Working Papers

**Cooperative Banks and Crime:
A Provincial-Level Analysis**

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CES ifo

Cooperative banks and crime: a provincial-level analysis

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Abstract

We investigate the extent to which crime, and the inability to effectively suppress it, affect the performance of local banks in terms of credit extension, asset quality, and profitability. The analysis focuses on cooperative banks in Italy, typically small institutions with strong ties to their local communities, over the period 2013–2023. The findings suggest that both crime and judicial inefficiency, even when considered separately and after controlling for banks' operational efficiency, significantly influence credit extension and the incidence of non-performing loans. While their impact on overall profitability appears limited, non-interest income is significantly reduced.

Keywords: cooperative banks, crime, judicial inefficiency, loans, profitability.

JEL Codes: G21, E51, K42

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1 Introduction

Cooperative banks play an important role for credit intermediation in the Euro area (McKillop et al. 2020), Italy is no exception (Beccalli et al. 2023). Among other aspects, their most distinguishing feature is a close bind with the small area in which they operate. This circumstance implies that their performance is intertwined with the dynamics of the area where the are settled in, more than for other types of banks.

Italy has been marked by deep-rooted and persistent geographical heterogeneity since its unification, most notably along the north-south axis (Aassve et al. 2021, Federico et al. 2019), but also across close-in-latitude regions and within them (Benassi et al. 2024), i.e. at the province level. This heterogeneity manifests across multiple dimensions, including the society, infrastructures, institutions and the economy. In this study, we focus on a specific facet of regional disparity in Italy: the prevalence of crime and the effectiveness of the judicial system in sanctioning it, thereby ensuring that legal norms serve as a credible deterrent. Accordingly, our research objective is to study whether and to what extent crime and judicial inefficiency in a area influence the performance of banks working in the same area.

To the best of our knowledge, the relationship between crime at the local level and banks performance has not been systematically studied yet. Nevertheless, several insights from the banking literature motivate our research question. Indeed, crime, including economic crime, can affect banks' operations through multiple channels. First, crime likely implies lower average credit scores that bank assign to potential borrowers (Guzman & Clark 2022, Haselmann & Wachtel 2010). Then, all things equal, we should observe less loans where crime is higher since lending conditions are tighter. Second, crime is likely associated also to the reimbursement rate, so that deteriorated loans correlate with crime (Bonaccorsi di Patti 2009). This association goes beyond what attributable to the economic cycle and we believe it to reflect also deeper cultural elements, such as the perceived legitimacy of legal norms and the moral obligation to honor debts (Haselmann & Wachtel 2010). Third, a deteriorated environment, i.e. high crime rates, might impact banks performance in different ways so that their capacity to generate profits is impaired (Bonaccorsi di Patti 2009, Haselmann & Wachtel 2010). The same relationships

have also been discussed to different extent with respect to judicial inefficiency (Schiantarelli et al. 2020, Müller 2022). Truly, crime statistics are likely to capture also other characteristics of a territory, such as less apparent features of its socio-economic development, etc (Downes et al. 2016). For all these reasons, we expect that crime and inability to suppress it affect local banks' performance. In line with the channels outlined above, our investigation therefore focuses on their influence on three specific indicators of banks' performance: credit extension, non-performing loans and overall profitability.

In our analysis, we control for other relevant factors that determine cooperative banks' performance. Among others, we devote considerable attention to capturing the efficiency of each individual bank. This is crucial, as the effect of crime could be confounded with each bank's operational efficiency.

The analysis is developed through panel regressions based on a micro-dataset covering all cooperative banks operating in Italy over the period from 2013 to 2023; the dataset is assembled through a complex merging of several sources.[1] The variables available are either at the bank or province level. In particular, crime and judicial inefficiency at the province level are attributed proportionally to banks according to the share of their branches in a province. Missing values of the crime and judicial inefficiency indicator (Nifo & Vecchione 2014) are handled through multiple imputation techniques. Bank-level efficiency, is quantified using Malmquist productivity indices, computed through Data Envelopment Analysis as proposed by Färe et al. (1994).

Our analysis contributes to the banking literature by uncovering novel insights. Overall, we find a clear effect of crime and judicial inefficiency on the capacity of cooperative banks to extend credit. This relationship remains robust even when we disentangle crime rates from judicial inefficiency and examine specific categories of crime, such as property-related offenses. Moreover, crime appears to influence the amount of non-performing loans. Although crime does not seem to significantly influence banks' overall profitability, it is associated with a reduction in income from specific sources, particularly fees and commissions.

The remainder of the paper is structured as follows. Section 2 briefly reviews the relevant literature. Section 3 shows stylized facts on cooperative banks and crime at the province level in Italy over the period under investigation. Section 4 describes the methodology and the data used. Section 5 presents and discusses the results of our analysis. We draw the conclusions in section 6.

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[1]The primary sources are Moody's Bank Focus database, Banca d'Italia, Italy's Ministry of Justice, Italy's national statistics institute (Istat).

2 Literature review

Cooperative banks, with their deep territorial embeddedness and mutualistic purpose, have historically thrived on localized knowledge and close proximity to their customers to mitigate information asymmetries (Alessandrini et al. 2008, Berger et al. 2005, Aiello & Bonanno 2016). As a result, they have often outperformed commercial banks in cost efficiency (Girardone et al. 2004, 2009, Battaglia et al. 2010, Aiello & Bonanno 2016), while playing a key-role in supporting small local entrepreneurs and easing financial constraints (Hasan et al. 2017, Bruno et al. 2018, Meslier et al. 2020, Beccalli et al. 2023). However, the very localized nature of cooperative banks exposes their performance to territorial vulnerabilities (Battaglia et al. 2010, Aiello & Bonanno 2016). Although the literature provides vast evidence of differences in terms of behavior and performance by ownership structure (Aiello & Bonanno 2016, Battaglia et al. 2010), specific analyses on cooperative banks remain limited. In what follows, we review the effects of internal and external factors driving banks' performance. We draw from the literature about banks in general, which naturally regards also cooperative banks.

There are many studies on banks' performance. Some works analyse the conditions affecting the general functioning of the credit market and its evolution (e.g. Guiso et al. 2004, Guzman & Clark 2022), while others focus on internal and external factors that shape more directly each bank' performance (Ahmad et al. 2019). Among other aspects, a general distinction can be done between authors using performance or productive indicators, such as the ROA, the NPL ratio or loan volumes (e.g.Berger & DeYoung 1997, Fiordelisi et al. 2011, Beck et al. 2015, Us 2017), and those who model banks' output using frontier techniques.[2]

Regarding the internal drivers, findings remain mixed. This is partly due to the multidimensional nature of performance, and partly to the lack of consensus on empirical methodologies as well as on the conceptual framework (Berger & Humphrey 1997, Aiello & Bonanno 2017, Bhatia et al. 2018, Ahmad et al. 2019). Undoubtedly, operational efficiency is one of the most extensively-studied internal factors. Among other aspects, scholars have studied its impact on NPLs, and Berger & DeYoung (1997) formulated possible hypotheses on this issue, namely "bad management, "bad luck", "skimping" and "moral

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[2]In this last group, a further distinction is between parametric techniques (Stochastic Frontier Analysis - SFA, and its developments, e.g.Aiello & Bonanno 2016, Girardone et al. 2004) and non-parametric techniques (Data Envelopment Analysis - DEA, and its developments, e.g. Seiford & Zhu 1999, Barth et al. 2013); see Bhatia et al. (2018), Ahmad et al. (2019) for a throughout review.

hazard". The "bad management hypothesis" posits that inefficiency leads to higher NPLs (Podpiera & Weill 2008). This view is supported by later studies employing Granger-causality methods (Fiordelisi et al. 2011, Berger & DeYoung 1997).[3] Efficiency is also positively associated with profitability, both in terms of return on assets (ROA) and profit efficiency (Oral & Yolalan 1990, Girardone et al. 2004). Furthermore, efficient banks are better positioned to expand lending, as they manage operational and credit risks more effectively (Berger & DeYoung 1997).

Capital adequacy, typically measured by the capital-adequacy ratio, is another key internal factor. Its relevance is mixed when considering different performance dimensions. Some studies (Berger & DeYoung 1997, Us 2017) find that well-capitalized banks exhibit lower NPL ratios due to more prudent risk-taking. Conversely, Ghosh (2017) argues that excess capital may lead to relaxed lending standards, thereby worsening loan quality. As for profitability, Diaconu & Oanea (2015) report a negative relationship between capital and ROA in cooperative banks, while Girardone et al. (2004) find a positive link between capital strength and profit efficiency. Also market capitalization influences the lending capacity: more capitalized banks are generally more capable of expanding credit (Gambacorta & Mistrulli 2004).[4]

Bank size has been object of investigation too, but conclusions remain ambiguous. Naili & Lahrichi (2020) highlight that the relationship between size and NPLs is inconclusive, with studies reporting both positive and negative associations. As for profitability, Girardone et al. (2004) suggest that economies of scale can enhance profit efficiency in cooperative banks. The influence of size on lending volumes is less well-documented and appears to vary depending on market structure and the regulatory context.

