initiate a case. The prosecutor's office notifies the prosecutor of the regional office where the suspect lives. At the moment that the seizure has been decided, the court nominates the delegated judge and the administrator responsible for the management of the seized assets.

The administrator must be a professional enrolled in a special register with expertise in business management. The administrator is endowed with all the powers of the owners of the assets. The appointed administrator has to manage the assets guaranteeing the maximum profit, with particular attention to preservation and custody. The law provides the possibility to increase the level of profitability, defining a new legal organizational structure that is able to guarantee the survival of the company. The judicial administrator must break up all the relationships and favorable conditions that the previous criminal management had given to the business activities.

In sum, the measure is aimed to take away a means to commit crimes and alter the competitive markets. Indeed, the discipline aims to correct and preserve the correct dynamics of the market and competition influenced the organized crime infiltration. The legal procedures are the response to the dangers deriving from the accumulation of illicit resources that lead to an "unfair" competition with the firm that complies with the laws and rules in the legal economy.

## 4.3 Data

We collected data on the universe of firms in the four largest regions in the south of Italy, namely Apulia, Calabria, Campania and Sicily. The data are provided by AIDA, the Italian Bureau Van Dijk database. The database contains balance sheet information of more than 700,000 companies in Italy from 2004 to 2016. In particular, it covers 100% of the Italian companies that are required to deposit the balance sheet without distinction of size and sector.<sup>4</sup> For each company, AIDA offers detailed financial variables and the optical balance, the name of the registered company, province of registration, fiscal code, and sector in which the firm operates for a period of 10 years.

Table 4.1 reports the summary statistics on key variables used in the empirical analysis of these firms and their geographical distribution. These are the legal firms that were never targeted by the judicial administration. We analyze 183,302 firms for a total of 892,770 observations over the period 2004-2016. As we can see, there is a large variation with respect to total assets, number of employees, turnover and other financial variables.<sup>5</sup> From Table 4.1, the geographical distribution of the firms reflects the relative size in terms of population of the fourth region. Figure 4.1 shows the industry where the firms operate according to the two-digit industry code. The first two industries are wholesale & retail and construction.

The challenge in the collection of the data is to recover information on the criminal firms treated by judicial administration. As a matter of definition, in this paper a firm is a criminal one (or an organized crime firm) if it enters in any year in our sample the status of JA. The first source of information on organized crime firms comes from AIDA that provides together with many other variables information on the legal status of each firm. In particular, the data contains information about potential legal procedures that affect companies, including the status of judicial administration pursuant the law on confiscation of criminal assets. Unfortunately, not all the firms present in AIDA and in fact treated by judicial administration have this information reported in the database. Indeed, AIDA sources are the Italian Chambers of Commerce that have difficulties in collecting systematically from tribunals this information because it is often confused in text fields that are difficult to read.

To increase the number of organized firms treated by judicial administration, we used Python programming language, through which we have automated the recovery of data on firms treated by judicial administration in online newspapers. To reduce errors in the identification of these firms the data were cross-checked with other official data (official press release from authorities, court documents). Hence, the data collected were merged with the financial statements available in AIDA, while some companies were deleted because of the lack of data available or discrepancy in terms of analyzed years.

Table 4.2 reports information on the organized crime firms and the data source. The sample of criminal firms contains 429 firms under preventive measures, and the financial data includes the years between 2004 and 2016. In the same table, we report the summary statistics of the financial variables before and after the event of judicial administration. We observe that the JA status decreases by a large extent the performance (measured by EBITDA over total assets) and the turnover ratio and the sum

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<sup>4</sup>All Limited companies: public limited company, company limited by shares, limited liability company.

<sup>5</sup>Given the large variation and the potential problem of mis-reporting, in the empirical analysis we follow the literature and we winsorize the outcome variables.

between tangible and intangible assets (with the difference that is hardly statistically significant given the large between firms variation existing in these variables).

As for the geographical distribution of organized crime firms, from Table 4.2, we observe that Calabria is strongly over-represented. We do not see this information surprising given the strong presence of criminal organizations in the economy of Calabria and the strong action of the legal authority against these organizations in the region during the last twenty years (Arlacchi, 2010). Indeed, the results of (Transcrime, 2013) and (Ravenda et al., 2015b) on firms under judicial administration confirm the geographical distribution of our organized firms in the south of Italy. Figure 4.2 shows the industry in which these firms operate. Most of them are in the construction sector, a finding that is supported by (Savona and Berlusconi, 2015), but there are a number of other industries in which the number of organized crime firms treated by judicial administration is not negligible. Finally, Figure 4.3 reports the temporal distribution of the year in which organized firms entered the status of judicial administration. Overall, we have large variations in terms of outcomes of legal firms and type, industry and entry years of organized crime firms in our sample.

#### 4.4 Empirical Strategy

The empirical strategy takes advantage of the panel structure of the data by exploiting the variation across provinces, industries and years in the timing in which an organized crime firm enters the status of judicial administration (JA). Let denote with  $i$  the generic legal firms and with  $j$  the organized crime firm that is subject to JA. In our analysis, a firm is legal if it never enters the status of JA.<sup>6</sup> As an additional step for our analysis, we define the relevant market of each firm with the industry ( $s$ ) and the province ( $p$ ) in which the firm operates and is located. Thus, firms  $i$  and  $j$  operate in the same relevant market if they are located in the same province and operate in the same industry. Since the object of the empirical analysis is to estimate the spillover effect of JA on legal firms  $i \neq j$ , the units of observation in our analysis are only legal firms  $i$ . We stress that we are not interested to estimate the impact on legal firms  $i$  of having a firm  $j$  in the same market. Instead, we are interested in estimating the economic spillovers of JA – a provision of an enforcement law combating criminal organizations – on firms  $i$ . A firm subject to JA is likely a criminal firm well before the implementation of JA. Thus, our estimations should be interpreted as the effect of JA on legal firms  $i$ , conditional on having at least one criminal firm  $j$  in the same market.

Our main model is the following:

$$y_{ipst} = \alpha_{st} + \gamma_t + \delta_i + \sum_{\tau=-4}^4 \beta_{\tau} JA_{ps(t-\tau)} + \epsilon_{ipst}. \quad (4.1)$$

where  $y_{itps}$  is a time variant characteristic (performance, turnover, tangible and intangible assets) of firm  $i$  in year  $t$ , operating in province  $p$  and industry  $s$ , identified by the two-digit industry code. The first set of fixed effect  $\alpha_{st}$  controls for any unobserved industry specific shock taking place in each year (industry-by-year FE), such as demand shocks. The other set of fixed effects are  $\gamma_t$  and  $\delta_i$ , specifically year and firm FE. The key variable,  $JA_{tps}$ , is zero if no firm  $j$  in industry  $s$  and province  $p$  of firm  $i$  was subject to JA. It is equal to one in the year in which at least one firm  $j$

<sup>6</sup>We discuss the implications of this assumption below.

entered the status of JA. In this specification, the coefficients  $\beta_\tau$  for  $\tau < 0$  test for the presence of pre-trends, as they reflect the relationship between current changes in JA status and past firm outcomes. The coefficients  $\beta_\tau$  for  $\tau > 0$  capture dynamic treatment effects (if any), as they reflect the relationship between current changes in JA and future firm outcomes. Finally,  $\beta_\tau$  for  $\tau = 0$  captures the on-impact change in JA on firm performance. Note that we omit to include any other time variant firm characteristics in model 4.1 because any real or financial variable would be endogenous in the model (a bad control).<sup>7</sup>

