CHARACTERISTICS OF ITALIAN FIRMS IN THE JUDICIAL ADMINISTRATION: CAN FINANCIAL RATIOS BE RED FLAGS OF CRIMINAL INFILTRATIONS?

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Abstract

In recent years, the importance of studying criminal infiltration in firms, especially in the context of accounting practice, cannot be underestimated. The paper aims to analyse firms under judicial administration (JA) to better understand where firms operate by investigating whether certain financial ratios can serve as red flags indicating criminal infiltration. The study examines a sample of 108 firms operating in the Italian context undergoing JA. Findings show that most of the firms were small, located in the south of Italy, structured as limited liability companies, active but undergoing insolvency procedures, and operating in the construction, wholesale and retail trade, car and motorcycle repair, rental, travel agencies, business support services, and real estate sectors. The analysis shows that firm size, performance, and debt can be used as red flags to indicate criminal infiltration. The results provide useful insights for understanding how accounting practices can help to identify criminal infiltration in firms.

Keywords: Accounting, Infiltrated Firms, Financial Ratios, Judicial Administration

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1. INTRODUCTION

In recent years, research on criminal infiltration has explored the impact of illegal activity from different perspectives. Some studies have analysed the phenomenon of criminal infiltration worldwide, others have focused on the impact of criminal organizations on the socio-economic context, and the last ones have examined the relationship between criminal organizations and firms.

To our knowledge, few studies have examined the relationship between criminal organizations and firms. When firms are infiltrated, accounting systems and practices can be modified to conceal illegal activities, perpetuate fraud, and facilitate money laundering (Bianchi et al., 2022; Compin, 2008; Ravenda et al., 2018). Understanding the dynamics of criminal penetration of organizations through the lens of accounting is imperative for several reasons. First, accounting data often serve as the primary source of evidence in identifying suspicious financial activity associated with organized crime. Analysis of financial records, audit tests, and transaction patterns can lead to the discovery of irregularities indicative of criminal infiltration, allowing for timely intervention and appropriate measures. Second, accounting plays a pivotal role in quantifying the financial impact of criminal infiltration on firms and society. Accounting tools can assess the direct and indirect costs associated with illegal activities, including financial losses, reputational damage, and regulatory penalties (Calamunci & Drago, 2020; Fabrizi et al., 2019).

The phenomenon of criminal infiltration is notably prominent in the regulatory landscape. In Italy, the legislator has implemented various tools over time aimed at preventing (for example, judicial control of firms at risk of mafia infiltration and judicial administration [JA]) or eliminating (through confiscation and asset sequestration) criminal infiltration of firms.

In light of these considerations, this paper aims to analyse firms under JA to better understand where the firms are located and the industry in which they operate, and to examine whether some financial ratios can serve as red flags of criminal infiltration. We decided to focus on firms under JA because, during this procedure, firms often exhibit a notable inclination to facilitate criminal activity without being classified as criminal firms. At this stage, it is crucial to identify key ratios that could supplement the existing conditions at the beginning of the judicial procedure. Therefore, the research question of this study is:

RQ: Can financial ratios be a red flag of criminal infiltrations in firms?

To address the research question, this article examines a sample of firms operating under JA in Italy, drawn from the Asylum Information Database (AIDA) over a 10-year period (2013–2022). Descriptive statistics are used to analyse data on the size, money laundering activities, performance, indebtedness, and asset elasticity of each firm. The analysis should serve to shed light on the differences occurring in the financial ratios before and after the JA procedure.

The findings showed that most of the firms in JA were small, located in the south of Italy, structured as limited liability companies (*società a responsabilità limitata* — S.r.l.), active but undergoing insolvency procedures, and operated in the buildings, wholesale, and retail trade, repairs of motor vehicles and motorcycles, rental, travel agencies, business support services, and real estate. The results related to money laundering revealed liquidity problems that were particularly evident after the JA. The data related to the firms' performance ratios revealed the low business performance of the firms in JA, while the debt ratio was high, especially in the building industry. Finally, the sample analysed exhibited low elasticity before the JA procedure with a noticeable increase in elasticity following the JA procedure.

The contribution of this paper is twofold. First, it contributes to the literature on organized crime (Alesina et al., 2019; Barone & Narciso, 2015; Buonanno et al., 2016; Daniele & Dipoppa, 2023; Daniele & Geys, 2015; Ferrante et al., 2021) by focusing on the analysis of the relationship between criminal organizations and firms. It aims to identify the effects of criminal infiltration in terms of financial ratios (Bianchi et al., 2022; Fabrizi et al., 2019; Le Moglie & Sorrenti, 2022).

Second, the article contributes to the accounting literature by highlighting the important role of accounting tools in detecting red flags and identifying criminal infiltration in firms. It emphasizes the importance of financial indicators and accounting practices in detecting and preventing illegal activities (Bianchi et al., 2022; Chircop et al., 2023; Compin, 2008; Fabrizi et al., 2019; Ravenda et al., 2018).

The remainder of the paper is structured as follows. Section 2 briefly reviews the literature on criminal organizations. Section 3 introduces the research methodology, outlining the data collection process and the identification of the strategy underlying the analysis. Section 4 presents the results of the paper. Section 5 includes the discussion, while Section 6 outlines the conclusion.

2. LITERATURE REVIEW

2.1. Criminal infiltrations into the socio-economic context and at the firm level

In today's intricate business environment, companies encounter a myriad of challenges that surpass conventional market competition. Among these challenges, an often underestimated but highly influential issue is the infiltration of criminal organisations into firms. This infiltration, marked by illicit activities and corrupt practices, poses a significant threat to the integrity, reputation, and long-term viability of organizations across a variety of sectors. One of the primary challenges in organized crime research arises from the absence of a universally accepted definition, compounded by the intricate nature of the phenomenon under study (von Lampe & Ole Johansen, 2004). Various definitions have emerged from international organizations, law enforcement agencies, and scholars (Albanese, 2000; Finckenauer, 2005; Hagan, 2006; van Dijk, 2007). Nonetheless, there remains a lack of consensus regarding the precise definition of organized crime (van Dijk, 2007). Research in this area pointed out that criminal infiltration into a business requires four elements: 1) a criminal organization; 2) one or more persons acting on behalf of the criminal organization as affiliates, supporters or trustees; 3) the contribution of financial resources (e.g., capital injection or a loan from shareholders) or human resources (e.g., appointment of an administrator, manager, or employee); 4) participation in the decision-making process of the business, understood as the ability to influence the actual management of the company and future decisions regarding investment strategies, hiring, contracts, and the selection of suppliers and clients (Riccardi & Berlusconi, 2016).

Research on criminal organizations has investigated the impact of this phenomenon related to various aspects. One stream of research has examined criminal infiltration worldwide; the second has examined the impact of criminal infiltration on socio-economic settings; and the third has examined the relationship between criminal organizations and firms.

The first area of research aimed to identify how the phenomenon of criminal infiltration changes across countries. Riccardi and Berlusconi (2016) investigated whether the phenomenon of criminal infiltration exists outside Italy and examined the differences in its manifestation. The authors collected several judicial documents in the 28 European Union (EU) countries, corresponding to approximately 950 companies. The findings showed the difficulty of comparing the various countries due to differences in regulations, considering criminal infiltration as a process that includes a series of sentinel offenses or prevention crimes (such as corruption, falsification of documents, accounting manipulations, and tax evasion). Other studies focused on investigating the impact of criminal phenomenon in a specific country. In this context, Schneider (2004) aimed to examine how the proceeds of profit-oriented criminal activity are transmitted both in Canada and abroad, in particular through the Canadian real estate market. The study aimed to identify, examine and quantify the types of illegal activities that generate criminal proceeds invested in the legitimate economy, the economic sectors that receive criminal proceeds, the specific assets or services used within these sectors, the transactions and processes used for money laundering purposes, and the specific methods or techniques used to facilitate the money laundering process in financial institutions. The introduction of the new mandatory transaction reporting regime in Canada is likely to increase the use of money laundering techniques. The study by Dugato et al. (2014) then aimed to develop and test a methodology for measuring organized crime in specific countries in the Latin American region. Their results provided a comprehensive understanding of how to measure and analyse organized crime in Latin America today, considering the phenomenon's regional specificities. In addition, the creation of a valid measurement of the phenomenon had important policy implications, as valid indicators can enhance the effectiveness of government actions and law enforcement. The study by Steinko (2012) was the first empirical research project to investigate money laundering in Spain. The study's conclusions induce the international community to consider the role of empirical knowledge in shaping legal initiatives aimed at combating criminal activities.