As said, the performance of banks, particularly their ability to extend credit, manage NPLs and generate profits, depends not just on internal factors but also on external/environmental ones, as well as on the interplay between them. Then, a substantial literature investigates the influence of environmental variables, such as market structure, industry dynamics and institutional quality (Naili & Lahrichi 2020). For instance, the functioning of credit markets has been linked to social capital (Guiso et al. 2004) and the strength of local institutions. In this regard, a high-quality institutional environment improves

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[3]The "bad luck hypothesis" argues that external shocks increase NPLs, leading to higher monitoring costs and reduced efficiency, and has found empirical support in Rossi et al. (2009). The "skimping" hypothesis suggests that banks devoting less effort in monitoring loans and underwriting may benefit in terms of cost efficiency at the cost of increasing NPLs in the long run.

[4]Related to capital adequacy, also liquidity might play a role. Often quantified using the loan-to-asset ratio, it has been found to positively affect profitability in cooperative banks (Diaconu & Oanea 2015). Albertazzi & Marchetti (2010) show that higher liquidity supports credit expansion, particularly during periods of financial stress. However, the literature provides limited evidence on the direct impact of liquidity on credit quality (NPLs).

credit allocation and loan performance. Agostino et al. (2023) find that corruption-control enhances the cost-efficiency of cooperative banks, likely, by lowering the costs associated with bribery (Lensink & Meesters 2012). Conversely, corruption is associated with higher non-performing loans (Bougatef 2016), as it distorts the allocation of bank funds toward bad projects (Park 2012).

Of course, several macroeconomic variables influence credit markets too. GDP growth and business cycle indicators -such as unemployment, inflation, interest rates, real exchange rates, and public debt- contribute to determine the amount of non-performing loans (NPLs) (Beck et al. 2015, Dimitrios et al. 2016, Naili & Lahrichi 2020), as well as NPL resolution times (Betz et al. 2020). Furthermore, also local market conditions play a relevant role. Indeed, Aiello & Bonanno (2016) show that demand density, market concentration and per-capita GDP are positively associated with profit efficiency (estimated via stochastic frontier analysis) in cooperative banks.

Our research focuses on crime, widely recognized as a key environmental factor affecting economic activity (Becker 1968) and thus banking operations. Crime is particularly relevant for cooperative banks due to their close ties with local communities (Battaglia et al. 2010). It affects the banking environment in multiple ways: it increases investment risk (Guzman & Clark 2022), shifts public resources from education (and thus, capital accumulation) and welfare to law enforcement, so negatively affecting the state of the economy and -in turn- credit markets (Guzman & Clark 2022). Furthermore, it weakens civic duty, by lowering the moral incentives to repay debt (Haselmann & Wachtel 2010). These dynamics contribute to higher loan default rates and reduce banks' capacity to generate profits (Bonaccorsi di Patti 2009, Haselmann & Wachtel 2010).

Evidence from Italy shows that economic crime exerts a significant drag on credit markets. In particular, organized crime penetration in southern Italy reduces small and medium enterprise loan approvals, primarily through collateral devaluation and heightened counterpart risk (Pinotti 2015). More generally, higher local crime rates are associated with increased credit costs and reduced access to credit (Bonaccorsi di Patti 2009). Battaglia et al. (2010) further show that crimes against banks affect negatively their profitability, but not their efficiency.

In this research context, the impact of crime on cooperatives' bank performance cannot overlook the role of the judicial system and its efficiency and effectiveness. In fact, while high crime can threaten financial institutions, a strong legal system that prosecutes and deters offenders can reduce this risk.

On the other hand, even moderate crime can have serious consequences where the judiciary is slow or ineffective, undermining legal certainty, discouraging lending, and weakening trust in contracts. For community-based banks like cooperatives, judicial inefficiency can worsen the impact of crime by eroding the institutional support needed for lending and asset recovery. The economic literature has shown that a dysfunctional judicial system, proxied by the backlog of civil trails (Fabbri & Padula 2004) and excessive long trial duration (Jappelli et al. 2005), tends to tighten credit constraints for households and encourages strategic payment delays by firms (Schiantarelli et al. 2020). Therefore, ignoring the role of the judiciary risks underestimating the broader challenges crime poses to banking.

3   Stylized facts on cooperative banks and crime in Italy

3.1   Cooperative banks

Credit institutions in Italy can be broadly classified into *commercial banks* and *local banks*. The former are by-far larger, diversified and operate (or can operate) nation-wide as well as in other countries, the latter are small and usually operate in a specific area at the region or province level.[5] Also, their legal status differs. While commercial banks are mostly public companies, whose stocks can be publicly quoted, local banks are organized in the form of cooperatives.

Within the category of local banks, we can further distinguish between "banche popolari" and "banche di credito cooperativo", i.e. cooperative banks (BCCs). The former have a larger scale, which can be even nation-wide, and are subject to softer rules regarding their operations and expansion. On the contrary, the latter are mutualistic cooperatives in which a large portion of credit has to be extended to their owners and to the local communities in which they operate. Both are ruled according to the "one head, one vote" principle. Cooperative banks are by-far more numerous, and smaller, than "banche popolari".

For the objective of our analysis, we explicitly focus on cooperative banks because, compared to other banks, they have a clear territorial connotation: they operate mainly in one province or in few

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[5]Italy institutional framework is as follows: the country is made of 20 regions (NUTS 2 level), which are divided into provinces for administrative purposes (NUTS 3 level); from a minimum of 1 to a maximum of 12. On the whole, the number of provinces is around 106. Differently from regions, whose number is fixed since their establishment in the seventies and variations require a tough constitutional process, provinces are more easily created or merged with others through ordinary national or regional laws.

bordering provinces. Box 1 summarizes the main characteristics of cooperative banks.

BOX 1: Characteristics of cooperative banks

Cooperative credit has preserved the distinctive characteristics that differentiate BCCs from other banks:

- the exercise of credit primarily in favor of members (over 50% of loans to members and/or risk-free activities);
- the provision of no less than 95% of exposures (loans and other risk activities) within the territorial area of competence;
- the allocation of at least 70% of annual net profits to legal reserves;
- the allocation of 3% of annual net profits to mutual funds for the promotion and development of cooperation;
- the allocation of the remaining profits, net of any revaluation of shares and the portion allocated to other reserves or distributed to members within the limits indicated below, for charitable or mutual purposes;
- the allocation of profits to members but in an amount not exceeding the maximum interest of postal savings bonds, increased by two and a half points compared to the capital actually paid;
- the non-distribution of the company's assets to members, neither during the company's life nor upon its dissolution;
- the principle of one-member-one-vote, regardless of the number of shares subscribed.

Following a reform passed in 2016, cooperative banks have to be part of a group, whose holding company executes the most complex operations and provides services for each cooperative bank in the group. There are two main groups, Banca ICCREA, which includes 117 cooperative banks, and Cassa Centrale Banca, which includes 65 cooperative banks. Under specific conditions, some other cooperative banks are allowed to operate autonomously outside these two larger banking groups.

Table 1 reports the national average number of branches (across provinces) by year for commercial banks and cooperative banks in Italy for the period 2015-2023. These data are extracted from the Bank

of Italy at the province level.[6] Compared to the number of commercial banks branches, which nation-wide decreased by 4.34 percent, cooperative banks' branches decreased by 2.79 percent over the period 2015-2023. However, if we calculate the variation rate of branches between 2023 and 2015 (earliest available datum) by province, and then we average those variation rates across provinces (values are in the Tables 13, 14 and 15 in the appendix), it results that commercial banks experienced an average decline of 16.06% in branch presence, while cooperative banks' branches remain virtually unchanged at the provincial level (variation of 0.0%). Such evidence of remarkable stability is used as key assumption in the construction of weights for assigning the CJI index to each bank; see section 4.2.

Table 2, and Figure 3 in the appendix, report the number of all bank branches per 100'000 residents. A clear and expected pattern emerges: once corrected for the population size, more branches are in the richer northern regions, compared to the poorer southern and islander regions. Differently, Figure 1 plots the absolute number of cooperative banks' branches in each province. Regardless of inhabitants, those result more concentrated in the mountainous areas of the north-east.

Table 1: Average number of bank branches

year	comm. banks	coop. banks
2013	.	.
2014	.	.
2015	177.7	40.4
2016	187.8	39.7
2017	200.6	40.0
2018	181.8	39.6
2019	171.9	39.6
2020	167.3	39.3
2021	151.6	38.8
2022	150.6	38.3
2023	142.9	38.2
Total	170.3	39.3

Our calculations on data extracted from the Bank of Italy.

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[6]Even though our period of investigation is from 2013 to 2023, values for the years 2013 and 2014 are missing.

