The effectiveness of a certification of legality. Evidence from Italian firms

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Abstract

Over the past decade, Italy has enacted a variety of measures to combat organized crime. White lists of legitimate businesses, established within each Italian prefecture, are a strategic tool to thwart mafia encroachment in the sectors most susceptible to infiltration. By replacing anti-mafia documentation, this mechanism fosters trust in the legality of enterprises among potential clients, suppliers, and financial institutions. Drawing on an extensive firm-level dataset, we employ a comprehensive, generalized difference-in-differences design to investigate the consequences of such certification on firms' access to credit and their profitability. Our findings indicate that this certification engenders tangible positive effects on firms' performance, manifested in improved credit access and enhanced profitability. Notably, the impact on banking obligations is particularly pronounced in regions where organized crime is more prevalent, such as the Southern regions of Italy. Conversely, the effect on profitability appears to be more accentuated in the North. These effects are more pronounced for firms that maintain certification over multiple years.

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Keywords: White List, Organized crime, Certification, Reputation, DID

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1 Introduction

In 2018, the "unobserved economy" in Italy stood at €211 billion, accounting for 11.9% of GDP. This comprises the "shadow economy" (€192 billion) as well as the illegal economy (€19 billion) (Istat, 2020). Illegal behaviour (crime, corruption) has economic and social costs. Widespread illegality curbs investment and growth, exacerbates firms' financial constraints, and reduces public revenue. An effective fight against illegality will produce evident improvements in the public accounts and foster healthy competition among economic actors.

Governments adopt measures to attenuate the adverse effects of illegality; the measures are both preventive (ex-ante) and punitive (ex-post). In Italy the most incisive intervention was the new Anti-Mafia Code enacted in 2011, which introduced a series of significant innovations and modifications to the previous code to enhance the efficacy of the fight against organized crime. This paper focuses on one particular tool, namely the so-called "white lists" (WL) of legitimate firms. These are lists of companies established in each Italian prefecture by Law 190/2012. Any firm operating in the sectors considered to be at highest risk of mafia infiltration can apply to register. Inclusion in a white list certifies a firm's extraneousness to the various forms of criminal infiltration. A firm may be registered in the WL if it meets the prescribed legality requirements. In this sense, WL registration may be considered a sort of government certification of legality.

The purpose of the white lists is to enhance anti-Mafia controls, particularly for business activities especially vulnerable to Mafia infiltration. For this reason, enrollment in a white list is mandatory for specific categories of businesses, in particular those with contracts or subcontracts with general government bodies. For these businesses, enrollment in a WL offers the advantage of bureaucratic simplification, doing away with the need for other anti-Mafia documentation. However, even if a company does not intend to participate in public procurement or work with government bodies, the list can serve as a safeguard in dealings with third parties, including relationships between private entities. The present study investigates precisely whether listing provides advantages for businesses apart from those arising from engagement with government.

When illegality is widespread, a government certification of an enterprise's legitimacy can be significant. In high-crime areas, borrowers are more fragile, and the signals that banks use to determine creditworthiness are less informative (Bonaccorsi di Patti 2009); it becomes crucial to address the heightened quality of firms in such contexts (Clougherty and Grajek 2008; Potoski and Prakash 2009).

Enterprises may utilize certification strategically as a way of signaling their trustworthiness to external parties, such as potential business partners or suppliers. The effectiveness of such certification depends on various factors, including the institutional framework and the characteristics of the firm. The value of third-party endorsement is enhanced when it generates a certification effect, signaling the quality of the company to external actors. This third-party

entity can be a reputable underwriter, a venture capital investor, or even a government authority, as noted in various studies (Carter and Manaster 1990; Lee and Wahal 2004; Feldman and Kelley 2006; Mart´ıand Quas 2018).

Government certification, in a form such as white-listing, can help reduce information collection costs. By assessing the legality of a firm, the WL attenuates information asymmetry between banks and companies, potentially easing credit constraints. This can lead to increased trust on the part of financial institutions, which may impact positively on the firm's access to credit and other financial opportunities.

Certification provides significant reputational benefits that instill confidence in a firm's potential among stakeholders. When a company earns a positive reputation, it gains brand goodwill (Shapiro 1983), which contributes to long-term profitability (Roberts and Dowling 2002). A company with a strong reputation can also establish privileged positions with various stakeholders, such as customers, supply chains, and potential investors (Kumar 2018). Roberts and Dowling (2002) further specify that a good reputation can lead to increased profitability and create competitive barriers for the firm. Numerous studies emphasize that a good reputation leads to higher demand for the firm's products and services, often resulting in higher prices, greater consumer satisfaction, and improved profits. These findings underscore the tangible, practical benefits of a good reputation in the market.

The present paper contributes to this literature by studying the effectiveness of WL certification. We present original firm-level data on the impact of the certification on firm's credit access and on profitability for a wide set of companies operating in different parts of Italy. We collect data on all enterprises registered in the white lists in Italy, from their introduction to 2020. After selecting a suitable treatment group, propensity score matching with common support is used to select a control group of firms in the same business sector as the WL firms. Comparing WL and non-WL companies, we find evidence that the certification does lead to better sales performance, especially in the Northern regions. The positive impact on sales is appreciably greater for firms with just one year of certification than for those with multiple years. The certification reduces the information asymmetry and the opacity

[4] of WL firms, easing access to bank credit. This is particularly relevant in the South of Italy, which has traditionally been characterized by more stringent borrowing constraints on firms and households (Guiso, Jappelli and Terlizzese, 1996; Schiantarelli, Stacchini and Strahan, 2020); for companies with more than a year of certification, the relevant coefficient is nearly twice that of firms located in the Centre-North.

The rest of the paper is organized as follows. Section 2 provides details on the characteristics of white list functioning and registration. Section 3 reviews the literature and formulates the research hypotheses. The distribution of WL firms is detailed in Section 4. Section 5 describes

[4] The signaling effect of certification on firm growth is stronger when the information asymmetry problem is severe.

the selection of the treatment and control groups and the empirical strategy. The results are shown in Section 6, and Section 7 presents some robustness checks. Section 8 concludes.

2 The white list: a certification of legality

In recent years, Italy has made significant legislative changes to combat organized crime and address the issue of criminal infiltration of the legal economy. One notable step was the introduction, with Legislative Decree 159/2011, of a new Anti-Mafia Code. This legislation instituted a comprehensive framework for combating organized crime and introduced substantial innovations to step up the efficacy of the fight against criminal organizations. Additionally, Parliament passed an anti-corruption law in November 2012, marking a pivotal shift towards a preventive rather than solely repressive approach. This legislation was intended to tackle corruption through proactive measures and preventive tools. These legislative developments highlight Italy's commitment to combating organized crime and addressing the challenges posed by criminal infiltration of the economy. They reflect a strategic focus on prevention and deterrence.[5]

Several ex-ante measures have been implemented to promote legality, particularly in the context of specific projects such as post-earthquake reconstruction in Abruzzo (Decree Law 39/2009), works related to Expo 2015 (Decree Law 135/2009), the Extraordinary Prisons Plan (Decree Law 195/2009), and post-earthquake reconstruction in Emilia (Decree Law 74/2012).[6] These special measures have introduced a new tool to streamline the obligations associated with the extensive amount of work to be carried out. In these experiences and subsequent endeavors, the provincial administration oversees the creation of a white list, i.e a roster of suppliers, service providers, and contractors operating in sectors at high risk of mafia infiltration that have been deemed extraneous to such infiltration.[7]

In 2013, following the success of those initiatives, new legislation introduced a provision for the acquisition of anti-mafia information, via WL, on companies operating in sectors at risk

[5]Raffaele Cantone, former President of the National Anti-Corruption Authority, notes that the fight against corruption operates on three distinct levels. First, there is the identification of specific risks within individual government bodies or particular sectors, followed by the adoption of anti-corruption plans to eliminate or minimize these risks. Second, there is a focus on enhancing procedural transparency, to make the commission of offenses more difficult. Lastly, there is the need to address conflicts of interest that could compromise the impartiality of decision-makers.

[6]These projects are particularly complex and have a significant economic dimension, making them susceptible to the interest of criminal organizations. Consequently, there was a need to establish detailed regulations for each phase of the contract awards and to enhance the overall control system.

[7]These legislative measures enhance the effectiveness of anti-mafia controls by specifically targeting entrepreneurial activities deemed particularly vulnerable to mafia infiltration. Firms have the option to apply for registration on the white list. The sectors identified as being at risk are those listed in the anti-corruption law (Law 190/2012, art. 53).

of infiltration.[8] Each prefecture compiles lists of companies in vulnerable sectors, certifying their non-involvement with criminal organizations.

Registration on a white list is initially valid for twelve months, during which time periodic checks may be conducted. After the first year, companies may apply for renewal of their registration, subject to ongoing scrutiny and evaluation. This mechanism ensures that registered companies maintain their commitment to legality and adhere to the criteria established by the white list system.

This system serves to strengthen anti-mafia controls by specifically targeting sectors at higher risk of infiltration. Companies operating in these sectors can apply voluntarily for registration, thus demonstrating their commitment to operating within the boundaries of legality and their determination to resist the influence of organized crime. The white list is a tool for transparency, integrity, and the prevention of mafia infiltration in susceptible sectors.

The companies that apply are fully aware that they will be subjected to rigorous verification of various aspects of their operations. These checks include assessment of the transparency of their organizational and functional structures, verification of compliance with tax and social security obligations, compliance with environmental and occupational safety regulations, and adherence to financial flow traceability requirements. These thorough checks are designed to ensure that the applicants are in compliance with the regulatory requirements, that they operate within the law, and that they possess the necessary legitimacy to be registered as "healthy." By meeting these criteria and demonstrating their adherence to legal obligations, companies can strengthen their reputation and position themselves as reliable and trustworthy entities within their industries.

The registration of a company on a white list certifies its dissociation from various forms of criminal infiltration, and serves as a substitute for the traditional anti-mafia documentation. The equivalence to the possession of anti-mafia documentation[9] applies to two main aspects: a) activities for which the company has been included in the white list; and b) contracts or subcontracts related to activities other than those for which the company has been included in the white list.