The estimated coefficients  $\beta_\tau$  for  $\tau \geq 0$  in model 4.1 measure the spillover effect of JA for legal firms. The causal interpretation is based on a conditional independence assumption (CIA): conditional on the set of FE  $\alpha_{st}$ ,  $\gamma_t$  and  $\delta_i$ , the year of entry of an OC firm  $j$  into JA is exogenous to the performance of legal firms  $i$  in the same relevant market identified by industry  $s$  and province  $p$ . There are several facts that support this assumption. Investigations about criminal firms last several years. The moment in which a criminal firm enters JA is determined by the involvement of the firm into a criminal organization. The status of JA is ultimately decided by a committee of judges on the basis of the penal code and the evaluation of the specific case. It is important to point out that the Italian criminal justice system has a high variability in the disposition time across and within districts. For instance, in the 2003 the disposition time varied between 307 days in the judicial district of Trento to 1242 days in the judicial district of Ancona (Ministero della Giustizia and Direzione Generale di Statistica, 2003).<sup>8</sup> We do expect that part of the variation in the timing of entry into JA across sectors and provinces is due to exogenous judicial offices and judge fixed effects.

Apparently, there is no reason to believe that the moment in which a firm enters JA is correlated to the performance of other firms in the same market. Any concern that this decision is related to the market conditions of the legal firms is accounted by the inclusion in model 4.1 of industry-by-year, firm and year FE. A first set of diagnostic tests on the identifying assumption are readily available from model 4.1. The absence of pre-trends would be consistent with the identifying assumption. Specifically, we should see the leads to be close to zero and not statistically significant. A second set of diagnostic and placebo tests are presented after the main results.

For reasons of tractability and to gain in efficiency, we further explore the dynamics of the impact of JA on legal firms by estimating a variation of model 4.1:

$$y_{ipst} = \alpha_{st} + \gamma_t + \delta_i + \beta_{short\_term} JA_{ps(t-1,t-4)} + \beta_{long\_term} JA_{ps(t-5,t-N)} + \epsilon_{ipst}. \quad (4.2)$$

In this model, the coefficient  $\beta_{short\_term}$  measures the impact of at least one JA event in the short term ( $JA_{ps(t-1,t-4)}$  is equal to 1 in the first four years after a JA event and 0 otherwise), while  $\beta_{long\_term}$  measures the impact of at least one JA event in the long

<sup>7</sup>One challenge to identification of model 4.1 is that a JA event may bring about other type of enforcement interventions against crime that we are not able to observe. In this case we would attribute the effect of other interventions to JA, with the estimated effect that would be upward biased. However, unless these interventions are province and industry specific (namely, targeting only some specific industries in some provinces), the effect of other measures against organized crime should be absorbed by the large set of fixed effects.

<sup>8</sup>Even within the same region we observe variation in the disposition time. For instance, in the Lombardy region (the most populated region of Northern Italy) disposition times vary from 400 days in Milano to 860 in Brescia. There are both factors at the district level and the judge level that explains this variability. Indeed, even within districts we observe variation in the length of trial depending, as illustrated by Coviello et al., 2015, on the flexibility that each judge has in the organization of his working time.

run ( $JA_{ps(t-5,t-N)}$  is equal to 1 in the in the fourth year after a JA event up to last year in our sample).<sup>9</sup>

As a final note, we point out the main difference with the empirical design of our closest paper (Fabrizi et al., 2018). In that paper, the authors use a diff-in-diff strategy where the treatment group is composed of firms in cities and industries in which a police operation took place. The control group is composed of firms in the same cities of the treated firms but in different industries. Fabrizio et al., 2018 implicitly assume a parallel trend assumption between firms in the control and treatment groups and do not use firm and cities fixed effects. Our strategy is different in that it exploits within-firm variation controlling for a number of shocks at the year and industry-by-year level.

## 4.5 Results

### Basic results

We start by estimating model 4.1 using as dependent variable a commonly used measure of performance, namely the earnings before interest, tax, depreciation and amortization (EBITDA) normalized by total assets (for example see Mitton, 2006 and Andres, 2008). In all the estimations errors are clustered at the firm level. Following the literature, we winsorize outliers of the dependent variable at 1 percent. Finally, model 4.1 is estimated with OLS.

In Figure 4.4 we report the point estimates on the leads and on the lags of model 4.1.<sup>10</sup> We observe that there is no clear pattern for the leads: the point estimates are close to zero and not precisely estimated. On the other hand, we observe that firm's performance measured by the EBITDA over total assets increases following a JA event. In particular, after the first year (first lag) the EBITDA normalized by total assets increases by 0.0017, namely by 2.2 percent relative to the average in the sample.

Next, we analyze the impact of JA on turnover normalized by total assets. Figure 4.5 reports the results of model 4.1. The point estimates on the leads, with the exception of the fourth one, are not precisely estimated and do not show again any particular empirical pattern. Firm turnover seems to increase two years after a JA event. The coefficient on turnover implies an average modest increase between the 0.7 and 1 percent per year. Finally, Figure 4.6 shows the results when the outcome is the sum of intangible and tangible assets normalized by total assets. From Figure 6 we observe that there is no evidence that on average firms increase their tangible and intangible assets after a JA event. If anything, the only coefficient that is precisely estimated is negative. However, we will see that this result masks a substantial degree of heterogeneity. From the results presented in the next section, it appears that when we take into account the number of firms entering JA and the market structure, there are strong spillover effects.

From this first set of results, we draw two preliminary conclusions. First, the identifying assumption is supported by the data in that there are no clear pre-trends of JA on the three variables that we considered (performance, turnover and tangible and intangible assets). Second, following a JA event, legal firms become more profitable and modestly increase their turnover. For the moment, it seems that there is

<sup>9</sup>Note that in model 4.1 and 4.2 we treat in the same way whether one or more firms enter the status of JA. In the next section we explore the heterogeneity of the effect with respect to the number of criminal firms entering the status of JA.

<sup>10</sup>Leads and lags are estimated separately to preserve a meaningful number of observations.

no effect on assets. Note that from Figure 4.4,4.5,4.6, the presence of firm fixed effects in model 4.1 implies that a positive and precisely estimated lag moves permanently the level of the dependent variable above the average level (unless we observe a negative and precisely estimated effect in subsequent lags).

Hence, as an additional step, we investigate if the spillover effect observed in the first four years following a JA event is vanished in subsequent years. We do this by estimating model 4.2, where the first coefficient ( $\beta_{short\_term}$ ) captures the average effect of the first four lags in model 4.1 and the second coefficient ( $\beta_{long\_term}$ ) captures the effect of a JA event in the long-run. Table 4.3 reports the results. To understand better the role of unobserved heterogeneity at the firm and the industry-by-year level, for each dependent variable we present three specifications by excluding firm and industry-by-year FE. Hence, while the relevant columns to look at are 3, 6 and 9 (in which we control for the full set of FE), the comparison with other columns helps to understand the extent of unobserved heterogeneity. We note that such unobserved heterogeneity – especially at the firm level – is very severe and causes a downward bias of the coefficients when we consider firms' performance and turnover (compare column 3 with 1 and 2 and column 6 with 5 and 4).