Among the studies that have analysed the impact of criminal organization on the socio-economic context (Bernardo et al., 2021; Boeri et al., 2024; Moro & Villa, 2017; Pinotti, 2020, Riccardi et al., 2019; Riccardi, 2014), many agree on the negative effects of illegal activities on economic development (Colonnelli & Prem, 2022; Daniele & Marani, 2011; Scognamiglio, 2018), as well as on the growth and quality of local institutional systems (Centorrino & Ofria, 2008; Dugato et al., 2020). Other authors have shown a negative association between the presence of criminal organizations and quality of life (Dugato et al., 2020) or technological development (Caglayan et al., 2017). Other results have shown that organized crime tends to undermine the integrity of public institutions (Barone et al., 2022; Dal Bó et al., 2006; van Dijk, 2007). Le Moglie and Sorrenti (2022) studied the impact of the 2007 subprime mortgage crisis on the establishment of firms in the Italian credit market, considering the presence of organized crime. They reported that provinces with a high presence of organized crime were less affected by the crisis in terms of the establishment of new enterprises compared to provinces with a lower criminal infiltration.

Several contributions have improved the understanding of the relationship between criminal organizations and firms (Cincimino et al., 2024). First, the Transcrime report (Savona et al., 2003) provided a detailed analysis of criminal firms and their investments, focusing primarily on the Italian context. The report is structured around five themes: 1) the operational areas of criminal firms in Italy; 2) the profits generated by criminal firms from their illegal activities in Italy; 3) how and where the criminal firms invest their revenues in Italy; 4) the presence and cases of investment of Italian criminal firms abroad; and 5) how can be identified the industry most vulnerable to criminal firms' investments.

Second, other studies have identified the key characteristics of firms linked to criminal organizations and explored their managerial practices (Fabrizi et al., 2017). Some studies have suggested that accounting plays a crucial role in criminal enterprises by hiding illegal activities. Accounting information, although misleading, is designed to have essential qualities, supporting the illusion of economic soundness (Cincimino et al., 2024; Compin, 2008). Additionally, Ravenda et al. (2015) found that connected firms tend to be more aggressive in managing earnings and avoiding labour taxes. Indeed, earnings manipulation can be used to reduce taxable income (Bianchi et al., 2022). Furthermore, Riccardi and Berlusconi (2016) noted that infiltrated companies may adjust their management strategy over time, this change can be reflected in accounting terms. For instance, infiltrated companies may divest and liquidate their assets if they suspect they are under investigation. Parbonetti (2021) conducted a study on the phenomenon of criminal infiltration in northern and central Italy, showing that infiltrated firms tend to be larger, more profitable, and more indebted than others in the region. Bianchi et al. (2022), investigated the impact of organized crime on firms' financial statements and performance. Their findings indicate that infiltrated firms have lower profitability despite higher sales and lower labour costs, as well as higher bank debt and lower cash holdings. These firms also tend to be more aggressive in their taxation plans and engage in earnings manipulation to reduce them.

Additional studies in this direction have analysed the economic impact of firms associated with criminal organizations (De Simoni, 2022; Parbonetti, 2021). These studies found that the elimination of criminal firms from the industry leads to significant performance improvements in non-criminal firms. De Simoni (2022) identified differences between legal and criminal firms in the financial, management, and operational realms, as evidenced by their financial statements.

Further studies have examined the impact of ablative and non-ablative instruments on infiltrated companies. Ravenda et al. (2018) found that earnings management can be used for money laundering around the time of confiscation. Meanwhile, Calamunci (2022) examined the impact of JA on a sample of Italian criminal firms, revealing challenges in maintaining profitability and efficiency levels after eliminating criminal connections.

To our knowledge, few studies have examined the relationship between accounting and criminal organizations, in particular, which ratios may be significant in detecting and mitigating criminal infiltration into firms. Given this research gap, this paper focuses on investigating whether certain financial ratios can serve as red flags to denote criminal infiltration within firms.

2.2. Strategies and legal instruments in Italy for combating criminal infiltration

The instruments used under Italian law to attack the assets of criminal organizations[1] can be grouped into two types: 1) non-ablative tools (judicial control of companies at risk of mafia infiltration and JA), and 2) traditional ablative tools (confiscation and assets' sequestration). The first instruments involve the participation of the Italian state in the management of the company without the complete exclusion of the owner, the second group of tools excludes the owners of the firm management, therefore the property's firm shifts to the Italian state.

One of the non-ablative instruments is the judicial control of companies at risk of mafia infiltration (Art. 34-bis Legislative Decree 159, 2011[2]). This instrument is applied when the risk of criminal infiltration is occasional and reveals indications of the emergence of unstable criminal infiltration. In addition to the requirement of occasional support, the law requires the existence of factual circumstances from which to deduce the existence of a concrete danger of criminal contamination, which influences economic activity.

For firms under judicial control, the court can impose the commitment to communicate to the judicial authority data about financial transactions and corporate documents and can proceed with the appointment of a "tutor" responsible for supervising the anti-mafia policies for a predefined period (minimum of one year and maximum of three). During this period, the tutor with a delegated judge will proceed to monitor the performance of the firm through bimonthly reports.

The second non-ablative tool is JA (Art. 34 Legislative Decree 159, 2011, fully replaced by Art. 10 of Law 161, 2017[3]), which is applied when it is supposed that the firm shows a strong aptitude for supporting criminal activity. This procedure does not establish the company as criminal. At this stage, control over the company is temporarily entrusted to a "judicial administrator". The JA is applied when one of the following conditions is met: 1) there is sufficient evidence to reveal mafia conditioning or intimidation (the firm takes the role of victim); 2) the presence in the corporate structure of members who are subjected to preventive measures or who are accused of criminal association or corruption. When JA ends if the same risks of criminal infiltration continue to exist, the Italian law has established two alternative ways of proceeding: 1) continue with the milder preventive measure of judicial control; or 2) the use of ablative tools.

Ablative tools involve the expropriation of assets by the Italian state. Assets sequestration is a provisional precautionary measure, while confiscation is a definitive measure after judicial assessment (Art. 20 and Art. 24 Codice Antimafia[4]).

This study examines non-ablative tools, particularly JA, aimed at mitigating the impact of criminal infiltration of firms. JA promotes the principle of business continuity, resulting in the recovery and reintegration of the firm into its context. The objective of this research is to assess whether the financial ratios and some firms' characteristics (size, industry) commonly associated with infiltrated firms in the existing literature, could also be significant for firms not yet defined as infiltrated. The purpose is to establish whether such ratios can be included among the factors that lead to state intervention.

3. RESEARCH METHODOLOGY

The article uses a sample of firms operating in Italy that were subject to JA. The sample was built by using the AIDA database over a 10-year period (2013–2022). Descriptive statistics and percentage analysis were used to analyse the sample. In particular, for each firm of the sample, the calculation of the financial ratios, described in the following paragraph, for the two years before the JA procedure and the two years after it was carried out. Then, the average value of each index for each two years was determined. Finally, a comparison was made between the average values of the ratios calculated before the start of JA and after JA to understand the adjustments that occurred.

3.1. Identification of firms' characteristics and financial ratios

According to previous studies, (Fabrizi et al., 2017; Transcrime, 2013; Savona et al., 2003; Parbonetti, 2021; Ravenda et al., 2015) infiltrated firms have certain characteristics:

- they operate in industries characterized by low technological content and high labour intensity (*Industry*);
- they tend to be medium and large in size (*Firms' size*);
- they engage in activities promoting money laundering (*Money laundering*);
- they have a competitive advantage linked to their ability to acquire financial resources at low cost, reduce labour costs and exhibit a strong inclination towards tax evasion (*Firms' performance*);
- they have high levels of debt (*Indebtedness*);
- the asset composition is often unbalanced in favour of liquidity and short-term credits (*Elasticity of assets*).

