

A Thesis Submitted for the Degree of PhD at the University of Warwick

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Essays in Public Economics

by

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Thesis Submitted

for the Degree of Doctor of Philosophy in Economics to the University of Warwick, Department of Economics

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Contents

\mathbf{Li}	st of	Figures	iii
\mathbf{Li}	st of	Tables	ii
A	ckno	wledgements	iv
D	eclar	ation	vi
1	Swe	eping the Dirt Under the Rug: Measuring Spillovers from	
	an 4	Anti-Corruption Measure	1
	1.1	Introduction	1
	1.2	Institutional Setting	5
		1.2.1 The law enforcement measure	6
		1.2.2 The procurement outcomes	9
	1.3	Data and descriptive statistics	11
	1.4	Empirical strategy	14
	1.5	Results on contracts below the 40,000 Euro threshold \ldots	17
	1.6	Mechanisms	18
		1.6.1 Splitting a single project in multiple contracts	19
		1.6.2 Results by types of good \ldots \ldots \ldots \ldots \ldots \ldots	22
	1.7	Results on renegotiations	22
	1.8	Robustness	25
	1.9	Conclusion	30
2	Doe	es decentralization matter? Evidence from Italian munici-	
	pali	${f ties}$	32
	2.1	Introduction	32
	2.2	Institutional Framework	36
	2.3	Data and Descriptive Statistics	39
	2.4	Empirical Strategy	40
	2.5	Results	45
	2.6	Conclusion	51

3	How	v do Fiscal Rules influence Public Spending? Evidence	
	from	n Italian municipalities	54
	3.1	Introduction	54
	3.2	Institutional framework and data	56
		3.2.1 Institutional Framework	56
		3.2.2 Data	57
	3.3	Estimation Strategy	59
	3.4	Results	62
		3.4.1 Robustness	65
	3.5	Conclusion	66
A	ppen	dix A (for Chapter 1)	68
	A1	General graphs	68
	A2	Analysis on the dissolved municipalities	69
	A3	Methods to compute the similarities between two descriptions $\ . \ .$	74
	A4	Additional Robustness checks of the main results $\ldots \ldots \ldots$	80
	A5	Robustness checks on similarity results	82
	A6	Robustness checks on results by type of good	86
	Α7	Additional informations on the renegotiations	86
A	opene	dix B (for Chapter 2)	89
A	open	dix C (for Chapter 3)	97
Re	eferei	nces	100

List of Figures

1.1	Map of the dissolutions	7
1.2	Distribution of contracts by face value	10
1.3	Map of the share of renegotiation in the Italian provinces	12
1.4	Bunching pre (and post) a neighbour's dissolution by procurement	
	type	14
1.5	Effect of the dissolution on bunching at 40,000 Euro	18
1.6	Effect of the dissolution on the bunching by procurement types	27
2.1	Impact of the IMU reform by Italian province	38
2.2	Event study of reform on property tax collected (Euros). \ldots .	45
2.3	Scatterplot of the municipalities' response to higher discretion. $\ .$.	46
2.4	Relative change of the property tax from the expected revenue.	47
2.5	Effect of the DSP on share of municipalities increasing loans $\ . \ .$	50
3.1	Map of the FBS per capita	59
3.2	Event study of reform on the likelihood of issuing a contract	61
3.3	Event study of reform on the execution of the contracts. \ldots .	62
A1	Distribution of the number of municipalities in a 10 kilometre ra-	
A1	Distribution of the number of municipalities in a 10 kilometre ra- dium	68
A1 A2	Distribution of the number of municipalities in a 10 kilometre ra- dium	68 69
A1 A2 A3	Distribution of the number of municipalities in a 10 kilometre ra- dium Distribution of contracts by face value	68 69 70
A1 A2 A3 A4	Distribution of the number of municipalities in a 10 kilometre ra- dium	68 69 70 70
A1 A2 A3 A4 A5	Distribution of the number of municipalities in a 10 kilometre ra- dium	68 69 70 70
A1 A2 A3 A4 A5	Distribution of the number of municipalities in a 10 kilometre ra- dium	68 69 70 70 71
A1 A2 A3 A4 A5 A6	Distribution of the number of municipalities in a 10 kilometre ra- dium	68 69 70 70 71 72
A1 A2 A3 A4 A5 A6 A7	Distribution of the number of municipalities in a 10 kilometre ra- dium	 68 69 70 70 71 72 73
A1 A2 A3 A4 A5 A6 A7 A8	Distribution of the number of municipalities in a 10 kilometre ra- dium	 68 69 70 70 71 72 73 75
A1 A2 A3 A4 A5 A6 A7 A8 A9	Distribution of the number of municipalities in a 10 kilometre ra- dium	 68 69 70 70 71 72 73 75 77
A1 A2 A3 A4 A5 A6 A7 A8 A9 A10	Distribution of the number of municipalities in a 10 kilometre ra- dium	 68 69 70 70 71 72 73 75 77 79
A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11	Distribution of the number of municipalities in a 10 kilometre ra- dium	 68 69 70 70 71 72 73 75 77 79 89
A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 B1	Distribution of the number of municipalities in a 10 kilometre ra- dium	 68 69 70 70 71 72 73 75 77 79 89 90

- B3 Event study of reform on municipal expenditure on services. . . . 91
- B4 Effect of the DSP on share of municipalities increasing loans \ldots 96
- C1 Event study of reform on the yearly expenditure on public works. 98
- C2 Map showing provinces receiving additional funds from the EU . . $\,$ 98 $\,$

List of Tables

1.1 Descriptive statistics		13
1.2 Effect on the number of contracts below $40,000$		17
1.3 Effect of the dissolution on the expenditure for split	projects	20
1.4 Effect of the dissolution on the expenditure around	the threshold.	21
1.5 Effect on the number of contracts for services and fu	Irniture above	
40,000 Euro by sectors		23
1.6 Effect of the dissolution on the probability of having	a renegotiation.	24
1.7 Effect of the dissolution on values of the contracts of	f public works	25
1.8 Effect of the dissolution using different control group	ps	28
1.9 Effect on municipalities with different bargaining pow	ver	30
2.1 Descriptive Statistics		/11
2.1 Descriptive Statistics		41
2.3 Effect of the IMU reform on fiscal autonomy	Tevenue	40
2.5 Effect of the IMU reform on the hudgetery behavio	· · · · · · · · ·	40
2.4 Effect of the IMO reform on the budgetary behavio	our or munici-	40
2.5 Effect of the IMU reform and DSD on loons		49
2.5 Effect of the INIO felorin and DSF on loans		51
3.1 Descriptive statistics		58
3.2 Effect of the DSP on contracts issued		63
3.3 Effect of the DSP on the issue of a contract of differ	cent sizes	63
3.4 Effect of the DSP on the length of the time overrun	s	64
3.5 Effect of the DSP on the logarithm of project size .		65
3.6 Effect of the DSP using different population interva	ls	66
A1 Effect of the dissolution on the dissolved municipality	ties	74
A2 Sample of similarity scores		78
A3 Effect on the number of contracts below 40,000 wit	h contracts of	
different size.		80
A4 Effect on the number of contracts below 40,000		81
A5 Effect on the number of contracts below 40,000		82
A6 Effect of the dissolution on farther municipalities		
The Encert of the dissolution on farther manerpanties .		83

A8	Effect on the expenditure for split projects using different similar-	
	ity scores.	84
A9	Effect on the expenditure for split projects using different similar-	
	ity scores	85
A10	Effect of the dissolution on the expenditure for split projects of	
	public works.	85
A11	Effect of the dissolution on total expenditure, including larger con-	
	tracts	86
A12	Effect on number of contracts larger than 40,000 Euros by type of	
	good and sector	87
A13	Effect on number of contracts larger than 40,000 Euros by type of	
	good and sector	87
B1	Effect of the IMU reform on public good provision	92
B2	Effect of the IMU reform on the budgetary behaviour with province	
	linear trends	92
B3	Effect of the IMU reform controlling for population times year FE	93
B4	Effect of the IMU reform, instrumented using share of municipal	
	revenue	94
B5	Effect of the IMU reform and DSP on loans	95
B6	Effect of the IMU reform and DSP on loans	97
C1	Effect of the DSP considering the EU funds	99

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Declaration

This thesis is submitted to the University of Warwick in accordance with the requirements of the degree of Doctor of Philosophy in Economics. I declare that it has not been submitted for a degree at another university. Chapter 2 is co-authored with Maggie Shi (Columbia University). Chapter 3 is joint work with Audinga Baltruinate (Bank of Italy).

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Abstract

This thesis explores the effects of various public policies on the behaviour of Italian municipalities. The different topics are summarised below.