Therefore, inclusion in the white list becomes crucial not only for government contracts but also for subcontracts. The consultation of the white list is mandatory for general government bodies, companies controlled by other public bodies, and firms assigned to public works. This requirement ensures that these entities properly assess the eligibility and legality of companies operating in at-risk sectors before entering into contracts or subcontracts. Consequently, contracting authorities no longer need to acquire the prescribed anti-mafia documentation and can proceed directly to contract negotiations with the successful bidder. White lists work in tandem with the traditional system of anti-mafia documentation. The creation of lists of

[8] This provision is outlined in Law 190 of 6 November 2012, and the D.P.C.M. (Decree of the President of the Council of Ministers) of 18 April 2013.

[9] Prime Minister's Decree DPCM 11/24/2016.

reputable enterprises is designed to streamline the verification process during the final stage of public tenders (after the award but before signature of the contract), or to demonstrate a company's good business practices to the credit system, suppliers, and customers.

White lists have been used increasingly of late, as evidenced by the "Liquidity Decree" of 4 June 2020. This decree, following the recommendations of the Ecomafie Commission, introduced amendments to the system known as "White List-Green." The changes mainly involve Article 4-bis and the inclusion of new sectors.

Under the revised system, in order to participate in public procurement companies involved in "environmental services" must be included in a dedicated "ad-hoc list." Until then, the white lists had encompassed activities related to the management of plants, landfills, remediation, and waste transport and disposal on behalf of third parties. The "Liquidity Decree" extended the scope of the list to cover a broader range of environmental activities.

The extension of the lists to include additional business sectors, such as environmental services, reflects a growing recognition of the importance of promoting transparency and legality across various industries. The inclusion of these sectors in the White List system signifies the acknowledgment that transparency, regulatory compliance, and adherence to legal requirements are crucial not only for environmental services but for businesses in general.

Extending the white lists and implementing stricter controls reflects increased emphasis on fostering transparency, integrity, and legality within the business community. This recognition underscores the significance of maintaining high standards of ethical conduct and promoting fair competition in all sectors, ultimately contributing to a more transparent and accountable business environment.

3 The literature and hypotheses

In a marketplace with significant information asymmetry, firms often face challenges in communicating their unobserved quality to consumers (Akerlof 1970; Landon and Smith 1998), institutions, and competitors. This problem is particularly pronounced in weak institutional environments, such as the Italian marketplace, which is characterized by a socio-institutional divide between the North and the South and substantial disparities in human and social capital.

The understanding that economic activity is deeply intertwined with social systems (Granovetter 1985; Polanyi 2001) has given rise to extensive research on how the social context influences business outcomes. A compelling body of economic and management literature has elucidated the signaling strategies employed by firms and their effects (Colombo 2021). Dranove and Jin (2010) define quality disclosure as the deliberate effort of a certification agency to systematically measure and report the quality of goods or services within a market. Quality disclosure can be manifested in various forms. Unlike other signals, third-party certification ensures that the company meets standard criteria set by institutions, which makes this the most effective means of disseminating information to stakeholders. Certification serves

as a signal for attributes that are not readily observable (Spence 1974). The value of such third-party endorsement increases as it generates a certification effect, providing external actors with a signal regarding the quality of the company. This third-party entity could be a reputable underwriter (Carter and Manaster 1990), a venture capital investor (Lee and Wahal 2004), or even a government authority (Feldman and Kelley 2006; Mart´ı and Quas 2018). The impact of the certification effect is particularly pronounced in regions where company transparency is limited (Di Patti and Dell'Ariccia 2004) or where a company faces challenges related to evasiveness, corruption, or criminal activities. Additionally, institutional voids may further amplify the significance of the certification effect, as it becomes crucial to address the stiffer quality challenges in such contexts (Clougherty and Grajek 2008; Potoski and Prakash 2009).

For the most part, the literature has examined the concept of credible commitments (Riordan and Williamson 1985) and the use of certification, guarantees, and brands as strategic signaling mechanisms (Akerlof 1970). Enterprises use certification to signal to external parties that they are reliable suppliers and partners. This perspective aligns with the principles of the New Institutional Economics, which hypothesizes that transaction uncertainty can be reduced thanks to the role of institutions in laying down crucial "rules of the game" that shape economic interactions (North 1991) and foster reputation and trust. Within this framework, Spence (1974) proposed that reputation is an integral part of the market signaling process through which firms effectively communicate relevant characteristics to customers and other stakeholders in order to maximize their status. Brands, in particular, generate value in various ways and exert influence over different stakeholders. Strong reputations can act as entry barriers, increasing the rate of return for companies above the opportunity cost of capital and thereby enhancing their market value. Similarly, Black, Carnes and Richardson (2000) argued that corporate reputation holds value for investors as it translates into financial benefits. These benefits include impeding the mobility of competitors, supporting premium pricing, and facilitating access to capital. The lack of transparency can stem from specific attributes of the firm or its operations. In this context, the literature distinguishes between "reputational" and "informational" opacity. The former relates to the lack of transparency arising from the characteristics of the firm itself, such as its age and size (Petersen and Rajan 1995), or stock exchange listing. Typically, small and young firms have trouble establishing a strong reputation, with information asymmetry that hinders their access to credit. Conversely, listed firms tend to be more transparent thanks to the exchanges' disclosure requirements (Bazrafshan, Kandelousi and Hooy 2016; Yuen et al. 2009).

Historically, Italy has experienced more stringent borrowing constraints than other countries for both enterprises and households, particularly in the Southern regions (Guiso, Jappelli and Terlizzese 1996; Schiantarelli, Stacchini and Strahan 2020). In fact, the cost of bank credit differs significantly between the Centre-North and the Centre-South. The average cost of debt in the Centre-North is lower. This cost disparity can be attributed, at least partially, to differences in credit risk, which tends to be higher in the South. As noted by Guzman and Clark (2022), there is a clear correlation between violent crime rates and credit ratings: areas with higher crime rates tend to have lower credit ratings. The prevalence of widespread illegality

poses challenges in assessing the quality of borrowers, reducing banks' willingness to lend (Bonaccorsi di Patti 2009). In areas characterized by high levels of crime, corruption, and weak institutions, the WL certification becomes particularly significant. It serves as a signal of the firm's adherence to legality, indicating that its operations are conducted without involvement in criminal activities. Recent work on the effects of legality certification has shown that it facilitates credit access by reducing banks' screening costs (Acconcia et al. 2021). A legality certification reduces information asymmetry between the firm and its external stakeholders, thereby fostering its productivity (DeBenedetto et al. 2023). By mitigating information asymmetry between banks and firms, the WL certification has the potential to alleviate the credit constraints faced by firms.
Consequently, we can formulate our first hypothesis for testing.

H1: WL-certified firms enjoy easier access to bank credit than non-certified firms.

Empirical studies provide compelling evidence of the advantages of third-party certification for firms. Graffin and Ward (2010) demonstrate that certification has a positive impact on long-term reputation, a crucial factor that can influence credit access. Francis, Khurana and Pereira (2005) present evidence that "firms in industries with greater external financing needs choose to disclose more financial information to the market, and an expanded disclosure policy for these firms leads to a lower cost of both debt and equity capital". Sufi (2009) demonstrates that bank loan ratings have significant effects on various financial and real outcomes for borrowers. Utilizing a direct prediction approach, Sufi identifies the causal effect of loan ratings on these outcomes. Obtaining a bank loan rating has the greatest impact on the financial and real aspects of borrowers' activities. The study further reveals that the introduction of credit ratings leads to an increase in the availability of debt financing. Firms that obtain a loan rating experience a significant increase in the ratio of debt change to lagged assets. Notably, this effect is particularly pronounced among firms that do not have a public bond rating prior to the implementation of loan ratings.

Meuleman and De Maeseneire (2012) present evidence of a positive impact of government certification on SMEs' subsequent access to external finance. This certification effect is more pronounced for long-term than short-term debt. Other studies have also examined the effects of certification on firms' activity. Some find positive effects on operational or organizational performance (Samson and Terziovski 1999; Romano 2000; Sun 2000, José Tarì and Molina 2002; Bayati and Taghavi 2007). Terlaak and King (2006) suggest that certification with a management standard confers a competitive advantage by reducing information asymmetry. As a result, certified facilities experience accelerated growth after certification, particularly when buyers have difficulty in acquiring information about suppliers.

Certification offers reputational benefits that enhance stakeholders' confidence in a firm's prospects. Uncertainty over performance standards enables third-party quality signals, such as certifications, to affect a firm's reputation. WL certification is important not only in revealing

otherwise hidden information but also for a symbolic value that transcends its informational content (Sine, David and Mitsuhashi 2007). Certifications serve as a mechanism for reputation transfer between the certifying organization and the certified entity (Stuart 1999). In the context of WL certification, this transfer instills confidence of legality among a firm's potential customers, suppliers, and banks. WL-certified enterprises operate under strict scrutiny, as they understand that their reputation can be compromised if they are later found to be undeserving of the endorsement. Consequently, we hold that WL inclusion establishes a good reputation for the certified firms, which, in turn, can have a positive impact on their performance.

We accordingly propose a second research hypothesis:

H2: There exists a positive association between a good reputation and the performance of WL-certified firms.

Reputations are regarded by economists as traits that signal a company's anticipated behaviour. Strategists emphasize that reputation is a source of competitive advantage. Accountants treat reputation as an intangible asset, while marketers recognize it as a powerful tool for attracting and retaining customers. Sociologists view reputation as a social construct that emerges from the relationships firms establish with stakeholders in their institutional environment. Corporate reputation, that is, is a multi-dimensional construct, encompassing a number of factors on which different stakeholders base their judgments of the company's performance. We draw insights from various strands of the economic and strategic literature. Shapiro (1983), emphasizing that a firm with a good reputation possesses brand goodwill, explores the implications of firm-specific reputations in a perfectly competitive environment with imperfect consumer information. Roberts and Dowling (2002) observe that reputation is a valuable asset, enabling a firm to achieve long-term profitability or sustained superior financial performance. Kumar (2018) notes the importance of reputation in firms' strategic responses to environmental threats, allowing them to establish privileged positions with customers, supply chains, and potential investors, ultimately improving performance. Roberts and Dowling (2002) also find that reputation can contribute to profitability and help create competitive entry barriers. All these studies concur that good reputation enhances the demand for a firm's products and services, often accompanied by higher prices, increased consumer satisfaction, and improved profits.