[1] In Italy, the Rognoni-La Torre Law of 1982 introduced Article 416-bis into the Italian penal code. This introduction marked the first acknowledgment in Italy of mafia-type unlawful associations as criminal offenses.
[2] https://www.normattiva.it/uri-res/N2Ls?urn:nir:stato:decreto.legislativo:2011-09-06;159
[3] https://www.normattiva.it/uri-res/N2Ls?urn:nir:stato:legge:2017-10-17;161
[4] https://www.normattiva.it/uri-res/N2Ls?urn:nir:stato:decreto.legislativo:2011-09-06;159

3.1.1. Industry

Regarding the first characteristics, typically, industries that extensively employ labour include handicraft industries such as food, buildings, mechanics, transport, textiles, wholesale, and retail, as well as service industries. The results showed that criminal organisations tend to operate primarily in the buildings or real estate industry (Fabrizi et al., 2017; Le Moglie & Sorrenti, 2022). De Simoni (2022) shows that infiltrated firms are more prevalent in cash-intensive industries such as accommodation, food, and entertainment. Criminal organizations also tend to be concentrated in industries where the bond with territory is an asset, such as buildings, and real estate. In addition, these firms often operate in economic activities characterized by low levels of innovation, limited investment in research and development (R&D), and a scarcity of skilled labour, particularly in administrative and support roles. Moreover, professional activities can also be targeted as criminal organizations exploit the expertise of professionals to conduct illegal transactions (Fabrizi et al., 2017; Parbonetti, 2021).

3.1.2. Firms' size

Previous studies (Fabrizi et al., 2017; Mirenda et al., 2019; Parbonetti, 2021) showed that firms with criminal infiltration were medium-large. However, other studies (De Simoni, 2022) show that most criminal firms are either small- or micro-sized, with only a few classified as large.

3.1.3. Money laundering

It was expected that firms infiltrated by criminal organizations would exhibit higher liquidity than non-criminal firms, based on the assumption that liquidity arises from illegal activities such as money laundering. However, the data often did not support this hypothesis (De Simoni, 2022; Fabrizi et al., 2017).

3.1.4. Firm's performance

Parbonetti (2021) showed that criminal firms are more profitable than non-criminal firms. Traditionally, firms infiltrated by criminal organizations are characterized by low labour costs and tax rates (Arlacchi, 1983; Chircop et al., 2023; Ravenda et al., 2015). These firms often receive preferential treatment in the granting of orders, contracts, and commercial outlets (Arlacchi, 1983; Chircop et al., 2023; Ravenda et al., 2015). However, the results often do not confirm this hypothesis (Fabrizi et al., 2017).

De Simoni (2022) has revealed that despite generating higher revenues compared to legal businesses, infiltrated firms generally have lower profitability, regardless of the type of infiltration. This is because they may prioritize objectives other than economic performance, such as money laundering and tax evasion. The author also shows that criminal firms are known as "competition firms" and often have higher labour costs, suggesting that they may be creating job opportunities for locals and associates to gain support for the criminal organisation and also as a way to strengthen their control over the local territory.

3.1.5. Indebtedness

Regarding the indebtedness level, some studies showed that in firms with criminal infiltration, the level of financial debt is lower (Savona & Riccardi, 2018) than in non-criminal firms. However, other studies do not confirm these results (Bianchi et al., 2022; Fabrizi et al., 2017), firms with criminal infiltrations rely on liquidity gained from illicit activities, thus sparing them at the expense of borrowing credit (Chircop et al., 2023). These results suggest a hypothesis: firms with criminal infiltration may divert financial resources away from non-criminal firms operating in the same context.

3.1.6. Elasticity of assets

Previous studies outlined that in infiltrated firms there is a prevalence of working capital on total assets, meaning an elasticity of the assets' structure correlated to criminal activities carried out by firms (Fabrizi et al., 2017).

All the characteristics described above are summarized in Table 1 below. The table displays the ratios calculated for each characteristic in our sample.

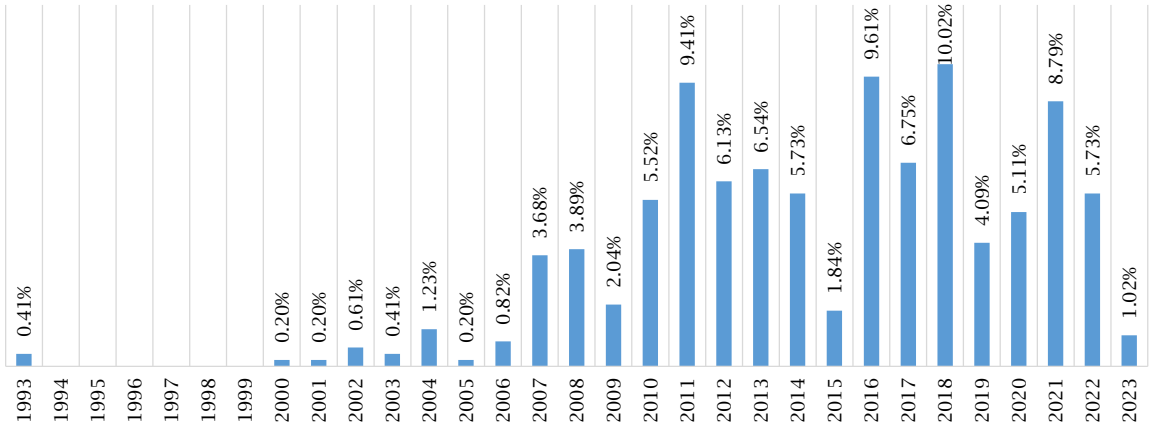
Table1. Financial ratios which characterised criminal firms

Characteristics of criminal firms	***Financial ratios***
Firms' size	• Employs and annual revenue.
Money laundering	• Liquidity ratio; • Cash on total assets ratio.
Firms' performance	• Labour costs on revenues; • The ratio of tax expense to pre-tax income; • Return on equity (ROE); • Return on assets (ROA).
Indebtedness	• Debt ratio.
Elasticity of assets	• Working capital on total assets.

3.2. Data collection process

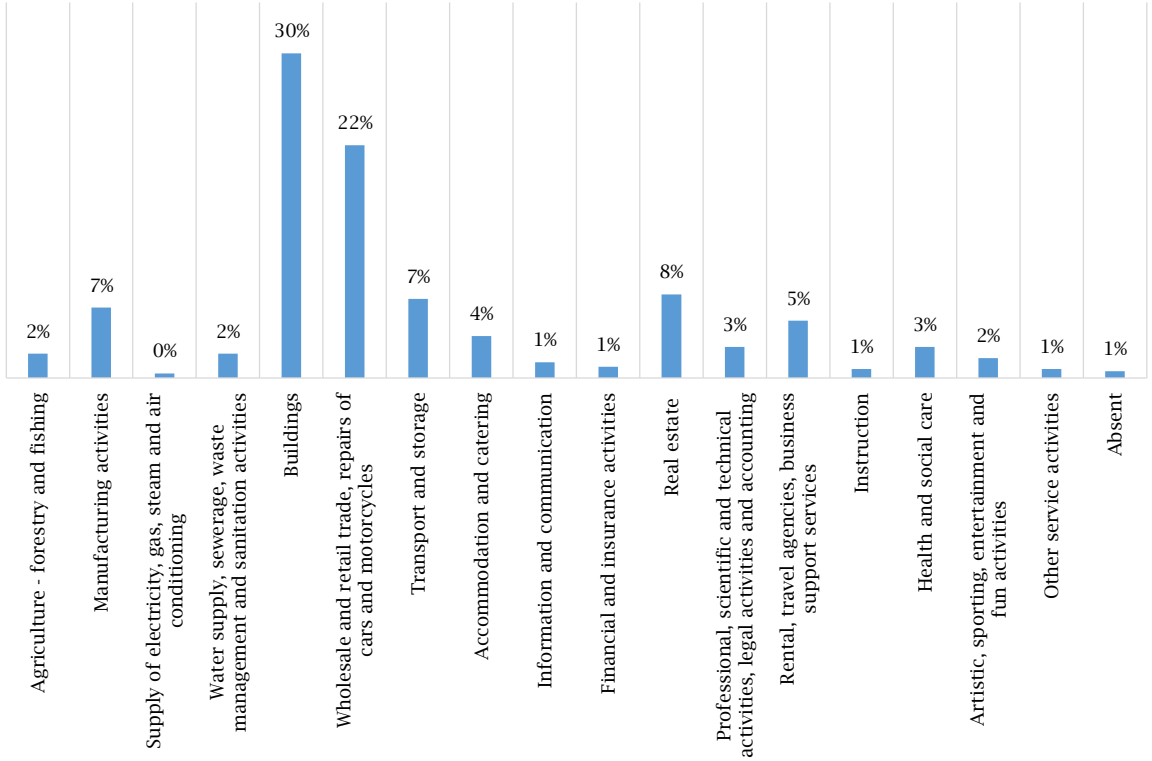
The sample extraction was carried out in May 2023 and covered the period from 2013 to 2022. We collected a sample of 489 firms that were classified according to the following criteria: 1) year of commencement of JA proceedings, 2) industry, 3) geographic region, 4) legal structure, and 5) legal status. The data are presented in Figures 1–4b below.

