

Crime and Debt in Italian Regions

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journals.sagepub.com/home/pfr**Chiara Oldani**^{1,2} 

Abstract

The paper investigates to what extent Italian regions' debt after 2007 has been influenced by the criminal behavior of elected politicians and public officials, and by swaps, a neglected aspect in the literature. Elected politicians and public officials have been pressured to provide services, raise spending and ameliorate budget figures; these pressures could have been managed with criminal behaviors or by using swaps that enjoyed substantially reduced accounting transparency and weak monitoring. Panel data results on yearly data of Italian regions from 2007 to 2021 confirm that regions' debt has been significantly influenced by the criminal behavior of elected politicians and public officials; a greater negative market value of swaps reduced the possibility to raise further debt. The political economy of debt reduction after the pandemic crisis should consolidate the fight against corruption, and provide a clear economic and legal framework for debt-related transactions.

Keywords

Criminal behavior, financialization of debt, Italy, regions, swap

JEL Classification: C33, E6, H74, R1

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Introduction

This paper investigates the effects on debt of criminal behavior perpetrated by elected politicians and public officials and the use of debt-related contracts by local administrations. The growth of public debt in European countries experienced in the last decades increased the resources managed by public administrators at both the central and local levels. 'Because government intervention transfers resources from one party to another, it creates room for corruption' (Acemoglu and Verdier 2000). Though the academic literature has largely analyzed the relationship between debt and crime or corruption, the financial aspects have not been closely examined.

The paper considers the case of Italian regions, where Presidents are elected by citizens and have been pressured to raise funds and ameliorate budget figures over the last years; these pressures could have been managed with criminal behaviors and by strategically using debt-related contracts, such as swaps, that enjoyed substantially reduced accounting transparency and weak monitoring. This issue has not been investigated in the literature, and the paper aims to fill this gap.

The economic theory showed that criminal behavior can negatively influence economic growth and investment (Mauro 1995); criminal behavior is 'the antithesis of political integrity, and[...] is costly because it impedes transactions, hinders trade, and economic growth and development' (Butler, Fauver and Mortal 2009)(2873). Crime and corruption 'arise due to the laxity of legal enforcement or a dysfunctional political system' (Khan, Mahata and Nag 2022). Corruption is an example of white-collar crime, that is, a crime 'committed by a person of respectability and high social status in the course of his/her occupation' (Sutherland 1949)(9). The weak institutional and political environment let the criminal behavior proliferate in Italy, even at the local level (Del Shleifer and Vishny 1993; Monte and Papagni 2001). Elected politicians should manage the resources in the public interest, but purely altruistic managers are quite rare; the incentives to be re-elected and pressures from stakeholders can alter politicians' behavior up to committing crimes related to their offices, like fraud, corruption and illicit behavior also related to criminal organizations (i.e., Mafia, Camorra, and 'Ndrangheta) (Corrado and Rossetti 2018; Del Monte and Pennacchio 2020; Bellido, Olmos and Román-Aso 2021).

Governments have increasingly looked to financial markets to satisfy their complex financing needs (i.e., financialization) (Mügge 2009; Ioannou 2023); OECD countries used financial contracts, such as interest rate swaps, to manage their debts (Organisation for Economic Cooperation and

Development 2011). The popularity of swaps among public administrations was due to the confidentiality of the contracts and their flexibility; the use of OTC contracts aimed at shifting part of the debt forward, smoothing interest payments, and alleviating the burden of expenses with up-front payments. Local public administrations have mimicked the behavior of central governments and subscribed to debt-related instruments, such as swaps, to manage their liabilities (De Mello 2001; Moldogaziev, Espinosa and Martell 2018). Citizens and other stakeholders have very limited control over the risks and management of financial liabilities by public administrations. The financial industry has been successful in ‘influencing policymakers to authorize municipalities to use derivatives and thereby to financialize their debt management’ (Trampusch and Fastenrath 2019) (1). Most of the available literature on the debt of local administrations in Europe looks at the period before 2007, while this paper considers the post-subprime crisis period.

Eurostat’s data testify that Italy is among the most indebted European countries; its public debt has not been reduced in recent decades, regardless of austerity measures; local administrations’ debts contributed to this trend. The federal reform that started in 2001 has not yet been completed by the Italian Parliament; regions (NUTS2) are first-level local administrations that manage their liabilities, issue debt, mostly in the form of (fixed rate) loans issued by the financial agency of the Treasury, and can use swaps (e.g., fixed to floating rates) to smooth the cost of debt or hedge it.

The debt of regions was €96 billion in 2007, reached its peak in 2011 (€101 billion), and turned to €76 billion in 2018. The consolidated debt of the Italian public sector was €1,600 billion in 2007, was €1,900 billion in 2011 and exceeded €2,000 in 2012. The negative market value of swaps used by regions was €803 million in 2007 and exceeded €1.1 billion in 2018 (Banca d’Italia 2018).

This paper is structured as follows: Section II describes the Italian institutional framework; Section III reviews the literature and sets the research questions; Section IV discusses the model and methodology; Section V describes the empirical data and presents the econometric results; and the last section lays out the study’s main conclusions.