In the model set out by Shapiro (1983), the competitive equilibrium demonstrates that firms can earn a stream of profits that primarily represents a competitive return on their investments in building and maintaining reputation. The premiums charged by sellers play a crucial role in incentivizing them to establish and nurture their reputations, thereby generating profits that offset the resources allocated to this. Theories of market signaling propose that certain agents can highlight their distinctive characteristics, which the public can subsequently utilize as a screening mechanism (Spence 1978, Spence 1974). Research conducted in the private sector

has revealed that reputational mechanisms can be understood through a model of reputation formation as a signaling game.

Corporate reputation serves as a signal that promises future performance to investors (Himme and Fischer 2014). Consequently, a higher level of reputation is associated with a lower future cost of equity (Pfarrer, Pollock and Rindova 2010). Vergin and Qoronfleh (1998) argue that reputation can encourage shareholders to invest in a firm, as it is positively correlated with superior overall returns. This signal can be productive, since adopting it enhances performance. As a result, reputation can influence entry decisions and attract high-quality participants in the private sector (Hui et al. 2018). By reducing information asymmetries in supply chains, reputation also bestows a competitive advantage upon certified firms. Firms with a strong reputation are better positioned to secure valuable resources, including employee retention, customer satisfaction and loyalty, and to attract talented and efficient staff.

Traditionally, researchers have focused on examining the relationship between corporate reputation and firm performance (Pfister, Schwaiger and Morath 2020). However, Delgado-Garcìa, QuevedoPuente and Dìez-Esteban (2013) have explored the link between reputation and risk. Building on this work and recognizing the widely accepted view that reputation reflects stakeholders' perceptions of a firm (Gatzert 2015; Raithel and Schwaiger 2015), our study investigates the impact of a strong reputation – defined as white list inclusion – on performance. Performance will be evaluated as the ratio of sales to total assets. A high ratio indicates that the company effectively leverages its assets to generate profits.

Some studies (Mohr, Webb and Harris 2001; Saeidi et al. 2015) show that tracing sales revenue can reveal how a firm's reputation influences customer attraction or deterrence. Survey data (Europe 2000) indicate that some 70% of consumers consider a company's ethical reputation when making purchasing decisions. Management literature underscores the importance of satisfying business customers to foster loyalty and ensure ongoing business relationships (Anderson and Narus 1998; Day 2000; Narayandas 2005). Maignan and Ferrell (2003) and Perry and Towers (2009) assert that firms demonstrate their commitment to fair trade to enhance sales.

Research by Luo and Zheng (2013) and Cheung et al. (2015), utilizing a positivist methodology to explore the link between Corporate Social Responsibility and sales, quantifies customer perception as a metric for these relationships. Companies with a commitment to CSR, possibly embodied in WL certification, can enhance customer trust and persuade customers to purchase their products. That is, corporations may benefit from WL certification by gaining a positive public image, earning customer appreciation and boosting sales. Troilo, De Luca and Guenzi (2009) provide supporting evidence on the impact of these values on a firm's performance, as measured by sales growth.

Companies that prioritize good governance are willing to disclose information, since they recognize that fulfilling their responsibilities will foster stronger relationships (Becchetti, Pinnacchio, Di Giacomo et al. 2005). By adhering to community norms, these companies can conduct their operations in a manner that aligns with societal expectations. Taking

responsibility not only builds trust but also garners support from the community, leading to various benefits for the company.

Our research hypotheses are intended to determine the effectiveness of legality certification in enhancing firms' activities. Accordingly, we analyze the performance of "certified" legal companies. In this respect, our study relates to the literature on mafia firms. Prior studies have demonstrated that mafia firms tend to expand in sectors with higher public expenditure (Pinotti 2015b). Their diversion of resources from productive to unproductive sectors hampers economic development and reduces the number of viable firms in the economy. Organized crime affects economic performance adversely by diminishing competitiveness (Detotto and Otranto 2010), contributing to the misallocation of public funds (Barone and Narciso 2015, Daniele and Dipoppa 2017), increasing the cost of funding (Bonaccorsi di Patti 2009), impeding foreign direct investment (Daniele and Marani 2011), and reducing firms' revenues (Mirenda, Mocetti and Rizzica 2022). If the WL certification affects performance positively, it could become an effective tool to combat mafia infiltration of the legitimate economy. In this context, taking a regional approach, we seek to determine at the sub-regional level whether a reputation for legality has a positive impact on firms' financial and economic performance.

4 Data and Sample selection

Italy has grappled with a long history of economic disparity, rooted in national unification in 1861 (Del Monte, De Luzenberger and University of California 1987). This economic gap is evident through significant regional differences, some areas experiencing faster economic development than others. Subsequent policies have addressed this disparity, but it remains a significant challenge (Gianpiero Torrisi and Tselios 2015). Factors such as the presence of economic dualism, developmental differences between the North and South, and the complexity of regional economic systems have helped to perpetuate this gap (Cellini and Torrisi 2014). Analysis and management of such economic disparity continues to be a crucial theme for Italian economic policy.

Historical, economic, social, and cultural factors have contributed to the creation and persistence of this divide. One of the main factors in the regional divide is the historical disparity in economic development. During the industrial era, Northern Italy developed a strong manufacturing base and modern infrastructure and was the driving force in the national economy. Southern Italy, instead, remained mainly agricultural, suffering a lack of investment and infrastructure. The North also benefited from a favourable geographical position, with greater access to European markets and better international connectivity. This facilitated the development of commercial activities and attracted foreign investment, while Southern Italy struggled with a more peripheral location and poorer connectivity, limiting opportunities for economic development. There is also a clear disparity in infrastructure. Northern Italy has enjoyed better road, rail, and port networks, enabling a higher flow of goods and efficient business logistics. Meanwhile, many areas in Southern Italy still have underdeveloped

infrastructure, hampering competitiveness and undermining the area's attractiveness for investors.

The regional divide has also been fueled by differences in the education system and vocational training. Northern Italian regions generally have greater availability of higher education institutions and better quality of education. This has created a skills and employment gap, Southern Italy facing higher unemployment rates and a less qualified workforce.

Lastly, cultural and institutional differences are a significant factor in the divide. Southern Italy has grappled with corruption, inefficient public administration (Del Monte et al. 2022), and organized crime. These factors have discouraged investment and created an atmosphere of insecurity that hampers economic growth and social advance. Arbolino and Boffardi (2023), analyzing the impact of illegal activities on the implementation of cohesion policy, point out that a deficient institutional context fosters the emergence of illicit practices. In the Italian context, this can be attributed to two primary factors: infiltration by organized crime and corruption.

The North-South divide, in fact, is often associated with issues of crime. However, it is worth noting that crime is not an inherent trait of either the Northern or Southern regions but rather the product of multiple socioeconomic, cultural, and institutional factors.

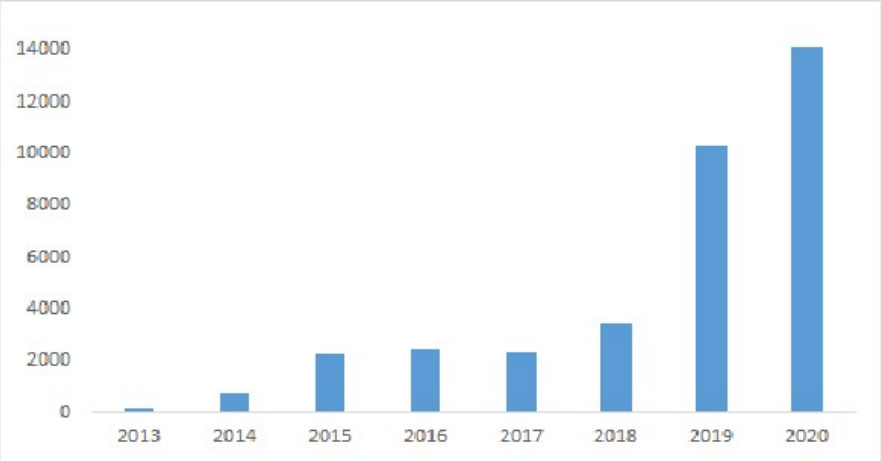
Several studies have found a strong correlation between the economic and social divide and the incidence of crime (Del Monte and Papagni 2001).

The Southern regions, characterized by more severe economic difficulties, unemployment, and poverty, may exhibit higher crime rates than the more prosperous North.

Historically, certain regions in Italy, particularly those in the South, have been afflicted by higher crime rates. Naples, Palermo, and parts of Calabria have previously experienced higher levels of organized crime, involving the Camorra, Cosa Nostra, and 'Ndrangheta, respectively. On the other hand, such Northern regions as Lombardy, Veneto, and Piedmont generally have lower crime rates. These regions are known for their economic prosperity and strong law enforcement presence and are generally considered to have lower levels of crime in businesses. Importantly, however, the prevalence of crime in businesses is affected by various factors and may vary by sector. In the North of Italy, businesses typically operate in a more favorable economic and legal environment than in the South. These Northern regions are characterized by a more highly developed economy, greater transparency, and a more efficient judicial system, which can impede the spread of crime in business. But this does not mean that businesses in Northern Italy are completely immune to criminal activity. Instances of fraud, corruption, money laundering, and other economic crimes occur in all Italian regions, including the North. Businesses need to adopt proper prevention and control measures to protect themselves against criminal activity. The authorities, at both national and regional level, have implemented various measures to combat crime in businesses, such as anti-money-laundering laws, regulations on transparency in public procurement, and stricter checks on the reliability of companies. These measures have been put in place to ensure legality and fairness in economic activities throughout the country.

Certainly, the white list may be a valid tool to counter criminal activity.[10] Since its introduction, companies' interest in registering has increased steadily. In Figure 1 we report the number of firms enrolled in the white lists, from 2013 to 2020. The first substantial increase in enrollments came about 2 years after the passage of Law 190/2012. From 2015 to 2018, there were 2,000-3,000 registrations annually, and new listings surged in 2019 and 2020.

Figure 1: *Companies registered in the white list, by year*



Source: Based on Prefecture data.

The white list can be a powerful instrument to prevent and combat illegality within companies, particularly those operating in sectors vulnerable to infiltration by organized crime. As noted, registration is voluntary, and companies can be listed within 90 days of their application to the Prefectures. During registration, companies are required only to specify the sector of activity they wish to register for and submit the relevant documentation for verification. But what are the risk sectors? In Article 53 of the Anti-Corruption Law and the amended version of Law 40/2020, Article 4-bis, paragraph 2, the following activities are defined as most exposed to the risk of mafia infiltration:

(a) extraction, supply and transport of soil and inert materials;

(b) packaging, supply and transport of concrete and bitumen;

(c) cold rental of machinery;

(d) supply of wrought iron;

(e) hot freight;

[10] The WL tool is described at length in section 2.