Figure 1. Percentage of firms under judicial administration by year



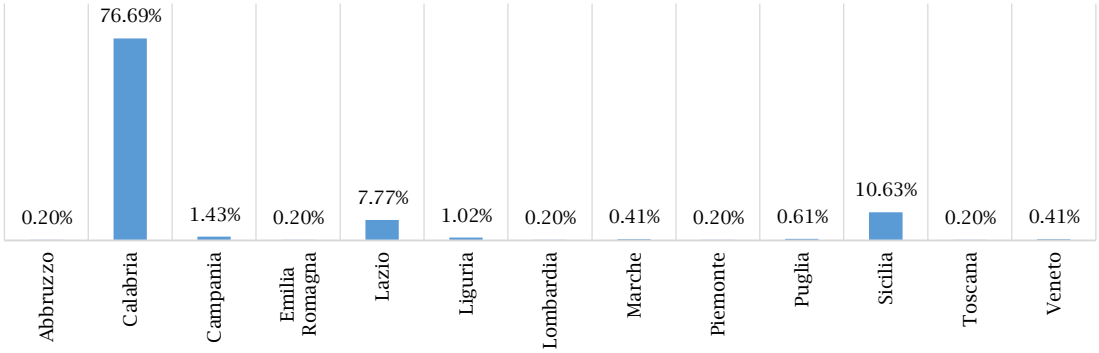
Source: Authors' elaboration.

Figure 2. Percentage of firms under judicial administration by industry



Source: Authors' elaboration.

Figure 3a. Percentage of firms under judicial administration by territory

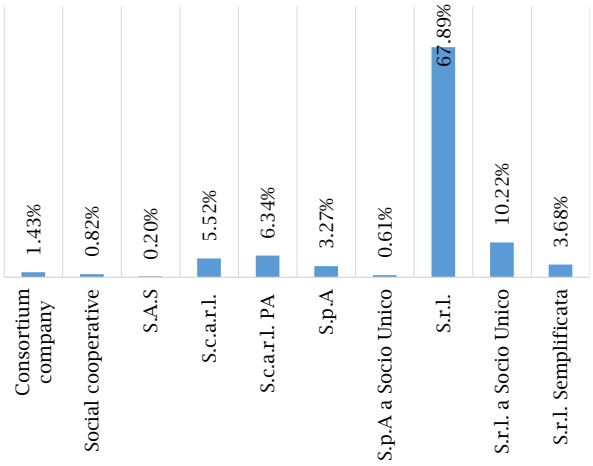


Source: Authors' elaboration.

Figure 3b. Geographical distribution of firms under judicial administration

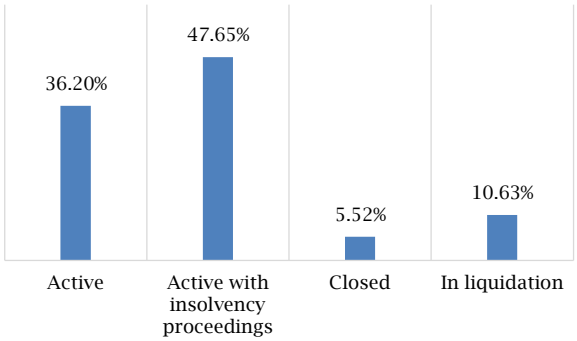
Source: AIDA database.

Figure 4a. Percentage of firms under judicial administration by legal forms



Note: S.A.S — società in accomandita semplice/limited partnership company; S.c.a.r.l. — società consortile a responsabilità limitata/ limited liability consortium company; S.c.a.r.l. PA — società consortile a per azioni (or S.c.p.A.)/joint stock consortium company; S.p.a. — società per azioni/joint stock company; S.r.l. — società a responsabilità limitata/limited liability company; S.r.l.s. — società a responsabilità limitata semplificata/simplified limited liability company.
Source: Authors' elaboration.

Figure 4b. Percentage of firms under judicial administration by legal status



Source: Authors' elaboration.

Figure 1 reports the temporal distribution of the year in which the JA procedure began for the sample firms. The time distribution extended from 1993 to 2023; the year with the most legal procedures was 2011, 2016, and 2018. Figure 2 displays the industries in which the sample firms operate. The identification of the industry to which each firm belonged was based on the ATECO (*ATtività ECOnomiche*)[5] classification. Most of the firms, in the sample operated in the buildings industry (30% of the sample), followed by wholesale and retail trade, repairs of motor vehicles and motorcycles (22% of the sample), real estate (8% of the sample), transport and storage (7% of the sample) and rental, travel agencies, business support services (5% of the sample). These results were confirmed by previous studies (Fabrizi et al., 2017; Le Moglie & Sorrenti, 2022; Savona et al., 2016; De Simoni, 2022).

Most of the firms in the JA were in Calabria (77% of the sample), Sicily (11% of the sample), and Lazio (8% of the sample) (see Figure 3a). This result was confirmed by the study of by Calamunci and Drago (2020) for Sicily and Calabria, while for Lazio was confirmed by the study of Parbonetti (2021). Most of the companies under the JA were limited liability companies (S.r.l.) as depicted in Figure 4a. The legal status of the firms included in the sample is displayed in Figure 4b. Approximately 84% of these firms were currently active, but 48% of the active firms were undergoing insolvency procedures.

Considering that one of the objectives of this paper is to analyse some financial ratios of firms undergoing JA before and after the start of these procedures, it was necessary to filter and further select firms from the sample described above. Therefore, the year 2013 was excluded from the analysis, since it was not possible to analyse the period before the start of the procedure, which resulted in the exclusion of 32 firms. Similarly, the years 2022 and 2023 were excluded, since it was not possible to analyse the period after the start of the procedure, which resulted in the exclusion of 28 and five firms, respectively. After that, the period between 2014 and 2021 was considered for the analysis.

[5] The ATECO code was introduced by the Italian National Institute of Statistics (ISTAT) and entered into force on January 1, 2008, and it serves to simplify the classification of economic activity and to apply the correct tax regime.

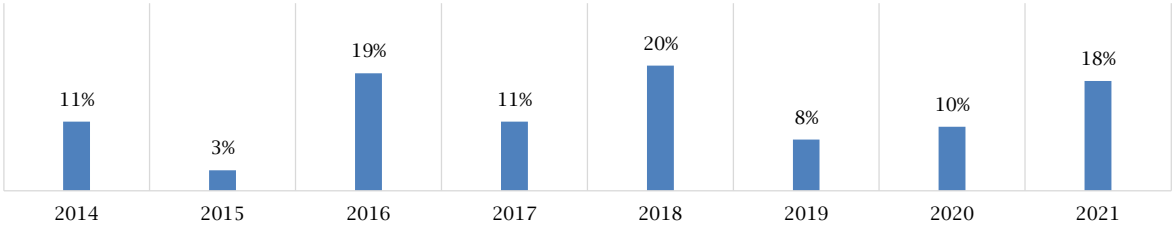
The year when the procedure commenced was designated as the year "zero", and as a result, the financial data weren't considered because the start of JA marks an exceptional circumstance, which can be reported in the firm's balance sheet.

After applying these filters, the sample consisted of 254 firms.