The Institutional Framework in Italy

Since the early 2000s, following significant administrative and financial reforms aimed at granting autonomy to subnational governments (Di Mascio and Natalini 2015), Italian regions (NUTS2) have steadily increased their financial obligations and debt. The Italian federal system is far from

being efficient (Baldini and Baldi 2014), also from a legislative point of view (Palermo and Wilson 2014).

Following the federal reform, regional debt in Italy can be financed through bonds, loans, and cash. To fund excess current expenditure the debt takes the form of loans (mortgages), subscribed to the financial agency of the Department of Treasury, i.e., the Cassa Depositi e Prestiti, at fixed interest rates. The bond market remains underdeveloped and limited to professional investors, with bonds used exclusively to fund investments, as required by Article n.199 of the Italian Constitution. Both loans and bonds are long-term debt (Banca d'Italia 2021), while regions in financial distress can request short-term cash advancements from the Treasury (short-term debt). Regions whose debt is out of control can be placed under special administration by the Treasury, limiting their ability to further raise debt and use debt-related contracts.

To ensure compliance with the Fiscal Compact Golden Rule (i.e., balanced budget rule), the total annuities for amortization of capital and interest on mortgages and bonds cannot exceed 20% of total tax revenues in a given year. Empirical evidence suggests that this Rule has effectively controlled subnational debt but has also resulted in a sharp decrease in investments (Monacelli, Paziienza and Rapallini 2016).

Since the 1990s, Italian local administrations started to fund their deficits with bonds and derivatives mainly to deal with the progressive decentralization of duties, and the declining support from the Italian central government (Lagna 2015). Contrary to the US, Italy is characterized by a small corporate capital market and a huge public debt; this does not incentive the growth of the subnational debt market and therefore debt-related contracts are popular funding sources.

The market value of swaps is considered a (potential) liability if negative (or asset if positive) in the Financial Statement of Italian regions. According to the information provided in the Financial Statement of regions and analyzed by the Corte dei Conti over the last decade (Corte dei Conti 2017, 2020) swaps were mostly fixed-to-floating interest rate contracts. Most contracts had a floor interest rate that was higher than the effective market rate over the period under observation (i.e., after 2007); this hedging strategy was common to all regions and swaps had negative market values.

Unlike the experiences of France (Pérignon and Vallée 2017) and Greece (European Commission 2010), Italian authorities affirm that swaps did not involve debt shifting and confirmed that their purpose was to hedge rather than speculative (Corte dei Conti 2017). Monitoring of swaps used by local administrations by the Treasury started after 2012, and the Corte dei

Conti, the public audit court, could not impede the accumulation of risks and potential losses before that date (Corte dei Conti 2016).

However, following lawsuits from various local authorities (regions, cities and public firms) against banks due to losses incurred from these instruments, the Government banned the use of derivatives in the public sector through the Stability Law for the year 2018. As a result of these institutional changes, some swaps have been foreclosed by local administrations, resulting in significant losses for taxpayers. After 2018, regions are banned from entering new contracts and existing swaps will expire based on the contractual terms, with the ban on new contracts taking effect only after 2020.

While the gross value of swaps used by regions has been under control, the Italian public sector's accounting system did not provide any information on the flows of funds related to these contracts until 2014, when the European System of Account (ESA) 2010 was implemented. The introduction of the modified accrual system increased the transparency in the accounting of assets and liabilities at all levels of the Italian State; however, the modified accrual accounting system is not immune from critics. The literature showed that the adoption of the modified accrual in the public sector made the accounting information more complex and arbitrary for citizens and politicians, reducing the accountability of politicians and leading to organizational problems (Bonollo 2023). Moreover, the qualitative information on financial contracts used by administrations is not yet provided in the modified accrual accounting and the burden of potential risks is not measured.

Literature Review

The paper fills a gap in the literature on public debt, its funding and criminal behavior. The literature has analyzed the channels through which corruption can affect public finances; in particular, corruption can lower tax revenues, increase expenditure and debt (Liu, Moldogaziev and Mikesell 2017). Corruption and criminal behavior make public expenditures wasteful and distort the composition of public spending. 'Corruption is a widespread phenomenon with damaging consequences' (Bellido, Olmos and Román-Aso 2021). In times of austerity, local administrations also react to the reduction of resources provided by the central State by using debt-related contracts, such as swaps, to fund their debt.

The accumulation process of the public debt can be analyzed starting from the budget constraint

$$Debt_{it} = (1 + r)Debt_{it-1} + G_{it} - T_{it} \quad (1)$$

Where the *Debt* of region *i* at time *t*, *G* is the expenditure of the administration and *T* is the revenue. European countries consider the debt to GDP ratio in the sustainability analysis of debt and the equation can be rewritten as:

$$\frac{Debt_{it}}{GDP_{it}} = \left(\frac{1+r}{1+g} \right) \frac{Debt_{it-1}}{GDP_{it-1}} + \frac{G_{it} - T_{it}}{GDP_{it}} \quad (2)$$

Eq. 2 shows that the debt to GDP ratio is a function of its past value, of macroeconomic and fiscal variables. We follow the literature that investigated the relationship between debt, criminal behavior, macroeconomic and financial variables for public administrations (Liu, Moldogaziev and Mikesell 2017; Apergis and Apergis 2019; Del Monte and Pennacchio 2020) and extend the model by including swaps among the drivers of debt. The relationship is as follows:

$$\frac{Debt_{it}}{GDP_{it}} = \alpha \frac{Debt_{it-1}}{GDP_{it-1}} + \beta X_{it-1} + \gamma Crime_{it-1} + \delta Swap_{it-1} + u_{it} \quad (3)$$

Where the Debt to GDP ratio of region *i* at time *t* is a function of its past value, of macroeconomic and local variables (X_{it-1}), such as the population, the administrations' fiscal revenues, the cost of debt (interests' expenses) and the political majority ruling regions, of *Crime* and of the *Swaps* used to manage the debt strategically; *u* is the error term.