Table 2: Average number of banks per 100'000 residents, by region and macro area

Geo	Mean	SD	VC	Geo	Mean	SD	VC
north-west				north-east			
[ITC1] Piemonte	46.22	6.11	0.13	[ITH3] Veneto	51.33	7.44	0.14
[ITC2] Valle d'A.	63.66	8.47	0.13	[ITH4] Friuli V. G.	57.22	8.07	0.14
[ITC3] Liguria	44.33	5.95	0.13	[ITH5] Emilia R.	57.55	8.44	0.15
[ITC4] Lombardia	48.88	7.35	0.15	Trentino A.A.			
centre				south			
[ITI1] Toscana	50.11	6.84	0.14	[ITF1] Abruzzo	39.77	5.40	0.13
[ITI2] Umbria	47	6.85	0.15	[ITF2] Molise	34.11	5.92	0.17
[ITI3] Marche	54.55	8.79	0.16	[ITF3] Campania	21.66	2.12	0.09
[ITI4] Lazio	35.44	5.07	0.14	[ITF4] Puglia	27.44	2.78	0.10
				[ITF5] Basilicata	36.22	3.80	0.10
				[ITF6] Calabria	20.00	2.00	0.10
Islands							
[ITG1] Sicilia	25.66	3.24	0.13				
[ITG2] Sardegna	33.66	2.69	0.08				
Total	41.83						

Our calculations on data extracted from the Bank of Italy.

Figure 1: Branches of cooperative banks, absolute values
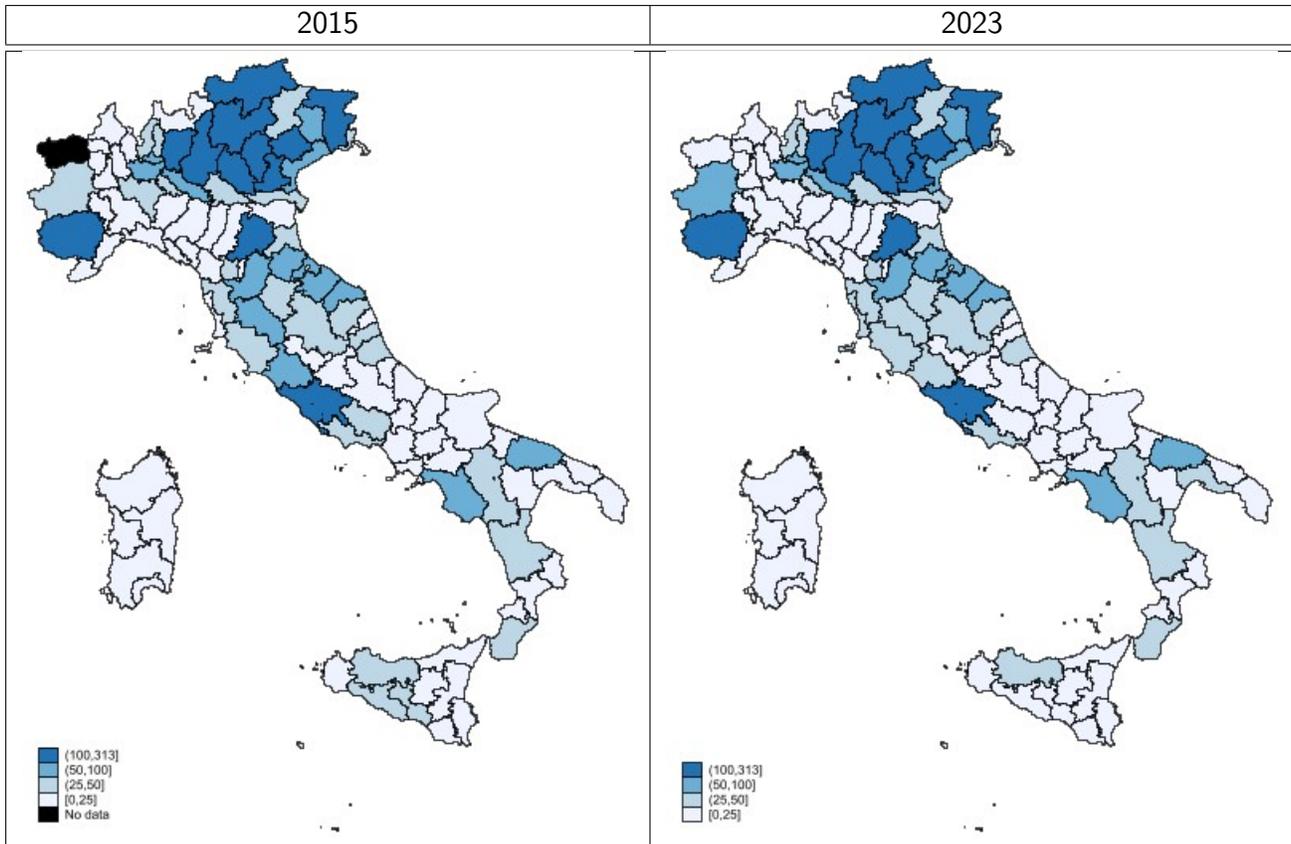
Data extracted from the Bank of Italy.

3.2 Crime and judicial inefficiency

To describe crime and judicial inefficiency, we use the composite indicator provided by Nifo & Vecchione (2014), the CJI index.[7] It is built using data on crimes against property, total civil crimes, submerged economy, tax gap, trial times and judges productivity; Table 3 lists these variables and their source.

Table 4 reports the yearly average value of the CJI index across provinces, for each year from 2013 to 2019. For the purpose of our analysis we will impute the values for the years from 2020 to 2023 using the constituent data series available; we will detail this point in the next section 4.1. It comes with no surprise that the values are fairly stable over time. Differently, geographical heterogeneity emerges from Table 5, which reports the regional average value (across provinces and years) of the CJI index with regions grouped by geographical area. Figure 2 plots the value of the index in 2013 and 2019 by province. Both Table 4, 5 and Figure 2 take to the same conclusion: crime and judicial inefficiency increase along the north-south axis and are fairly stable over the period considered.

Table 3: Constituent variables of the Crimes and Judicial Inefficiency index

variable	source
Crimes against property,*	ISTAT
Total civil crimes,*	ISTAT
Submerged economy	ISTAT
Tax gap	Tax Agency
Trial times*	Ministry of Justice
Magistrate productivity	Ministry of Justice

ISTAT stands for Italy's National Statistics Institute. Variables marked with * are the one used in the imputation of values for the period 2020-2023 method.

Table 4: CJI index by year

year	Mean	Stand. Dev.
2013	0.576	0.227
2014	0.549	0.246
2015	0.581	0.235
2016	0.563	0.242
2017	0.543	0.228
2018	0.606	0.225
2019	0.569	0.242
2020	.	.
2021	.	.
2022	.	.
2023	.	.
Total	0.570	0.238

Data are from Nifo and Vecchione (2014).

[7]Nifo & Vecchione (2014) call this index, which is a subcomponent of their more-general Institution and Quality Index, as "Rule of Law". However, we believe that the term "rule of law" conveys better the the principle that all individuals, institutions, and entities -public and private, including the state itself- are accountable to laws. We therefore prefer to refer to it as Crime and Judicial Inefficiency index, CJI in short.

Table 5: CJI index, by region and macro area

Geo	Mean	SD	VC	Geo	Mean	SD	VC
north-west				north-east			
Piedmont	0.731	0.091	0.124	Veneto	0.829	0.074	0.090
Valle d'A.	0.964	0.041	0.042	Friuli V. G.	0.827	0.046	0.056
Liguria	0.503	0.086	0.171	Emilia R.	0.682	0.114	0.168
Lombardy	0.743	0.118	0.159	Trentino A.A.	0.931	0.061	0.065
centre				south			
Tuscany	0.640	0.100	0.157	Abruzzo	0.546	0.109	0.199
Umbria	0.618	0.044	0.071	Molise	0.539	0.104	0.193
Marche	0.733	0.129	0.175	Campania	0.208	0.082	0.394
Lazio	0.423	0.073	0.172	Puglia	0.405	0.100	0.246
				Basilicata	0.552	0.073	0.132
				Calabria	0.123	0.084	0.682
islands							
Sicily	0.238	0.095	0.402				
Sardinia	0.424	0.108	0.254				

Our calculations on data from Nifo and Vecchione (2014).