Chapter 1 studies how the implementation of an anti-corruption measure in a municipality affects the procurement behaviour of neighbouring municipalities that are not directly targeted. I exploit the implementation of the dissolution of a municipal government for infiltration by organised crime. I show that these municipalities react in two ways: first, they issue more contracts under a threshold (40,000 Euro) below which evidentiary requirements become less stringent and transparency is lower, making more difficult to prove any illicit. The response accounts for approximately 20 per cent of the yearly average expenditure from 40,000 Euros to 100,000 Euros. Second, municipalities amend less often contracts for public works and the existing amendments are smaller in size. Amending a contract is a practice considered as a signal of potential corruption.

Chapter 2 investigates how fiscal decentralization affects local public spending in Italy. We exploit an unexpected reform of the property tax implemented in Italy in 2012. The reform increased in decentralization with the increase of the municipal property tax coupled with a large reduction in national transfers to municipalities. Using an instrumental variable approach, we show large heterogeneity in the amount municipalities actually collected with their newfound discretion, compared to the government suggestion. On average, municipalities increase the total revenue and spending on public services. Finally, we show that greater decentralisation affects differently municipalities subject to fiscal rules.

Chapter 3 studies the impact of fiscal rules limiting the deficit accumulation on the procurement behaviour of Italian municipalities. Using data on procurement contracts from 2008 to 2015, we show two findings. First, municipalities subject to fiscal rules decrease by 4 percent the number of contracts issued every year and municipal spending on public works is reduced by 18 percent. Second, fiscal rules also impact the effectiveness of public spending. After the DSP is implemented, delays in the execution of public works are approximately 40 percent shorter. The results are consistent with the hypothesis that fiscal rules impact both the level of investment and the effectiveness of public spending.

1 Sweeping the Dirt Under the Rug: Measuring Spillovers from an Anti-Corruption Measure

1.1 Introduction

Holding public officials accountable helps to prevent illegal activities such as corruption (United Nations (2004)). However, the implementation of measures to prosecute public officials who do not comply with the law can also influence the behaviour of other public bodies. Anti-corruption policies deter irregularities in neighbouring public bodies (Colonnelli and Prem (2017), Galletta (2017), Avis et al. (2018) and Chabrost and Saussier (2018)), but deterrence is not the only possible consequence. If the measure triggers further investigations, nontargeted public bodies can strategically react to the anti-corruption measure to avoid future screening, especially if they have some type of connection with the target. I show that this is indeed the case, focussing on the behaviour of Italian municipalities.

I study the spillover effects of a national anti-corruption policy in Italy that targets municipalities colluding with organized crime. If there is evidence of collusion between elected officials and criminal organisations, the national government can dissolve a local administration. Under the policy, all elected public officials are replaced by three high-ranking members of the law enforcement body, nominated by the national government. I exploit the dissolutions of Italian municipal governments from 2011 to 2016 to analyse the response of the neighbouring municipalities. I use an event study strategy and observe the reaction of the municipalities that share a border with a dissolved municipality and compare it to the reaction of all Italian municipalities that do not share a border with it.

I focus on procurement contracts, using a novel dataset containing information on all the procurement contracts of all Italian municipalities. Public procurement involves a large segment of the Italian economy, representing approximately 10 percent of Italian GDP (Government (2013)). It is a sector vulnerable to corruption: all the cases of dissolution in this study were motivated by irregularities in the procurement sector.¹

I focus the analysis on two relevant outcomes of procurement behaviour of the mu-

¹The vulnerability of the procurement sector to corruption is not a peculiarity of Italy. The OECD estimates that 57 percent of the corruption cases in OECD countries happened in the procurement sector (OECD (2014)).

nicipalities. First, I study the change in the number of contracts issued around a relevant threshold for the Italian procurement law (i.e. 40,000 Euros). Different rules apply for contracts smaller than the threshold, which decrease the paperwork required, the reporting requirements, and, for contracts of services and furniture only, increase the discretion of the public official in the choice of the winning firm. Therefore, contracts smaller than the threshold are less transparent and with fewer evidentiary requirements that law enforcement bodies can use to prove an illicit behaviour. Then I focus the analysis on renegotiations of contracts for public works. Renegotiating a contract implies awarding additional funds to the firm for the completion of the public work, due to unforeseen costs or complications. Excessive renegotiations of contracts are considered a signal of potential corruption by the Italian monitoring authority, since cases of corruption related to the renegotiations are common (Di Cristina (2012)).²

Municipalities react to the neighbouring dissolution by issuing a higher number of contracts smaller than 40,000 Euros. In particular, municipalities shift contracts of services and furniture from above to below the 40,000 Euro threshold, without changing the overall expenditure around it. The effect lasts on average longer than the dissolution itself. On average, municipalities increase the number of contracts smaller than 40,000 Euro by approximately 12 percent per year, during the years of the dissolution, and 26 percent afterwards.The effect corresponds to an annual shift below the threshold of approximately 1 percent of the expenditure above the threshold.³ The neighbouring dissolution also deters municipalities from renegotiating contracts for public works during their execution. The probability of renegotiating an existent contract decreases on average by 4 percent and the value decreases approximately by 70 percent. The response on the renegotiations accounts for 9 percent of the yearly expenditure for public works.⁴

Municipalities respond to the neighbouring dissolution exploiting margins of the procurement process with fewer evidentiary requirements and engaging less in activities with higher risk of corruption. These responses are consistent with the hypothesis that municipalities attempt to minimise the scrutiny by law enforcement bodies, when a neighbouring municipality is dissolved. I provide two pieces

 $^{^{2}}$ Ferraz and Finan (2011) and Coviello and Gagliarducci (2017) show how renegotiations are more likely when mayors have no re-election incentives.

 $^{^{3}}$ I consider the average annual expenditure in contracts larger than 40,000 Euro. The effect would consist in 18 percent of the yearly expenditure in contracts between 40,000 Euro and 100,000 Euro, and it would be approximately 6 percent of the average expenditure for contracts between 40,000 Euro and 250,000 Euro.

⁴I have considered only the public works larger than 150,000 Euro, since the information on renegotiations is compulsory only for those contracts.

of evidence to support this interpretation.

First, using a language modelling technique and approximate string matching, I show that municipalities increase the number of contracts below 40,000 Euro by splitting a single project worth more than 40,000 Euro into multiple contracts smaller than the threshold. I identify whether projects have been split in smaller parts in the following way. First, I compare the text describing the characteristics of the procured good in each contract using word embeddings, which is a language modelling technique used to capture the semantic meaning of the words, and approximate string matching.⁵ If the municipality issues two contracts in the same year with a similarity of at least 95 percent under these critieria and the sum of the contracts' values is larger than 40,000 Euro, then I consider them to be part of the same project. A back-of-the-envelope calculation shows that the increasing in expenditure below 40,000 Euro is entirely due to the increase in split projects.

Finally, I show that the municipalities move contracts below the threshold in sectors in which the infiltration of criminal organisations is more likely, namely construction and waste management.⁶ More than 70 percent of the dissolution cases were the results of infiltration in those two sectors.⁷

Therefore, establishing legal thresholds that change the procurement law might have unfortunate consequences. In 2018, the Italian legislator acknowledged that criminal organisations exploited the 40,000 Euro threshold to complicate the investigations of law enforcement bodies. The legislator ruled that, from 2019 onwards, awarding multiple contracts under the 40,000 Euro threshold to the same firm is an evidence of illicit behaviour that can justify a dissolution.⁸

This paper relates to multiple strands of literature. First, it contributes to the literature on spillovers from monitoring. The most closely related papers by Colonnelli and Prem (2017), Galletta (2017), Avis et al. (2018) and Chabrost and Saussier (2018) find that law enforcement acts as a deterrent for misconduct in neighbouring municipalities. Conversely, Lichand and Fernandes (2019) show how anti-corruption audits can have negative effects, whereby other unmonitored

⁵Computing the similarity with an approximate string matching technique implies computing the similarity between two descriptions with four different string matching measures (i.e. the Levenshtein measure, the Demerau-Levenshtein, the Jaro and the Jaro-Winkler). Appendix A3 describes the methodologies in details.

⁶It is not a contradiction that the contracts shifted below the 40,000 Euros are those of furniture and services but the response comes from construction and waste management. Indeed, both these sectors can have both public works, services and furniture.

⁷Infiltration in specific sectors is common for criminal organisation: organised crime seeks legal activities that can cover for money laundering (Transcrime (2017)).

⁸Ruling of Consiglio di Stato, Sez. III, Sent. 26/09/2019, n.6435.

municipalities engage with corrupt vendors by moving their activities from the audited municipality. My paper contributes to this literature by showing how law enforcement measures can encourage other public bodies to commit irregularities in a less inferable way for reducing the chance of scrutiny by law enforcement bodies.