Debt and Corruption

The economics of crime investigates the theoretical determinants of criminal behavior (Yezer 2014); victimless crimes such as corruption, fraud and illicit behaviors are influenced by different variables, such as the legal environment, the level of wealth of the population, and the enforcement decision. However, criminal behavior is very difficult to measure, and its effects in public finance models are often nonlinear; (Acemoglu and Verdier 2000) describe an inverted U relationship between public expenditure and corruption.

The empirical literature showed that corruption increased public debt in OECD countries in the period 1995–2015 (Del Monte and Pennacchio 2020). (Apergis and Apergis 2019) investigated the link between corruption and government debt on a panel of 120 countries over the period 1999–2015 and confirmed that the relationship is positive, but non-linear and affected by the endogeneity of variables.

U.S. states with greater intensities of public corruption (e.g., Illinois) have higher levels of debt (Liu, Moldogaziev and Mikesell 2017). Criminal behavior is associated with greater credit risk and higher bond yields in the U.S. public sector (Butler, Fauver and Mortal 2009); corrupt politicians paid higher fee premiums and favored certain intermediaries.

In Europe, the lack of homogenous local public finance data and ‘significant domestic variation in local economic conditions’ limit the extent of empirical comparative exercises (Ioannou 2023). (Del Monte and Papagni 2007) investigated the determinants of corruption with regional panel data in the period 1963–2001 and found that the incomplete federal reform of Italy, and the ‘interventionism in the South of the country’ led to corruption and impeded growth. (Corrado and Rossetti 2018) documented the extent of corruption and criminal behavior in Italian regions and its potential threats to debt and growth in the period 2001–2011; (Barone and Narciso 2015) found that in 2004–2009, the presence of organized crime in Italian municipalities positively affected the probability of obtaining and the amount of funds. (Pilonato 2022) describes a relevant case study in Italy, where the lack of appropriate control favored the corruptive behavior at different levels of the administration.

The empirical literature has investigated the criminal behavior as related to the personal characteristics of managers, both in the corporate and the public sectors. Political connections and lobbying can significantly influence the likelihood of being involved in victimless crimes (Butler, Fauver and Mortal 2009).

Following the literature on debt and corruption (Apergis and Apergis 2019), we can state the first research question to be tested:

Q1. the relationship between debt and corruption for Italian regions is positive.

The use of Swaps at the Local Level

The reduced support from central governments and the introduction of fiscal discipline to the budgets of local governments are at the root of the financialization of European local administrations (Ioannou 2023). Local governments’ financialization involved the increased use of bond financing, innovative financial schemes for investment in infrastructure and the use of financial derivatives, such as interest rate swaps; larger debt leads to a greater use of swaps (i.e., vicious debt-swap cycle) (Dodd 2010; Luby 2012; Kass, Luby and Weber 2019).

The public finance literature has described the use of debt-related contracts by U.S. local administrations since the '90s thanks to the availability of data (Luby and Kravchuk 2013; Khumawala, Ranasinghe and Yan 2016). The financialization of debt at the local level raises certain socio-economic issues when the excessive risks taken lead to default (Ponder and Omstedt 2022). European local administrations in the UK, France and Italy used swaps to satisfy their funding needs. In the '90s, British municipalities extensively used swaps embedded into long-term loans (Tickell 1998) and 'the configuration of the local political economy was an important driver of financialization processes' (Mertens et al. 2021). From 2000 to 2007 French municipalities incurred substantial losses caused by the misuse of complex swaps and the central government bailed out the local administrations (Aidan and Dorin 2013; Pérignon and Vallée 2017). From 2007 to 2014, Italian regions with higher debt used swaps, hoping to counterbalance the reduced resources received from the central state and finance their debts due to unfunded expenditures (Oldani and Fantini 2020).

During the period under observation (2007–2021) Italian regions hedged their debt with interest rate swaps, but the hedging strategy produced a significant negative market value (Corte dei Conti 2017, 2020); this reduced the ability of the region to subscribe new debt-related contracts. Based on the results of the literature and the hedging strategy of regions, we can state the second research question to be tested:

Q2. The relationship between debt and the negative market value of swaps is negative.