Figure 2: CJI index
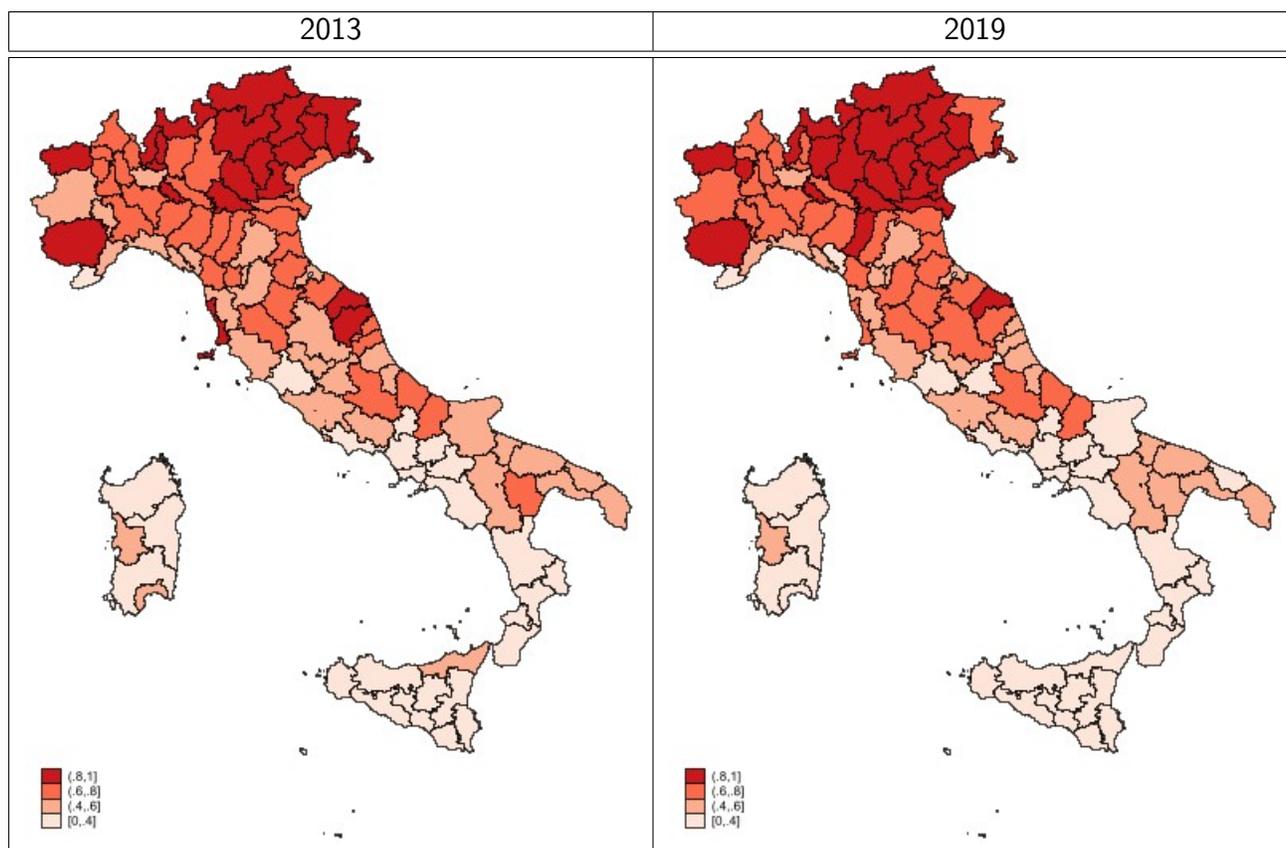
Data from Nifo and Vecchione (2014). A darker color reflects a higher value of the CJI index, i.e. lower crime and judicial inefficiency.

4 Methodology and data

4.1 Empirical strategy

Our analysis is based on panel regressions in which we include bank-specific fixed effects and compute robust (id-clustered) standard errors. To address the potential endogeneity of the efficiency indicator and of the internal controls, those enter the regression with their first lag, i.e. their predetermined value; among the others, see Agostino et al. (2023). This ensures consistent estimates of the coefficients under standard assumptions.[8] As a robustness check, in the spirit of the dynamic panel estimators by Arellano & Bond (1991), etc, we also estimate an instrumental variable specification in which we use the lags of the efficiency measure, and of the other internal controls, as internal instruments for their respective contemporaneous value; see section 5.4.

As outlined in the previous sections, our objective is to evaluate whether -and to what extent- crime and judicial inefficiency influence the performance of cooperative banks. Our analysis focuses on three key performance indicators: credit extension, asset quality and profitability. These indicators serve as dependent variable in three separate sets of regressions. As for the explanatory variables, aside from crime and judicial inefficiency, which are synthesized through the CJI index (Nifo & Vecchione 2014) -the core of our analysis-, we use the same set of control variables in all regressions.

Our primary control variable is for banks' internal **efficiency**. Firstly, we use the *cost-to-income* ratio, defined as operating expenses over operating income. It is a widely-used flow-based indicator of operational efficiency. To align the information it provides to the other efficiency indicators used (i.e. the Malmquist indices, see below), we will use its opposite ($negCOtIN = COtIN * -1$) in the regressions in section 5, so that an increase of $negCOtIN$ will reflect more operational efficiency. To deepen our understanding, we also use its decomposition in *operating expenses to employees* ($EXtEM$) and *operating income to employees* ($INtEM$).[9] Both are common measures of cost and profit efficiency, and help to interpret the results of the cost-to-income ratio. Furthermore, to capture efficiency in more general terms, we use also estimates of overall efficiency based on the Malmquist productivity indices (Färe et al. 1994); see section 4.1. The rationale is to account for how efficiency determines banks'

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[8]This approach is at the basis of vector-autoregression estimations as well as of dynamic panel estimators.

[9]Operating income and operating expense over employees are the components of cost-to-income normalized to employees.

output given a specific amount of inputs. Then, the aim is to widen the spectrum with respect to the cost-to-income as the contributions by Fiordelisi et al. (2011), Agostino et al. (2023), etc suggest. An increase of the two versions of the Malmquist indices we use conveys more overall efficiency. In any case, using more efficiency measures will serve also as a robustness check.

As for the other controls, we include variables that can be clustered into *internal and external controls*, respectively. The former are meant to reflect each bank's characteristics, the latter reflect the environment where banks operate. As for the **internal controls**, apart for the efficiency indicator, we include: *total deposits* (DEP) to reflect banks' size, we prefer it to total assets to reduce simultaneity with the dependent variables, which are all part or related to the asset side of a bank's balance sheet; *equity to total assets* (EQtTA), a higher capital ratio is related to lower leverage and borrowing costs (Casu & Molyneux 2003), moreover, a higher capital ratio should mitigate managers' opportunistic behavior by reducing their incentive to take on excessive risk and by entailing greater shareholder control (Casu & Girardone 2004, Alhassan 2015). As mentioned above, the internal controls, as well as the efficiency measures, enter the regressions with their first lag. As for the **external controls,** we include: *province GDP* (GDP), to account for the economic stance of the area in which cooperative banks operate; the *interest rate on loans* (IRL), we use it to account for the cost of borrowing; the *concentration ratio* (CNR), which is to account for competition in the area where a cooperative bank operates. More information on the source and construction of these variables is in the following section.

4.2   Data

The construction of the dataset for our analysis has required data from different sources, the frequency is annual and we cover eleven years for the period 2013-2023.

Our primary source is BankFocus (A) from which we extract bank-level data. In details, we extract balance-sheet information for the entire period under investigation (A1), and the location of each branch of all cooperative banks in the year 2022 (A2); at any moment of extraction, branches location is available only for the last year. Data with the location of each branch report the city in which each branch is settled. These are used to calculate weights to assign proportionally the CJI index to each bank. To wit, if cooperative bank A has 60% of its branches in province X, and 40% in province Y, then the value of the CJI index assigned to bank A comes from the weighed average across those provinces.

As for the balance-sheet data, we extract from BankFocus all the more relevant bank-level variables and ratios that we use in our regression analysis either as dependent variable (loans, the NPL ratio and ROA), or as internal controls (cost-to-income, total deposits, equity-to-total assets, etc) or for the estimation of efficiency; see the next subsections about the methodology.

We extract the number of branches of different bank typologies at the province level from Banca d'Italia (B1), these are the data at the basis of the previous discussion in section 3.1, as well as the average interest rate on retail loans (B2). The number of bank branches, regardless of the bank typology, is used to calculate concentration ratios to account for the level of competition in each province where a cooperative bank has its headquarter. These are later used as external controls in the regression analysis in section 5, in the manner of Aiello & Bonanno (2016) and Agostino et al. (2023). Concentration ratios for each province are calculated as the ratio of its number of bank branches (of any bank) over the maximum value observed, i.e. the value of the province with the largest number of branches; the calculation is performed year by year.[10] The average interest rate on retail loans (B2) is used as an external control in the regression analysis.

We obtain real GDP by province (C) from Italy's national statistics institute, ISTAT; it is used as an external control in the regression analysis.[11]

The Crime and Judicial Inefficiency (CJI) index is taken from Nifo & Vecchione (2014), a discussion on its evolution was in section 3.2. It is only available for the years 2013-2019. Then, we extract data on crime rates (E1, E2) and the duration of legal proceedings (E3) from the statistics department of Italy's Ministry of Justice, both are at the basis of Nifo & Vecchione (2014)'s calculation of the index (see section 3.1), and we use them to impute values of the CJI index for the years from 2020 up to 2023.[12] All data used are listed in Table 6. The CJI index is the explicative of interest in our analysis.

Imputation

As just explained, data on the CJI index from Nifo & Vecchione (2014) are available only up to 2019, we extend the values up to 2023 by means of imputation methods. This is done by using the variables

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[10]Since data are missing for the years 2013 and 2014, we have no other options than setting the value for those missing years equal to the value in 2015.

[11]In truth, we extract the nominal GDP by province and the national CPI, and then convert nominal GDP into real terms.

[12]Ministero della Giustizia, Direzione Generale di Statistica e Analisi Organizzativa: https://webstat.giustizia.it/

at the basis of its construction for its extension. Among those six variables, see section 3.2, we use the series available up to 2023. In more details, we employed multiple imputation using predictive mean matching (PMM). This method imputes missing values by matching each incomplete observation to a set of observed cases with similar predicted values and then randomly selecting a donor from the nearest neighbors (Schafer 1997, StataCorp 2023).[13] Then, the imputation model included the duration of trials, total crimes and crimes against property as predictors and was performed separately within groups defined by bank to account for potential group-level heterogeneity. We generated 75 imputed data sets, which are then used in the panel regressions commented below to obtain the estimate of the coefficient of the CJI index and perform the test on its statistical significance.