When we focus on the relevant columns (3, 6 and 9), as for the short-term effect (coefficient  $\beta_{short\_term}$  in model 4.2), we observe a positive and in some cases statistically significant impact of a JA event. As for the long-run effect (coefficient  $\beta_{long\_term}$  in model 4.2), there is some indication that the effect is positive especially for the EBITDA and the turnover, but the coefficients are associated to large standard errors (especially in column 9). From these results, we conclude that the increase in performance and turnover following a JA event takes place in the first years after the event.

#### 4.5.1 Additional results

In the previous analysis, we analyzed JA events as discrete events without considering the number of entries into the JA status per year. In fact, it is quite common in our sample that in a given year and industry, more than one criminal firm enters the status of judicial administration. Conditional on having at least one firm subject to JA in a given relevant market, the average number of firms in a JA status is 6. Here, we re-estimate model 4.2 by adding the number of firms entering JA and interacting this variable with  $JA_{ps(t-1,t-4)}$  and  $JA_{ps(t-5,t-N)}$ . Specifically, the model we estimate is:

$$y_{ipst} = \alpha_{st} + \gamma_t + \delta_i + \beta_{short\_term} JA_{ps(t-1,t-4)} + \beta_{long\_term} JA_{ps(t-5,t-N)} + \gamma_1 N\_JA_{pst} + \gamma_2 JA_{ps(t-1,t-4)} \times N\_JA_{pst} + \gamma_3 JA_{ps(t-5,t-N)} \times N\_JA_{pst} + \epsilon_{ipst}, \quad (4.3)$$

where  $N\_JA_{pst}$  is the number of criminal firms subject to JA (varying at the year-province-industry level) and  $\gamma_2$  and  $\gamma_3$  are the coefficients that capture the intensive margin of JA. Panel A of Table 4.4 reports the estimated coefficients of model 4.3. Recall that  $JA_{ps(t-1,t-4)}$  and  $JA_{ps(t-5,t-N)}$  are dummies equal to 1 in the first four years after a JA event and between the fifth year after a JA event until the last year in which a firm is present in the sample, respectively. The interaction of these variables with the number of firms in the JA status ( $N\_JA_{pst}$ ) should be interpreted as the effect of the *number* of JA events on legal firms' outcome variable in the short and in the long run. Thus, the coefficients of interest in model 4.3 are  $\gamma_2$  and  $\gamma_3$ . With

one exception, these estimated interaction effects are positive, consistently with the idea that the spillover effect of JA is increasing with the number of firms that were targeted by enforcement law.

To understand the total spillover effect of a given number of firm entries in JA in the short run, we should sum up the estimated coefficient  $\beta_{short\_term}$  and the estimated coefficient  $\gamma_2$  multiplied by the number of firms entering JA. As for the long run, we should sum up  $\beta_{long\_term}$  and the estimated coefficient  $\gamma_3$  multiplied by the number of firms entering JA. Panel B of Table 4.4 reports this exercise for a number of firms entering JA equal to 2, 4 and 6. As we can see in column 1, we observe a strong and statistically significant spillover effects on EBITDA in the long-run, while in the short-run there is a precisely estimated effect only for the first two firms entering the JA status. From column 2 where the outcome is the turnover, the spillover effects are positive but only marginally significant. Finally, from column 3, where the outcome is the investment in tangible and intangible assets, we observe a strong and precisely estimated spillover effect in the first four years after a JA event that – given the large interaction effect in Panel A – strongly increases with the number of firms entering JA. For example, the entry of two firms in JA increases investments in tangible and intangible assets by 0.7 percent.

Next, we show how the spillover effect varies with respect to the market structure in which the organized crime firms targeted by JA operate. We focus on the degree of competition in a market proxied by the number of firms existing in a given province and industry. In particular, for each year and industry, we compute the median, the 25th and the 75th percentile of the number of firms in our sample. We normalize these numbers by the total number of firms in a province. With this procedure, we have an industry-province specific distribution of the number of firms that is normalized by the total number of firms in a province. Hence, each firm in a given year, province and industry has associated a number that reflects the number of competing firms.

Hence, we estimate model 2 along the distribution of market competitiveness. Table 4.5 reports the results from this empirical exercise. Despite the lack of precision in several estimates, we observe that the spillover effects are never concentrated in markets characterized by the largest number (normalized) of firms. In markets where the degree of competition is high (captured by a high number of firms), the effects are modest and sometimes negative (see for example column 4 of Table 4.5). Here are two possible and not mutually exclusive explanations for these results. First, markets characterized by few firms are dominated by a criminal organization that succeeded to create entry barriers. In this type of market, the removal of the criminal connection to a former criminal firm has a larger effect. Second, in markets with few firms, the removal of the criminal connection of an organized crime firm is relatively more important than in markets with a large number of firms.

#### 4.5.2 Threats to identification and robustness checks

In the absence of an experimental design, identification of the spillover effects of JA is based on a conditional independence assumption discussed in Section 4, namely that conditional on the large set of fixed effects the timing of entry into JA is exogenous to legal firms' outcomes. This assumption excludes the possibility of industry specific province shocks correlated to entry into JA and to the performance of legal firms. As we have seen, the fact that in Figure 4.4,4.5,4.6 we do not observe a clear pattern of the leads supports the identifying assumption. However, there are several issues with identification. First, we made the hypothesis that a firm is legal if



it never enters the status of *JA*. In fact, we may have several organized crime firms not entering the status of *JA* in our sample period. These firms can benefit from other firms entry in *JA* not because they are legal but precisely because they are criminal and start to play the role of the former organized crime firms. We expect that the number of these firms is low with respect to the total number of firms in each province and industry. Hence we see unlikely that the results are affected or completely determined by the presence of these firms.

Second, the trends in *JA* at the industry-province-year level may mask unobserved trends in profitability of legal firms. To affect our results, however, these unobserved trends must be province specific since we already condition for industry-by-year FE. We cannot address this concern by including province-by-industry-by-year FE because they would absorb our key variable, but we can at least include region-by-industry-by-year. Figure B.1, B.2, B.3 in Appendix B replicate Figure 4.4, 4.5, 4.6 but including region-by-industry-by-year FE instead of industry-by-year FE. By comparing Figure 4.4, 4.5, 4.6 and B1-B3, we see that we lose precision in the latter figures, but the results are essentially unchanged. This type of evidence reassures us that trends in *JA* are not associated with unobserved factors affecting firms' profitability.

## 4.6 Conclusions

In this paper, we have analyzed the effect of a focused-asset policy targeting organized crime firms. In particular, we have evaluated the provision of a law passed in 1982 in Italy that introduced the possibility to confiscate criminal productive assets. Under the provision of the law, the criminal firm enters the status of judicial administration with an external manager nominated by the legal authority. In practice, a criminal firm entering the status of judicial administration continues to exist but breaks any link with the criminal organization.

Using data on financial measures on a universe of all limited companies in the four largest regions in the south of Italy, we have evaluated the impact of a firm entering in the status of judicial administration on the other firms. Evaluating measures such as performance (captured by EBITDA normalized by total assets), size (captured by turnover normalized by total assets) and investments, we have found that a *JA* event in a given province and industry increases all three measures. The spillover effects are small if we consider the single firm, but they are very large if we look at the total number of firms in a market. The empirical strategy is based on yearly variation in the exposure of legal firms to *JA* events targeting organized crime firms. The panel structure of the data has allowed us to control for a large set of fixed effects at the industry, year and firm level that should absorb confounding effects.