Methodology

The literature on criminal behavior in the U.S. public sector relies on data on crimes perpetrated by public officials released by the Department of Justice (DOJ) (Butler, Fauver and Mortal 2009; Liu, Moldogaziev and Mikesell 2017). Other studies considered qualitative measures of perceived crimes that are not available at the subnational level (Bellido, Olmos and Román-Aso 2021). In this empirical exercise, two different measures have been considered: the first is the ratio between the number of public officials sentenced guilty of crimes related to their office (i.e., fraud, corruption, extortion, bribery and criminal organization) and the population; this measure is very similar to the U.S. federal conviction rate (Butler, Fauver and Mortal 2009). The limits of the conviction rate are known in the

literature; in particular, the lack of trust in the justice system, endogenously related to white-collar corruption, can reduce the number of trials, leading to measurement error problems and bias in the estimates.

The second measure is a dummy variable equal to 1 if the president of the region has been sentenced guilty of crimes related to the office (i.e., fraud, corruption, extortion, bribery and criminal organization) also related to criminal organizations (i.e., Mafia, Camorra, and 'Ndrangheta) and 0 otherwise; information on crime status comes from national newspapers and the Wikipedia pages of regions' presidents. This alternative measure of criminal behavior is tailored to the Italian administrative system, where the president of the region leads the party or coalition that wins the election, and if he/she resigns, elections occur. This dummy variable can suffer from similar statistical bias that affect the conviction rate.

Based on the previous literature findings, debt over GDP (eq. 3) should positively correlate with criminal behavior, positively with regions' GDP per capita and with the interests' expenses over GDP (Del Monte and Pennacchio 2020). Greater revenues can reduce the debt to GDP ratio; however, regions have limited fiscal space and their revenues cannot adjust to excess spending needs. The negative market value of swaps negatively correlates with the debt to GDP ratio. Some controls are added as a robustness check to extend the baseline model and reduce variables' endogeneity: in particular, the political majority of regions.

The political majority variable addresses the fact that the damages of crimes on growth are influenced by political instability (Alesina and Tabellini 1990); moreover, there is evidence that political factors play a major role in explaining the perceived corruption in OECD countries, including Italy, over the period under observation (Bellido, Olmos and Román-Aso 2021). The political majority is measured in two alternative ways; the first is a dummy variable (*Left Political Party*) equal to 1 if the majority belongs to left-wing parties, and its coefficient is expected to be positive, since left-wing parties contributed to debt stockpiling in Italy (Buiatti, Carmeci and Mauro 2014). The second is the Ideology index (Berry et al. 1998) that can be defined as a function of the percent of electoral votes that a winner receives in political elections, relative to their runner-up candidate (*%VotesWin*). Specifically, the *Ideology* index can be defined as:

- $\%VotesWin * (1 + Weight/100) \rightarrow$ if the president belongs to leftist parties
- $100 - \%VotesWin * (1 + Weight/100) \rightarrow$ if the president belongs to right-wing parties

Weight is the remainder after the winner and incumbent voting results are tallied. The *Ideology* measure ranges between 0 and 100, where the values closer to 0 are associated with left-wing parties, the values closer to 100 are associated with right-wing ones, and the values around 50 show competitive political systems.

Data and Results

Yearly data from 2007 to 2021 for 15 ordinary stature regions (225 observations) come from different sources, as reported in Table 1. Regions with special statutes (the islands and border regions) enjoy different levels of financial autonomy from the central state and have not been considered in the study.

We plotted the relationship between our measure of corruption and the ratio between public debt and GDP for all regions (Figure 1). The graph suggests that there is a positive relationship between the two variables.

The average debt of regions, the first level of local administration, during the period 2007–2021 was €6 billion (Table 1). The smaller debt was €340 million, up to €20 billion, with a spare number of regions issuing almost 50 percent of the total debt (i.e., Lombardy, Lazio, Campania, and Piedmont), mostly in the form of loans at a fixed interest rate issued by the financial agency of the Italian Treasury, Cassa Depositi e Prestiti. The GDP had an average value of €98 billion and fiscal revenue had an average value of €13 billion, with a descending path in most regions due to the prolonged economic downturn (Figure 2E). The debt to GDP ratio in the sample has an average of 6.7% (Figure 2A). The interests' expenses vary widely among the regions, with an average of €1.2 billion and a standard deviation of €1.47 billion. The population is not distributed in a homogenous way among regions; more populated regions are Lombardy in the North (10 million inhabitants), Lazio in the Centre (5 millions) and Campania in the South (6 millions); smaller regions do not reach 1 million inhabitants (e.g., Umbria in the Centre, Molise in the South) (Figure 2F).

Some empirical studies in the literature used the notional value of U.S. local administration swaps (Stewart and Cox 2008); the paper instead uses the market value that is the amount of money requested by the counterpart to foreclose the swap contract. The average negative market value is €74 millions, with a high variability; smaller regions like Basilicata and Molise had a value of €1 or €2 millions, while larger regions like Piedmont, Lazio, Campania, and Veneto exceeded €100 millions (Figure 2C).

Table I. Descriptive Statistics, Yearly Data, 2007–2021.