Malmquist index of efficiency

We compute Malmquist productivity indices (Färe et al. 1994) based on Data Envelopment Analysis (Charnes et al. 1978) to compare our estimates based on the productivity indicator, i.e. the cost-to-income, with a more comprehensive measure of efficiency. To estimate the efficiency frontier using DEA, we use two specifications. *Malm 1* includes total expenditures, fixed assets, total deposits and equity as inputs; and it includes gross loans and advances to customers, other operating assets and non-interest income as outputs. *Malm 2* uses the same set of inputs as *Malm 1*, but it adds total interest income to the outputs. As common when working with private companies, we choose to estimate the frontier according to the input orientation. We thus compute the Malmquist index representing the yearly Total Factor Productivity (TFP, hereafter) *change* for each bank from time t to time $t+1$, which is equal to:

$$M^{t,t+1}(x^t, y^t, x^{t+1}, y^{t+1}) = \left[\frac{D^t(x^{t+1}, y^{t+1})}{D^t(x^t, y^t)} \cdot \frac{D^{t+1}(x^{t+1}, y^{t+1})}{D^{t+1}(x^t, y^t)}\right]^{1/2},$$

where $x^t, y^t, x^{t+1}, y^{t+1}$ are the inputs and outputs at time t and $t+1$, respectively, and D^t, D^{t+1} are the output distance functions at the two periods. We then transform them into levels to make them comparable to the other productivity measures we use as explicatives in the panel regressions. Specifically, we set the TFP equal to 100 in 2018 (mid-year) for each bank, and recursively compute the level of productivity forward and backward in time by using its change.[14] This transformation yields

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[13]PMM is a robust, semi-parametric approach that preserves the distributional properties of the original data and avoids imputing implausible values, making it particularly suitable for variables that are not normally distributed.

[14]In details, starting from the value of 100 in 2018, we multiply it by the corresponding TFP change to recover the

Table 6: Data and sources

A1	Balance-sheet variables for cooperative banks	2013-2023	BankFocus
A2	Location of each branch by cooperative bank	2022	BankFocus
B1	Distribution of bank branches by province	2015-2023	Banca d'Italia
B2	Average interest rate on loans	2013-2023	Banca d'Italia
C	Real GDP by province	2013-2023	Istat
D	Crime and Judicial Inefficiency Index	2013-2019	Nifo & Vecchione (2014)
E1	Crimes against property	2013-2023	Istat
E2	Total civil crimes	2013-2023	Istat
E3	Trial times	2013-2023	Ministry of Justice

ISTAT stands for Italy's National Statistics Institute.

a time-consistent relative productivity level series for each bank, which we then use as explicative in the level-based panel regressions.

5 Estimation output

In this section we present our estimates and discuss the results for each of the three key performance indicators, namely loans, non-performing loans and return on assets. For the interpretation of the following output, the right-hand side variables used are to be read as follows: an increase in the crime and judicial inefficiency index (CJI index), reflects more legality, i.e. less crime and a more efficient judiciary; an increase in the opposite of cost-to-income (negCOtIN) reflects more operational efficiency; an increase in the Malmquist indices (Malm 1 and Malm 2) reflect more overall efficiency.

5.1 Loans

The first dimension of a bank's activity that we consider is credit extension, we therefore use as dependent variable the stock of loans.[15] We study the effect on lending to evaluate whether crime and judicial inefficiency impair cooperative banks capacity to extend loans. Indeed, banks operating in a territory characterized by high crime levels might apply comparatively higher lending requirements, such as higher guarantees or collateral. Table 7 reports the estimation output.

The estimated coefficients indicate that crime has a strong effect on lending. Indeed, a 1 point increase in the CJI index is associated with 0.566 points increase in lending. This suggests that co-operative banks allocate more funds where crime is lower and courts work better. As for efficiency,

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following observation, and we do as such up to 2023. In contrast, to recover values before the base year, we divide the subsequent level by the previous TFP change.

[15]In details, it is *Gross loans and advances to customers*.

Table 7: Loan regressions

depVar: Loans	1		2		3		4		5	
CJI	0.566	**	0.545	**	0.587	**	0.541	**	0.561	**
	(0.233)		(0.230)		(0.223)		(0.183)		(0.183)	
L.negCOtIN	- 0.001									
	(0.001)									
L.INtEM			0.000							
			(0.000)							
L.EXtEM					0.001	*				
					(0.001)					
L.Malm_1							0.002	**		
							(0.001)			
L.Malm_2									0.002	**
									(0.001)	
L.DEP	0.781	**	0.763	**	0.732	**	0.821	**	0.823	**
	(0.095)		(0.105)		(0.127)		(0.028)		(0.028)	
L.EQtTA	0.015	**	0.015	**	0.004		0.000		-0.001	
	(0.007)		(0.005)		(0.013)		(0.006)		(0.006)	
GDP	0.414		0.502		0.372		-0.038		-0.017	
	(0.450)		(0.426)		(0.331)		(0.148)		(0.151)	
IRL	-0.077	**	-0.086	**	-0.081	**	-0.071	**	-0.077	**
	(0.010)		(0.013)		(0.008)		(0.005)		(0.006)	
CNR	0.229		0.210		0.189		0.198		0.218	
	(0.229)		(0.233)		(0.216)		(0.192)		(0.194)	
Observations	2392		2385		2385		2236		2236	
Adj. R^2	n.a.		n.a.		n.a.		n.a.		n.a.	

Panel regressions performed by including bank fixed-effects and computing robust (bank-clusterd) standard errors. Estimations are based on the imputed values of the CJI index for the years 2000-2023. Variables with the prefix "L." enter the regression in first lag. CJI is the index of crime and judicial inefficiency, negCOtIN is the opposite of the cost-to-income ratio, INtEM is the income-to-employees ratio, COtEM is the cost to employees ratio, Malm 1 and Malm 2 are the Malmquist efficiency indices, DEP is total deposits, EQtTA is Equity to Total Assets, GDP is provincial GDP, IRL is the interest rate on loans, CNR is the concentration ratio.

the operational efficiency measure, cost-to-income, is non-significant, as well as its decomposition, operating income over employees, which is more suited to catch efficiency in terms of productivity. In contrast, limited evidence emerges suggesting that when operating costs increase with respect to employees, banks seem able to extend more credit. This could depend on the availability of more resources to each employee, as reflected by higher costs, which makes possible to intermediate more funds. In contrast to cost-to-income, overall efficiency based on the Malmquist indices (Malm 1 and Malm 2) neatly suggests that banks more efficient in general terms intermediate more funds (columns 4 and 5 in Table 7).

As for the other controls, the amount of lending is positively related to the bank size, as reflected by the amount of deposits. Although significance is not robust across estimations, also the capital structure might mater, as more equity to total assets seems related to more loans. Quite surprisingly, provincial income does not play a significant role, as does not the level of competition. In contrast, higher interest rates are reasonably related to lower loans as expected.

The CJI index is a synthesis of crimes, both total and property crimes, with judicial inefficiency. We

are interested to understand whether all its components play a role. We replace the CJI index with its constituencies one at a time in Table 8; for ease of exposition, we report the results only when cost-to-income is included as efficiency measure. Then, the first column includes the total amount of civil crimes, the second the total amount of just property crimes, the third judicial inefficiency in terms of the average length of a trial. Estimations in Table 8 serve also as a mayor robustness check since they are performed without imputing missing values for the years 2019-2023, which is instead the case when the CJI index is used as in Table 7.[16]

The estimation output reports a significant, negative effect of all the three components of the CJI index. Although the effect of trial length seems very small, it is significant anyway. Moreover, property crimes emerge as more explicative than civil crimes in general.

Table 8: Loan regressions, CJI components

depVar: Loans	1		2		3	
Trial Length	-0.000	**				
	(0.000)					
Civ. Crime			-11.995	**		
			(5.511)			
Pro. Crime					-17.351	**
					(6.936)	
L.negCOtIN	0.001		-0.000		-0.001	
	(0.001)		(0.001)		(0.001)	
L.DEP	0.771	**	0.731	**	0.678	**
	(0.098)		(0.134)		(0.149)	
L.EQtTA	0.015	**	0.019	**	0.019	**
	(0.007)		(0.008)		(0.008)	
GDP	0.344		0.369		0.283	
	(0.425)		(0.442)		(0.396)	
IRL	-0.075	**	-0.045	**	-0.042	**
	(0.009)		(0.007)		(0.007)	
CNR	0.146		0.031		0.132	
	(0.226)		(0.240)		(0.232)	
Observations	2392		2465		2465	
Adj. R^2	0.61		0.63		0.64	

Panel regressions performed by including bank fixed-effects and computing robust (bank-clusterd) standard errors. Estimations are not based on the imputed values of the CJI index in this case, but on real values of its costituences. Variables with the prefix "L." enter the regression in first lag. CJI is the index of crime and judicial inefficiency, negCOtIN is the opposite of the cost-to-income ratio, Malm 1 and Malm 2 are the Malmquist efficiency indices, DEP is total deposits, EQtTA is Equity to Total Assets, GDP is provincial GDP, IRL is the interest rate on loans, CNR is the concentration ratio.