Second, this paper contributes to a growing literature showing that, when under scrutiny, agents substitute activities to less well-monitored margins. There are examples of this type of response in the literatures on procurement (Gerardino et al. (2017)); taxation and subsidies (Asatryan and Peichl (2016), Carillo et al. (2017), Almunia and Lopez-Rodriguez (2018) and Daniele and Dipoppa (2018)) and corruption and crime (Yang (2008), Knight (2013), Niehaus and Sukhtankar (2013) and Dell (2015)). My paper contributes to this literature by showing that agents not monitored directly can have similar responses as well. When law enforcement bodies scrutinise the behaviour of a public administration, they may inadvertently incentivise unexpected responses from other institutions. Furthermore, my results also indicate the response of public bodies can be complex and involve multiple variables at the same time. Municipalities engage less in activities with higher risk of irregularities, but also increase the number of contracts with fewer evidentiary requirements.

Third, the project relates to the broad literature studying corruption in the procurement sector. The evidence shows that corruption acts as "grease in the wheel" for least productive firms to operate in the procurement sector (Colonnelli and Prem (2017)). In particular, this literature shows how more corrupt public officials exploit the higher discretion of some awarding procedures for awarding contracts to investigated (or politically connected) firms (Baltruinate et al. (2018) and Decarolis et al. (2019)). This paper contributes to this literature by showing an unexplored mechanism of how public bodies can enforce an high level of discretion. Municipalities split larger projects into multiple smaller contracts to award contracts without the use of public tender.

Fourth, this project contributes to the literature that shows why public bodies change contracts' values so that they are below legal thresholds (Palguta and Pertold (2017) and Szucs (2017) and Baltruinate et al. (2018)). This literature suggests that public bodies exploit changes in the procurement law in order to award contracts to a specific firm. The contribution of my paper is twofold. First, I show that public bodies could exploit legal thresholds for different purposes as well. The results of my paper are consistent with the hypothesis that municipalities change contract values in order to limit the availability of circumstantial evidence of a potential irregularity. I also show a potential mechanism behind the shift towards contracts below the threshold. Municipalities split a large project in multiple smaller contracts without changing the size of the total project. This is consistent with municipalities strategically exploiting the legal threshold without impacting real variables such as quality of the good, which would be more likely to be affected with a change in the project size.

Finally, this paper relates to the literature that show the determinants of renegotiations of a contract. Renegotiations are more likely either if the mayor is more tenured or does not face any re-election incentive (Ferraz and Finan (2011) and Coviello and Gagliarducci (2017)), or if the project is smaller or more complex or it is awarded with private negotiation or a first price auction (Decarolis (2014), D'Alpaos et al. (2013) and Decarolis and Palumbo (2015)). I show how renegotiations can be a relevant outcome to study when focussing on the response to anti-corruption measures. In this case, the municipalities can use the renegotiations of a contract for the award of additional resources to the winner firm.

The remainder of the paper proceeds as follows. Section 1.2 provides the institutional background to the law enforcement measures and public procurement in Italy. Section 1.3 describes the data. Section 1.4 illustrates the empirical strategy. Section 1.5 shows the results on the number of contracts below the 40,000 Euro. Section 1.6 analyses the mechanisms behind the shift of contracts from above to below the threshold. Section 1.7 shows the results on the renegotiation of contracts for public works and Section 1.8 discusses the robustness checks. Finally, Section 1.9 concludes.

1.2 Institutional Setting

In this section, I discuss the main features of the institutional setting. First, I describe the law enforcement measure, which limits the influence of organised crime on municipal governments. Then, I describe the procurement outcomes that I use in this study, in particular, how contracts change around the 40,000 Euro threshold. I discuss why the 40,000 Euro threshold is relevant and how changes in the procurement law affect the probability of detection of irregularities. Finally, I discuss why studying the municipalities' response to the probability of renegotiating an existing project is relevant for my study.

1.2.1 The law enforcement measure

During the 1980s, the infiltration of mafia clans into local administrations became increasingly common. In the 1990s, the national government introduced stricter regulations for tackling collusion among public officials and criminal organisations. In particular, the law 164/1991 introduced the dissolution of a municipal government for mafia infiltration. The national government can decree the dissolution of a municipal government, when the law enforcement bodies provide evidence of direct (or indirect) links between members of the local government and the mafia.

When a municipal government is dissolved, the elected officers are replaced by three high-ranking members of the law enforcement bodies (the *Commissioners*). The commissioners replace the elected officials in all of their duties, and they only deal with the ordinary business of the municipality. Their objective is to reduce the influence of the criminal organisation on the municipal government. Acconcia et al. (2014) and Galletta (2017) show how dissolved municipalities reduce the level of investment in the municipality substantially during the dissolution, keeping constant the amount of current expenditure.⁹ The law prescribes the dissolution to last between 12 and 24 months, although they usually last between 24 and 36 months.¹⁰ After the dissolution, the municipality holds new elections for the municipal government.

Figure 1.1 shows the geographical distribution of the dissolutions in the period of my analysis. Most of the dissolutions are in the south of Italy, in particular in Sicily, Calabria and Campania.

The dissolution has several steps. In some cases, the process starts with a police investigation that identifies connections between municipal officials and organised crime¹¹. The investigation may begin for reasons which are extraneous to the direct involvement of the mafia in the municipal government.¹²

Then, the provincial¹³ prefect establishes a commission in charge of evaluating

 $^{^{9}}$ In Appendix A2 I show the change in procurement behaviour of the dissolved municipalities. There is no change around the 40,000 Euro threshold, but results are consistent with findings from Galletta (2017) who studies the total level of expenditure.

 $^{^{10}}$ As shown in the Appendix A2

 $^{^{11}\}mathrm{As}$ shown in Figure A5, the process for the dissolution started with an arrest in 36 percent of the cases

¹²Commissione parlamentare d'inchiesta sul fenomeno delle mafie e su altre associazioni criminali, anche straniere (2005).

¹³Italian provinces are the smallest institutions after the municipality. There are 110 provinces in Italy.



Figure 1.1: Map of the dissolutions

The map shows the Italian provinces where there has been at least a dissolution in the period of my analysis (2011-2016).

the municipality's activities for three months. The goal of the commission is to provide both evidence of the existence of a connection between the municipality and organised crime, and circumstantial evidence of the influence of the criminal organisation on the municipality's behaviour. The evidence may also not constitute a crime, since the dissolution is a precautionary measure to limit the influence of the criminal organisation, but it has to prove objectively the influence of organised crime on the municipality. Therefore, the national state considers as objective evidence behaviours like awarding contracts to firms owned by mafia members or the illicit use of the emergency clause. Awarding contracts smaller than 40,000 Euro directly to a firm is not considered objective evidence of the influence of organised crime. Interestingly, on September 2018 a verdict also included the direct award of multiple contracts smaller than 40,000 Euro to the same firm as an objective circumstantial evidence that justifies dissolution (Consiglio di Stato, Sez III, 10/01/2018, n.96). This verdict acknowledges how vulnerable small contracts are to corruption and it also highlights how the 40,000 Euro threshold is relevant for this topic in the Italian case.

At the end of the three months, the commission produces a report for the Italian *Ministry of Interior* within 45 days. Finally, the national government and the President of the Republic validate the decision. What is relevant for this study is

that municipalities have no prior information on the dissolution of a neighbouring municipality in the years prior to its implementation and the entire process that concludes with the dissolution lasts at most 10 months.¹⁴

When implementing a dissolution, the law enforcement body publishes a detailed report describing the motivations for the dissolution. I use those reports to collect information on the irregularities in the procurement sector that the law enforcement bodies found during the investigation, and what sector organised crime infiltrated in the dissolved municipality.¹⁵ The most frequent reason for the dissolution is the failure to verify the identity of the owner of the winning firm as a mafia member. Unfortunately, I have no information on the identify of the winning firm of the procurement contracts in the data.

The second most frequent motivation is the one that I exploit in this study. That is, the municipality exploited the emergency clause to award a procurement contract larger than 40,000 Euro directly to a firm even in the absence of any emergency. In this way, the municipality could award the contract directly to firms owned by criminal organisations without the use of the public tender. In Section 1.5, I show that, after a dissolution, neighbouring municipalities increase the number of procurement contracts smaller than 40,000 Euro rather than using the emergency clause to award larger contracts directly.

Criminal organisations infiltrated more frequently in two sectors of the dissolved municipalities. Some sectors are more vulnerable to the infiltration of organised crime. They share common features that make them particularly suitable for infiltration. First, the quality of the good is difficult to assess, so criminal organisations can earn additional profit providing goods of lower quality. Second, their activities are difficult to monitor, so these business can also become a legal cover for money laundering of illegal activities.¹⁶ In approximately 70 percent of the dissolution cases, the criminal organisations infiltrated in two sectors: construction and waste management. In the remaining 30 percent of cases, they infiltrated in one of the other 44 sectors of the municipal activity. In Section 1.6, I show that the response comes only from contracts related to construction and waste management, in which criminal organisations are particularly likely to infiltrate.

 $^{^{14}}$ The national law n.410/1991 states explicitly the steps and the timing of the dissolution.