This paper is a first attempt to estimate the indirect effects of an enforcement law that confiscate productive criminal assets. As such, it contributes to an emerging literature on the economic effects of organized crime by using firm level data. The paper also presents some limitations. First, several estimated effects go in the expected direction but are not always precisely estimated, a circumstance that limits the conclusions of the empirical analysis. Second, the causal interpretation of the results is based on the assumption that conditional on firm, year-by-industry and year fixed effects, the year of entry of organized crime firms into *JA* is exogenous. While we have produced evidence in support of this assumption, there are a number of scenarios in which this assumption may fail. Future research should exploit natural

experiments to further investigate the spillover effects of enforcement laws targeting productive criminal assets.

## Tables and Figures

TABLE 4.1: Legal firms – Summary statistics and geographical distribution

Panel A				
Firm characteristics	Mean	St Dev	Min	Max
Ebitda/total assets*	-0.0757	142.8453	-134892	2731.913
Turnover**	1.4333	93.445	2.03e-08	86245
Total assets	2032.858	16766.12	0.001	2257537
(Tangible + Intangible Assets)/ total assets	0.5364	9.2280	-17.9360	5606.304
Employees	8.7581	164.4324	0	143017
Panel B				
Geographical distribution	Number of obs	Percentage	Number of firms	Percentage
Apulia	246,596	27,63	46,268	25.24
Calabria	89,824	10.07	17,577	9.59
Campania	295,423	33.08	69,937	38.15
Sicily	260,927	29.23	49,520	27.02
Total	892,770	100	183,302	100

Notes. Summary statistics and geographical distribution for legal firms are reported.

\* Ebitda is calculated as earnings before interest, tax, depreciation and amortization.

\*\* Turnover is the ratio between total revenue and total assets

TABLE 4.2: Organized Crime Firms – Summary statistics and geographical distribution

Panel A				
Firm characteristics	(1) Mean	(2) Before JA	(3) After JA	(4) Difference
Ebitda/ total assets*	0.0354 (0.47194)	0.0470 (0.52294)	0.0108 (0.3374)	0.0361* (1.71)
Turnover**	1.0725 (4.5634)	1.1539 (5.0685)	0.8994 (3.2329)	0.255 (1.32)
Total assets	8788.2 (49447.88)	9853.298 (50314.68)	6443.218 (47428.69)	3410.1* (1.66)
(Tangible + Intangible Assets) / total assets	0.3293 (0.8748)	0.3121 (0.9314)	0.3661 (0.7390)	-0.0540 (-1.38)
Employees	15.6149 (91.1245)	17.7973 (110.2086)	11.5384 (33.276)	6.259 (1.56)

Panel B				
Geographical distribution	Region	AIDA source	Other sources	Total Number
	Apulia	4	3	7
	Calabria	252	13	265
	Campania	1	14	15
	Sicily	43	99	142
Total		300	129	429

Notes. Summary statistics in Panel A and geographical distribution for criminal firms entering the JA status in Panel B are reported. In columns (1)-(2)-(3) of Panel A standard deviation in parenthesis. In column (4) of Panel A t-statistics of the difference between the variables in column (2) and (3). Other sources in Panel B are online newspapers.

\* Ebitda is calculated as earnings before interest, tax, depreciation and amortization.

\*\* Turnover is the ratio between total revenue and total assets

TABLE 4.3: Dynamic Effects of Judicial Administration (JA)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Ebitda	Ebitda	Ebitda	Turnover	Turnover	Turnover	Assets	Assets	Assets
$JA_{ps(t-1,t-4)}$ (short-run effect)	-0.0088*** (0.0008)	-0.0003 (0.0012)	0.0018 (0.0012)	-0.1462*** (0.0061)	-0.0078 (0.0049)	0.0101** (0.0051)	-0.0656*** (0.0023)	0.0003 (0.0016)	-0.0022 (0.0016)
$JA_{ps(t-5,t-N)}$ (long-run effect)	-0.0061*** (0.0020)	-0.0021 (0.0025)	0.0013 (0.0025)	-0.0364*** (0.0133)	-0.0104 (0.0101)	0.0123 (0.0104)	-0.0423*** (0.0049)	0.0037 (0.0034)	0.0015 (0.0034)
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Firm FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Sector-by-year FE	NO	NO	YES	NO	NO	YES	NO	NO	YES
Observations	892,770	892,770	892,770	892,770	892,770	892,770	892,550	892,550	892,550
R-squared	0.0005	0.5533	0.5537	0.0026	0.7869	0.7874	0.0020	0.8930	0.8931
Number of Firms	183302	183302	183302	183302	183302	183302	183282	183282	183282

Notes. Dependent variable are indicated in the first row: ebitda (1-3), turnover (4-6), and tangible plus intangible assets over total assets (7-9). The estimated coefficients are from model 2 in the text. Models estimated are with OLS. Standard errors clustered at the firm level are in parentheses. Significance at the 10% level is represented by \*, at the 5% level by \*\*, and at the 1% level by \*\*\*.

TABLE 4.4: Dynamic Effects of Judicial Administration (JA) - number of firms under judicial administration