(f) road transport on behalf of third parties;

(g) construction site guardian;

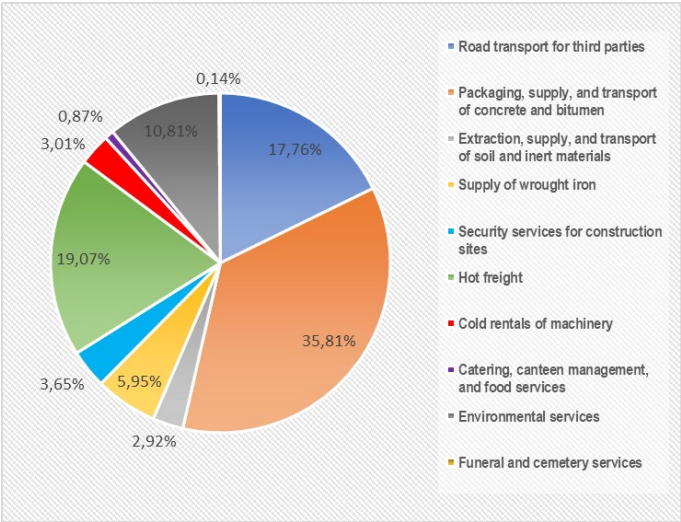
(h) funeral and cemetery services;

(i) catering, canteen management, food services;

(j) environmental services, including waste collection, domestic and cross-border transport, including on behalf of third parties, waste treatment and disposal, as well as remediation and reclamation activities and other services related to waste management.

In Figure 2, we show the percentage of WL grouped by these 10 sectors.

Figure 2: *Percentage of white list by sector*



Source: Based on Prefectures data.

It is clear from the figure that the most important sectors here are *Road transport for third parties*, *Packaging, supply, and transport of concrete and bitumen,* and *Enviromental services*. It is worth noting that these sectors have historically been prime targets for organized crime. As a result, legitimate businesses seeking to distance themselves from criminal activities have no option but to utilize certification tools like the white list.

4.1 Geographical distribution of the white list and the crime rate

Given the different characteristics of the Italian regions, we hypothesized that the WL certification is likely to be more important for companies operating in contexts where crime is more widespread. We accordingly investigated possible links between the diffusion of WL and the crime rate by combining the data on *Crime Level* and *Concentration of WL companies*. First, in order to trace the nationwide distribution of WL firms, we mapped the universe of the

White List firms by georeferencing techniques, with province-level detail. We built an indicator comparing the total number of firms on the lists of the Prefectures from 2013 to 2020 with the average number of active firms in the same period. Considering that the white lists were introduced by Law 190 of 6 November 2012, we selected the firms registered from 01/01/2013 to 31/12/2020 (the last year of data availability).[11] We specify five concentration levels (Very Low, Low, Medium, High, Very high).[12] Figure 3 shows high concentration of WL firms in the province of Aosta, Trento, some provinces in Lombardy and Veneto, in the North; in the Center, along the Apennines and in some provinces of Lazio; and finally in most of the provinces of Southern Italy.

It is useful to remember that the WL instrument was greatly sensitized during the reconstruction following the earthquake in L'Aquila in 2009 and subsequently in Emilia Romagna in 2012 (Figure 3).[13] Secondly, we identified the local level of crime by developing a province-based crime rate. The variable that captures organized crime (OC) at the provincial level is defined by considering three primary types of crime, in the period 2013-2020:

- Mafia-type associations (association);
- Mafia-related murders (murder);
- Extortion cases (extortion);

The variable (OC) is standardized by resident population.[14]

This index gives a numerical assessment of the level of crime in a province. Here too we define 5 levels of crime (Very Low, Low, Medium, High, Very high).[15] The distributions of the

[11] The list of companies provided by the prefectures covers the period from 2011 to 2021, but the companies registered before 2013 counted only on an experimental basis before the real implementation phase, so we have not used these companies. In any case, considering the companies enrolled before 2013, the geographical distribution does not change.

[12] To define the size of the classes, we divided the distribution scores into quantiles. In particular, the provinces with scores between of 0-0.0045 are considered provinces with a very low concentration of WL; 0.0045-0.0057 means Low concentration;
0.0057-0.0084, Medium concentration; 0.0084-0.011, High concentration; and 0.011-0.022, Very High concentration.

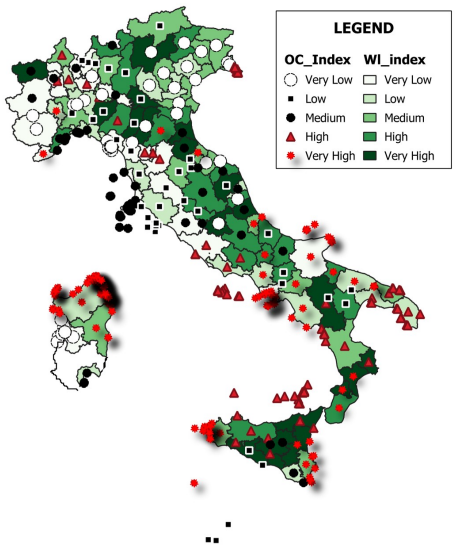
[13] The use of the white list tool, as a certificate of legality for firms, has allowed a rapid and effective urban-environmental reconstruction of areas heavily damaged by extraordinary natural phenomena, because it allows transparency and legitimacy in granting public contracts for reconstruction work.

[14] The variable is operationalized as follows:

[15] To define the size of the classes we divided the crime index into quantiles. In particular, the provinces with scores of 0-0.00010 are considered provinces with very low concentration of WL; 0.00010-0.00012, Low concentration; 0.00012-0.00014, Medium concentration; 0.00014-0.00017, High concentration; 0.00017-0.00037, Very High concentration.

two variables *Crime Level* and *Concentration of WL companies* have been mapped via georeferencing (Figure 3).

Figure 3: *Geographical distribution of white list*



Source: Based on Movimprese, Istat and Prefectures data

Looking at Figure 3, our initial hypothesis appears to be confirmed. Specifically, in Southern Italy, where the crime level is higher, there is a notable concentration of WL companies. This reinforces the notion that WL certification serves as a valid instrument for companies operating in regions characterized by higher criminal activity.

Our initial exploratory results on the relative presence of WL companies in different parts of the country mirror the findings of the literature. For example, Pinotti (2015a), studying the impact of mafia on two Southern regions, verifies that a mafia presence lowers per capita GDP by 16%. Daniele (2009) shows that the mafia organization determines lower productivity, reduces both local and foreign investment, and creates an unfavorable socio-institutional climate for business. Also, Astarita, Capuano and Purificato (2018) provide evidence of a negative impact of the mafia on the Italian economy on the macro level.

White list registration certifies that a company operates legally. Therefore, a company may be interested in this as a way to signal this asset. This may be of special relevance to businesses operating in areas with a strong presence of criminal organizations.

5 Empirical strategy

To test our hypotheses, one must compare the performance of firms that are on the white list with those that are not. As a result, we need to distinguish between a group of "treated" firms (WL firms) and a group of "untreated" (non-WL) companies.

5.1 *Treatment and control groups*

We gather data on companies registered on the white lists from each Italian prefecture, covering the period from the introduction of the certification to 2020. Significantly, the certification is valid for one year, so firms choose whether to renew their registration during the period. On the other hand, it is also possible that some companies may be withdrawn from the lists. We collected information from 2013 to 2020 on the universe of WL companies. Certain firms, as explained below, are excluded from the treatment group, which is thus naturally constituted by those remaining. The WL certification replaces the anti-mafia documentation, which is mandatory for contract awards with public entities.[16] When a company takes part in multiple procurement processes, being on the white list is highly advantageous, as it supersedes the submission of anti-mafia documentation for each procedure. But we are also interested in potential additional benefits from white list registration, particularly as regards firms' reputation with banks, suppliers, and customers. To isolate the specific advantages, we exclude from the sample companies that have won public procurement contracts exceeding €150,000. These firms have distinct characteristics compared to other white-listed firms. Table 1 makes it clear that there are significant differences between the two groups of firms in our variables of interest, specifically *Bank Debt* and *Sales*. The table reports the results of a two-sample t-test to determine whether there exists a statistically significant difference between the means of the two groups: white-listed firms that secured and did not secure public tenders. The mean values turn out to be higher for the firms that have won public contracts, and the differences are statistically significant. To isolate the specific advantages of white-listing, we have chosen to take as treatment group only companies that have not won public procurement contracts. The rationale is to eliminate any potential influence of public procurement contracts on the results and focus solely on the impact of white list certification.

Table 1: Two-sample t-test on the dependent variables on WL firms

	WL NOT ANAC	WL ANAC	diff
BANK DEBT	15.24	19.00	-3.76***
SALES	-0.14	-0.23	0.89***

[16] This documentation is compulsory for public procurement procedures worth more than €150,000.

After selecting the treatment firms, we add information on companies' financial statements from the Bureau Van Dijk's AIDA database. We thus collected information on the balance sheets of Italian firms for the period 2011-2020. To choose a suitable control group, one must select a sample of companies that are eligible for certification but have not actually obtained it. As mentioned earlier, any company operating in the sectors specified by Law 190/2012 can apply for white-listing, so all the companies in these business sectors are potential registrants. The AIDA database includes all firms operating in these sectors, which we considered as potential WL firms. We conducted the same t-test as in Table 1 on them (the results are reported in the appendix in Table 11). For the same reasons mentioned earlier, we excluded the companies that had won public procurement contract awards.

However, this control group is still inadequate, because we need to compare firms of equal treatment probability, which can be accomplished by utilizing the propensity score. In an experimental sample, we can compare the averages because the treatment allocation is randomized. Now, let us imagine a scenario where this randomness does not exist, and consider a group of firms where each firm has the same probability of being treated. Within this group, there are some firms that have received treatment and others that have not. Consequently, we can take treatment allocation as random within this particular group of firms. In situations lacking an experimental design, assignment to the treatment group is often not random. As a result, the units that do and do not receive treatment may differ not only in treatment status but also in other characteristics that could influence both participation and the outcome. To mitigate the potential biases, matching methods identify a non-treatment unit that closely resembles a participating unit. This approach allows for estimating the impact of the intervention by comparing a participant with a matched non-participant (Heinrich, Maffioli and Vazquez 2010). In this study, our aim is to compare two sets of firms: those that have obtained a certification of legality and those that have not.