¹⁵Figure A6 and A7 shows respectively the irregularities that the law enforcement bodies found in the procurement activity of the dissolved municipalities and the sectors in which organised crime infiltrated.

 $^{^{16}}$ The Italian Law n. 190/2012 states all the sectors of the economy more vulnerable to infiltration of criminal organisations. The waste management and construction sectors are the two most classical examples.

Finally, I focus my attention on the reaction of neighbouring municipalities after a dissolution for two reasons. First, criminal organisations often influence the economy of large areas. There are many examples of criminal organisations influencing multiple neighbouring municipalities at the same time (DIA (2016)). Second, municipalities can react to a neighbouring dissolution because they perceive that it is more likely to be scrutinised next. Many cases of dissolution had provided enough evidence of illicit regarding other public bodies that justified the dissolution of nearby municipalities as well.¹⁷

1.2.2 The procurement outcomes

Italian procurement law varies based on a few characteristics of the procured goods. For example, the law regulating contracts for public works is different from that for services and furniture. Similarly, Italian procurement law changes depending on the value of the contract: larger contracts have stricter regulation.

There is a relevant threshold at 40,000 Euro. The law n.163/2006 prescribes three changes in the law for contracts smaller than the threshold. First, contracts under 40,000 Euro are less transparent, since the municipality does not have to publish any documentation for awarding the contract. Second, municipalities have to incur lower administration and compliance costs (i.e. red tape costs). For example, municipalities do not have to supply as much information about contracts smaller than 40,000 to the Italian monitoring authority (ANAC).

Finally, municipalities can legally award a procurement contract smaller than 40,000 Euro directly to a firm, avoiding the public tender. The procedure for contracts larger than 40,000 Euro is different depending on the type of good procured. Contracts for public works can be awarded without public tender regardless of size, but a public tender must be used for larger contracts of services and furniture. The only exception to this rule is in case of emergency. In practice, municipalities often exploit the emergency clause, even when there is no emergency, to avoid the public tender.

Figure 1.2 shows the distribution of the procurement contracts by face value. Municipalities have strong incentives to design contracts just below the 40,000 Euro threshold. Municipalities issue approximately ten times more procurement

¹⁷An example is the dissolution of Giugliano in 2013 that provided enough evidence of collusion between other municipalities and the clan of *Casalesi* to motivate other four dissolutions in the same province (DIA (2013)).



contracts every year just below 40,000 Euro than just above.¹⁸

Figure 1.2: Distribution of contracts by face value

The figure shows the distribution of the procurement contracts by face value. There is a substantial bunching at the 40,000 Euro threshold (dashed line). The figure does not include contracts larger than 100,000 Euros. Figure A2 shows the distribution with all the procurement smaller than 1,000,000 Euros.

It is easier to detect irregularities for contracts of services and furniture larger than 40,000 Euro for two reasons (Corradino et al. (2017)). First, the municipality must use a public tender. This involves a larger number of economic agents and, therefore, there is a higher probability that one of them detects (and reports) an irregularity. The municipality can try to avoid issuing public tender by misusing the emergency clause. Even though the overexploitation of the emergency clause is common in the Italian procurement sector (ANAC (2018)), it is risky. The law enforcement body can verify whether there was an emergency and investigate if there was not.¹⁹

On the other hand, detecting irregularities in contracts smaller than 40,000 Euro is more complicated since the municipality can award the contract, without a public tender. The law enforcement body has to find other sources of evidence to trigger a formal investigation.

 $^{^{18}}$ The average number of contracts between 35,000 and 40,000 issued in a year is 2.16, while it is 0.22 for contracts between 40,000 and 45,000 Euro.

¹⁹Figure A6 shows how often the law enforcement body exploits the wrong use of the emergency clause to motivate a dissolution. In fact, the overexploitation of the emergency clause is the second most frequent motivation for the dissolutions in my period of analysis.

Several steps of the procurement process are particularly vulnerable to illicit behaviours. Every year ANAC publishes a report describing the phases of the procurement process that the law enforcement bodies should monitor more closely and the common signs of illicit behaviours (ANAC (2015)).²⁰ In particular, I focus on the renegotiations of the contracts of public works.²¹

In a renegotiation the winning firm requests additional funds to complete the contract, due to unforeseen costs or complications. The firm can seek additional resources up to one fifth of the original contracts value. The renegotiation is not meant to change the quality of the good procured: it should only allow the winning firm to complete the original contract.

Figure 1.3 shows the average share of public works that had a renegotiation in the different Italian provinces. There is a lot of heterogeneity, since firms use renegotiation in many situations, not necessary related to corruption. Nevertheless, renegotiating a contract for public works is also a common practice in areas where organised crime is widespread, like Sicily.

1.3 Data and descriptive statistics

The primary source of data is the universe of procurement contracts issued by all Italian municipalities from 2011 to 2016. The data contains 7,965,123 contracts, and a large share of them are tiny: the average size of a contract is 18,453 Euro, and the median is 1,230 Euro. ANAC collects the data, and it is also in charge of monitoring the procurement sector. For each contract, the data contains information on: its value, the purchasing municipality, the awarding mechanism (e.g. public tender or discretionary procedure), date of the purchase and a description of each item. For contracts of public works larger than 150,000 Euro, the data also contains information and its value. The data details additional information on the good procured for contracts larger than 40,000 Euro. In particular, each contract larger than 40,000 Euros is associated with a 9 digit code (i.e. the CPV) that categorises the type of good in detail.²²

²⁰In Appendix A7, I list all the parts of the procurement process that the monitoring authority suggests to monitor more closely since they are more vulnerable to corruption.

 $^{^{21}}$ For example, in the motivation documents for the dissolution of the municipality of Taurianova (2013), it is possible to read that the municipal government agreed to renegotiate contracts of public works without justifications. In the motivation of the dissolution of Palazzo Adriano (2016) the law enforcement body describes how extreme the exploitation of the renegotiations for illegal purposes can be. They show how the municipal government allowed renegotiations of contracts worth more than the contracts.

 $^{^{22} \}rm The \ CPV$ establishes a single classification system for public procurement used to describe the subject of the contract. More info at https://simap.ted.europa.eu/cpv .



Figure 1.3: Map of the share of renegotiation in the Italian provinces. The map shows the average share of renegotiations in the contracts for public works issued in each Italian province. In the Appendix A7, I show the geographical distribution of the average value of the amendments.

I also include municipal characteristics (i.e. population) from the Italian national bureau of statistics (ISTAT) and mayors' characteristics (i.e. place of birth and the number of years until the next election) from the Home Department.

Table 1.1 shows descriptive statistics of the variables of interest. I highlight four different facts: municipalities issue more contracts immediately below the 40,000 Euro threshold; the expenditure around 40,000 Euro accounts for approximately 5 percent of average yearly expenditure of the municipalities; approximately one-third of public works are subject to renegotiations, and municipalities of-ten avoid the use of public tender when awarding contracts between 40,000 Euro and 100,000 Euro. Public tenders are used in approximately one-fifth of contracts for services and furniture. This suggests that municipalities often exploit the emergency clause to award larger contracts.

Figure 1.4 shows that municipalities exploit the conditions in the procurement law at 40,000 Euro when a neighbouring municipal government is dissolved. The number of contracts just below the 40,000 Euro for services and furniture increases substantially, after the dissolution. There is no change in the distribution of contracts for public works.

	All	municipalities
	Mean	Standard deviation
Procurement		
N. contracts	171	(229)
N. contracts btw. 10,000 and 40,000 Euro	19	(38)
N. contracts btw. $40,000$ and $100,000$ Euro	2	(10)
Expenditure (in thousands Euro)	3,204	(50, 386)
Exp. btw. 10,000 and 40,000 Euro (in th. Euro)	181	(434)
Exp. btw. 40,000 and 100,000 Euro (in th. Euro)	139	(695)
Sh. public works	0.185	(0.141)
Sh. services	0.476	(0.138)
Sh. furniture	0.338	(0.125)
Sh. renegotiations	0.282	(0.400)
Sh. pub. tender btw. 10,000 and 40,000 Euro	0.035	(0.103)
Sh. pub. tender btw. 40,000 and 100,000 Euro	0.147	(0.297)
Sh. pub. tender btw. 40,000 and 100,000 Euro for services and furniture	0.197	(0.344)
Sh. pub. tender b tw. $40,000$ and $100,000$ Euro for public works	0.098	(0.278)
Municipalities characteristics		
Population	7,277	(40, 297)
Local mayor	0.39	(0.48)
N. neighbours	5.89	(2.12)
N. mun. within 10km	14.1	(11.1)
N. of contracts	7,965,123	
N. of municipalities	7,753	
N. of treated municipalities	176	

Table 1.1: Descriptive statistics

The table summarises the following yearly variables: N. contracts is the average number of contracts issued. N. contracts btw. 40,000 and 100,000 Euro corresponds to the average number of contracts between 40,000 and 100,000 Euro. N. contracts btw. 10,000 and 40,000 Euro is the average number of contracts between 10,000 and 40,000 Euro. The same applies for the expenditure variables. Sh. public works is the share of contracts that are about public goods, Sh. services is the average share of services, while Sh. furniture is the average share of furniture. Sh. renegotiations is the average share of contracts for public works larger than 150,000 Euro that have been renegotiated. Sh. pub. tender btw. 10,000 and 40,000 Euro is the average share of contracts between 10,000 and 40,000 Euro is the average share of contracts between 10,000 and 40,000 Euro is the average share of contracts between 10,000 and 40,000 Euro is the average share of contracts between 10,000 and 40,000 Euro is the average share of contracts between 10,000 and 40,000 Euro is the average share of contracts between 10,000 and 40,000 Euro is for contracts between 40,000 and 100,000 Euro is for contracts between 40,000 and 100,000 Euro. Finally, the municipality's characteristics are: average population, average share of mayors who are born in the municipality, average number of neighbour municipalities, average number of neighbouring municipalities are the municipalities sharing a border with the dissolved municipality.