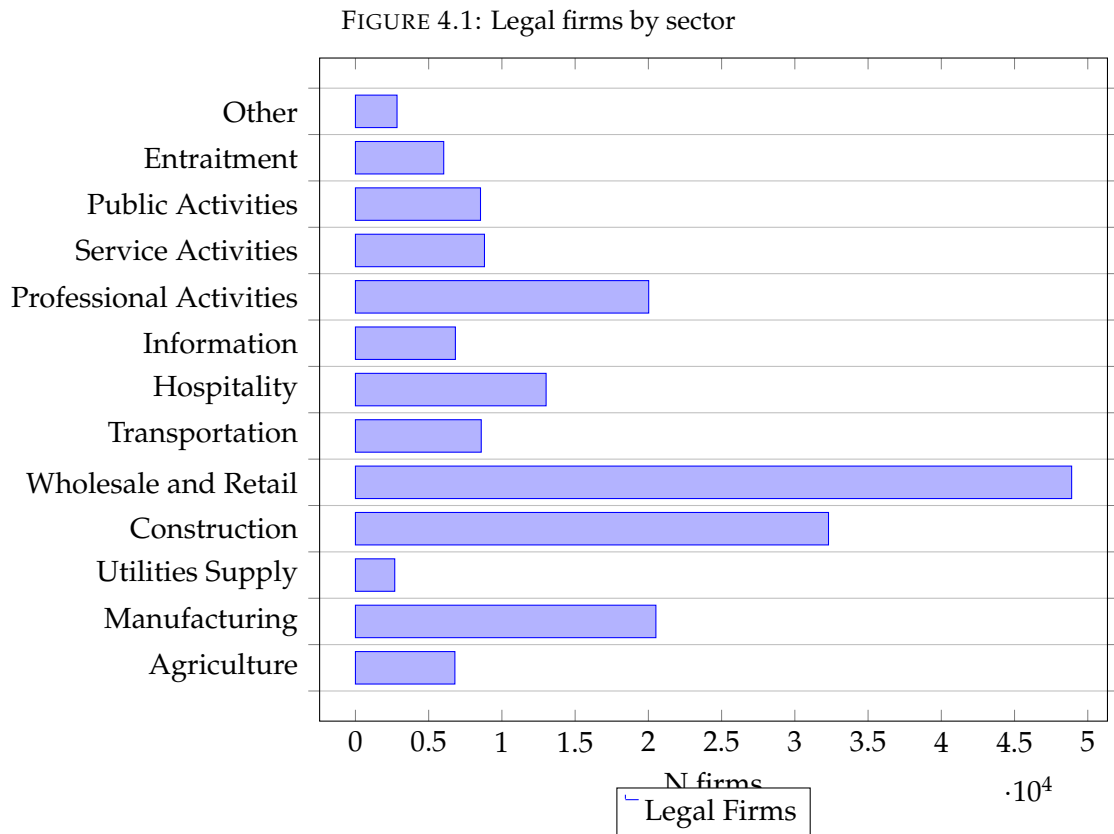
	(1)	(2)	(3)
Panel A	Ebitda	Turnover	Assets
$JA_{ps(t-1,t-4)}$ (short-run effect)	0.0024** (0.0012)	0.0099* (0.0053)	-0.0043*** (0.0016)
$JA_{ps(t-5,t-N)}$ (long-run effect)	0.0051*** (0.0016)	0.0120* (0.0070)	0.0009 (0.0020)
N_JA (number of criminal firms in JA)	-0.0006 (0.0008)	0.0007 (0.0031)	-0.0039*** (0.0008)
$JA_{ps(t-1,t-4)} \times N\_JA$	0.0005 (0.0008)	0.0001 (0.0033)	0.0040*** (0.0008)
$JA_{ps(t-5,t-N)} \times N\_JA$	0.0003 (0.0004)	-0.0006 (0.0018)	0.0001 (0.0003)
Year FE	YES	YES	YES
Firm FE	YES	YES	YES
Sector-by-year	YES	YES	YES
Observations	892,770	892,770	892,550
R-squared	0.5537	0.7874	0.8931
Number of Firms	183302	183302	183282
Panel B			
$JA_{ps(t-1,t-4)} + JA_{ps(t-1,t-4)} \times N\_JA, (N\_JA = 2)$ (total effect of having 2 firms in JA in the first four years)	0.0033** (0.0016)	0.0102 (0.0063)	0.0037** (0.0016)
$JA_{ps(t-1,t-4)} + JA_{ps(t-1,t-4)} \times N\_JA, (N\_JA = 4)$ (total effect of having 2 firms in JA in the first four years)	0.0042 (0.0029)	0.0105 (0.0117)	0.0117*** (0.0029)
$JA_{ps(t-1,t-4)} + JA_{ps(t-1,t-4)} \times N\_JA, (N\_JA = 6)$ (total effect of having 6 firms in JA in the first four years)	0.0052 (0.0045)	0.0107 (0.0180)	0.0196*** (0.0044)
$JA_{ps(t-5,t-N)} + JA_{ps(t-5,t-N)} \times N\_JA, (N\_JA = 2)$ (total effect of having 2 firms in JA from the fifth year)	0.0056*** (0.0015)	0.0107 (0.0068)	0.0012 (0.0018)
$JA_{ps(t-5,t-N)} + JA_{ps(t-5,t-N)} \times N\_JA, (N\_JA = 4)$ (total effect of having 4 firms in JA from the fifth year)	0.0062*** (0.00178)	.0095 (0.0083)	0.0014 (0.0017)
$JA_{ps(t-5,t-N)} + JA_{ps(t-5,t-N)} \times N\_JA, (N\_JA = 6)$ (total effect of having 6 firms in JA from the fifth year)	0.0067*** (0.0023)	0.0082 (0.0108)	0.0017 (0.0020)

Notes. Dependent variable are indicated in the first row: ebitda (1), turnover(2), and tangible plus intangible assets over total assets (3). Estimated coefficients from model 2 in the text. Models estimated are with OLS. Standard errors clustered at the firm level are in parentheses. Significance at the 10% level is represented by \*, at the 5% level by \*\*, and at the 1% level by \*\*\*.

TABLE 4.5: Dynamic Effects of Judicial Administration (JA)-  
differential effects and market structure

	(1)	(2)	(3)	(4)
	Ebitda	Ebitda	Ebitda	Ebitda
Panel A	Number of firms			
	1st quartile	2nd quartile	3rd quartile	4th quartile
$JA_{ps(t-1,t-4)}$	0.0112*** (0.0036)	0.0039 (0.0045)	0.0004 (0.0020)	-0.0016 (0.0025)
$JA_{ps(t-5,t-N)}$	0.0092* (0.0055)	0.0009 (0.0061)	0.0105*** (0.0030)	0.0024 (0.0024)
Observations	223,177	223,291	223,014	223,288
R-squared	0.5776	0.5999	0.6060	0.5742
Number of Firms	54161	56816	57656	53313
	Turnover	Turnover	Turnover	Turnover
Panel B	1st quartile	2nd quartile	3rd quartile	4th quartile
$JA_{ps(t-1,t-4)}$	-0.0013 (0.0130)	0.0365** (0.0153)	0.0233** (0.0092)	0.0036 (0.0138)
$JA_{ps(t-5,t-N)}$	-0.0199 (0.0184)	0.0385* (0.0222)	0.0642*** (0.0133)	0.0032 (0.0130)
Observations	223,177	223,291	223,014	223,288
R-squared	0.7945	0.7965	0.8101	0.8141
Number of Firms	54161	56816	57656	53313
	Assets	Assets	Assets	Assets
Panel C	1st quartile	2nd quartile	3rd quartile	4th quartile
$JA_{ps(t-1,t-4)}$	0.0116*** (0.0043)	-0.0029 (0.0043)	-0.0091*** (0.0027)	-0.0035 (0.0029)
$JA_{ps(t-5,t-N)}$	0.0043 (0.0070)	-0.0032 (0.0063)	0.0032 (0.0033)	0.0006 (0.0029)
Observations	223,070	223,237	222,977	223,266
R-squared	0.8980	0.9101	0.9137	0.9028
Number of Firms	54147	56812	57652	53311