Variable	Mean	Standard Dev.	Unit	Obs.	Source
Debt	5,820,437,000	(4,906,437)	euro	225	ISTAT
GDP	97,814,975,000	(91,662,368)	euro	225	ISTAT
Revenues	12,737,361,965.733	(9,753,151,083.718)	euro	225	ISTAT
Interest expense	111,902,547.780	(147,443,715.473)	euro	225	ISTAT
Population	3,376,539.658	(2,503,742.09)	unit	225	ISTAT
Market Value Swap	72,348,214.286	(95,018,073.317)	euro	225	Corte dei Conti
Political party	0.600	(0.491)	0–1	225	Regions webpage
Ideology	53.310	(9.915)	1–100	225	Electoral data
Crime public officer	859.115	(716.199)	unit	165	ISTAT
Dummy corrupt	0.204	(0.404)	0–1	225	Regions webpage

Legenda: Debt is the total gross debt; GDP is the regional gross domestic product.

Revenues are regional revenues; interest expense are the regional expenses.

Population is the number of inhabitants in the region.

Market value swap is the negative market value of swap contracts.

Political Party is a dummy = 1 if the President belongs to left-wing parties.

Ideology is an index that goes from 1 (left-wing majority) to 100 (right wing majority).

Crime public officer is the number of public officers sentenced as guilty of crimes related to their duties.

Dummy corrupt is = 1 if the President has been sentenced as guilty of crimes related to the office.

Regional data referring to the political majority ruling the regions and crimes of regions' presidents related to the office have been hand-collected from the regions' websites, the Wikipedia pages of regions' presidents and national newspapers. Political parties with a majority in Italian regions in the 2007–2021 period belonged to the centre-right (40 percent) or centre-left (60 percent). According to the data, centre-left parties, like the Democratic Party or Sinistra e Libertà, governed in the majority of regions during the period under observation, except for the 2010–12 years. Centre-right parties, like Forza Italia, Lega Nord, and Alleanza Nazionale, had the majority in Northern regions that exhibited higher GDP per capita and fiscal revenues.

Data on electoral votes come from the Minister of Internal Affairs; the mean value of the ideology index is 53; some regions have been more contested, like Lazio, while others have been ruled by left-wing (Emilia Romagna and Tuscany) or right-wing majority (Veneto and Lombardy) over the entire period under observation (Figure 2D). Regional data on crimes committed by public officials come from ISTAT and are limited to the period 2007–2017; the conviction rate has been computed following the extant literature (Butler, Fauver and Mortal 2009; Corrado and Rossetti 2018) as the ratio between crimes perpetrated by regional public officials and the population; crimes are corruption, extortion, bribery, abuse, misuse or breach of public office duties, and forgery. The mean conviction rate is 0.03 percent, with a standard deviation of 0.012. Regions in the South exhibit higher conviction rates if compared with those in the Centre; a higher conviction rate is also the result of an efficient justice system, like in the case of Liguria (Figure 2B).

From 2007 to 2021, there have been 43 presidents in the 15 regions; according to the law, presidents stay in the office for five years and cannot be elected more than twice. The justice system is very slow in Italy, and 9 presidents are under investigation in 2023, but have not yet reached the third degree of judgment; 11 presidents had no investigation and 13 have been acquitted; 10 presidents of the regions have been sentenced to conviction for crimes related to their office, 2 in the North, 2 in the Centre, and 6 in the South of the country. This geographic distribution is in line with that computed for the conviction rate.

The literature on debt and crime widely reports endogeneity of variables; to address this issue, we first estimate eq.(3) with fixed effect model and then with a dynamic linear panel data technique: the first-moment Generalized Method of Moments (Arellano and Bond 1991). The fixed effect is chosen over the random effect model, following the Hausman test. The Arellano-Bond GMM estimator for dynamic panel data takes the first

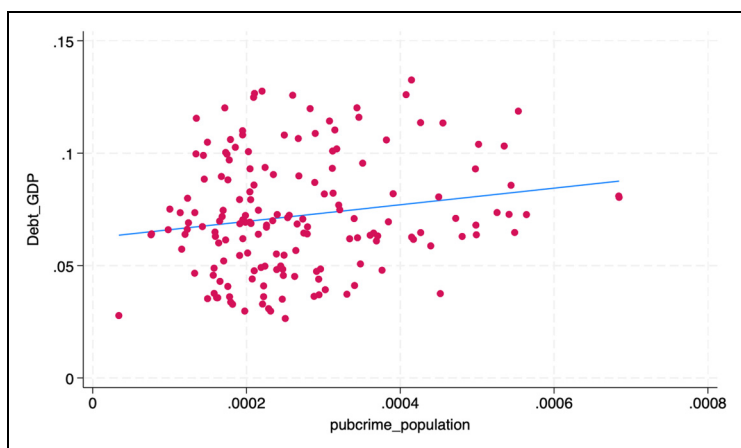


Figure 1. Crime and debt in Italian regions, yearly data 2007–2021.

difference of the regression equation to eliminate individual effects; it also circumvents the problem of reducing the number of observations that affects instrumental variable estimates when the sample size and time horizon are not very large, like in this case. Instrumental variables are the differenced lagged independent variables and the lagged regions' population. The Levin Lin Chu unit root test supports the use of the first lag of variables in the estimates (Table A1). This econometric method has been successfully applied in the literature that has investigated the nonlinear relationship between debt and corruption (Apergis and Apergis 2019). The small number of observations limits the robustness checks that can be further performed.