Of the 254 firms, the JA procedure was initiated and completed within two months for nine of them. It was decided to exclude these firms, believing that the rapid closure of the procedure was due to errors and therefore no real risks of criminal infiltration. The sample, therefore, consists of 245 firms.

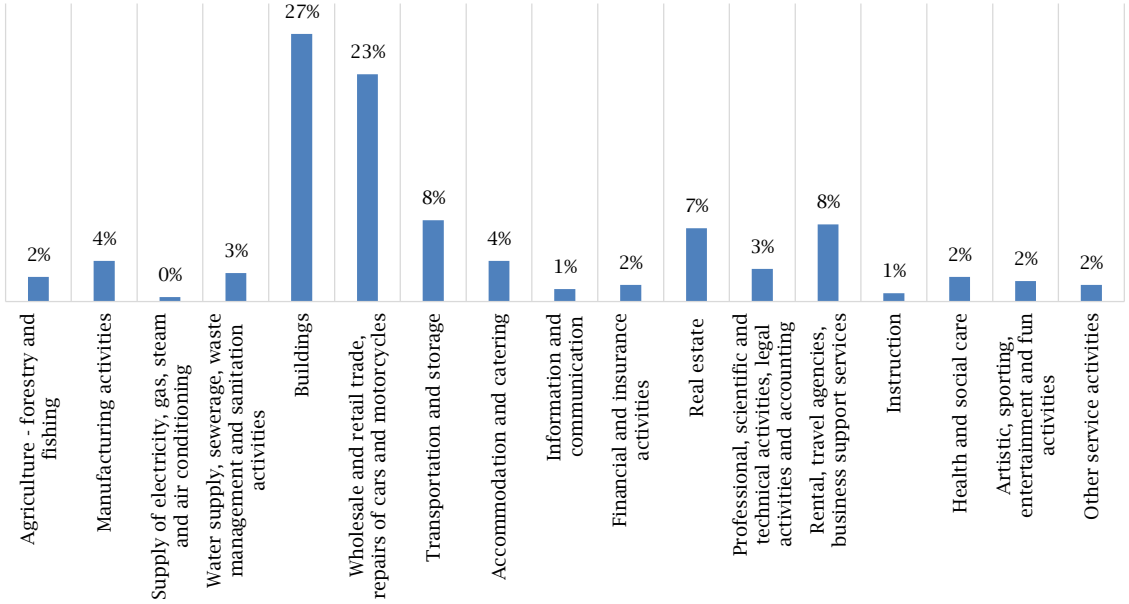
The firms in the final sample have the characteristics depicted in Figures 6 and 7.

Figure 5. Percentage of firms under judicial administration by year in the final sample



Source: Authors' elaboration.

Figure 6. Percentage of firms under judicial administration by industry in the final sample



Source: Authors' elaboration.

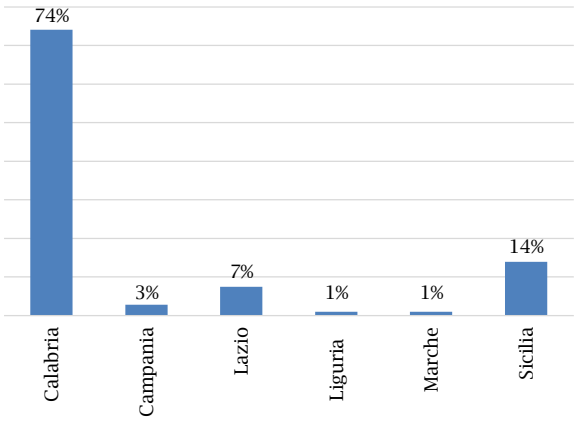
For the data analysis, the firms operating in the industry in which the percentage is equal to or greater than 5% were selected. As displayed in Figure 6, the selected firms operated in the buildings industry (66 firms, 27% of the sample), wholesale and retail trade, repairs of motor vehicles and motorcycles industry (56 firms, 23% of the sample), rental, travel agencies, business support services industry (19 firms, 8% of the sample), transport and storage industry (20 firms, 8% of the sample) and real estate industry (18 firms, 7% of the sample).

To ensure two years before the beginning of JA and two years after, firms that entered JA between 2015 and 2020 were included.

According to the above description, the final sample was made up of 108 firms.

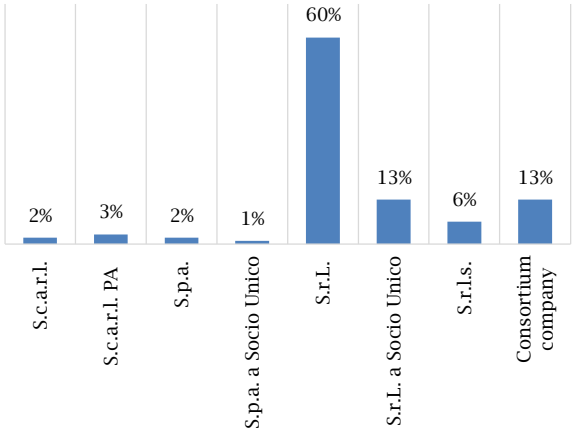
The distribution of the final sample by territory is confirmed as described for the total sample. Most of the firms were in Calabria (74% of firms), followed by Sicily (14% of firms) and Lazio (7% of firms) as displayed in Figures 7a–7b.

Figure 7a. Percentage of firms under judicial administration by territory in the final sample



Source: Authors' elaboration.

Figure 7b. Percentage of firms under judicial administration by legal form in the final sample



Note: S.c.a.r.l. — Società consortile a responsabilità limitata/Limited liability consortium company; S.c.a.r.l. PA — Società consortile a per azioni (or S.c.p.A.)/Joint stock consortium company; S.p.a. — Società per azioni/Joint stock company; S.r.L. — Società a responsabilità limitata/Limited liability company; S.r.l.s. — Società a responsabilità limitata semplificata/Simplified limited liability company.
Source: Authors' elaboration.

Figure 7b shows that the majority of firms (79%) were limited liability companies (60% of the firms are limited liability companies (*S.r.L.*), 13% of the firms are limited liability companies with singular shareholder *S.r.L. a Socio Unico* and 6% are limited liability companies simplified (*S.r.L. semplificata*).

Figure 8 depicted that 94% of firms in the final sample were active on the date of data collection, but 63% of them were currently undergoing insolvency procedures.

4. RESEARCH RESULTS

4.1. Firms' size

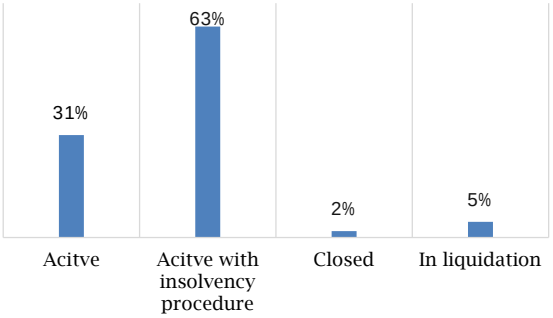
To classify firms by size, the definition of micro, small, and medium-sized enterprises (MSMEs) of European legislation was considered (European Commission [EC], 2003).

According to European law, a micro enterprises are defined as enterprises which employ fewer than 10 persons and whose annual turnover or annual balance sheet total does not exceed 2 million euros; a small enterprise is a firm with fewer than 50 employees and annual revenue or total assets not exceeding 10 million euros; a medium-sized enterprise is a firm with fewer than 250 employees and annual revenue or total assets not exceeding 43 million euros (EC, 2003, p. 14).

The analysis focused on the number of employees and annual revenues of the firms at the beginning of JA.

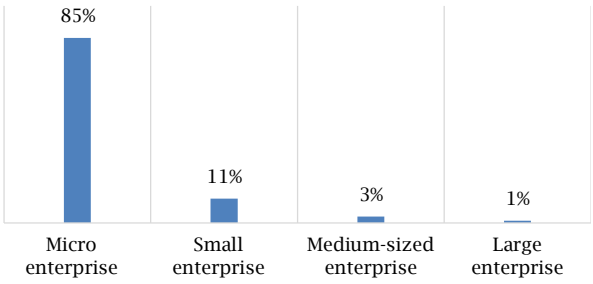
The data analysis shows the results depicted in Figure 9 and Table 2.

Figure 8. Percentage of firms under judicial administration by legal status in the final sample



Source: Authors' elaboration.