The primary concern when comparing these two groups is possible sample self-selection bias, which is the most common risk associated with comparing two subject groups. The self-selection problem arises when individuals or units participate in a study or adopt a specific treatment on a voluntary basis. This self-selection can bias the results if the participants differ systematically from non-participants or those who elect an alternative treatment. Self-selection can lead to a lack of representatives of the participants in relation to the larger population, compromising the external validity of the study. Further, differences in characteristics between participants and non-participants can influence the results and potentially generate erroneous conclusions regarding the effects of the treatment. In an experimental design, randomization ensures that all the relevant characteristics of the units studied, observable and unobservable alike, are balanced (i.e. equally distributed) between treatment and control group; and because of this the difference in mean outcomes correctly estimates the impact of the intervention. Without randomization, however, the groups may differ not only in treatment status but also in covariate values. To ensure that propensity-score-based analysis will reduce bias and produce accurate estimates of the treatment effect in an observational study, it is crucial to respect two

fundamental assumptions: a) the *Conditional Independence Assumption (CIA)*; and b) the *Common support condition*. The *Conditional Independence Assumption* states that, given the propensity score (the estimated probability of receiving treatment), a set of covariates observable by the researcher is independent of the treatment received. However, it must be noted that CIA is a very strong assumption that may be hard to verify fully in complex situations. Erroneous assumptions or inadequate data can affect the validity of the estimates, so in using propensity scores, critical analysis and consideration of other potential sources of bias are essential. The *Common support condition* ensures that there are similar individuals in both groups and allows for meaningful comparisons. Addressing this condition is essential to ensure that the matched groups are balanced and that the analysis can provide reliable results. To create a balanced comparison group by matching treated individuals with similar untreated individuals based on their estimated probability of receiving the treatment, we use propensity score matching technique with common support. This technique helps to recreate a *sort of random allocation*, reducing the bias produced by the lack of true randomization. After calculating the propensity score for each observation, one must verify the overlap between the treatment and comparison groups in the range of propensity scores. This overlap is commonly referred to as "common support" (Leuven and Sianesi 2003). The common support condition requires that data be available throughout the entire range of propensity score distributions for both the treated and the control groups. In other words, there must be units or observations in both groups across all regions of the propensity score distribution, allowing valid matching or comparison. Once the common support has been determined, individuals that fall outside of the common support should be excluded (Rosenbaum and Rubin 1983).

A crucial factor to ensure the validity of the analysis in propensity score matching is the selection of variables. The matching strategy is based on CIA, which requires that the outcome variables be independent of treatment given the propensity score (Caliendo and Kopeinig 2008). Therefore, matching involves selecting a set of covariates that convincingly meet this requirement. Research by Heckman, Ichimura and Todd (1997) and Dehejia and Wahba (1999) has shown that omitting crucial variables can substantially amplify bias in the resulting estimates. A straightforward guideline for selecting the conditioning variables is to begin with the factors that determine performance, which can be identified from the theoretical and empirical literature. Subsequently, we can eliminate hypothetical causal variables that are not statistically significant. In particular, we match untreated firms with treated firms based on a propensity score derived from a probit regression incorporating a set of covariates exogenous to the treatment, as in Austin (2010). We conducted a series of tests (both graphical and statistical) to assess the balance of covariates between the treated and control groups.[17] The variable selection process combines empirical evidence and financial theory. We considered several firm characteristics, including size (*size*), a geographical variable (*Cod_prov*) and another variable capturing the characteristics of the company's location, specifically a measure

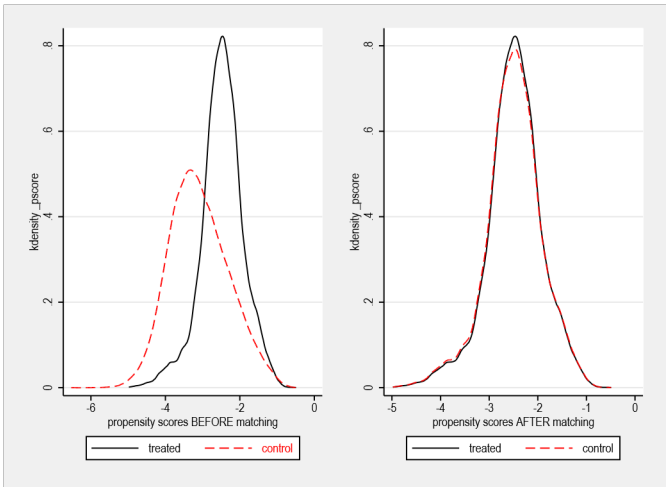
[17] All tests available upon request.

of crime (*oc_index*), and finally a variable classifying the company's economic activity (*cd_ateco*). After completing the variable selection, the main objective is to achieve balance in the covariate distributions and then assess the covariate balance after the matching. To estimate the propensity score, one can choose between different matching algorithms, i.e. among alternative ways of using the propensity score to match comparison units with treated units. Regardless of the type of algorithm, some factors must be considered: a) matching with or without replacement, b) how to assess (or set the standard) for proximity, c) whether and how to weight cases in the analysis, and d) number of comparison units matched to each treatment unit (Heinrich, Maffioli and Vazquez 2010). In our analysis, to estimate the propensity score matching[18] the matching algorithm selected is nearest neighbour matching (NNM, with caliper equal to one-quarter of the standard deviation of the propensity score[19] and the number of neighbours used to calculate the matched outcome equal to 2. Nearest neighbour matching, also referred to as "greedy matching," is a method in which treated units are matched individually with the closest eligible control unit. This involves iterating through the list of treated units and selecting the nearest available control unit for each. It is called "greedy" because the pairing does not consider how other units are or will be matched and it does not aim to optimize any specific criterion. NNM is the most commonly used form of propensity score matching. It has been studied extensively through simulations and is well documented in the literature (Thoemmes and Kim 2011); (Zakrison, Austin and McCredie 2018). A look at the graph of the propensity scores for the treatment and comparison groups after balancing confirms the presence of overlap within the range of propensity scores for both groups (Li and Zhao 2006). It is essential to ensure a balanced distribution of propensity scores for the treatment and comparison groups. In Figure 4 we observe a complete overlap in the distribution of propensity scores between the treatment and control groups after matching by propensity scores. The initial sample was 12,181 WL and 317,821 non-WL firms; after matching and the exclusion of some firms with missing data, the final panel consisted of 175,870 firms: 10,282 WL and 165,588 non-WL during the period 2011-2020. This analysis will allow us to discern whether white list certification has a significant impact on companies' financial health and reputation, independently of their involvement in public procurement contracts. It will shed light on the specific advantages of white-listing and how they can benefit companies apart from winning public procurement contract awards.

[18] The analysis employed a program called "psmatch2," developed by Leuven and Sianesi (2003). This program is compatible with Stata and can be installed and utilized for propensity score matching.

[19] There is no consensus on the best size of the caliper. One relatively less arbitrary convention is to take a caliper of one-quarter of a standard deviation of the propensity score (Stuart and Rubin 2008).

Figure 4: *Overlap in Propensity Scores in Treated and Matched Samples before and after Propensity Score matching.*



5.2 *Methodology*

We estimated the effect of WL registration on a firm's activity using a difference-in-differences regression model applied to a panel of treated and untreated firms. Specifically, we estimated the following equation:

$$Yi,t = \alpha i + \lambda t + \beta WhiteListi,t + \varphi Xi,t + \varepsilon i,t \quad (1)$$

where α_i are firm fixed effects, λ_t are year fixed effects, and $\varepsilon_{i,t}$ is an error term. The firm fixed effects help address variations in the cross-sectional dimension and control for unobserved time-invariant factors that might cause bias owing to omitted variables, while the year fixed effects account for unobserved events specific to each year that could impact uniformly on all firms. In all estimations, we consider standard errors robust to contemporaneous spatial correlation and heteroskedasticity, so as to account for the possibility that the decisions of firms in a given province may be correlated if they are driven by common administrative rules and policies.

Y is the outcome variable, considered in two different profiles, the firm and the year, *i* and *t* respectively. We change the outcome variable according to the hypothesis being tested. White list registration can bring various benefits to a company. It is a form of government certification. WL-certified firms operate within a documented, demonstrated legal framework, guaranteeing that their business is untainted by criminal elements. The certification thus reduces information asymmetry between banks and firms, presumably entailing better borrowing opportunities. We measure a company's borrowing capacity by the ratio of bank debt to revenue. (Gupta and Newberry 1997; Kim, Wang and Zhang 2016). A firm on the white list signals its adherence to legality, with a "reputational effect" that may benefit sales. Both customers and suppliers tend

to prefer doing business with legal firms. Consequently, WL registration might well enhance a firm's performance. We measure performance as sales over total assets (in log), an index commonly employed in the literature (Rice et al. 2015), including the literature on corporate social responsibility (Giannarakis 2014).

The estimated coefficient β measures the causal effect that we are interested in. $WhiteList_i$ is a dummy equal to 1 if firm i is in the WL register in year t and for the duration of the certification, 0 for years preceding the registration, and missing for years after enrollment if the firm is no longer on the list. In the case of companies never registered, the variable is 0 throughout the entire period. In order to validate both H1 and H2, the coefficient must be positive and statistically significant coefficient. This would indicate that, on average, treated firms have better access to bank credit and better performance than non-listed firms.

The identification strategy depends on the assumption that the treated firms' entry year is not influenced by their performance. In any event, eligibility for the white list is not determined by the level of debt or sales; the only certification requirements are related to the legality of the entrepreneur, legal representatives, and their cohabitants. Consequently, WL certification can be assumed independent of the firm's activity and financial structure, making it exogenous in this context.

Following the literature, we selected a vector, $X_{i,t}$, of covariates that affect the dependent variables. In particular, we observe some characteristics in terms of:

- firm structure - we take into account financial leverage, investment in tangible goods, investment in intangible goods (Gupta and Newberry 1997), ROI, indebtedness, and a profitability index.[20] All the monetary variables are scaled by total assets. We also consider the age of the firm, the number of employees, and dummies for size (small, medium, large).
- *OC_index* - to check the local rooting of criminal organizations, we constructed a province-level variable to capture the relative presence of organized crime throughout Italy.