Figure 1.4: Bunching pre (and post) a neighbour's dissolution by procurement type

The figure shows the bunching for the neighbour municipalities before and after the dissolution for the different types of procured good. The bin size is 5,000 Euro. The contracts for services and furnitures are the only one bunching at 40,000 Euro. This suggests that the relevant change in the law that neighbour municipalities exploit is the possibility of awarding the contracts smaller than 40,000 Euro without public tender. This is the only change in the law at 40,000 Euro that affects only services and furnitures.

1.4 Empirical strategy

The identification strategy relies on the exogeneity of the treatment, that is the exact timing of the dissolution of a municipality being as good as random. The exogeneity assumption would be compromised if the neighbouring municipalities have information on the start of the process resulting in the dissolution. For example, the neighbouring municipalities could infer that a dissolution will be implemented soon if an arrest of a public official systematically anticipates it. This does not seem to be the case since, between 2011 and 2016, only 26 out of 73 dissolutions had any arrested public official before their implementations.²³ The exogeneity assumption would be compromised if the municipalities knew

²³Information on arrested public officials has been collected from newspapers articles collected on Factiva. I would like to thank Gianmarco Daniele and Tommaso Giommoni who allowed me to double-check my findings on the arrests with their data. Figure A5 shows the geographical distributions of the arrests and dissolutions between 2011 and 2016. There were 171 arrests of public officials and 73 dissolutions.

in advance about the start of the dissolution. Law n.410/1991 describes the process of the dissolution in all its steps and it specifies how there should be no information disclosure on the dissolution before its implementation.

Therefore, the empirical strategy is based on multiple dissolution shocks happening at different times in different areas of Italy. I estimate both a triple difference-in-difference and a difference-in-difference, comparing municipalities with a neighbouring dissolved municipality at time t with those that at the same time do not share any border with a dissolved municipality.

Section 1.5 shows the results on the number of contracts below the 40,000 Euro threshold, they are computed from Equation (1.1). The contracts issued by each municipality in every year are split into bins of 5,000 Euro each. Therefore, the resulting estimation strategy is a triple difference-in-difference in which the outcome variable is the number of contracts for services and furniture issued by municipality m, in bin b at time t. This estimation strategy compares the change in the number of contracts in each bin, between treated and control municipalities, before and after the implementation of the dissolution and it shows whether the effect is larger for contracts issued in the bins below the threshold. Equation 1.1 allows me to compare the effect of the dissolution taking into account time-invariant characteristics of municipalities and bins.

$$N_{b,m,t} = \alpha_b + \alpha_m + \alpha_t + \delta_0 Treat_{-m,t} + \delta_1 After Treat_{-m,t} + \beta_0 Treat_{-m,t} \times \mathbb{1}\{25,000 \le b \le 40,000\} + + \beta_1 After Treat_{-m,t} \times \mathbb{1}\{25,000 \le b \le 40,000\} + \gamma_0' X_{m,t} + \gamma_1' \overline{X}_{-m,t} + \epsilon_{b,m,t}$$
(1.1)

The outcome variable is the inverse hyperbolic sine of the number of procurement contracts issued by municipality m, in year t, in bin b. The α terms are respectively bin, municipality and year fixed effects. $Treat_{-m,t}$ is a dummy taking a value one if it is the first, second or third year since commissioners are in charge of a neighbouring dissolved municipality. The variable $AfterTreat_{-m,t}$ takes value one if it is one or two years since the commissioners left a neighbouring dissolved municipality. $X_{m,t}$ are municipality controls, and $\overline{X}_{-m,t}$ are the average of neighbours' controls. I control for the logarithm of the population, a dummy equal to one if the mayor is born in the municipality and the number of years remaining before the next election to account for political cycles. All the standard errors account for spatial heteroskedasticity and autocorrelation for all municipalities within a ten kilometres radius (Conley (2008)).²⁴ The main coefficients of interest are β_0 and β_1 . β_0 shows the differential effect of nearby dissolution on the number of contracts between 25,000 Euros and 40,000 Euros. β_1 shows whether the effect persists for contracts between 25,000 Euros and 40,000 Euros in the years after the dissolution as well.

In order to provide evidence on the mechanisms of Section 1.6.2 I use Equation 1.2, which is a specification at the municipality-year level:

$$Y_{m,t} = \alpha_m + \alpha_t + \beta_0 Treat_{-m,t} + \beta_1 After Treat_{-m,t} + \gamma'_0 X_{m,t} + \gamma'_1 \overline{X}_{-m,t} + \epsilon_{m,t}$$
(1.2)

I use Equation 1.2 for two different outcomes: first, the outcome in Section 1.6.1 is yearly expenditure on contracts issued for split projects. In particular, two contracts are considered to be split if the same municipality issues them in the same year, the similarity of their descriptions is above 95 percent for one of the two similarity measures that I use and the sum of the contracts size is larger than 40,000 Euro. Second, in Section 1.6.2, $Y_{m,t}$ corresponds to the number of contracts issued above the 40,000 Euro threshold for two different sectors: those in which the infiltration of organised crime is more likely (i.e. construction and waste management), and all others combined.

Finally, I use a contract-level specification for Section 1.7. I exploit the information on the type of object procured, 25 to compare changes in the likelihood of having a renegotiation and its average value, controlling for time-invariant characteristics of the good. Therefore, Equation 1.3 is the regression equation for Section 1.7:

$$\mathbb{1}\{Amendment_{g,m,t} = 1\} = \alpha_g + \alpha_m + \alpha_t + \beta_0 Treat_{-m,t} + \beta_1 After Treat_{-m,t} + \gamma_0' X_{m,t} + \gamma_1' \overline{X}_{-m,t} + \epsilon_{g,m,t}$$

$$(1.3)$$

 $^{^{24}\}mathrm{I}$ would like to thank Thiemo Fetzer and Solomon Hsiang for sharing online their codes for running the Conley standard errors. http://www.trfetzer.com/conley-spatial-hac-errors-with-fixed-effects/ and http://www.fight-entropy.com/2010/06/standard-error-adjustment-ols-for.html .

 $^{^{25}}$ I use the first four digits of the *CPV* as fixed effects. The first four digits of the CPV allows me to categorise the contracts in 949 different categories of good.

(1)	(2)	(3)
Num. Proc.	Num. Proc.	Num. Proc.
0.1234^{***}	0.1212^{***}	0.1215^{***}
(0.0270)	(0.0272)	(0.0272)
0.2770^{***}	0.2661^{***}	0.2660^{***}
(0.0664)	(0.0648)	(0.0648)
Υ	Υ	Y
Ν	Υ	Υ
Ν	Ν	Υ
507,204	507,204	507,204
5.65	5.65	5.65
	(1) Num. Proc. 0.1234*** (0.0270) 0.2770*** (0.0664) Y N N 507,204 5.65	$\begin{array}{cccc} (1) & (2) \\ \text{Num. Proc.} & \text{Num. Proc.} \\ \\ 0.1234^{***} & 0.1212^{***} \\ (0.0270) & (0.0272) \\ 0.2770^{***} & 0.2661^{***} \\ (0.0664) & (0.0648) \\ \end{array}$

Table 1.2: Effect on the number of contracts below 40,000

The outcome variable is the inverse hyperbolic sine of the number of procurements for services and furniture in each bin. The following controls are included: population, indicator whether the mayor is born in the municipality, number of years until the next election, the average of the controls for neighbouring municipalities, year fixed effects and province-specific linear trends. I use the Conley standard errors to account for spatial HAC errors. Conley standard errors are computed for all the municipalities within a ten kilometre radius. Figure A1 shows the distribution of the number of municipalities within ten kilometres for all Italian municipalities.

The notation of Equation 1.3 and controls do not change with respect to Equations 1.1 and 1.2. Since it is a contract-level regression, I also control for a type of good fixed effect (i.e. α_g). In the following sections, I show results of the above-mentioned regression equations.