Figure 9. Classification of the firms by size



Source: Authors' elaboration.

Table 2. Classification of the firms by size across various industries

Industry	*Micro enterprise*	*Percentage*	*Small enterprise*	*Percentage*	*Medium-sized enterprise*	*Percentage*	*Large enterprise*	*Percentage*
Real estate	8	9%	3	25%	1	33%	-	-
Wholesale and retail trade, repairs of motor vehicles and motorcycles	25	27%	2	17%	-	-	-	-
Buildings	49	53%	6	50%	1	33%	-	-
Rental, travel agencies, business support services	3	3%	1	8%	1	33%	1	100%
Transport and storage	7	8%	-	-	-	-	-	-
Total	**92**	**100%**	**12**	**100%**	**3**	**100%**	**1**	**100%**

Source: Authors' elaboration.

The data showed (see Figure 9) that 85% of the firms were classified as micro-enterprises, 11% of the sample was small enterprises, and only one was categorized as a large firm; therefore, almost all of the sample was small firms. These results were supported by previous studies (De Simoni, 2022).

The majority of micro-enterprises and small enterprises operate within the buildings industry (53% and 50% of the sample), followed by the wholesale and retail trade, repairs of motor vehicles, and motorcycles industry (27%) with micro-enterprises, and real estate industry (25%) about small-enterprises.

4.2. Money laundering

4.2.1. Liquidity ratio

An analysis of the liquidity ratio of the firms deemed a positive liquidity position when the average liquidity ratio is equal or greater than 1, and a negative liquidity position otherwise.

The results of the data analysis are depicted in Tables 3–5.

Table 3. Liquidity ratio analysis before and after judicial administration

Liquidity ratio	*Average value before JA*	*Percentage*	*Average value after JA*	*Percentage*
Positive liquidity	27	25%	17	16%
Negative liquidity	64	59%	23	21%
Data not available	17	16%	68	63%
Total	108	100%	108	100%

Source: Authors' elaboration.

Table 4. Liquidity ratio analysis before and after judicial administration in various industries

Industry	*Negative disposal of liquidity before JA*	*Percentage*	*Negative disposal of liquidity after JA*	*Percentage*
Real estate	7	11%	3	13%
Wholesale and retail trade, repairs of motor vehicles and motorcycles	14	22%	6	26%
Buildings	35	55%	11	48%
Rental, travel agencies, business support services	4	6%	3	13%
Transport and storage	4	6%	-	-
Total	**64**	**100%**	**23**	**100%**

Source: Authors' elaboration.

Table 5. Comparison of liquidity ratio before and after judicial administration procedure

Variation average index between before and after JA	*Firms*	*Percentage*
Increase	21	53%
Decrease	18	45%
Unchanged	1	3%
Total	**40**	**100%**

Source: Authors' elaboration.

The results in Table 3 showed that the majority of the firms (59%) in the period previous to the beginning of JA operated in the condition of limited liquidity; this trend was confirmed by the results after JA.

From the distribution of firms with negative liquidity by industry (see Table 4), it was evident that firms both before and after JA were primarily in the buildings industry (55% before JA, and 48% after JA), real estate (11% before JA, and 13% after JA), and wholesale and retail trade, repairs of motor vehicles, and motorcycles (22% before JA and 26% after JA).

The comparison of the 40 firms with financial data available both before and after JA revealed the results shown in Table 5.

The data denoted that the liquidity ratio increased for 53% of the analysed firms. Further examination of the distribution of the 40 firms by industries revealed that the increase in the liquidity ratio primarily affects firms operating in the buildings industry.

4.2.2. Cash on total asset ratio

In analysing the cash-to-assets ratio of companies, a good liquidity position was determined when the average ratio was equal to or greater than 1. Conversely, financial difficulties were identified when the average ratio was below 1. The results of the data analysis are presented in Tables 6–8.

Table 6. Cash-to-assets ratio analysis before and after judicial administration

Cash / Total assets ratio	*Average value before JA*	*Percentage*	*Average value after JA*	*Percentage*
Liquidity	-	-	-	-
Financial difficulties	60	56%	31	29%
Data not available	48	44%	77	71%
Total	**108**	**100%**	**108**	**100%**

Source: Authors' elaboration.

Table 7. Cash-to-assets ratio analysis before and after judicial administration in various industries

Industry	*Financial difficulties before JA*	*Percentage*	*Financial difficulties after JA*	*Percentage*
Real estate	9	15%	6	19%
Wholesale and retail trade, repairs of motor vehicles and motorcycles	16	27%	5	16%
Buildings	27	45%	17	55%
Rental, travel agencies, business support services	2	3%	2	6%
Transport and storage	6	10%	1	3%
Total	**60**	**100%**	**31**	**100%**

Source: Authors' elaboration.

As shown in Table 6, the results confirmed the findings of the liquidity ratio analysis. It was found that all the firms were experiencing financial difficulties (56% of the sample). Additionally, the distribution of these firms by industries revealed that most of the firms experiencing financial difficulties were in the buildings industry both before and after JA (45% before JA, and 55% after JA), followed by wholesale and retail trade, repairs of motor vehicles, and motorcycles (27% before JA, and 16% after JA), and real estate (15% before JA, and 19% after JA) (see Table 7).

Table 8. Comparison of cash-to-assets ratio before and after judicial administration procedure

Variation average index between before and after JA	*Firms*	*Percentage*
Increase	16	52%
Decrease	15	48%
Total	**31**	**100%**

Source: Authors' elaboration.

The results presented in Table 8 were obtained for the comparison of 31 firms with available financial data both before and after the introduction of JA.

The results confirmed the findings obtained using the liquidity ratio analysis.

The analysis of the ratios used to measure money laundering showed that the sample firms were experiencing financial difficulties, therefore, these ratios did not explain the presence of illegal activity related to money laundering.

4.3. Firms' performance

4.3.1. Labour costs on revenue

The analysis of labour costs on revenue (labour-to-revenue ratio) was considered as low incidence if the ratio was less than 0.5, and high incidence otherwise.

The data analysis revealed the results depicted in Tables 9–11.

Table 9. Labour-to-revenue ratio analysis before and after judicial administration

Labour costs on revenue	*Average value before JA*	*Percentage*	*Average value after JA*	*Percentage*
Low incidence	45	42%	11	10%
High incidence	13	12%	10	9%
Data not available	50	46%	87	81%
Total	**108**	**100%**	**108**	**100%**

Source: Authors' elaboration.

Table 10. Labour-to-revenue ratio analysis before and after judicial administration in various industries

Industry	*Low incidence of labour cost before JA*	*Percentage*	*Low incidence of labour cost after JA*	*Percentage*
Real estate	4	9%	5	45%
Wholesale and retail trade, repairs of motor vehicles and motorcycles	10	22%	1	9%
Buildings	27	60%	4	36%
Rental, travel agencies, business support services	1	2%	1	9%
Transport and storage	3	7%	-	-
Total	**45**	**100%**	**11**	**100%**

Source: Authors' elaboration.

Table 9 shows that before the JA procedure, the average labour costs to revenue remained below 0.5, indicating a low incidence of labour costs share in 42% of the firms analysed. However, this percentage decreased to 10% of firms after JA.

Before the introduction of JA, industries with a low share of labour costs in revenue were buildings (60%), wholesale and retail trade, repairs of motor vehicles, and motorcycles (22%). After the introduction of JA, industries with a low share were real estate (45%) and buildings (36%) (see Table 10).

For the comparison of the 21 firms with financial data available both before and after JA's procedure, the results displayed in Table 11 were obtained.

Table 11. Difference of labour costs on revenue ratio before and after judicial administration procedure

Variation average index between before and after JA	*Firms*	*Percentage*
Increase	13	42%
Decrease	8	26%
Total	**21**	**68%**

Source: Authors' elaboration.

The data displayed in Table 11 indicate that for 42% of the analysed firms, there was an increase in the incidence of labour cost on revenue compared to the period before JA. Additionally, within this group, the industry with the greatest increase was buildings, which comprised eight firms, representing 62% of the total firms with increased labour cost incidence.