Table 7 in the Appendix specifies the variables and the sources. Table 9 shows descriptive statistics for treated and untreated firms.

The diff-in-diff empirical design requires satisfaction of the common trend assumptions, which can be tested by analysis of the pre-treatment dummies as in the following event study model (Mora and Reggio 2019):

$$Y_{i,t} = \alpha_i + \lambda_t + \sum_{t=n}^{n} n_t D_{i,t} + \varphi X_{i,t} + \varepsilon_{i,t} \quad (2)$$

Y is the outcome variable for firm i in year t. D denotes the set of event-time dummies, which take the value of 1 only for WL firms if year t is k periods before/after their WL registration.

[20] See, among others, Ginesti, Ballestra and Macchioni (2020).

The omitted category, *D0,* is the year of enrollment itself; the remaining *v* coefficients measure the effects in the period before and after enrollment (*t0*). All estimations include the same controls as in the baseline equation. $\varepsilon_{i,t}$ is the idiosyncratic error term.

The event study estimates can also evaluate the dynamic impact of the measure, namely the patterns of bank debt and sales trajectories in treated and untreated firms in each year following enrollment.

Figure 5: *Dynamics of WL impact - Bank Debt*

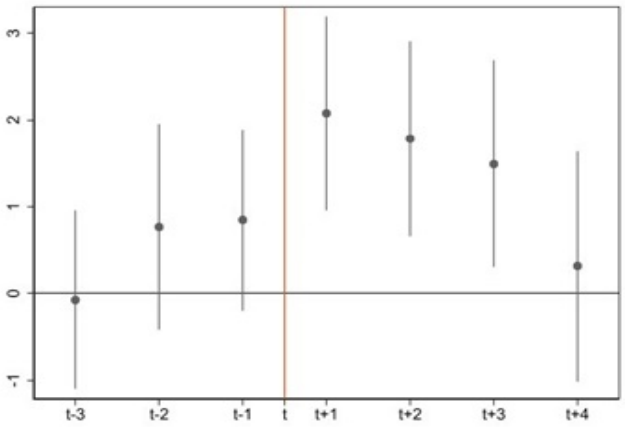
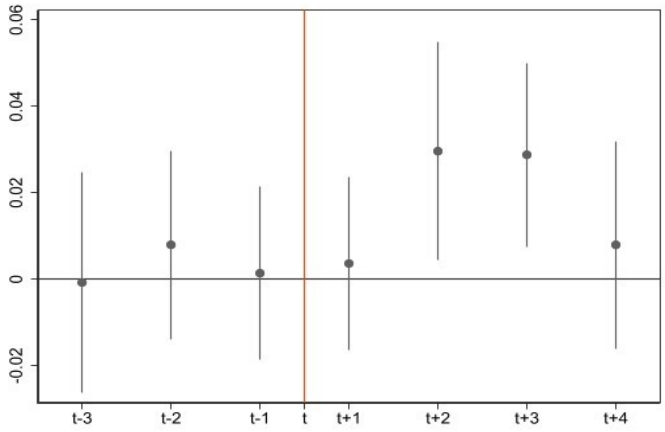


Figure 6: *Dynamics of WL impact – Sales*



Notes: The figures report coefficients and confidence intervals estimated according to eq. 2. Dots refer to point estimates, spikes to 95% confidence intervals. The omitted category is the year of the WL registration (t). We include the maximum possible number of leads and lags, namely 3 years before and 4 years after the registration. All regressions include firm fixed effects, year fixed effects, the age of the firm, leverage, intangible assets, size dummies, and provincial crime index. When the dependent variable is Bank Debt *we also control for ROI and profitability. When the dependent variable is* Sales *we also control for tangible assets and number of employees. Standard errors are clustered at the firm level.*

With regard to anticipation effects, we would have expected firms to show a gradual rise in both bank debt and sales. But the coefficients for the pre-treatment period are not significantly

different from zero, meaning that there were no significant changes in these two variables in the period leading up to WL registration. That is, there were no anticipation effects. There were no observable adjustments or divergent patterns in the behavior of firms on the verge of being listed. However, the lead coefficients are statistically significant, indicating that once firms are officially on the white list, there were significant effects on their bank debt and sales. These effects became evident after registration, suggesting that WL status did affect firms' financial and sales decisions, producing observable changes.

6 Results

The empirical analysis tests our research hypotheses, examining the advantages for firms from white list registration. As noted above, the variable of interest here is the dummy *White list*, which helps us to determine how a company's performance changes with certification of legality.

Table 2 presents the baseline results. The first column displays results when the dependent variable is *Bank debt*, while in the last column the dependent variable is *Sales*. To account for potential confounding factors, we include year fixed effects, individual fixed effects, a set of variables for size and capital structure, firm age, and the crime rate of the province. The coefficient of interest is consistently positive and significant at the 0.1% confidence level. These findings support the view that the certification of legality has an impact on companies' activity. On average, the bank credit of firms on the white list is about 0.8% greater than that of non-certified firms. Further, *Sales* is 4% greater for WL than non-WL firms. Consequently, we can conclude that both H1 and H2 are confirmed. White listing not only enhances credit access but also generates a positive reputational effect, resulting in an increase in sales.

Table 2: WL certification impact

	Bank Debt	Sales
White list	0.799***	0.040***
	(3.41)	(5.73)
Year FE	YES	YES
Firm FE	YES	YES
Controls	YES	YES
Observations	545,371	743,553
Number of firms	109,838	114,428

Notes: Data are firm level and annual from 2011 to 2020. The dummy White list equals 1 if firm i registered in the white lists, for all the years of validity of the certification, and 0 for all other firms. All estimations contain dummies for size, firm fixed effects, year fixed effects, provincial crime index, intangible assets, leverage, and age. When the dependent variable is Bank Debt we also control for ROI and profitability. When the dependent variable is Sales we also control for tangible assets and number

*of employees. The t-statistics relative to clustered standard errors at the province×year level and robust to heteroskedasticity are reported in parentheses. Statistical significance is denoted as follows: *** p<0.001, ** p<0.01, * p<0.05.*

As observed above, the North and South of Italy exhibit distinct structural and institutional differences. The Northern regions are characterized by smaller firms, less investment in R&D, and a greater availability of infrastructure, while the Southern regions face challenges such as inefficient bureaucracy, a lack of skilled human capital, and the significant presence of criminal organizations.

The causes and effects of this regional divergence are beyond the scope of the present study, but it is interesting to see whether or not there are regional differences in the impact of white list certification. Table 3 provides further evidence of regional asymmetry, in particular as regards the variable *Bank Debt*. In the Northern regions, there is no difference between white-listed and other firms, suggesting that WL certification does not facilitate credit access in that part of the country.

In the Southern regions, by contrast, there is a significant disparity in *Bank Debt* between WL and non-WL firms. On average, the former have approximately 1% more *Bank Debt* than non-WL firms. This suggests that where crime is more prevalent and firms are less transparent, the certification does effectively help banks to assess the creditworthiness of potential borrowers. The varying effectiveness of white list certification by region strongly indicates the impact of regional factors such as crime rates and degree of transparency on the relationship between certification and access to credit.

For *Sales* as well, the regional differences in the impact of listing persist. Our analysis reveals a significant and positive impact of certification on profitability in the Northern regions, while in the South the coefficient is not significantly different from zero. That is, a perceptible effect of white list certification on profitability is found only in the North.

Table 3: Geographic impact

	Bank Debt		Sales	
	Center-North	South	Center-North	South
White list	0.409	1.030**	0.061***	0.017
	(1.47)	(2.52)	(8.70)	(1.25)
Year FE	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES
Controls	YES	YES	YES	YES
Observations	434,670	110,701	568,397	175,156
Number of firms	86,019	23,819	85,155	29,273

Notes: Data are firm level and annual from 2011 to 2020. The dummy White list equals 1 if firm i is registered in the white lists, for all the years of validity of the certification, and 0 for all other firms. All estimations contain dummies for size, firm fixed effects, year fixed effects, a provincial crime index,

*intangible assets, leverage, and firm age. When the dependent variable is Bank Debt we also control for ROI and profitability. When the dependent variable is Sales we also control for tangible assets and number of employees. The t-statistics relative to clustered standard errors at the province×year level and robust to heteroskedasticity are reported in parentheses. Statistical significance is denoted as follows: *** p<0.001, ** p<0.01, * p<0.05.*

WL certification is valid for one year, after which a firm can have it renewed if it continues to meet the requirements. Treated firms may hold the certification for just one year or for multiple years. There are several reasons why a company may be counted as listed for only one year. First, it may no longer fulfill the requirements. Second, it may elect not to apply for renewal. Third, the registration may have been in the last year of our sample period, after which the certification may still be valid but not counted.

The duration of certification, whether for one year or multiple years, can be significant in our analysis, owing especially to its differential impact on the outcome variables. If listing reduces information asymmetry between banks and enterprises, its signaling value should be stronger in the year of registration. The impact on profitability is expected to increase with each additional year of certification as the firm's reputational benefit spreads and strengthens.

Our predictions are partially confirmed by the results presented in Table 4. The estimation of *Bank Debt* shows that for firms with only one year of certification the coefficient is not statistically significant, but contrary to our expectations, WL registration does have a positive effect on bank credit for firms that hold the certification for multiple years. This result might depend on the credibility of the signal: banks see certification as a reliable indicator of a firm's quality only when it is held consistently over a number of years.

At the same time, against our initial expectations, the impact on *Sales* is slightly greater for firms with just one year of certification than for those with multiple years. On average, sales are 10% higher for WL than for non-WL firms, suggesting that the impact on sales may be stronger in the year of registration and not accumulate over time.

These results highlight the complexity of the relationship between the duration of WL certification and its effects on different outcome variables. In short, the impact may vary with the particular variable examined.