1.5 Results on contracts below the 40,000 Euro threshold

In this section, I show the effect of a neighbouring dissolution on the number of contracts smaller than 40,000 Euro. Table 1.2 shows the results of Equation 1.1 using all the contracts for services and furniture smaller than 70,000 Euro. The number of contracts below 40,000 Euro increases on average by approximately 12 percent during the neighbouring dissolution and 26 percent afterwards. The coefficients are all stable to the inclusion of province-specific linear trends and controls.

Figure 1.5 shows the effect of a neighbouring dissolution on the number of contracts smaller than 40,000 Euro from Equation 1.1 for all the years before, during and after the dissolution. There is no anticipation effect of the neighbouring dissolution. During the dissolution, neighbouring municipalities increase the number of procurements between 25,000 and 40,000 Euro from 8 to 24 percent on average.



Figure 1.5: Effect of the dissolution on bunching at 40,000 Euro The Figure shows the effect of neighbouring dissolution on the number of procurements for services and furniture issued below the 40,000 Euro by treated municipalities. Coefficients represent the percentage increase in the number of procurement between 25,000 and 40,000 Euro issued before, during and after the neighbouring dissolution. The time 0 is the year of the dissolution, while commissioners are in charge up to year 3.

The effects of the implementation of a law enforcement measure in a neighbouring municipality are long lasting: they persist longer than the duration of the dissolution. A simple back-of-the-envelope calculation shows that the effect corresponds to an annual shift of 18 percent of the yearly expenditure on contracts between 40,000 and 100,000 Euros.

There might be different mechanisms explaining the municipalities' responses, hence it is difficult to interpret the results of the section without further analysis. In Section 1.6, I provide evidence to corroborate the hypothesis that the increase in the number of smaller contracts is an attempt to minimise scrutiny by law enforcement bodies exploiting less monitored margins of the procurement process.

1.6 Mechanisms

I discuss two results that help to interpret the findings in Section 1.5. In Section 1.6.1 I show that municipalities increase the number of contracts below the threshold by splitting a large project in multiple (smaller) contracts. In this way, the size of the project would not change, but the municipality could issue contracts smaller than 40,000 Euro.

In Section 1.6.2, I show that contracts moved from above the 40,000 Euro thresh-

old are those related to the sectors that organised crime is more likely to infiltrate. These sectors are construction and waste management and they are identified from the dissolutions reports. They show that criminal organisation infiltrated those sectors in 70 percent of the dissolutions.

1.6.1 Splitting a single project in multiple contracts

A municipality can keep contracts below the 40,000 Euro threshold by deciding to invest less resources in the project, this would imply issuing a smaller contract and impacting variables such as quality of the good, efficiency or corruption. Alternatively, the municipality can break a larger contract into multiple smaller contracts. Splitting would make the award of the overall project less transparent and would provide fewer circumstantial evidence for the law enforcement bodies to prove any potential irregularity without necessarily affecting real variables such as quality of the good.

I exploit the description of the procured good in each contract to determine whether two contracts are related to the same object and therefore could have been issued in a single (larger) contract. In particular, I compare the descriptions of all contracts smaller than 40,000 Euro, but jointly larger than the threshold, issued in the same year by the same municipality.

I compare the descriptions of the contracts using two different methods.²⁶ First I measure the similarity of the descriptions between two contracts with four different similarity measures: the Levenshtein measure, the Demerau-Levenshtein measure, the Jaro, and Jaro-Winkler measures. These are different ways to compute the similarity (i.e. the distance) between two matched descriptions for approximate string matching. For example, the Demerau-Levenshtein measure defines the distance between two strings by counting the minimum number of operations needed to transform one string into the other, where an operation is defined as an insertion, deletion or substitution of a single character, or a transposition of two adjacent characters. The main weakness of this method is in the way of computing similarity. These four measures do not capture the meaning of the words, but they only count the number of changes needed to make the two descriptions identical. Therefore, a use of different words to describe the same object (e.g. synonyms) could invalidate the results.²⁷

²⁶In Appendix A3, I describe the two methods in details.

 $^{^{27}}$ For example, the maximum similarity between the word *street* and *road* using the four above-mentioned measures is 0.472, on a maximum of 1, even thoug they are synonyms.

	Word2Vec		Appr. strin	g matching
	(1) Exp.	(2) Exp.	(3) Exp.	(4) Exp.
$Treat_{m,t}$ $AfterTreat_{m,t}$	$ \begin{array}{r} 42,831^{***}\\(11,923)\\57,483^{***}\\(21,254)\end{array} $	$27,645^{**} \\ (12,092) \\ 39,286^{*} \\ (20,993)$	$19,720^{***} \\ (7,029) \\ 30,755^{***} \\ (11,651)$	$14,362^{**} \\ (7,196) \\ 25,738^{**} \\ (11,751)$
Province linear trends	Ν	Y	Ν	Y
Observations Baseline mean	37,973 45,148	37,973 45,148	37,973 24,000	37,973 24,000

Table 1.3: Effect of the dissolution on the expenditure for split projects.

The outcome variable is the expenditure on split projects of services and furniture (i.e. contracts smaller than 40,000 Euro which are about the same object and pooled together would be a contract larger than 40,000 Euro) identified using Word2Vec and approximate string matching to compare the objects' descriptions. Two contracts are considered to be part of the same project if the similarity is 95 percent or higher. The following controls are included: population, indicator whether the mayor is born in the municipality, number of years until the next election, the average of the controls for neighbouring municipalities, year fixed effects and province-specific linear trends. I use the Conley standard errors to account for spatial HAC errors. Conley standard errors are computed for all the municipalities within a ten kilometre radius. Figure A1 shows the distribution of the number of municipalities.

Therefore, I complement these findings with a further analysis using word embeddings, a language modelling technique from natural language processing based on the co-occurrence of words to preserve their semantic meaning. In particular, the specific model I rely on is Word2Vec (Mikolov et al. (2013)). Word embeddings allows me to compare the meanings of the descriptions, allowing changes like synonyms and different ordering of the words. Appendix A3 shows the similarity scores with both methods for a sample of descriptions from the data. Word2vec performs better in capturing the differences in meanings between the contracts' descriptions.

Table 1.3 shows the results of Equation 1.2, using as outcome variable the yearly expenditure on split projects of services and furniture. In Table 1.3, two contracts are considered part of the same project if they are issued by the same municipality, in the same year, the joint value of the two projects is larger than 40,000 Euro and the similarity between the descriptions is at least 95 percent.²⁸

 $^{^{28}}$ Appendix A5 shows the results with different thresholds of similarity for both techniques.

	(1) Expenditure	(2) Expenditure	(3) Expenditure
	Expenditure	Experienture	Experiature
$Treat_{m,t}$	20,853 (15,174)	17,673 (13,751)	6,747 (8 577)
$AfterTreat_{m.t}$	$62,112^{***}$	62,992***	58,378***
• · · · · ·	(23, 831)	(23,508)	(17, 333)
$20,000 \text{ Euro} \leq \text{Contract Size} \leq 100,000 \text{ Euro}$	Υ	Ν	Ν
$20,000$ Euro \leq Contract Size \leq 80,000 Euro	Ν	Υ	Ν
30,000 Euro \leq Contract Size \leq 60,000 Euro	Ν	Ν	Υ
Observations	46,327	46,327	46,327

Table 1.4: Effect of the dissolution on the expenditure around the threshold.

The outcome variable is the yearly expenditure on contracts of services and furniture around the 40,000 Euro threshold. The following controls are included: population, indicator whether the mayor is born in the municipality, number of years until the next election, the average of the controls for neighbouring municipalities, year fixed effects and province-specific linear trends. I use the Conley standard errors to account for spatial HAC errors. Conley standard errors are computed for all the municipalities within a ten kilometre radius. Figure A1 shows the distribution of the number of municipalities within ten kilometres for all Italian

municipalities.

The use of two different methods for computing the similarity of the contracts' descriptions does not change the interpretation of the results. The main results are in column 2, in which Word2Vec is used to compute the similarity between the descriptions. After the dissolution of a municipal government, neighbouring municipalities increase the average expenditure on split projects by approximately 27 thousand Euro on a baseline of 45 thousand. The effect persists both during the presence of the commissioners and after they leave the dissolved municipality.

I complement the results in Table 1.3 with an analysis of the total yearly expenditure in contracts around the 40,000 Euro threshold. Table 1.4 shows the results of Equation 1.2, where the outcome variable is the yearly total expenditure on contracts for services and furniture of different sizes. In this way I show that municipalities are only making their public expenditure less transparent, with no change in the total amount spent around the threshold.²⁹

Therefore, results of Table 1.3 and 1.4 show that municipalities do not change the level of expenditure during a neighbouring dissolution, but they increase the share of the expenditure on less transparent contracts, that are more difficult for the law enforcement to monitor.