5.2 Non-performing loans

We now turn to study whether crime and judicial inefficiency influence asset quality. Indeed, even when banks are cautious because they know the area where they operate, they might not successfully screen borrowers and this could increase the amount of NPLs. Since we control for economic developments,

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[16]Non using imputation methods allows to calculate goodness-of-fit statistics, Table 8 reports the adjusted R^2.

Table 9: NPL regressions

depVar: NPL ratio	1		2		3		4		5	
CJI	-19.156	**	-17.665	**	-18.323	**	-19.783	**	-20.188	**
	(5.713)		(5.764)		(5.721)		(5.913)		(5.862)	
L.negCOtIN	0.101	**								
	(0.022)									
L.INtEM			-0.001							
			(0.003)							
L.EXtEM					-0.017	**				
					(0.007)					
L.Malm_1							-0.051	*		
							(0.028)			
L.Malm_2									-0.047	*
									(0.026)	
L.DEP	-11.714	**	-10.855	**	-10.193	**	-12.350	**	-12.398	**
	(1.095)		(1.368)		(1.390)		(1.247)		(1.255)	
L.EQtTA	-0.183		-0.411	*	-0.212		-0.101		-0.085	
	(0.176)		(0.238)		(0.352)		(0.467)		(0.469)	
GDP	-33.490	**	-42.973	**	-41.075	**	-32.444	**	-32.891	**
	(6.187)		(6.359)		(6.361)		(5.721)		(5.886)	
IRL	0.812	**	1.423	**	1.407	**	1.215	**	1.359	**
	(0.234)		(0.194)		(0.192)		(0.199)		(0.216)	
CNR	28.268	**	27.141	**	27.003	**	30.298	**	29.855	**
	(7.929)		(8.382)		(8.340)		(7.990)		(7.927)	
Observations	2338		2334		2334		2195		2195	
Adj. R^2	n.a.		n.a.		n.a.		n.a.		n.a.	

Panel regressions performed by including bank fixed-effects and computing robust (bank-clusterd) standard errors. Estimations are based on the imputed values of the CJI index for the years 2020-2023. Variables with the prefix "L." enter the regression in first lag. CJI is the index of crime and judicial inefficiency, negCOtIN is opposite of the cost-to-income ratio, INtEM is the income-to-employees ratio, COtEM is the cost to employees ratio, Malm 1 and Malm 2 are the Malmquist efficiency indices, DEP is total deposits, EQtTA is Equity to Total Assets, GDP is provincial GDP, IRL is the interest rate on loans, CNR is the concentration ratio.

the effect of crime that we aim to capture is therefore disjoint from the economic dynamics of the territory, then it should also capture some habits, or cultural aspects, related to the willingness to pay back a loan. To investigate this issue, we use a specification similar to the one in Table 7, but where we replace the dependent variable with the NPL ratio; the estimation output is in Table 9.

As expected, crime and judicial inefficiency emerge as strong determinants of the NPL ratio in all the specifications tested. It is of particular interest to discuss in this case the coefficients of the efficiency measures. Cost-to-income is positive and significant, meaning that higher efficiency increases the NPL ratio. At a first sight, this is a puzzling result. However, the decomposition of cost-to-income shows that this result depends entirely on costs. Then, a sensible interpretation is that when the resources to each employee increase, as reflected by the cost-to-employees ratio, NPLs decrease. This is not a new result in this branch of literature, as also Berger & DeYoung (1997) make the same hypothesis. In contrast, the Malmquist indices consistently indicate that when overall efficiency increases, NPLs decrease.

5.3 Return on assets

In this last set of regressions, we investigate whether crime and judicial inefficiency make a difference for banks' profits. For this purpose, we use the return-on-assets ratio (ROA) as dependent variable. Based on the previous results on lending, as the amount of credit that each bank extends is inversely associated to the criminality rate it faces, we would expect a negative effect also on banks' profitability. Table 10 reports the estimation output.

Crime and judicial inefficiency turn out not significant in any of the specification used. In contrast, the GDP, the average interest rate on loans and the amount of deposits are correctly signed and significant. Also the efficiency measures do not have any relevant impact on profitability, neither when efficiency is considered in flow terms, nor when overall efficiency is used.

Table 10: ROA regressions

depVar: ROA	1		2		3		4		5	
CJI	0.110		0.118		0.145		0.311		0.298	
	(0.390)		(0.386)		(0.386)		(0.375)		(0.374)	
L.negCOtIN	0.001									
	(0.002)									
L.INtEM			0.000	*						
			(0.000)							
L.EXtEM					0.000					
					(0.000)					
L.Malm_1							0.001			
							(0.001)			
L.Malm_2									0.002	
									(0.001)	
L.DEP	0.395	**	0.388	**	0.388	**	0.339	**	0.340	**
	(0.132)		(0.129)		(0.135)		(0.057)		(0.056)	
L.EQtTA	0.018		0.011		0.009		-0.039	**	-0.036	**
	(0.015)		(0.016)		(0.020)		(0.013)		(0.013)	
GDP	1.619	**	1.517	**	1.445	**	0.933	**	0.932	**
	(0.589)		(0.507)		(0.530)		(0.304)		(0.309)	
IRL	0.156	**	0.156	**	0.163	**	0.175	**	0.171	**
	(0.023)		(0.016)		(0.017)		(0.012)		(0.013)	
CNR	-0.545		-0.596		-0.584		-0.638		-0.642	
	(0.402)		(0.403)		(0.407)		(0.419)		(0.416)	
Observations	2393		2386		2386		2237		2237	
Adj. R^2	n.a.		n.a.		n.a.		n.a.		n.a.	

Panel regressions performed by including bank fixed-effects and computing robust (bank-clusterd) standard errors. Estimations are based on the imputed values of the CJI index for the years 2020-2023. Variables with the prefix "L." enter the regression in first lag. CJI is the index of crime and judicial inefficiency, negCOtIN is the opposite of the cost-to-income ratio, INtEM is the income-to-employees ratio, COtEM is the cost to employees ratio, Malm 1 and Malm 2 are the Malmquist efficiency indices, DEP is total deposits, EQtTA is Equity to Total Assets, GDP is provincial GDP, IRL is the interest rate on loans, CNR is the concentration ratio.

A straight interpretation of this result is that local banks could be able to offset the negative impact of criminality by adjusting their business, i.e. income sources or practices, accordingly, since they know the area where they operate. From this perspective, we investigate whether the CJI index has a

differential impact on the two main banks' income sources: *interest income* and *non-interest income*. We therefore use the decomposition of the ROA into (i) interest income over total assets, IItTA, and (ii) non-interest income over total assets, NIItTA, as separate dependent variables into two alternative regressions. Table 11 (panel A) reports the output when we use interest income over average total assets. Limited evidence emerges in favour of a positive effect in terms of higher interest income where criminality rates are higher; this might depend upon stricter credit conditions applied. However, this result does not emerge as robust. In contrast, as shown in Table 11 (panel B), the criminality rate plays a clearly negative effect on non-interest income over total average assets. As non-interest income derives predominantly from fees and commissions, this signals that banks sell less services, or diversify less, where criminality is higher. The fact that the effect of the CJI index on the two ROA components is opposite is likely to explain its non-significant effect on the aggregate ROA reported in Table 10.

Table 11: ROA regressions, components of ROA

Panel A: Interest Income to average total assets					
depvar: R_IItATA	1		2		3
CJI	0.007		0.008 **		0.008 **
	(0.005)		(0.003)		(0.003)
L.negCOtIN	0.000				
	(0.000)				
L.Malm_1			-0.000 **		
			(0.000)		
L.Malm_2					-0.000
					(0.000)
L.DEP	-0.001		0.002 **		0.002 **
	(0.003)		(0.001)		(0.001)
L.EQtTA	0.001		0.000		0.000
	(0.001)		(0.000)		(0.000)
GDP	0.027		0.010 **		0.010 **
	(0.017)		(0.002)		(0.002)
IRL	0.002 **		0.003 **		0.003 **
	(0.001)		(0.000)		(0.000)
CNR	0.004		0.005		0.005
	(0.004)		(0.003)		(0.003)
Observations	2391		2240		2240
Adj. R^2	n.a.		n.a.		n.a.

Panel B: Non-interest income to average total assets					
depVar: NIItATA	1		2		3
CJI	-0.018 **		-0.016 **		-0.016 **
	(0.007)		(0.006)		(0.007)
L.negCOtIN	-0.000				
	(0.000)				
L.Malm_1			-0.000 *		
			(0.000)		
L.Malm_2					-0.000
					(0.000)
L.DEP	-0.007 **		-0.010 **		-0.010 **
	(0.003)		(0.001)		(0.001)
L.EQtTA	0.000		-0.001 **		-0.001 **
	(0.000)		(0.000)		(0.000)
GDP	-0.051 **		-0.050 **		-0.050 **
	(0.010)		(0.006)		(0.006)
IRL	0.001 **		0.001 **		0.001 **
	(0.001)		(0.000)		(0.000)
CNR	-0.022 **		-0.023 **		-0.024 **
	(0.007)		(0.007)		(0.007)
Observations	2391		2240		2240
Adj. R^2	n.a.		n.a.		n.a.