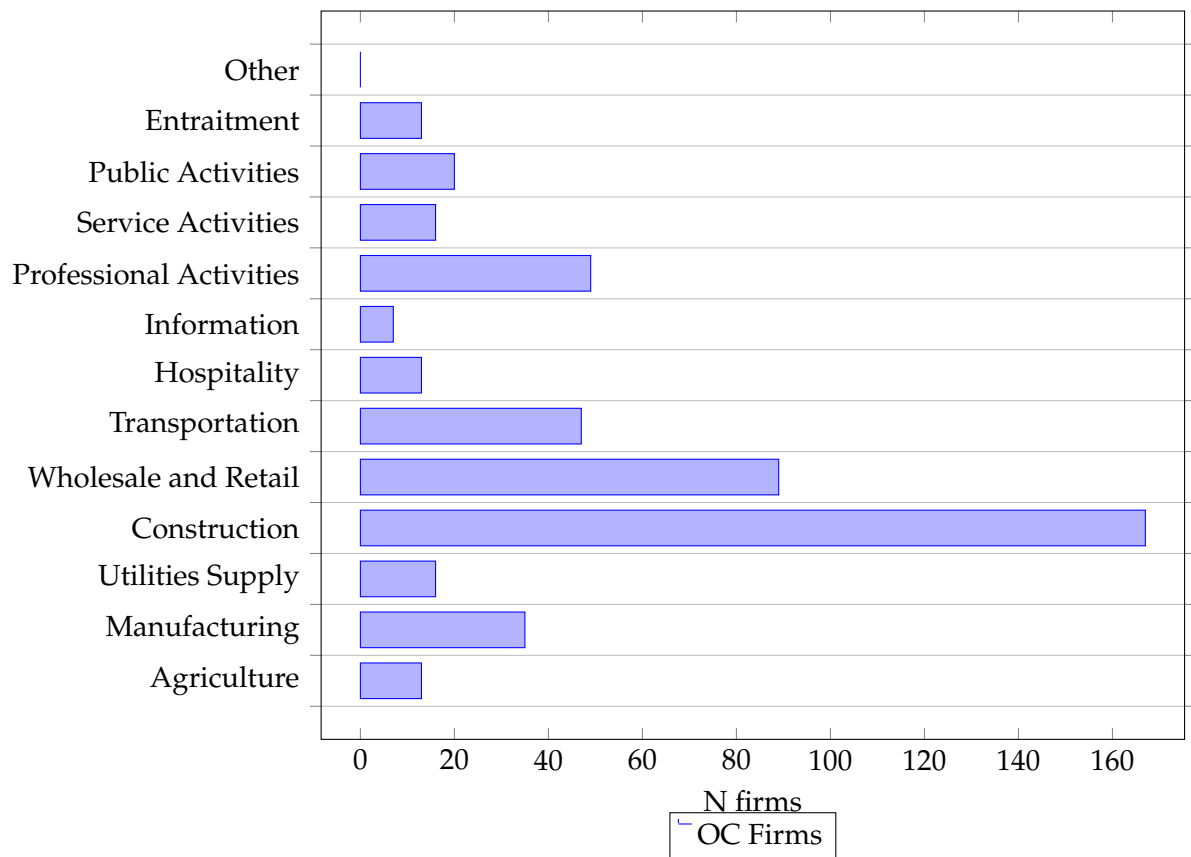
Notes. Estimated coefficients from model 2 in the text for each quartile of the total number of firms per province and industry normalized by the total number of firms in each province. Dependent variable in Panel A is ebitda, in Panel B turnover and in Panel C tangible plus intangible assets over total assets. Models estimated are with OLS. Standard errors clustered at the firm level are in parentheses. Significance at the 10% level is represented by \*, at the 5% level by \*\*, and at the 1% level by \*\*\*.



Notes: The figure reports the number of legal firms by sector.

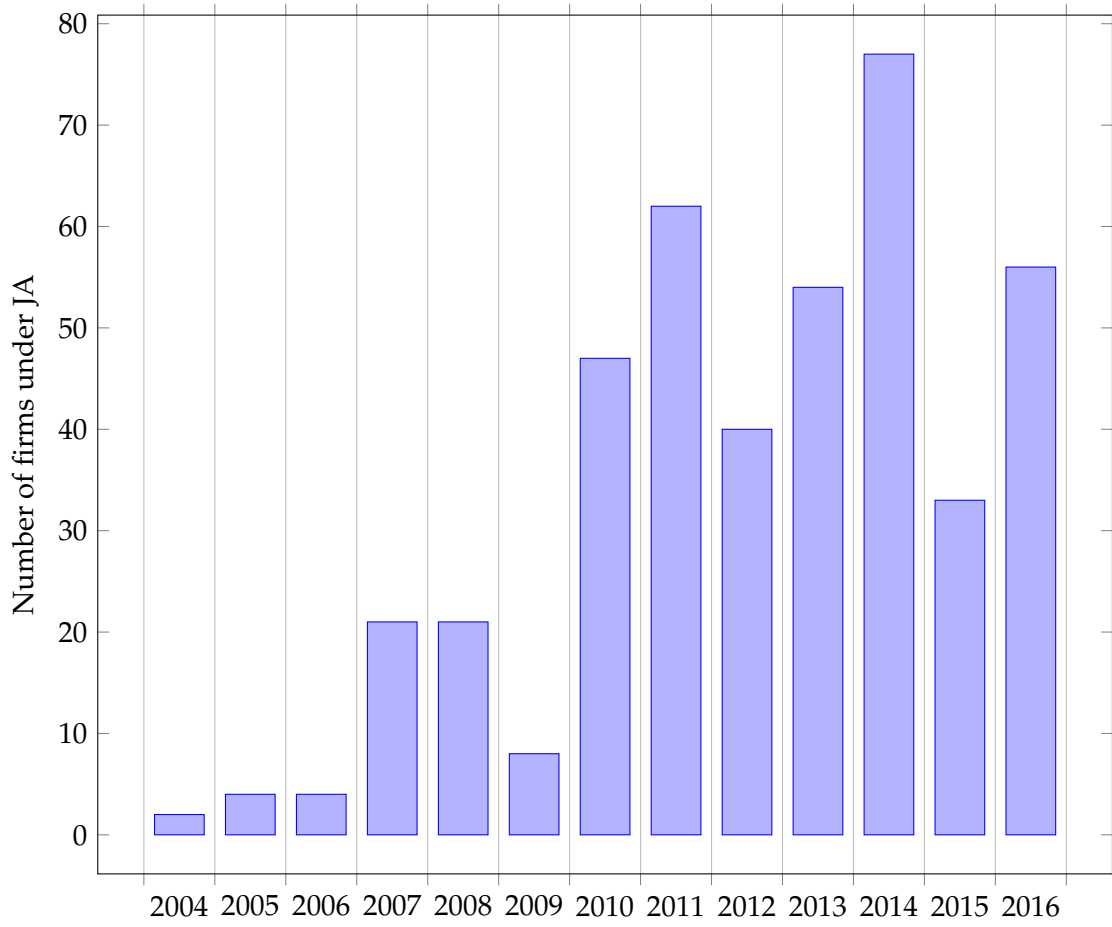


FIGURE 4.2: Criminal firms under JA by sector



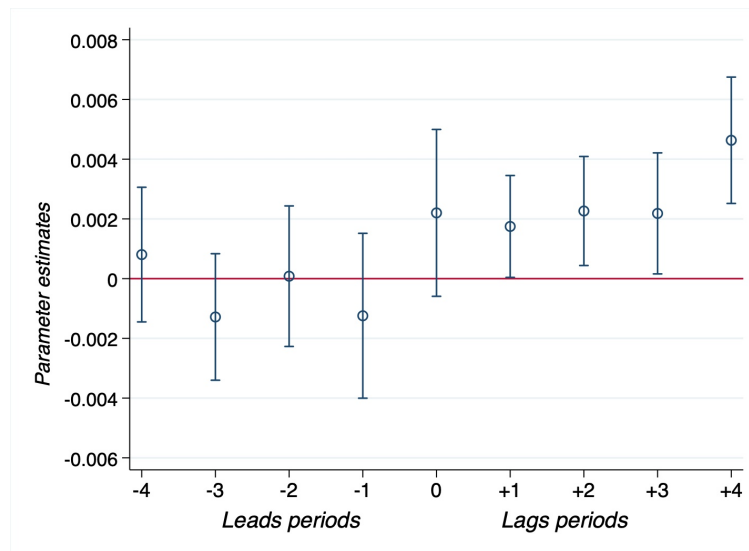
Notes: The figure reports the number of criminal firms subject to judicial administration by sector.