Empirical evidence of equation (3) reported in Table 2 shows that debt is very persistent over time and confirms that criminal behavior significantly and positively correlates with debt to GDP, as reported in the literature (Liu, Moldogaziev and Mikesell 2017; Apergis and Apergis 2019; Del Monte and Pennacchio 2020). A 1 percent increase in criminal or public officials in the population pushes debt up by 6–12 percent (Table 2A), and a 1 percent increase in presidents' criminal behavior pushes debt up by 0.2–0.3 percent (Table 2B). However, while the dummy variable associated with the corruption of regions' presidents is statistically significant, the conviction rate (crime over population) is not. A greater negative market value of swaps reduced the debt to GDP ratio by 0.016–0.022 percent, confirming that the counterparts of swaps exercise an effective external control. The

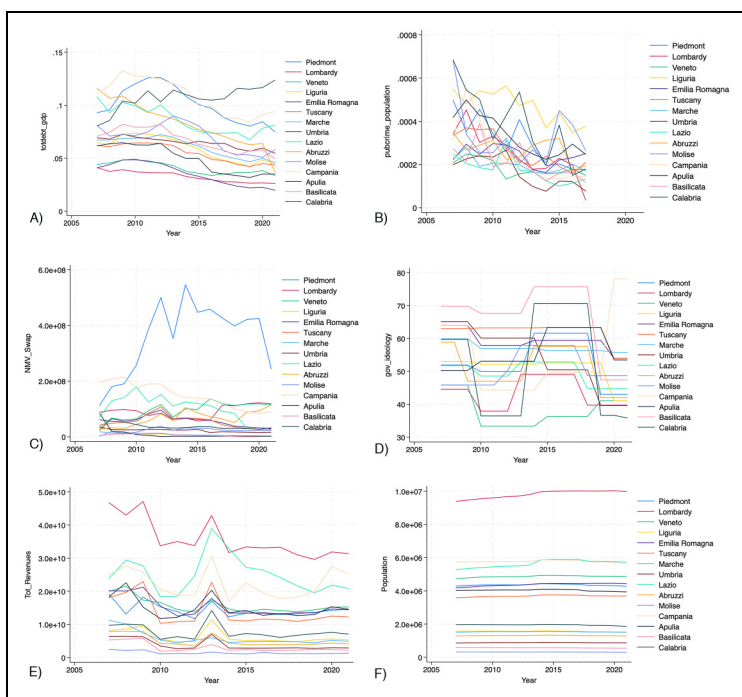


Figure 2. Regional data. A. Debt to GDP of regions, yearly data 2007–2021, B. Crime / population of region, yearly data 2007–2021, C. Market value of swaps, yearly data 2007–2021, D. Regions' ideology index, yearly data 2007–2021, E. Revenues of regions, yearly data 2007–2021, F. Regions' population, yearly data 2007–2021.

signs and magnitude of macroeconomics and financial variables are as expected. Larger regions run larger debt over the period under observation; a greater cost of debt, measured with the interest expense over GDP, further drives debt. Fiscal revenues and the population of regions are very persistent variables and their coefficients are not statistically significant. If a left-wing political party ruled the regions, their debt to GDP diminished by 0.5 percent; this result depended on the size of the regions, since right-wing parties ruled in larger and highly indebted regions in the North (i.e., Piedmont, Lombardy and Veneto). The ideology index confirms that left-wing parties (i.e., a smaller ideology index) are associated to smaller debt to GDP. However, the control variable is not statistically significant.

Table 2A. Fixed Effect Estimates Results, 2007–2021 Yearly Data.

	Debt/GDP _t	Debt/ GDP _t	Debt/GDP _t	Debt/ GDP _t
Covariates:				
<i>Debt/GDP_{t-1}</i>	0.88*** (0.04)	0.88*** (0.04)	0.88*** (0.04)	0.86*** (0.04)
<i>Crime / Population_{t-1}</i>	2.87 (4.6)	6.9 (4.8)	4.5 (4.4)	3.0 (4.84)
<i>GDP per capita_{t-1}</i>	1.68e-06*** (5.09e-07)		1.91e-06*** (4.9e-07)	1.74e-06*** (5.02e-07)
<i>Interest /GDP_{t-1}</i>	4.17*** (0.7)	4.15*** (0.76)	4.152*** (0.68)	4.32*** (0.69)
<i>Population_{t-1}</i>	-5.22e-09 (4.79e-09)	-9.71e-09** (4.79e-09)		-6.17e-09 (4.74e-09)
<i>Revenues per capita_{t-1}</i>		-2.84e-07 (3.1e-07)		
<i>Ideology_{t-1}</i>	-0.00003 (0.00006)	-0.00003 (0.00006)		
<i>Political party_{t-1}</i>			-0.002** (0.001)	-0.002** (0.001)
<i>NMV Swap_{t-1}</i>	-1.6e-11* (9.15e-12)	-1.59e-11* (9.51e-12)	-1.79e-11* (8.93e-12)	-1.71e-11* (8.92e-12)
Obs.	165	165	165	165
F	95.26	87.7	114.4	98.76
Prob > F	0.000	0.0000	0.0000	0.0000
Chi2 (3) Hausman test	458.58			
Prob	0.0000			

Note: SE in parenthesis; *, **, *** is significant at 10%, 5% and 1% respectively.