4.3.2. Ratio of tax

The tax ratio is calculated by tax expenses to pre-tax profit, reflecting the amount of taxes imposed per unit of income. In Italy firms' income is taxed proportionally, with the tax known as IRES (*L'imposta sul Reddito delle Società)* set at 24% of taxable income. Therefore, for the analysis of firms' tax ratio a value below 24% was considered as low incidence, while a value above 24% was considered high incidence.

The data analysis depicted in Tables 12–14 shows the results.

Table 12. Ratio of tax analysis before and after judicial administration

Ratio of tax	*Average value before JA*	*Percentage*	*Average value after JA*	*Percentage*
Low incidence	25	23%	7	6%
High incidence	38	35%	11	10%
Negative values	8	7%	9	8%
Data not available	37	34%	81	75%
Total	**108**	**100%**	**108**	**100%**

Source: Authors' elaboration.

Table 13. Ratio of tax analysis before and after judicial administration in various industries

Industry	*High incidence before JA*	*Percentage*	*High incidence after JA*	*Percentage*
Real estate	3	8%	2	18%
Wholesale and retail trade, repairs of motor vehicles and motorcycles	5	13%	2	18%
Buildings	25	66%	4	36%
Rental, travel agencies, business support services	2	5%	3	27%
Transport and storage	3	8%	-	-
Total	**38**	**100%**	**11**	**100%**

Source: Authors' elaboration.

Table 12 shows that before JA, 35% of the firms had a high tax expense incidence. These proportions remained steady after JA. Table 13 displayed that the industry with a high tax expense incidence both before and after JA was buildings (66% before JA. and 36% after JA).

Table 14 below indicates the results of the comparison of the 16 firms with financial data available both before and after JA emerged.

Table 14. Difference in the ratio of tax before and after judicial administration procedure

Variation average index between before and after JA	*Firms*	*Percentage*
Increase	13	81%
Decrease	3	19%
Total	**16**	**100%**

Source: Authors' elaboration.

The data indicate that in 81% of the analysed firms, there was an increase in the incidence of tax expenses compared to the period before JA. Similarly, within this set, the industry showing the most significant increase was buildings, with six firms representing 46% of the total firms.

4.3.3. Return on equity

Return on equity is a key indicator of a firm's profitability and provides a concise measure of its performance. It is often used to assess the quality of an investment by comparing ROE with the risk-free return, for example, the return on risk-free assets, normally government bonds. The difference between ROE and the risk-free return represents the risk premium attributed to shareholders for investing in the firms.

In analysing the ROE of the firms, we considered the average return on risk-free assets, calculated as the average monthly values from 2015 to 2020 (data were obtained from the annual report "Rendistato" published by the Bank of Italy — https://shorturl.at/d4bfL). The calculated average value is 1.239. Therefore, if the ROE is greater than 1.239 the investment is deemed profitable, and the firm's performance can be positively evaluated. Conversely, if the ROE is less than 1.239 the investment is not profitable, and the firm's performance is not acceptable.

The data analysis results are displayed in Tables 15–17.

Table 15. ROE analysis before and after judicial administration

ROE	*Average value before JA*	*Percentage*	*Average value after JA*	*Percentage*
ROE greater than return on risk-free asset	47	44%	15	14%
ROE less than return on risk-free asset	25	23%	18	17%
Data not available	36	33%	75	69%
Total	**108**	**100%**	**108**	**100%**

Source: Authors' elaboration.

Table 16. ROE analysis before and after judicial administration in various industries

Industry	*ROE greater than return on risk-free asset before JA*	*Percentage*	*ROE greater than return on risk-free asset after JA*	*Percentage*
Real estate	9	19%	4	27%
Wholesale and retail trade, repairs of motor vehicles and motorcycles	12	26%	3	20%
Buildings	18	38%	4	27%
Rental, travel agencies, business support services	3	6%	3	20%
Transport and storage	5	11%	1	7%
Total	**47**	**100%**	**15**	**100%**

Source: Authors' elaboration.

In the period before JA 44% of firms analysed ROE were greater than return on risk-free assets as depicted in Table 15.

The industries with ROE greater than the return on risk-free assets were buildings (38% before JA, and 27% after JA) and wholesale and retail trade, including repairs of motor vehicles and motorcycles (26% before JA, and 20% after JA) (see Table 16).

For the comparison of the 33 firms with financial data available both before and after JA, the results are displayed in Table 17.

Table 17. Difference in ROE before and after judicial administration procedure

Variation average index between before and after JA	*Firms*	*Percentage*
Increase	11	33%
Decrease	22	67%
Total	**33**	**100%**

Source: Authors' elaboration.

Table 17 shows that 67% of firms analysed the ROE decreased after JA. Also, in this case, the industry with the greatest increase was the buildings (13 firms, representing 49% of the total number of firms).

4.3.4. Return on assets

Return on assets is a financial ratio that indicates how profitable a firm is to its total assets. To be satisfactory, the ROA must be higher than the interest rate that the firm must pay on the debt capital. If the value of the ROA is greater than the interest, the management operations are creating value. For this reason, we calculated the average interest rate applied by the banks considering the quarterly rates from 2015 to 2020 (data were obtained from Serie Storica TEGM (*Tassi Effettivi Globali Medi*) — http://www.verifichefinanziamenti.it/serie_storica_tegm_tassi_soglis/), the value obtained is 8.27; thus, if the ROA is greater than 8.27 the investment is profitable; if the ROA is lower than 8.27 the investment is not profitable.

The results of the data analysis shows are displayed in Tables 18–19.

Table 18. ROA analysis before and after judicial administration

ROA	*Average value before JA*	*Percentage*	*Average value after JA*	*Percentage*
ROA is greater than the interest rate applied by banks	9	8%	7	6%
ROA is lower than the interest rate applied by banks	83	77%	33	31%
Data not available	16	15%	68	63%
Total	**108**	**100%**	**108**	**100%**

Source: Authors' elaboration.

Table 19. ROA analysis before and after judicial administration in various industries

Industry	*ROA is lower than interest rate applied by banks before JA*	*Percentage*	*ROA is lower than interest rate applied by banks after JA*	*Percentage*
Real estate	8	10%	4	12%
Wholesale and retail trade, repairs of motor vehicles and motorcycles	20	24%	7	21%
Buildings	45	54%	19	58%
Rental, travel agencies, business support services	6	7%	3	9%
Transport and storage	4	5%	-	-
Total	**83**	**100%**	**33**	**100%**

Source: Authors' elaboration.

Both before and after JA, the ROA was lower than the interest rate applied by the banks (77% before JA, and 31% after JA) as shown in Table 18.

Data analysis of firms across industries revealed that companies with a ROA lower than the interest rate applied by the banks operated mainly in the buildings industry (54% before JA, and 58% after JA) and wholesale and retail trade, including repairs of motor vehicles and motorcycles (24% before JA, and 21% after JA) (see Table 19).

However, when comparing the financial data of the 40 firms available both before and after JA, no significant changes were observed.

The analysis of the ratios used to measure firms' performance led to the following considerations.

Firms' performance before JA takes advantage of a low incidence of labour costs on revenue, these incidences increase in the period after JA. This result could confirm that this ratio could be employed as a red flag to detect criminal infiltration.

Analysis of the tax ratio of firms shows high tax expense incidence before JA and the incidence increases after the legal procedure. This means that the ratio, for the sample analysed, cannot be considered to denote tax evasion. The increase in this ratio in the period after JA could be justified by the rigorous application of the tax code by the judicial administrator.

The ROE in the period before JA was greater than the return on risk-free assets for the majority of firms while decreasing after the JA procedure. This result could confirm that this ratio could be employed as a red flag to detect criminal infiltration. The ROA was lower than the interest rate applied by banks both before and after JA. This result shows that the ratio cannot be used as a red flag to detect criminal infiltration.

4.4. Indebtedness

The analysis of the firm's debt ratio considered a tolerable level of debt when the average value was equal to or greater than 2, and an elevated level of debt otherwise. The data analysis revealed the results depicted in Tables 20–21.

Table 20. Debt ratio analysis before and after judicial administration

Debt ratio	*Average value before JA*	*Percentage*	*Average value after JA*	*Percentage*
Tolerable level of debt	24	22%	16	15%
Elevated level of debt	68	63%	24	22%
Data not available	16	15%	68	63%
Total	**108**	**100%**	**108**	**100%**

Source: Authors' elaboration.