Panel regressions performed by including bank fixed-effects and computing robust (bank-clusterd) standard errors. Estimations are based on the imputed values of the CJI index for the years 2000-2023. Variables with the prefix "L." enter the regression in first lag. CJI is the index of crime and judicial inefficiency, negCOtIN is opposite of the cost-to-income ratio, Malm 1 and Malm 2 are the Malmquist efficiency indices, DEP is total deposits, EQtTA is Equity to Total Assets, GDP is provincial GDP, IRL is the interest rate on loans, CNR is the concentration ratio.

5.4 Instrumental variables estimation

In this section, we conduct a robustness check concerning the estimator used in our analysis. In the previous section, we addressed the potential endogeneity of the balance-sheet-related regressors by employing their predetermined value (i.e., their first lag), following the approach by Agostino et al. (2023) and VAR analysis. Here, in contrast, we adopt a two-stage instrumental variable estimator. In line with the dynamic panel data literature (Arellano & Bond 1991 and later contributions by the

same authors), we use the first two lags of the endogenous variables as internal instruments. The regressors suspected of endogeneity are the efficiency measure, total deposits and the equity-to-total-assets ratio; i.e. the internal controls. Table 12 reports the instrumental-variable estimation for the main specifications discussed in the previous sections.[17]

On the whole, the estimation output confirms the conclusions of our analysis. Lower crime rates and judicial inefficiency exert a significant positive effect on credit extension, a significant negative effect on non-performing loans and a dubious effect on profitability. Sign and significance of the efficiency measures are almost always as in the main regressions in the previous sections. Also the other two instrumented variables, deposits and equity-to-total assets, maintain in general the same sign and significance.

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[17]We do not report the estimations based on the decomposition of cost-to-income because they do not add much in this context.

Table 12: IV estimations

Panel A: Loans	1		2		3	
CJI	1.035	**	1.505	**	1.469	**
	(0.442)		(0.171)		(0.169)	
L.negCOtIN	-0.006					
	(0.005)					
L.Malm_1			0.002	**		
			(0.000)			
L.Malm_2					0.003	**
					(0.000)	
L.DEP	0.826	**	1.032	**	1.025	**
	(0.275)		(0.033)		(0.033)	
L.EQtTA	0.037		-0.009		0.001	
	(0.054)		(0.010)		(0.010)	
GDP	0.981	*	0.154	*	0.149	*
	(0.503)		(0.090)		(0.087)	
IRL	-0.091	**	-0.014	*	-0.045	**
	(0.045)		(0.008)		(0.007)	
CNR	0.060		0.331	**	0.271	**
	(0.182)		(0.117)		(0.117)	
Observations	2271		1994		1994	
Adj. R^2	n.a.		n.a.		n.a.	
Panel B: NPLs	1		2		3	
CJI	-35.464	**	-34.983	**	-34.855	**
	(9.455)		(6.931)		(7.031)	
L.negCOtIN	-0.235					
	(0.191)					
L.Malm_1			-0.034	**		
			(0.011)			
L.Malm_2					-0.038	**
					(0.017)	
L.DEP	-19.488	**	-16.290	**	-16.438	**
	(4.141)		(1.728)		(1.829)	
L.EQtTA	-1.159		0.406		0.193	
	(0.877)		(0.480)		(0.503)	
GDP	-30.201	**	-29.377	**	-29.233	**
	(9.678)		(4.120)		(4.084)	
IRL	-0.606		-0.124		0.352	
	(1.271)		(0.364)		(0.348)	
CNR	30.134	**	29.392	**	29.910	**
	(5.759)		(5.405)		(5.393)	
Observations	2225		1957		1957	
Adj. R^2	-0.29		0.34		0.34	
Panel C: ROA	1		2		3	
CJI	0.333		0.797	*	0.833	*
	(0.610)		(0.450)		(0.463)	
L.negCOtIN	-0.026					
	(0.022)					
L.Malm_1			-0.000			
			(0.001)			
L.Malm_2					-0.000	
					(0.001)	
L.DEP	0.564	**	0.473	**	0.497	**
	(0.198)		(0.090)		(0.098)	
L.EQtTA	0.094		-0.010		-0.007	
	(0.067)		(0.027)		(0.029)	
GDP	2.386	**	1.367	**	1.355	**
	(0.717)		(0.263)		(0.264)	
IRL	-0.015		0.200	**	0.202	**
	(0.153)		(0.020)		(0.021)	
CNR	-0.697	*	-0.550	*	-0.532	*
	(0.374)		(0.319)		(0.321)	
Observations	2272		1993		1993	
Adj. R^2	0.23		0.13		0.13	

Panel, Instrumental-Variable regressions performed by including bank fixed-effects and computing robust (bank-clusterd) standard errors. Estimations are based on the imputed values of the CJI index for the years 2020-2023. Variables with the prefix "L." enter the regression in first lag. CJI is the index of crime and judicial inefficiency, negCOtIN is the opposite of the cost-to-income ratio, Malm 1 and Malm 2 are the Malmquist efficiency indices, DEP is total deposits, EQtTA is Equity to Total Assets, GDP is provincial GDP, IRL is the interest rate on loans, CNR is the concentration ratio.

6 Conclusions

In this study we have investigated whether and to what extent crime and judicial inefficiency shape the performance of cooperative banks in Italy. We have studied banks' performance in terms of credit extension, asset quality and profitability. The analysis is developed around the consideration that, given their strong territorial ties and mutual structure, cooperative banks are particularly exposed to the environment where they operate and thus to territorial disparities that characterize the Italian economic and institutional landscape.

Based on a panel dataset covering all cooperative banks in Italy from 2013 to 2023, built by combining multiple sources at the bank and provincial levels, we find robust evidence that higher crime and judicial inefficiency negatively affect credit supply. This suggests that when operating in more criminal and institutionally fragile environments, cooperative banks are likely to adopt more cautious lending policies. Also, we find that crime and judicial inefficiency are strong predictors of loan deterioration, since they are associated with more non-performing loans. Considering that we control for local economic conditions, this result suggests that also behavioral and cultural factors are in play, and those determine borrowers' willingness to repay to a certain extent. Eventually, we do not find robust evidence that crime and judicial inefficiency impact overall bank profitability, but they negatively affect non-interest income. This implies that banks diversify less in more criminal areas, likely to contain risks.

On the whole, our results hold across different specifications, and when we change estimator to cope with potential endogeneity. Then, our findings contribute to the literature on banking, institutional quality and credit markets, and confirm that banks are sensitive to an adverse environment. Given the effect found both on credit extension and non-performing loans, the lack of an effect on overall profitability suggests that banks might adjust their business model so to reduce the adverse effect of crime and judicial inefficiency on their income. From a policy perspective, our results underline the importance of improving institutional effectiveness to ensure the proper functioning of local credit markets, this would help in promoting local development and reducing socio-economic disparities, particularly in structurally heterogeneous countries such as Italy.

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Appendix

Figure 3: Bank branches per 100 inhabitants (any bank)

2015	2023
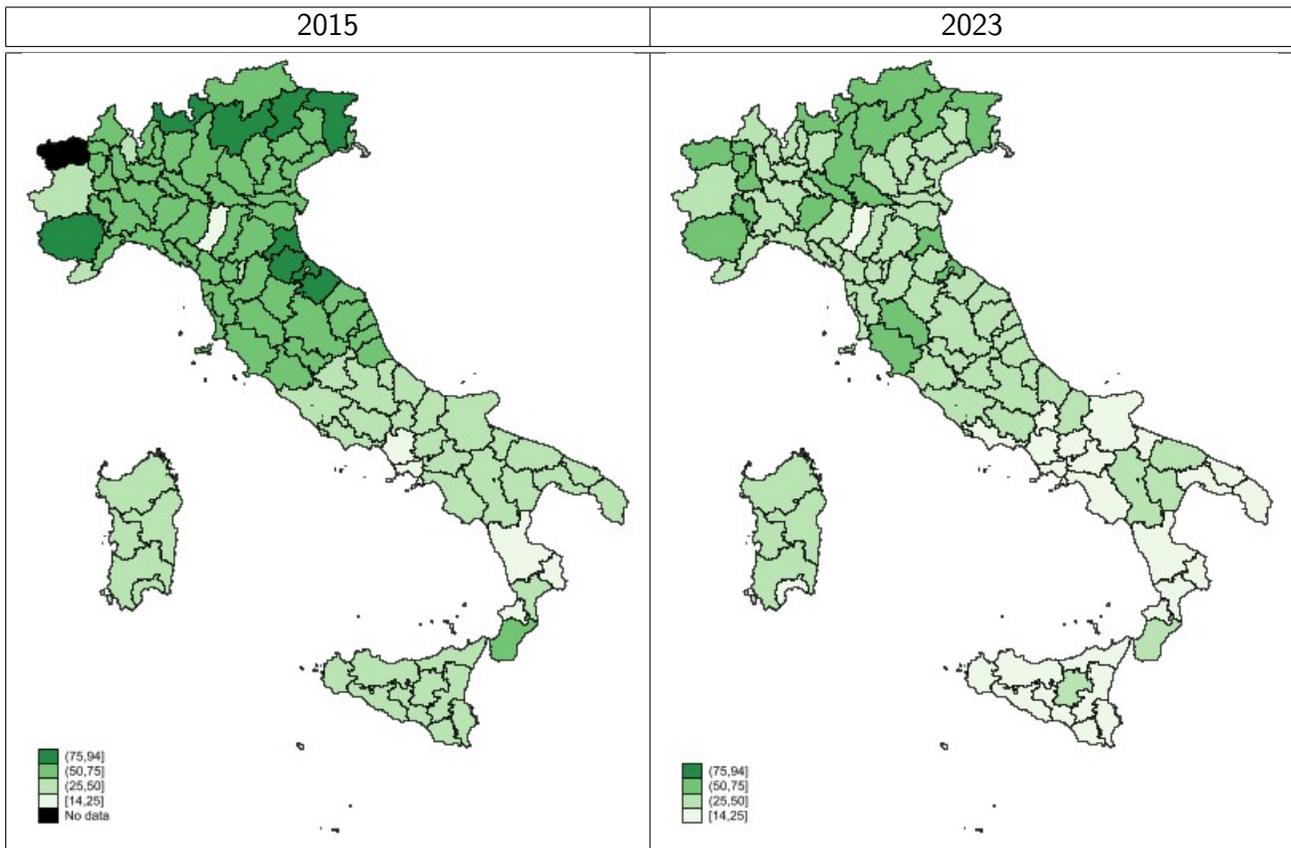
Data extracted from the Bank of Italy.