Table 4: Importance of time

	Bank Debt		Sales	
	One year	Multiple years	One year	Multiple years
White list	0.004	0.999***	0.100***	0.027***
	(0.01)	(3.81)	(8.44)	(3.64)
Year FE	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES
Controls	YES	YES	YES	YES
Observations	518,088	528,229	699,863	715,569
Number of firms	104,974	106,852	108,451	110,645

*Notes: Data are firm level and annual from 2011 to 2020. The dummy Whitelist equals 1 if firm i registered in the white lists, for all the years of validity of the certification, and 0 for all other firms. All estimations contain dummies for size, firm fixed effects, year fixed effects, provincial crime index, intangible assets, leverage, and firm age. When the dependent variable is Bank Debt we also control for: ROI and profitability. When the dependent variable is Sales we also control for tangible assets and number of employees. The t-statistics relative to clustered standard errors at the province×year level and robust to heteroskedasticity are reported in parentheses. Statistical significance is denoted as follows: *** p<0.001, ** p<0.01, * p<0.05.*

The results shown in Table 4 may depend, at least in part, on regional differences. We accordingly conducted further analysis, dividing firms into Northern and Southern and further dividing the treated firms, within each regional group, by the duration of their white list certification (one year or multiple years). The first panel of Table 5 presents the results for Bank Debt, indicating that if the certification is valid for just one year, it does not have significant signaling value. And even when the certification remains valid for multiple years, it has significant impact only in the Southern regions. This suggests that in regions with greater opacity and more widespread crime, banks attach greater value to the certification when it is durable. That is, the importance of WL certification may vary by region and by its duration, with a particularly pronounced effect in the Southern regions owing to specific contextual factors. As Table 5 shows, with respect to Sales the White list dummy variable is consistently positive and statistically significant in the Northern regions, with an effect that is more pronounced for firms just enrolled; for these firms, we observe a significant impact also in the South.

In summary, the WL certification has a positive effect on firms' profitability mainly in the Center-North regions, where WL firms are recognized as "legal" by customers and suppliers. This recognition helps generate additional business opportunities and trust-based relationships, contributing to improved profitability.

Table 5: WL certification impact by time and area

Bank Debt				
	Center-North		South	
	One year	Multiple years	One year	Multiple years
White list	-0.191	0.580	0.058	1.207**
	(-0.41)	(1.80)	(0.05)	(2.78)
Year FE	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES
Controls	YES	YES	YES	YES
Observations	417,252	422,465	100,836	105,764
Number of firms	83,025	83,974	21,949	22,878

Sales				
	Center-North		South	
	One year	Multiple years	One year	Multiple years
White list	0.096***	0.053***	0.121***	0.001
	(7.79)	(7.04)	(4.35)	(0.10)
Year FE	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES
Controls	YES	YES	YES	YES
Observations	541,263	549,521	158,600	166,048
Number of firms	81,571	82,701	26,880	27,944

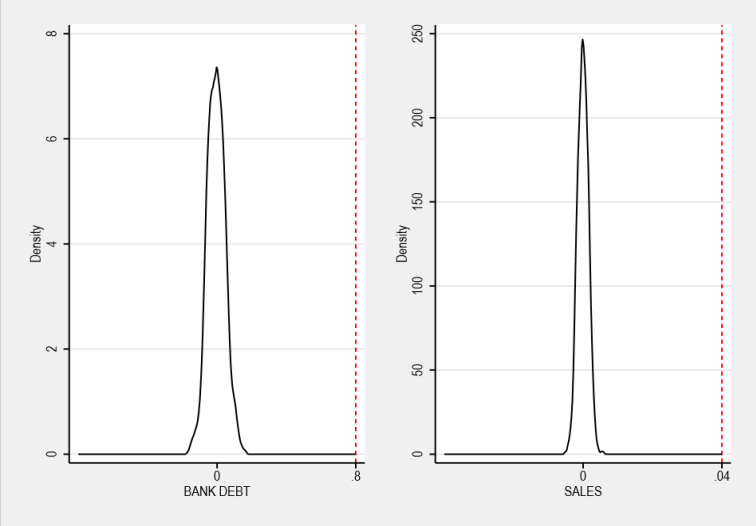
*Notes: Data are firm level and annual from 2011 to 2020. The dummy variable White list equals 1 if firm i registered in the white lists, for all the years of validity of the certification, and 0 for all other firms. All estimations contain dummies for firm size, firm fixed effects, year fixed effects, provincial crime index, intangible assets, leverage, and firm age. When the dependent variable is Bank Debt we also control for ROI and profitability. When the dependent variable is Sales we also control also for tangible assets and number of employees. The t-statistics relative to clustered standard errors at the province×year level and robust to heteroskedasticity are reported in parentheses. Statistical significance is denoted as follows: *** p<0.001, ** p<0.01, * p<0.05.*

7 Robustness

7.1 *Placebo Test*

As an exogenous event, the gain from the WL "tool" could be a "false fact," insofar as the true cause might be other factors (Yu, Yang and Xu 2022). So we run a placebo test, which can be taken as a robustness analysis in evaluating the treatment effect in an empirical study. The placebo test, also called placebo "treatment" or placebo "effect" test, is a statistical analysis comparing a placebo (dummy or inactive) treatment with an active treatment to determine whether the latter has a significant effect over and above the placebo effect. In econometrics, a placebo test is not the comparison of a drug with a sugar pill (Brown et al. 2019). Rather, it is a sort of "conceptual" placebo, in which you repeat your analysis using a different dataset, or a different part of your dataset, where no intervention occurred. Following Calamunci (2022), we ran a placebo experiment, repeating the analysis but for a year in which there was no intervention. For each company, we took a WL enrollment year different from the actual one. A good placebo test demonstrates that your effect does not exist when it "shouldn't" be found. Our sample of firms covered the years 2011-2020, ten years in all. The year event was then randomly assigned 1,000 times and the corresponding fake dummy was generated for each randomly assigned fake year. After defining a fake year dummy we performed the placebo test by randomly assigning the starting and ending years of the event to each firm. Simulating the process 1,000 times, we plot all the simulated coefficients: the graph shows that all the simulated (fake) coefficients should be around zero and significantly different from the true coefficient (red vertical line). The test is intended to determine how many times these placebo point estimates were closer to or lower than the true point estimate. The idea is to avoid the erroneous attribution of an impact on firm performance that doesn't actually exist. The test was run on all the dependent variables. Figure 7 plots the density distribution diagram for the 1,000 placebo point estimates; the red line represents the true coefficient of the treatment variable. The placebo effect estimate was obtained estimating regression 1 with the placebo fake WL dummies on *Bank Debt* and on *Sales* as independent variables. The point estimates are generally higher than the true value. For *Bank Debt* and *Sales*, the results of the placebo test are to the left of the true coefficients. These findings confirm the expected results; in fact, the estimate of the fake coefficients on our treatment variable turns out to be quite distant indeed from the real coefficient, so the exercise provides substantial evidence that our results do not reflect a statistical finding.

Figure 7: *Placebo Tests: Bank Debt and Sales*



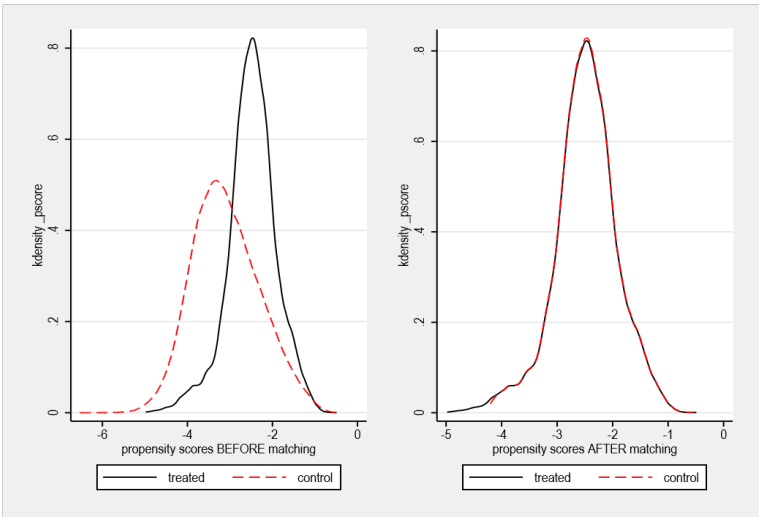
Notes: Probability density function of the coefficients obtained by estimating regression 1 with the placebo WL dummies. The perpendicular red line represents the true value of WL coefficients.

7.2 *Different control groups*

The results presented in Table 5 were produced using the sample selection methodology outlined in Section 5.1. Here we continue with additional robustness checks for additional corroboration of our initial hypotheses. In particular, we run regression 1 using different algorithms to estimate the propensity score match. It is clear that asymptotically all the PSM estimators should yield the same results (Smith and Todd 2001), especially when samples are small and the selection of the matching algorithm is accordingly important, as highlighted by Heckman, Ichimura and Todd (1997). The selection typically involves a trade-off between bias and variance. In other words, deciding which matching method to use becomes critical, insofar as some techniques may reduce bias in treatment effect estimates, but at the cost of increased variability, while others may provide more stable estimates at the cost of additional bias. Striking the right balance is essential to ensure the reliability and validity of the results, especially when working with limited data. In our case, we elected to reduce the size of samples significantly by using two different variants of Nearest Neighbour Matching (NN): 1) NN:1 "without replacement" (column N1 in Table 6) with the Average Treatment Effect (ATE) option and standard caliper equal to one-quarter of the standard deviation of the propensity score (Stuart and Rubin 2008); and 2) NN:2 "with replacement" (column N3 in Table 6) with the Average Treatment Effect (ATE) option, and a very narrow caliper. For both matchings, only firms in the "On-support" region were selected. The "On-support" range ensures that you are comparing subjects that have similar likelihoods of receiving the treatment. This range is where the propensity scores of subjects from the treatment and control groups overlap, allowing for a more balanced and valid comparison in propensity score matching (Caliendo and Kopeinig

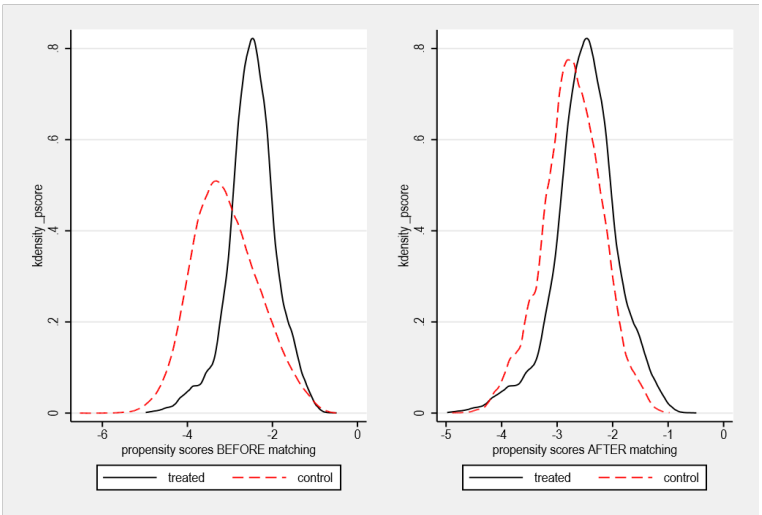
2008). Figures 8 and 9 show the overlap in propensity scores in the treated and matched samples before and after matching respectively for N1 and N3.