Table 3 reports the GMM Arellano Bond estimates, that confirm those reported in Table 2. A 1 percent increase in crimes of public officials over the population pushes debt up by 4–5 percent (Table 3A), and a 1 percent increase in presidents' criminal behavior pushes debt up by 0.2 percent (Table 3B). However, the coefficients are not statistically significant. The limited number of observations of the conviction rate (crime over population) limits the explanatory power of instrumental variables' estimates. A 1 percent increase in the negative market value of swaps reduce the debt

Table 2B. Fixed Effect Estimates Results, 2007–2021 Yearly Data.

	Debt/GDP _t	Debt/ GDP _t	Debt/ GDP _t	Debt/GDP _t
Covariates:				
<i>Debt/GDP_{t-1}</i>	0.94*** (0.03)	0.90*** (0.03)	0.92*** (0.03)	0.94*** (0.03)
<i>Dummy Corrupt_{t-1}</i>	0.002** (0.001)	0.003*** (0.001)	0.002*** (0.001)	0.002** (0.001)
<i>GDP per capita_{t-1}</i>	1.29e-06*** (3.13e-07)		1.2e-06*** (3.16e-07)	1.26e-06*** (3.13e-07)
<i>Interest /GDP_{t-1}</i>	4.07*** (0.64)	3.96*** (0.69)	4.35*** (0.65)	4.19*** (0.64)
<i>Population_{t-1}</i>			-5.19e-09 (3.93e-09)	
<i>Revenues per capita_{t-1}</i>		-3.18e-07 (3.07e-07)		
<i>Ideology_{t-1}</i>	0.00004 (0.00004)	0.00001 (0.00004)		
<i>Political party_{t-1}</i>			-0.0005 (0.0009)	-0.0005 (0.0008)
<i>NMV Swap_{t-1}</i>	2.25e-11*** (8.5e-12)	-2.13e-11** (8.74e-12)	-2.13e-11** (8.48e-12)	-2.21e-11** (8.47e-12)
Obs.	210	210	210	210
F	193.5	176.5	166.61	193.32
Prob > F	0.000	0.0000	0.000	0.000
Chi2 (3) Hausman test	118.7			
Prob.	0.0000			

Note: SE in parenthesis; *, **, *** is significant at 10%, 5% and 1% respectively.

to GDP by 0.03%. While macroeconomic and fiscal variables contribute to explaining the debt accumulation, the political majority of regions does not statistically correlate with debt to GDP. The goodness of fit of the estimates, measured with the Wald Chi square, was high in all the equation's specifications. The Sargan post-estimation test for over-identifying restrictions confirms the instrumental variable' choice (lagged population).

As a further check, we estimated the fixed effect model on the subsample of regions with debt over GDP higher than 6% (Table 4); the number of

Table 3A. Arellano Bond GMM Estimates Results, 2007–2021 Yearly Data.

	Debt/GDP _t	Debt/GDP _t
Covariates:		
<i>Debt/GDP_{t-1}</i>	0.92*** (0.05)	0.91*** (0.06)
<i>Crime Population_{t-1}</i>	3.89 (5.3)	4.88 (5.3)
<i>GDP per capita_{t-1}</i>	1.8e-06*** (6.02e-07)	1.98e-06*** (5.96e-07)
<i>Interest /GDP_{t-1}</i>	4.47*** (0.83)	4.33*** (0.8)
<i>Ideology_{t-1}</i>	-0.0001 (0.00008)	
<i>Political party_{t-1}</i>		-0.002 (0.001)
<i>NMV Swap_{t-1}</i>	-2.84e-11* (1.47e-11)	-2.54e-11* (1.48e-11)
Obs.	150	150
Wald Chi2	567	577
Prob > F	0.000	0.000

Note: SE in parenthesis; *, **, *** is significant at 10%, 5% and 1% respectively.

Instruments: differenced independent variables; lag of population

observations is reduced to 123 (or 109); results are very close to those referring to the entire sample of regions. The use of swaps is significantly correlated with debt, while the criminal behavior of public officials and presidents seems not to be a significant driver of debt. These results can be influenced by the measurement error of the crime-related variables, widely reported in the literature.

These results are in line with those reported in the available literature (Bellido, Olmos and Román-Aso 2021) and answer the research questions: during the period 2007–2021 there is a positive relationship between the debt to GDP ratio and crime of Italian regions, and there is a negative relationship between the debt to GDP ratio and the negative market value of swaps,. Further comparative research to investigate the relationship between debt, its financialization and criminal behavior for local administrations in the eurozone will be possible when more granular public finance data is made publicly available for research.

Policy Implications

Among the macroeconomic implications of criminal behavior in the public sector is its impact on debt. The paper contributes to the understanding of

Table 3B. Arellano Bond GMM Estimates Results, 2007–2021 Yearly Data.