FIGURE 4.3: Number of criminal firms subject to JA by year



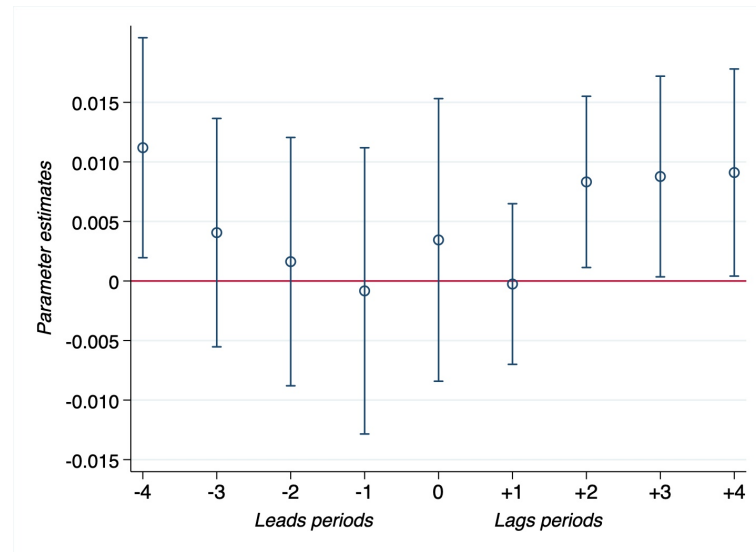
Notes: The figure reports the number of firms subject to judicial administration by year.

FIGURE 4.4: Ebitda over total asset: dynamic effect of judicial administration on legal firms



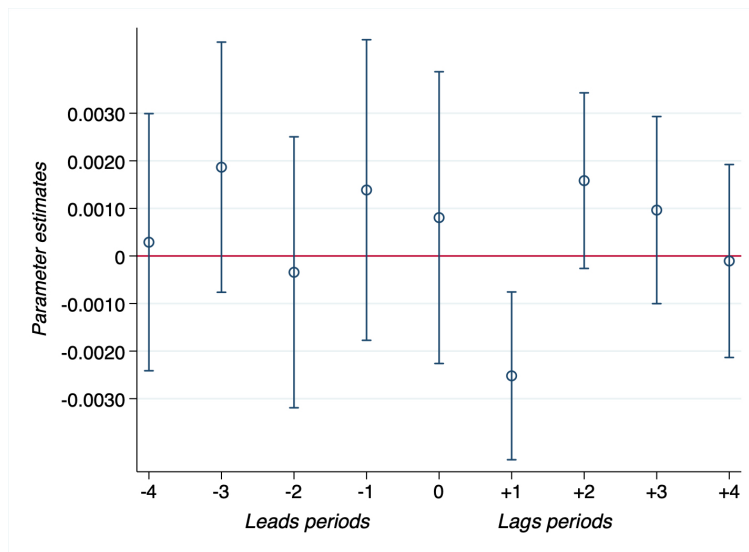
Notes: Dependent variable: EBITDA over total assets. Regression coefficients of 4 (yearly) leads and 4 (yearly) lags with respect to the year of entry of a criminal firm into judicial administration (model 1). Bars represent 90 percent confidence intervals. Standard errors are clustered at the firm level.

FIGURE 4.5: Turnover: dynamic effect of judicial administration on legal firms



Notes: Dependent variable: turnover. Regression coefficients of 4 (yearly) leads and 4 (yearly) lags with respect to the year of entry of a criminal firm into judicial administration (model 1). Bars represent 90 percent confidence intervals. Standard errors are clustered at the firm level.

FIGURE 4.6: Tangible and intangible assets over total assets



Notes: Dependent variable: (Tangible assets + intangible assets) over total assets. Regression coefficients of 4 (yearly) leads and 4 (yearly) lags with respect to the year of entry of a criminal firm into judicial administration (model 1). Bars represent 90 percent confidence intervals. Standard errors are clustered at the firm level.



## Appendix A

# Appendix - Chapter 3

Following Pitt and Lee (1981), the stochastic frontier model for panel data can be written as:

$$y_{it} = \alpha + \beta' x_{it} + v_{it} \pm u \quad (\text{A.1})$$

Where  $y_{it}$  is the performance expressed in profit or cost forms of firm  $i$  in period  $t$ ,  $x_{it}$  is the vector of inputs or prices,  $v_{it}$  is the statistical noise term zero mean and constant variance, and  $u$  is a one-sided strictly non-negative term representing inefficiency which follows a half-normal distribution, that is,  $u_{it} \sim iidN + (0, \sigma_u^2)$ . The sign of the  $u$  term is positive or negative according to whether the frontier defines a cost or production function, respectively.

All time-varying models are characterized by the same intercept  $\alpha$  across productive units. This assumption is a cause of misspecification bias, when in the case of time-invariant unobservable factors, unrelated to the production process but related to the output. Consequently, the inefficiency term can capture the influence of these factors, producing biased results (Belotti, Daidone, et al., 2013).

However, the analysis provided in chapter 3 used a Greene approach, using time-varying model. Indeed, Greene (2005) approached the misspecification issue through a time-varying model that can be expressed as:

$$y_{it} = \alpha_i + \beta' x_{it} + v_{it} \pm u_{it} \quad (\text{A.2})$$

Considering the specific intercept  $\alpha_i$  intended to capture all time-invariant heterogeneities. Using this specification time-varying inefficiency are disentangled by unit specific time-invariant unobserved heterogeneity. Accordingly, depending on the assumptions on the unobserved unit-specific heterogeneity, Greene defined these models as "true" fixed (TFE) or random-effects (TRE). Following Greene (2005), the log-likelihood function for the true fixed-effects stochastic frontier model is expressed as:

$$\log L = \sum_{i=1}^N \sum_{t=1}^T \log \left[ \frac{2}{\sigma} \Phi \left( -\lambda \left( \frac{y_{it} - \alpha_i - x_{it}\beta}{\sigma} \right) \right) \phi \left( \left( \frac{y_{it} - \alpha_i - x_{it}\beta}{\sigma} \right) \right) \right] \quad (\text{A.3})$$

where  $\phi(\cdot)$  and  $\Phi(\cdot)$  are the probability and cumulative density functions of a standard normal distribution respectively;  $\sigma = \sqrt{\sigma_u^2 + \sigma_v^2}$  is the standard deviation of the composite error term  $\varepsilon_{it} = v_{it} - u_{it}$  and  $\frac{\sigma_u}{\sigma_v}$  is the ratio of inefficiency standard deviation to noise standard deviation.