Table 21. Debt ratio analysis before and after judicial administration in various industries

Industry	*Elevated level of debt before JA*	*Percentage*	*Elevated level of debt after JA*	*Percentage*
Real estate	8	12%	4	17%
Wholesale and retail trade, repairs of motor vehicles and motorcycles	12	18%	5	21%
Buildings	36	53%	11	46%
Rental, travel agencies, business support services	6	9%	3	13%
Transport and storage	6	9%	1	4%
Total	**68**	**100%**	**24**	**100%**

Source: Authors' elaboration.

The data indicates (see Table 20) that both before and after JA, the level of debt remained elevated, with 63% before JA and 22% after JA in both periods, the industry with the highest level of debt was buildings (53% before JA, and 46% after JA), followed by rental, travel agencies, and business support services (18% before JA, and 21% after JA) (see Table 21). However, when comparing the financial data of the 40 firms available both before and after JA, no significant changes were observed.

The high level of debt confirms that this ratio could be useful to detect criminal infiltration.

4.5. Elasticity of assets

In analysing the elasticity of assets employed by the firms, a structure was deemed elastic when the ratio of working capital to total assets exceeded 0.5, and rigid when the ratio was below 0.5.

The data analysis generated the following results displayed in Tables 22–24.

Table 22. Working capital on total asset ratio analysis before and after judicial administration

Working capital on total asset	*Average value before JA*	*Percentage*	*Average value after JA*	*Percentage*
Elastic structure	36	33%	30	28%
Rigid structure	56	52%	10	9%
Data not available	16	15%	68	63%
Total	**108**	**100%**	**108**	**100%**

Source: Authors' elaboration.

Table 23. Working capital on total asset ratio analysis before and after judicial administration in various industries

Industry	*Rigid structure before JA*	*Percentage*	*Rigid structure after JA*	*Percentage*
Real estate	6	11%	-	-
Wholesale and retail trade, repairs of motor vehicles and motorcycles	13	23%	2	20%
Buildings	32	57%	5	50%
Rental, travel agencies, business support services	3	5%	3	30%
Transport and storage	2	4%	-	-
Total	**56**	**100%**	**10**	**100%**

Source: Authors' elaboration.

The results in Table 22 demonstrate that in the pre-JA period, the majority of firms analysed (56 firms, representing 52% of the sample) had a rigid structure, indicating that their fixed assets exceeded their current assets. In the post-JA period, the results showed a reverse situation, with a prevalence of firms exhibiting an elastic structure (30 firms, representing 28% of the sample).

The distribution by industries of firms with a rigid structure (see Table 23) were buildings (57% of the sample) and wholesale and retail trade, including repairs of motor vehicles and motorcycles (23% of the sample).

Comparing the ratio of the 40 firms with data available both before and after JA, the results presented in Table 24 showed that in the post-JA period, total working capital increased for 58% of firms, while 38% experienced a decrease. The industries primarily characterized by this elasticity were buildings (14 firms, representing 61% of the sample), rental, travel agencies, and business support services (4 firms, representing 17% of the sample), and real estate (3 firms, representing 13% of the sample).

The ratio could not be useful to detect criminal infiltration.

Table 24. Difference of working capital on total assets before and after judicial administration procedure

Variation average index between before and after JA	*Firms*	*Percentage*
Increase	23	58%
Decrease	15	38%
Unchanged	2	5%
Total	**40**	**100%**

Source: Authors' elaboration.

5. DISCUSSION

The findings showed that most of the firms in JA were in the south of Italy (Calabria, Sicily) and were limited liability companies. The majority of them were active but undergoing insolvency procedures. The results revealed that most of the firms undergoing JA operated in the buildings, wholesale and retail trade, repairs of motor vehicles and motorcycles, rental, travel agencies, business support services, transport and storage, and real estate. These results were supported by previous studies (De Simoni, 2022; Fabrizi et al., 2017; Le Moglie & Sorrenti, 2022; Savona & Berlusconi, 2015).

An analysis of firm size confirmed that most firms were small, consistent with previous studies (De Simoni, 2022), most of them operated in the buildings, wholesale and retail trade, repairs of motor vehicles and motorcycles, and real estate.

The results related to money laundering revealed an unexpected trend. It is generally assumed that criminal firms maintain higher liquidity compared to non-criminal firms. Surprisingly, the analysed firms showed liquidity challenges, particularly evident after JA. This result is consistent with previous studies (Fabrizi et al., 2017), although it deserves further analysis.

Results related to the firms' performance ratios revealed important trends. The results of costs of labour on revenue ratio were supported by previous studies (Chircop et al., 2023; Ravenda et al., 2015). The results highlighted the positive effects of the JA procedure indicating an increase in labour costs after JA. Notably, the buildings industry exhibited the highest percentage in this regard. Analysis of the tax ratio of firms shows high tax expense incidence before JA and the incidence increases after the legal procedure. This means that the ratio, for the sample analysed, cannot be considered to denote tax evasion. The ROE in the period before JA was greater than the return on risk-free assets for the majority of firms while decreasing after the JA procedure. Finally, ROA was lower than the interest rate applied by banks both before and after JA.

The results showed a high debt ratio both before and after the JA procedure, this result was supported by previous studies (Bianchi et al., 2022; Fabrizi et al., 2017).

Finally, the results related to asset elasticity contrasted with previous studies (Fabrizi et al., 2017). The sample analysed exhibited low elasticity before the JA procedure with a noticeable increase in elasticity during the JA procedure.

6. CONCLUSION

This article explored the relationship between criminal organizations and firms; specifically, the study analysed firms undergoing JA and the context in which they operated, examining whether certain financial ratios could be considered red flags indicating criminal infiltration. The results also shed light on the differences that occurred between before and after JA.

The research employed data from the AIDA database. We calculated specific ratios related to various characteristics of criminal firms, such as firm size (measured by employees and annual revenue), money laundering (measured by liquidity ratio and cash on total assets), firms' performance (measured by ROE, ROA, labour costs on revenues, and tax ratio), indebtedness (measured by debt ratio), and elasticity of assets (measured by working capital on total assets).

In summary, the analysis showed that firm size, firm performance and indebtedness ratios could be employed as red flags to denote criminal infiltration.

Based on the results achieved, various avenues for future research emerge. First, particular attention should be paid towards the building industry in future studies. The small sample size could enable a thorough investigation into the characteristics of criminal organizations within this industry. The analysis could be based on a detailed financial analysis, with a focus on calculating relevant ratios to yield significant insights. Secondly, future research can investigate the tax evasion phenomenon. Some studies identified the levels of tax debts with tax evasion. However, the high level of tax debts can be related to a temporary difficulty of a company often due to a lack of liquidity. Tax debts themselves don't mean tax evasion. However, a deep analysis of the financial statement across a small sample of firms would shed light on this issue.

This study offers practical implications in understanding how accounting tools can help to identify criminal infiltration within organizations. By establishing appropriate ratios, accounting can serve as an effective tool to pinpoint red flags to denote potential criminal activity.

The paper makes a twofold contribution. First, it contributes to the literature on the analysis of the relationship between criminal organizations and firms identifying the effects of criminal infiltration, in terms of financial ratios (Bianchi et al., 2022; Fabrizi et al., 2019; Le Moglie & Sorrenti, 2022). Secondly, it contributes to the accounting literature by highlighting the important role of accounting tools in identifying red flags for detecting criminal infiltration within the firms. Specifically, it sheds light on the crucial role of financial indicators and accounting practices in detecting and preventing illicit activities (Bianchi et al., 2022; Chircop et al., 2023; Compin, 2008; Fabrizi et al., 2019; Ravenda et al., 2018).

The study's limitations are related to the data set. Firstly, the data set was unbalanced, as most of the firms were located in Calabria. This imbalance can be explained by the significant presence of organized crime in this region. Secondly, most of the firms analysed were limited liability companies that publish financial statements in a simplified form, which means that most data are missing. To overcome this limitation, it is necessary to analyse all the documents that compose the financial statements (balance sheet, income statement, notes to the financial statements). To this end, comparative case studies can offer insights into how specific characteristics and contextual factors influence the significance of certain ratios as red flags.

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