 $^{^{29}\}mathrm{Appendix}$ A5 shows the results on the yearly expenditure considering contracts of different sizes.

1.6.2 Results by types of good

In this section, I analyse what contracts municipalities move below the 40,000 Euro threshold during a neighbouring dissolution. I focus on what sectors the objects of the contracts are. As described in the dissolution reports, criminal organisations infiltrated dissolved municipalities in particular in two sectors of the municipalities activity: construction and waste management. Therefore, I exploit the detailed information for contracts larger than 40,000 Euro to analyse whether municipalities moved construction and waste management contracts below the 40,000 Euro threshold.

Table 1.5 shows the results of Equation 1.2 using as outcome variable the number of contracts issued above 40,000 Euro for the two of sectors³⁰. The first two columns show that treated municipalities only reduce the number of contracts above 40,000 Euro for goods in the construction and waste management sectors; the third and fourth columns show that there is no effect for contracts in all the other sectors.

The results of Table 1.5 shows that municipalities respond to a neighbouring dissolution by moving contracts which are more likely to suffer the influence of criminal organisations below the 40,000 Euro threshold. The results of this section and of Section 1.6.1 show that municipalities react to the neighbouring dissolution by splitting large projects in vulnerable sectors into multiple smaller and less transparent contracts. The law enforcement body then has to prove the maladministration in other ways, since the direct award for smaller contracts is considered a legitimate procedure.

1.7 Results on renegotiations

Renegotiation of a contract for public works is a phase of procurement that is vulnerable to corruption (Di Cristina (2012)). The municipality can award additional resources directly to the winning firm without a public tender. This creates incentive for collusion between the public official and the firm, winner of the contract. A contract should be renegotiated only when the firm incurs in an unexpected inconvenience that does not allow it to complete the object of the contract. In practice, contracts of public works are renegotiated in 30 percent of the cases.

Table 1.6 shows the results of Equation 1.3. The outcome is a dummy taking

 $^{^{30}\}mathrm{Appendix}$ A12 shows additional robustness on the results of Table 1.5.

	Construction and waste man.		Oth	ners
	(1)N	(2) N	(3) N	(4) N
$Treat_{m,t}$ $AfterTreat_{m,t}$	-0.120* (0.062) -0.007	-0.202*** (0.071) -0.116	0.055 (0.175) 0.279	$\begin{array}{c} 0.137 \\ (0.172) \\ 0.237 \end{array}$
	(0.109)	(0.126)	(0.268)	(0.289)
Province linear trends	Ν	Y	Ν	Y
Observations Baseline mean	$11,178 \\ 0.21$	$11,178 \\ 0.21$	$11,178 \\ 1.49$	$11,178 \\ 1.49$

Table 1.5: Effect on the number of contracts for services and furniture above 40,000 Euro by sectors.

The outcome variable is the number of contracts for services and furniture in the two categories of sectors. Contract size is between 40,000 Euro and 70,000 Euro. The waste management category includes the following types of services: waste management, removal of sewage, cleaning and environmental services. The following controls are included: population, indicator whether the mayor is born in the municipality, number of years until the next election, the average of the controls for neighbouring municipalities, year fixed effects and province-specific linear trends. I use the Conley standard errors to account for spatial HAC errors. Conley standard errors are computed for all the municipalities within a ten kilometre radius. Figure A1 shows the distribution of the number of municipalities within ten kilometres for all Italian municipalities.

(1)	(2)	(3)
Renegotiation=1	Renegotiation=1	Renegotiation=1
-0.061***	-0.064***	-0.038**
(0.016)	(0.017)	(0.019)
-0.039	-0.039	0.011
(0.025)	(0.027)	(0.033)
Ν	Ν	Y
Ν	Υ	Υ
Υ	Υ	Υ
77,338	73,087	73,087
0.297	0.297	0.297
	(1) Renegotiation=1 -0.061^{***} (0.016) -0.039 (0.025) N N Y 77,338 0.297	$\begin{array}{cccc} (1) & (2) \\ \mbox{Renegotiation}{=}1 & \mbox{Renegotiation}{=}1 \\ \hline -0.061^{***} & -0.064^{***} \\ (0.016) & (0.017) \\ -0.039 & -0.039 \\ (0.025) & (0.027) \\ \hline & & & & \\ & & & & \\ & & & & & \\ \hline & & & &$

Table 1.6: Effect of the dissolution on the probability of having a renegotiation.

The outcome variable is a dummy taking value 1 if the public works contract had been renegotiated. All the specifications have good fixed effect (i.e. based on the first four digits of

the *CPV*.) The following controls are included (when specified): population, indicator whether the mayor is born in the municipality, number of years until the next election, the average of the controls for neighbouring municipalities, year fixed effects and province-specific linear trends. I use the Conley standard errors to account for spatial HAC errors. Conley standard errors are computed for all the municipalities within a ten kilometre radius. Figure A1 shows the distribution of the number of municipalities within ten kilometres for all Italian municipalities. These results are based on all the public works larger than 150,000 Euro, the only contracts for which information about renegotiations is available.

value one if the contract has been renegotiated, zero otherwise. The probability of renegotiating the contract during a neighbouring dissolution decreases by approximately four percent.

Assuming that the renegotiation does not change the quality of the procured good, the municipalities engage less in activities that are often associated with corruption, when a neighbouring municipality is dissolved. Nevertheless it is possible that municipalities assign the resources previously awarded during the renegotiation to other phases of the procurement process. Therefore, in Table 1.7 I look at the effect of the neighbouring dissolution on the amount of resources spent on public works projects.

First, I compute the rebate for each contract. The rebate is a measure of relative saving that the public administration achieved in awarding the contract. Indeed, the Rebate_{q,m,t}, is defined as follows:

$$\text{Rebate}_{g,m,t} = \frac{\text{Reservation } \operatorname{Price}_{g,m,t} - \operatorname{Final } \operatorname{Price}_{g,m,t}}{\text{Reservation } \operatorname{Price}_{g,m,t}}$$
	(1)	(2)	(3)
	Renegotiation Value	Rebate	Tot. Project value
$Treat_{m,t}$ $AfterTreat_{m,t}$	-0.704** (0.337) -0.362 (-0.378)	-0.005 (0.008) -0.010 (0.013)	$\begin{array}{c} 0.011 \\ (0.062) \\ -0.005 \\ (0.087) \end{array}$
Observations	$18,541 \\ 13,419$	52,515	52,515
Baseline Mean		0.089	337,348

Table 1.7: Effect of the dissolution on values of the contracts of public works

The outcome variable are respectively the logarithm of value of renegotiations, the rebate and the logarithm of the total value of the projects. All specifications have good fixed effect (i.e. 206 different fixed effects coming from the *CPV*.) The following controls are included: population, indicator whether the mayor is born in the municipality, number of years until the next election, the average of the controls for neighbouring municipalities, year fixed effects

and province-specific linear trends. I use the Conley standard errors to account for spatial HAC errors. Conley standard errors are computed for all the municipalities within a ten kilometre radius. Figure A1 shows the distribution of the number of municipalities within ten kilometres for all Italian municipalities. These results are based on all the public works larger than 150,000 Euro, the only contracts for which information about renegotiations is available.

I estimate Equation 1.3 using three different outcomes. The first outcome is the logarithm of the value of the renegotiations, since the municipalities could agree to fewer renegotiations but increase the size of each of them. The second column uses the rebate of each contract, column three considers the total project size.

Table 1.7 shows that municipalities also decrease the size of renegotiations during the neighbouring dissolution, and they do not redistribute the decrease in resource spent during the renegotiation to other phases of the procurement process. Therefore, I conclude that the dissolution has a deterrent effect on the behaviour of neighbouring municipalities with respect to outcomes that the law enforcement body knows are particularly vulnerable to corruption, like the renegotiations. A back-of-the-envelope calculation shows that the decrease correspond to 9 percent of the yearly expenditure for public works larger than 150,000 Euro.

1.8 Robustness

In this section, I show the main robustness checks to confirm the validity of my results and their interpretation³¹. First, in Section 1.2.1, I check that the relevant difference between contracts above and below the threshold is the greater

³¹Appendix A4 shows additional robustness checks.

discretion to award smaller contracts without a public tender. By issuing a smaller contract, municipalities can have higher discretion in the choice of the winner firm and reduce the evidence that law enforcement bodies can use to prove potential illicit behaviours. I can test whether this is the provision that municipalities exploit, since it is the only change in the law at the 40,000 Euro threshold applying to services and furniture, but not to public works.

Therefore, Figure 1.6 shows the results of equation 1.1 for all the years before, during and after the neighbouring dissolution, replicating the analysis in Section 1.5 for public works only (top panel). Results for services and furniture (i.e. Figure 1.5) are replicated in the bottom panel. Since the effect comes exclusively from contracts for furniture and services, it confirms that municipalities increased the number of contracts smaller than 40,000 Euro for goods in construction and waste management to avoid the public tender without perpetrating any illicit behaviours (like the erroneous use of the emergency clause).