As Greene (2005) argued, it is required the simultaneous estimation of all  $N+K+2$  parameters because no transformation or conditioning operation will produce a likelihood function that is free of the fixed effects. The variance parameters for this half-normal model are given by  $\Lambda^2 = \frac{\sigma_u^2}{\sigma_v^2} \geq 0$ . If  $\Lambda = 0$ , there are no technical

inefficiency consequences, and all the deviation from the production function are caused by noise. The error term  $u_{it}$  is the log-difference between the maximum output and the actual output; hence, the technical inefficiency is equal to the percentage by which the actual output could increase without adding inputs. The efficiency index (TE) of firm  $i$  in year  $t$  could be written as:

$$TE_i = \frac{y_i}{\exp(x_i\beta + v_i)} = \frac{\exp(x_i\beta + v_i - u_i)}{\exp(x_i\beta + v_i)} = \exp(-u_i) \quad (\text{A.4})$$

where  $0 \leq TE_i \leq 1$ .

It indicates the ratio of realized production over the maximum technical output obtainable for a firm (when there is not inefficiency).

The ML estimation of the true fixed effects variant presents more problem than the true random effects that can be conveniently estimated using simulation-based techniques. The two main issues of the true fixed effects are related to the estimation of nonlinear panel data models. One is mostly computational considering the extensive dimension of the parameters space. The second one regards the incidental parameters problem that results when the number of units is somewhat large compared to the dimension of the panel. In both cases, since only  $T_i$  observations are used to estimate each unit specific parameter,  $\alpha_i$  are inconsistently determined as  $N \rightarrow \infty$  with fixed  $T$  (Lancaster, 2000; Neyman, Scott, et al., 1948). Since this inconsistency biases mostly the variance parameters, which constitute the key ingredients in the post-estimation of inefficiencies as shown Belotti and Ilardi (2012), the maximum-likelihood dummy variable (MLDV) approach is applied correctly when  $T \geq 10$  (the length of the panel is large).

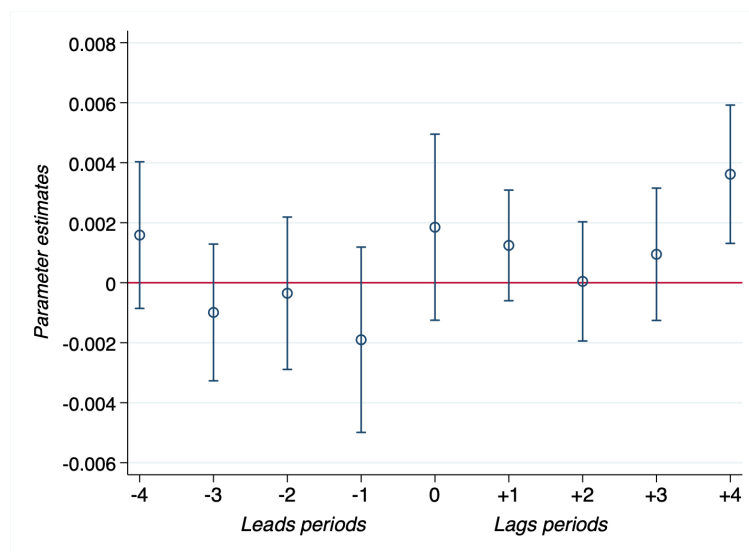
The Greene model has advantages mainly for two reasons. The TFE models disentangle firm effects (fixed or random) from inefficiency, where inefficiency can either be independent and identically distributed or can be a function of exogenous variables. Secondly, it takes into account for unobserved heterogeneity, such that systematic differences between firms are considered by including a firm-specific fixed effect,  $\alpha_i$ , which accounts for firm-specific characteristics not captured by the included variables.



## Appendix B

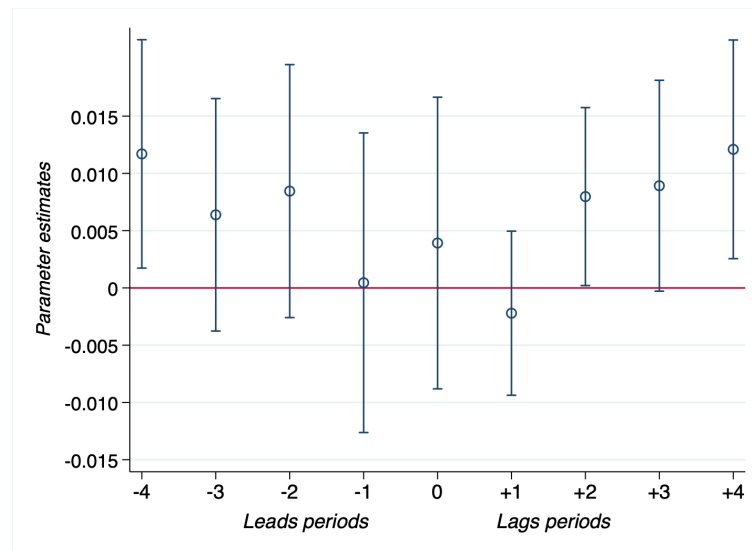
# Appendix - Chapter 4

FIGURE B.1: Ebitda over total asset: dynamic effect of judicial administration on legal firms



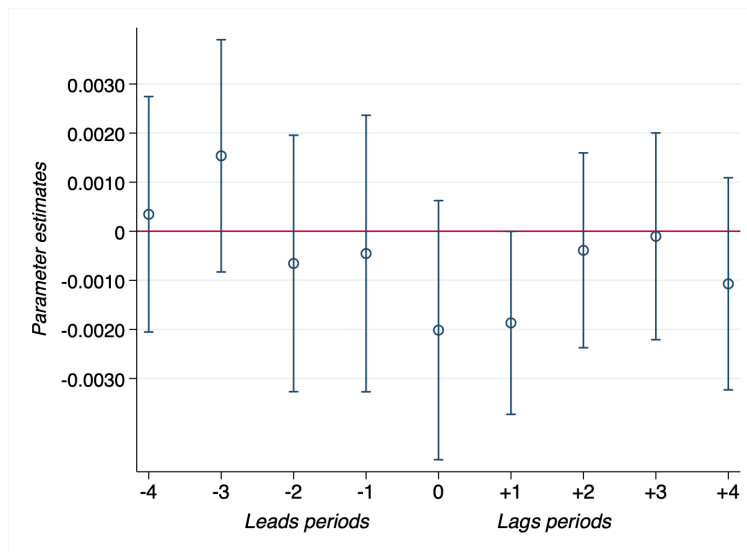
Notes: Dependent variable: EBITDA over total assets. Regression coefficients of 4 (yearly) leads and 4 (yearly) lags with respect to the year of entry of a criminal firm into judicial administration (model 1 including region-by-year-by industry FE instead of year-by-industry FE). Bars represent 90 percent confidence intervals. Standard errors are clustered at the firm level.

FIGURE B.2: Turnover: dynamic effect of judicial administration on legal firms



Notes: Dependent variable: EBITDA over total assets. Regression coefficients of 4 (yearly) leads and 4 (yearly) lags with respect to the year of entry of a criminal firm into judicial administration (model 1 including region-by-year-by industry FE instead of year-by-industry FE). Bars represent 90 percent confidence intervals. Standard errors are clustered at the firm level.

FIGURE B.3: Tangible and intangible assets over total assets



Notes: Dependent variable: EBITDA over total assets. Regression coefficients of 4 (yearly) leads and 4 (yearly) lags with respect to the year of entry of a criminal firm into judicial administration (model 1 including region-by-year-by industry FE instead of year-by-industry FE). Bars represent 90 percent confidence intervals. Standard errors are clustered at the firm level.



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