Figure 8: *Overlap in Propensity Scores in Treated and Matched Samples before and after Matching.N:1*



Source: Authors processing

Figure 9: *Overlap in Propensity Scores in Treated and Matched Samples before and after Matching. N:3*



Source: Authors processing

Table 6 supports the main results presented in Section 6. Applying the baseline equation to various control samples resulted in findings consistently similar to those in 2. Specifically, WL firms had greater access to bank credit and higher sales than non-WL firms[21].

Table 6: Effect of WL certification with different control groups

	Bank Debt		Sales	
	N1	N3	N1	N3
White list	0.622**	0.697***	0.017*	0.027***
	(2.33)	(2.99)	(2.05)	(4.02)
Year FE	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES
Controls	YES	YES	YES	YES
Observations	67,744	255,214	105,017	373,281
Number of firms	13,306	48,842	15,372	55,152

*Notes: Data are firm level and annual from 2011 to 2020. The dummy variable White list equals 1 if firm i registered in the white lists, for all the years of validity of the certification, and 0 for all other firms. All estimations contain dummies for firm size, firm fixed effects, year fixed effects, provincial crime index, intangible assets, leverage, and firm age. When the dependent variable is Bank Debt we also control for ROI and profitability. When the dependent variable is Sales we also control for tangible assets and number of employees. The t-statistics relative to clustered standard errors at the province×year level and robust to heteroskedasticity are reported in parentheses. Statistical significance is denoted as follows: *** p<0.001, ** p<0.01, * p<0.05.*

7.3 *Firms not renewing the certification*

Our findings indicate a generally positive impact of WL certification both on firms' borrowing capacity and on their overall performance. A natural question is whether this effect persists even after the firm loses or chooses not to renew its certification. The firm's quality could well be recognized only as long as the certification is valid, the positive effect diminishing when it lapses. But there could also be a lasting impact, the positive effects enduring even after the firm is no longer certified. To address this question, we introduce a dummy variable set to 1 if a firm's WL certification is not renewed. As Table 7 shows, the positive influence does not persist when the firm is no longer on the White List.

[21] We replicated the entire empirical analysis using two different control groups; the results were consistent with the main exercise. Results available upon request.

Table 7: Impact on firms not renewing the certification.

	Bank Debt	Sales
WL not renew	1.235	0.001
	(1.66)	(0.06)
Year FE	YES	YES
Firm FE	YES	YES
Controls	YES	YES
Observations	536,577	728,795
Number of firms	109,161	113,757

*Notes: Data are firm level and annual from 2011 to 2020. The dummy variable WL not renew equals 1 if firm i is no longer registered in the white lists, for all the years after the end of validity of the certification, and 0 for all other firms. All estimations contain dummies for firm size, firm fixed effects, year fixed effects, a provincial crime index, intangible assets, leverage, and age of the firm. When the dependent variable is Bank Debt we also control for ROI, and profitability. When the dependent variable is Sales we also control for tangible assets and number of employees. The t-statistics relative to clustered standard errors at the province×year level and robust to heteroskedasticity are reported in parentheses. Statistical significance is denoted as follows: *** p<0.001, ** p<0.01, * p<0.05.*

8 Concluding remarks

The purpose of the white lists is to enhance the effectiveness of pre-emptive anti-mafia checks for economic entities operating in sectors that are relatively more susceptible to mafia infiltration. At the same time the initiative seeks to bolster the prevention of criminal activities targeting the legitimate economy throughout Italy. Naturally, the impact at the subnational level is intertwined with the specific characteristics historically distinguishing Northern and Southern regions.

Criminal organizations undermine legality and security where they are active (La Spina and Lo Forte 2006). Their presence augments uncertainty, erodes trust and mutual cooperation among individuals, and generates adverse effects on local market dynamics between businesses. This results in elevated costs for market transactions, consequently weakening the socio-economic structure and the operational efficiency of local enterprises. Measures to contrast illegality accordingly form part of the agenda of governments. The white list system is intended to enhance anti-mafia monitoring, focusing on the sectors more vulnerable to mafia involvement. Businesses in these sectors can register on the white list voluntarily, showcasing their dedication to lawful operation and their resolve to ward off the potential influence of organized crime.

Our study offers fresh insights into the functioning of white list certification that are relevant both for managers and for government authorities. Utilizing a new firm-level database, we estimate a significant and positive impact of the legality certification on firms' activity in both Northern and Southern Italy. The certification affects companies' access to bank credit; on average, WL enterprises' banking debt is higher than that of non-WL firms; the former are eligible for a larger credit of around €8,000 per million. The empirical analysis shows similar results when the dependent variable is *Sales*. The results underscore structural and institutional differences between Northern and Southern regions. In the former, with their smaller presence of crime, the average banking debt of WL firms is not significantly different from that of their non-WL counterparts.[22] By contrast, in the Southern regions, where the phenomenon of criminal infiltration of the economy has been historically significant, the banking debt of WL businesses is 1.03% higher than that of non-WL businesses. Moreover, the WL registration does have a positive effect on *Bank debt* for Southern firms that hold the certification for multiple years. As a result, we can conclude that there is an asymmetry between Italian areas, especially in terms of access to bank credit. The certification is a useful tool for banks to determine the creditworthiness of borrowers in areas with high rates of crime and opaque businesses. When taking into account how WL certification affects *Sales*, the geographical effect is crucial. Here, in fact, profitability is a result of the company's good reputation and has a positive effect on firms' profitability in the Centre-North regions, where WL firms are recognized as "legal" by customers and suppliers. The estimated coefficient is slightly higher in the year of the certification than in the following years. Therefore, we might conclude that the certification attenuates information asymmetry between banks and enterprises and eases the firms' credit constraint. Moreover, the legality certification has a high value for customers and suppliers in Northern regions, where it positively affects corporate reputation and profitability.

Our results offer evidence of the effectiveness of the public policy enacted by the Italian authorities via Law 190/2012, which introduced proactive measures actively bolstering law-abiding enterprises and enhancing transparency in sectors vulnerable to mafia influence. In particular, our research underscores an important, unintended effect of White List certification: even when a company does not take part public procurement procedures or receive contract assignments from general government entities, inclusion in the white list serves as a safeguard in dealings between private entities. It not only reduces information asymmetry with banks but also improves the firm's reputation. By officially certifying certain companies as "legal," the white list testifies to firms' financial reliability and helps to establish a framework for reputation cultivation. Our findings strongly indicate that the WL certification, through its endorsement of legality, can significantly enhance a company's operations. As a result, the ultimate outcomes include advantages for businesses that go beyond those associated with interactions with public

[22] It differs only at the 10% level of significance.

entities. Policy-making, accordingly, can harness this certification to encourage legal compliance within businesses.

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APPENDIX

Table 8: Variables

Variable	Description	Source
WL	A dummy variable equals 1 for all the years in which the company is registered in the WL registers and 0 otherwise.	Italian prefectures
BANK DEBT	Debts contracted with credit institutions.	AIDA Bureau Van Dijk
SALES	This ratio evaluates a company's efficiency in generating sales from its assets. It is calculated by dividing the total sales by the average total assets.	AIDA Bureau Van Dijk
TA	Investments in tangible assets on total asset	AIDA Bureau Van Dijk
INT	Investments in intangible assets on total asset	AIDA Bureau Van Dijk
DIP	Number of employees	AIDA Bureau Van Dijk
LEV	Financial leverage is the use of debt to buy more assets. Leverage is employed to increase the return on equity. The variable is standardized on total asset	AIDA Bureau Van Dijk
AGE	Age of firm. It is calculated as the difference between the year and the year of establishment	AIDA Bureau Van Dijk
ON	Financial charges indicate all the interest payable and management costs connected to the financing provided to a company by banks or credit institutions	AIDA Bureau Van Dijk
ROI	Return on Investment is calculated by dividing an investment's net profit (or loss) by its initial cost.	AIDA Bureau Van Dijk
OC INDEX	The variable, at the province level, captures the spread of organized crime (OC) considering three main types of crime: mafia-type association (association), mafia-murders (murder); extortions (extortion). It is dived by population	Authors elaboration on Italian National Statistical Institute data
SMALL & MEDIUM	Firm size, include a dummy for medium and small firms.	AIDA Bureau Van Dijk

Table 9: Descriptive statistics on treated firms

	mean	min	max	sd	count
BANK DEBT	16.22	0	100	20.10	202800
SALES	-0.16	-16.15	12.95	0.88	262552
DIP	2.67	0	11.86	1.49	252190
ROI	7.99	-30	30	9.74	171943
INT	0.03	-0.10	1	0.08	268131
TA	0.36	-0.21	18679.93	43.89	263459
LEV	0.72	-1.23	10229	20.61	268131
AGE	15.51	-10	140	14.89	333870
OC INDEX	1.70e-07	1.22e-08	4.87e-07	9.24e-08	332870
ON	0.14	-0.038	34980	67.55	268110
SMALL	0.28	0	1	0.45	334390
MEDIUM	0.33	0	1	0.47	334390

Table 10: Descriptive statistics on untreated firms

	mean	min	max	sd	count
BANK DEBT	12.03	0	100	19.71	897020
SALES	-0.66	-19.35	13.59	1.62	1412998
DIP	1.88	0	10.38	1.35	975859
ROI	4.79	-30	30	10.22	873844
INT	0.05	-3.18	6.33	0.12	1652556
TA	1.57	-2.63	1393591	1151.62	1592994
LEV	14.78	-464.42	3166443	3325.44	1652556
AGE	8.80	-10	216	13.78	3274960
OC INDEX	1.81e-07	1.22e-08	6.11e-07	9.62e-08	3267460
ON	0.041	-0.23	8588.511	9.797582	1652441
SMALL	0.077	0	1	0.26	3294200
MEDIUM	0.53	0	1	0.49	3294200

Table 11: Two-sample t-test on the dependent variables in control group

	NOT ANAC	ANAC	diff
BANK DEBT	11.16	14.42	-3.26***
SALES	-0.72	-0.10	-0.62***