Table 13: Commercial vs. Cooperative banks, by province (A-F)

province name	COM banks, mean	COM banks, change	BCC banks, mean	BCC banks, change
Agrigento	82.22	-0.27	24.89	-0.22
Alessandria	180.00	-0.22	4.67	-0.50
Ancona	184.22	-0.49	58.44	0.05
Aosta	54.83	.	16.33	.
Arezzo	135.89	-0.39	31.67	-0.03
Ascoli Piceno	81.67	-0.37	27.00	-0.17
Asti	118.33	-0.18	11.00	0.00
Avellino	69.67	0.09	21.44	0.05
Bari	252.22	-0.23	56.00	0.15
Barletta-Andria	71.78	-0.07	11.22	0.44
Belluno	96.00	-0.10	26.00	0.04
Benevento	49.89	-0.18	13.00	-0.08
Bergamo	379.89	-0.16	127.22	-0.17
Biella	107.22	-0.23	0.00	.
Bologna	445.56	-0.22	115.33	0.01
Bolzano-Bozen	153.11	0.23	180.00	-0.08
Brescia	415.44	-0.13	223.11	-0.05
Brindisi	66.00	-0.26	12.22	0.27
Cagliari	120.00	-0.58	2.44	0.50
Caltanissetta	43.33	-0.43	27.11	-0.17
Campobasso	55.22	-0.43	13.67	0.00
Carbonia-Iglesi	32.50	.	0.00	.
Caserta	131.56	-0.25	6.67	0.17
Catania	197.33	-0.27	18.78	-0.05
Catanzaro	61.00	-0.21	19.78	0.05
Chieti	106.67	-0.35	16.78	0.13
Como	199.33	-0.02	45.00	-0.02
Cosenza	112.00	-0.35	32.11	0.17
Cremona	132.22	0.06	68.44	-0.12
Crotone	21.11	-0.06	7.33	-0.44
Cuneo	292.00	-0.25	122.22	-0.06
Enna	35.89	-0.36	14.11	-0.07
Fermo	71.56	-0.36	11.56	-0.08
Ferrara	139.89	-0.36	17.89	0.12
Firenze	406.33	-0.25	68.22	-0.35
Foggia	131.78	-0.08	11.22	0.09
Forlì Cesena	175.11	-0.37	67.89	0.00
Frosinone	96.78	-0.35	26.11	-0.24
...				
Total	170.26	-0.16	39.32	0.00

"... banks, mean" is the average (across the years 2015-2023) number of branches of commercial (COM) or cooperative (BCC) banks, "... banks, change" is the difference between the value in the years 2015 and 2023 of the branches of commercial (COM) or cooperative (BCC) banks.

Table 14: Commercial vs. Cooperative banks, by province (G-P)

province name	COM banks, mean	COM banks, change	BCC banks, mean	BCC banks, change
Genova	337.44	-0.19	2.44	1.00
Gorizia	31.33	-0.33	35.44	-0.08
Grosseto	93.11	-0.22	34.22	-0.14
Imperia	72.44	-0.19	10.00	0.00
Isernia	16.22	-0.40	2.67	0.00
L'Aquila	84.22	-0.07	22.22	0.05
La Spezia	100.22	-0.21	3.78	0.33
Latina	103.67	-0.17	25.89	0.04
Lecce	148.78	-0.31	14.78	0.50
Lecco	135.56	0.14	28.22	-0.13
Livorno	131.56	-0.13	25.56	0.08
Lodi	67.22	0.20	42.89	-0.30
Lucca	160.22	-0.11	23.33	0.00
Macerata	135.89	-0.46	32.00	0.06
Mantova	204.22	-0.17	41.22	0.00
Massa Carrara	81.22	-0.24	2.00	0.00
Matera	41.78	0.03	12.00	0.18
Medio Campidano	34.00	.	0.00	.
Messina	130.89	-0.37	14.11	0.33
Milano	1087.33	-0.16	84.56	-0.06
Modena	292.44	0.04	11.22	0.00
Monza e della B	250.11	-0.04	64.22	-0.13
Napoli	526.44	-0.24	5.67	1.25
Novara	134.89	0.07	0.00	.
Nuoro	76.33	0.15	0.00	.
Ogliastra	25.00	.	0.00	.
Olbia-Tempio	66.00	.	0.00	.
Oristano	61.78	-0.25	6.44	0.17
Padova	332.78	-0.27	110.44	-0.07
Palermo	250.56	-0.39	38.22	-0.08
Parma	230.89	-0.24	16.67	-0.17
Pavia	204.67	-0.16	23.00	-0.31
Perugia	269.11	-0.38	41.67	0.08
Pesaro Urbino	143.89	-0.51	61.67	0.03
Pescara	85.56	-0.39	23.00	0.00
Piacenza	113.78	-0.22	13.44	-0.20
Pisa	178.78	-0.12	34.44	-0.21
Pistoia	90.78	-0.40	36.67	-0.30
Pordenone	98.89	-0.22	52.22	0.02
Potenza	80.56	0.16	30.56	-0.18
...				
Total	170.26	-0.16	39.32	0.00

"... banks, mean" is the average (across the years 2015-2023) number of branches of commercial (COM) or cooperative (BCC) banks, "... banks, change" is the difference between the value in the years 2015 and 2023 of the branches of commercial (COM) or cooperative (BCC) banks.

Table 15: Commercial vs. Cooperative banks, by province (R-V)

province name	COM banks, mean	COM banks, change	BCC banks, mean	BCC banks, change
Ragusa	55.67	-0.29	5.78	0.20
Ravenna	202.00	-0.18	44.89	-0.07
Reggio Emilia	247.44	-0.06	39.44	-0.10
Reggio di Calab	86.56	-0.24	7.22	-0.25
Rieti	50.33	-0.44	8.00	0.00
Rimini	135.44	-0.26	69.11	-0.14
Roma	1214.33	-0.25	175.56	-0.03
Rovigo	75.67	-0.34	43.89	-0.19
Salerno	191.00	-0.14	100.56	-0.01
Sassari	156.56	0.05	0.00	.
Savona	110.78	-0.23	9.33	-0.10
Siena	116.11	-0.28	48.22	-0.29
Siracusa	71.00	-0.29	9.56	0.11
Sondrio	69.89	3.91	2.00	0.00
Sud Sardegna	106.14	.	1.14	.
Taranto	84.78	-0.29	25.89	0.04
Teramo	83.44	-0.38	28.56	-0.13
Terni	87.56	-0.36	8.22	0.25
Torino	735.33	-0.32	52.89	0.27
Trapani	98.56	-0.38	17.33	-0.16
Trento	131.89	-0.17	266.78	-0.26
Treviso	280.11	-0.07	124.78	-0.07
Trieste	68.89	-0.30	19.67	0.22
Udine	205.89	-0.19	128.11	-0.19
Varese	282.44	-0.12	11.11	0.09
Venezia	272.56	-0.15	82.67	-0.02
Verbano-Cusio-O	53.22	1.00	2.11	0.50
Vercelli	93.33	-0.03	0.00	.
Verona	358.89	0.07	108.22	-0.08
Vibo Valentia	19.89	-0.35	7.22	-0.33
Vicenza	303.11	-0.06	130.56	0.02
Viterbo	106.22	-0.41	49.67	-0.14
...				
Total	170.26	-0.16	39.32	0.00

"… banks, mean" is the average (across the years 2015-2023) number of branches of commercial (COM) or cooperative (BCC) banks, "… banks, change" is the difference between the value in the years 2015 and 2023 of the branches of commercial (COM) or cooperative (BCC) banks.