	Debt/GDP _t	Debt/GDP _t
Covariates:		
<i>Debt/GDP_{t-1}</i>	0.97*** (0.04)	0.96*** (0.04)
<i>Dummy Corrupt_{t-1}</i>	0.002* (0.001)	0.002 (0.001)
<i>GDP per capita_{t-1}</i>	1.36e-06*** (3.65e-07)	1.36e-06** (3.59e-07)
<i>Interest /GDP_{t-1}</i>	4.35*** (0.78)	4.39*** (0.77)
<i>Ideology_{t-1}</i>	-5.33e-06 (0.00005)	
<i>Political party_{t-1}</i>		-0.003 (0.001)
<i>NMV Swap_{t-1}</i>	-3.63e-11*** (1.40e-11)	-3.55e-11** (1.40e-11)
Obs.	195	195
Wald Chi2	978	980.7
Prob > F	0.000	0.000

Note: SE in parenthesis; *, **, *** is significant at 10%, 5% and 1% respectively.

Instruments: differenced independent variables; lag of population.

how criminal behavior affects local administrations' public debt and its financialization, a largely unexplored area in public finance. According to results, in the period 2007–2021, the growth of debt has been influenced by the criminal behavior, measured with regional conviction rates and the criminal behavior of regions' presidents. Although the measurement error of the criminal behavior variable can reduce the explanatory power of estimates, the criminal behavior of regions' presidents is statistically significant in most equations estimates. What is new to the literature is the fact that the growth of debt is tied to the use of swaps. Swaps used by regions accumulated negative market values, that limited the possibility to run further debt; financial intermediaries exerted a significant control over the financial sustainability of local administrations.

The federal reform has not yet been completed, and advantages of decentralization in Italy are still difficult to measure. While there are no evidences of a criminal use of swaps, the inability to regulate them pushed the Parliament to ban their use within the public sector after 2018, without addressing their financial risks, introducing any effective guidelines for

Table 4. High Debt Region - Fixed Effect Estimates Results, 2007–2021, Yearly Data.

	Debt/GDP _t	Debt/GDP _t	Debt/GDP _t	Debt/GDP _t
Covariates:				
<i>Debt/GDP_{t-1}</i>	0.88*** (0.04)	0.9*** (0.04)	0.85*** (0.05)	0.84*** (0.05)
<i>Crime / Population_{t-1}</i>			2.3 (5.83)	0.84 (5.7)
<i>Dummy Corrupt_{t-1}</i>	0.004*** (0.001)	0.002 (0.001)		
<i>GDP per capita_{t-1}</i>		1.54e-06*** (5.57e-07)	2.25e-06*** (6.6e-07)	2.23e-06*** (6.6e-07)
<i>Interest /GDP_{t-1}</i>	3.66*** (0.8)	3.65*** (0.78)	4.09*** (0.85)	3.89*** (0.83)
<i>Revenues per capita_{t-1}</i>	-4.22e-07 (3.6e-07)		-0.0008 (0.007)	
<i>Ideology_{t-1}</i>	-0.00002 (0.00006)	-2.79e06 (0.00006)		
<i>Political party_{t-1}</i>			-0.003* (0.001)	-0.003* (0.001)
<i>NMV Swap_{t-1}</i>	-2.12e-11** (1.02e-11)	-2.23e-11** (9.91e-12)	-2.14e-11** (1.06e-11)	-2.1e-11* (1.06e-11)
Obs.	123	123	109	109
F	74.05	79.42	44.9	51.17
Prob > F	0.0000	0.000	0.000	0.000
Sargan Chi2(91)	127.87			
Prob > Chi2	0.007			

Note: SE in parenthesis; *, **, *** is significant at 10%, 5% and 1% respectively.

local administrators, or any risk management principles on debt-related contracts (Italian Government 2013).

Implications of results are more challenging for policymakers; the public debt exploded in 2020 due to the COVID-19 pandemic crisis, but in the coming years European local governments are very likely to suffer from a reduction of resources from central states and of fiscal revenues. The political economy of debt reduction following the pandemic crisis should fight against corruption and other crimes in the public sector, but also provide a

clear economic and legal framework for debt-related transactions. While the reduction of corruption and crime has been already approached at the domestic and European levels, the legal framework of debt related contracts necessary to create a stable and resilient environment has not yet been addressed.

In the coming years, local administrations will look for other innovative financial contracts to satisfy their funding needs. Choices on the frontier of financial markets are in the fintech space; similarly to swaps in the recent past, they enjoy little monitoring and almost no supervision. European authorities should avoid the accumulation of excessive financial risks, a known unknown.

Data Availability Statement

Data comes from publicly accessible sources, as detailed in the paper and as follows:

Data on debt and the negative market value of swap come from Banca d'Italia
<https://infostat.bancaditalia.it/>

Data on regional crime, population, revenues and GDP per capita come from Istat
<https://esploradati.istat.it/databrowser/#/en>

Data on political party and on the level of schooling of regions' president come from the regions' websites

Data on convictions come from the webpages on national newspapers (e.g., Corriere della Sera, Repubblica, Ansa)

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Author Biography

Chiara Oldani is professor of Monetary Economics. Her area of research is financial economics and innovation.

Appendix

Table A1. Levin Lin Chu Unit Root Test.

<i>Variable</i>	<i>I lag P value</i>
Debt / GDP	0.000
Crime public officer / Population	0.000
Interest / GDP	0.000
GDP per capita	0.000
Revenues per capita	0.000
Ideology	0.15