Second, Table 1.8 shows the results of Equation 1.1 using different sets of control groups. A possible concern is that using all the Italian municipalities that do not share a border with a dissolved municipality may be too broad as control group. There might be time-varying differences between municipalities that are not captured by the province-specific linear trends. Column 2 computes the results of Equation 1.1 limiting the control group to those municipalities in provinces with at least a dissolved municipality, but that do not share any border with it. Finally, column 3 exploits the different timing of the dissolutions to constrain the control group to those municipalities that will share (or had shared) a border with a dissolved municipality over the period. Results are robust to the inclusion of different control groups.

I next examine whether alternative hypotheses can explain the results of Equation 1.5. Other motivations can generate results similar to those of Section 1.5. For example, the dissolution is likely to create a shock in the procurement market of the area, since the dissolved municipality is likely not to operate at full capacity during its dissolution. In fact, Acconcia et al. (2014) and Galletta (2017) show how commissioners substantially reduce the spending of the municipality during the dissolution, since they have to eliminate the influence of organised crime in the municipality's business. Therefore, the commissioners' activity might reduce the size of the market for firms operating in the area. Therefore neighbouring municipalities can have more bargaining power following the dissolution and issue more contracts below 40,000 Euro to avoid the public tender and exploit the increase in bargaining power in a one-to-one negotiation with firms. Coviello



Figure 1.6: Effect of the dissolution on the bunching by procurement types The Figure shows the effect of the neighbouring dissolution on the number of procurements issued below the 40,000 Euro by the treated municipalities by procurement types. The top graph shows the effect for public works, whereas the bottom graph is for services and furniture. The coefficients represent the percentage increase in the number of procurements between 25,000 and 40,000 Euro issued before, during and after the dissolution of a neighbouring municipality. The time 0 is the year of the dissolution, while the commissioners are in charge of the neighbouring municipality up to year 3.

	(1) Num. Proc.	(2) Num. Proc.	(3) Num. Proc.
$Treat_{m,t} \times (25,000 \le \text{Bin} \le 40,000)$ $AfterTreat_{m,t} \times (25,000 \le \text{Bin} \le 40,000)$	0.122^{***} (0.027) 0.266^{***} (0.065)	0.081^{**} (0.033) 0.212^{***} (0.059)	0.103^{***} (0.037) 0.246^{***} (0.062)
	(0.003)	(0.000)	(0.002)
All mun.	Υ	Ν	Ν
Same Province	Ν	Υ	Ν
Neighbour only	Ν	Ν	Υ
Observations	507,20	111,649	$11,\!650$
Baseline Mean	5.65	5.60	6.03

Table 1.8: Effect of the dissolution using different control groups

The Table studies the effect of the neighbouring dissolution considering different control groups. The first column estimates Equation 1.1 on the full sample, the second one restricts it to those provinces with at least a dissolution over the period. Finally, the third column

estimates the results based only on the treated municipalities. I exploit the different timing of the dissolution to compare municipalities that are affected by the treatment at different points over the period. The outcome variable is the inverse hyperbolic sine of the number of procurements in each bin. The following controls are included: population, indicator whether the mayor is born in the municipality, number of years until the next election, the average of the controls for neighbouring municipalities, year fixed effects and province-specific linear trends. I use the Conley standard errors to account for spatial HAC errors. Conley standard

errors are computed for all the municipalities within a ten kilometre radius. Figure A1 shows the distribution of the number of municipalities within ten kilometres for all Italian

municipalities.

et al. (2018) show that higher discretion can be a condition that municipalities might exploit in order to improve the quality of the procured good.

Table 1.9 shows the results of the analysis of this alternative hypothesis. First, I compute the reduction in the procurement activity that each dissolved municipality faces during the dissolution, in the following way:

$$RelativeChange_{d} = \frac{\text{N. of Contracts}_{d,during} - \text{N. of Contracts}_{d,pre}}{\text{N. of Contracts}_{d,pre}}$$

N. of Contracts_{d,during} is the average number of procurement contracts issued during the dissolution by the dissolved municipality. N. of Contracts_{d,pre} is the average number of contracts issued in the years prior to the dissolution. Relative Change shows the average change in the procurement activity of the dissolved municipality, which captures the change in the bargaining power of the neighbouring municipalities. In fact, the more the dissolved municipality reduces its business (i.e. Relative Change is negative), the higher is the likely increase in the bargaining power of the neighbouring municipalities, since firms have lost more business opportunities.

Therefore, I estimate the following regression:

$$N_{b,m,t} = \alpha_b + \alpha_m + \alpha_t + \delta_0 Treat_{-m,t} + \delta_1 After Treat_{-m,t} + \delta_2 Treat_{-m,t} \times Relative Change_d + \delta_3 After Treat_{-m,t} \times Relative Change_d + \beta_0 Treat_{-m,t} \times \mathbb{1}\{25,000 \le b \le 40,000\} + \beta_1 After Treat_{-m,t} \times \mathbb{1}\{25,000 \le b \le 40,000\} + \beta_2 Treat_{-m,t} \times Relative Change_d \times \mathbb{1}\{25,000 \le b \le 40,000\} + \beta_3 After Treat_{-m,t} \times Relative Change_{-d} \times \mathbb{1}\{25,000 \le b \le 40,000\} + \gamma'_0 X_{m,t} + \gamma'_1 \overline{X}_{-m,t} + \epsilon_{b,m,t}$$

$$(1.4)$$

Equation 1.4 is similar to Equatin 1.1 with an additional interaction. I observe the differential effect of the neighbouring dissolution for municipalities with a different bargaining power. Table 1.9 shows the results of the estimation. The first column shows the results of Equation 1.1, and Column 2 those of Equation 1.4. The data shows that neighbouring municipalities increase the number of contracts below 40,000 Euro when the dissolved municipality reduces its business, since the coefficients of the interactions are negative and statistically significant. However, even though bargaining power may matter, its change cannot explain all the main effect.

	(1)	(2)
	Num. Proc.	Num. Proc
$Treat_{m,t} \times (25,000 \le Bin \le 40,000)$	0.103^{***}	0.122^{***}
	(0.037)	(0.039)
$AfterTreat_{m,t} \times (25,000 \le Bin \le 40,000)$	0.246^{***}	0.311^{***}
	(0.062)	(0.096)
$Treat_{m,t} \times (25,000 \le \text{Bin} \le 40,000) \times \text{Relative Change}_{-m}$		-0.0004**
		(0.0000)
$AfterTreat_{m,t} \times (25,000 \le Bin \le 40,000) \times Relative Change_{-m}$		-0.0004*
		(0.0000)
Observations	$11,\!650$	$11,\!650$
Baseline	6,03	6,03

Table 1.9: Effect on municipalities with different bargainig power

The table examines whether the effect of the dissolution is driven by an increase in the bargaining power of the neighbouring municipalities. A change of one unit in

Relative Change_m corresponds to a change of ten units of procurement contracts compared to before the dissolution. The outcome variable is the inverse hyperbolic sine of the number of procurements in each bin. The following controls are included: population, indicator whether the mayor is born in the municipality, number of years until the next election, the average of

the controls for neighbouring municipalities, year fixed effects and province-specific linear trends. I use the Conley standard errors to account for spatial HAC errors. Conley standard errors are computed for all the municipalities within a ten kilometre radius. Figure A1 shows

the distribution of the number of municipalities within ten kilometres for all Italian municipalities.

1.9 Conclusion

I show that anti-corruption measures are not only an effective way to make public officials accountable and prevent illegal activities, but they also impact the behaviour of other unmonitored institutions. I focus on the behaviour of Italian municipalities and I show that they react to the dissolution of a neighbouring municipal government for mafia infiltration. I show that neighbouring municipalities attempt to minimise scrutiny by the law enforcement body exploiting less monitored margin of the procurement process and engaging less in activities with higher risk of corruption.

I focus on two particular dimensions of procurement by Italian municipalities. First, I show the municipalities' behaviour in issuing procurement contracts for services and furniture around a relevant threshold (i.e. 40,000 Euro). Contracts for services and furniture below 40,000 Euros have fewer evidentiary requirements, since municipalities can award them directly to a firm without committing any irregularity. Furthermore, contracts smaller than 40,000 Euro are also less transparent, since the municipality does not have to publish any documentation prior to awarding the contract and has to provide a lower level of information to the monitoring authority.

Finally, I study whether neighbouring municipalities renegotiate public works contracts. Renegotiations are considered one of the most delicate phases of the procurement process in terms of corruption, since they are top up payments from the municipality to the winning firm, without the use of a public tender.

I show that when the national government dissolves a municipal government, neighbouring municipalities increase the number of procurement contracts smaller than 40,000 Euro, without changing the total amount spent around the threshold. In particular, municipalities split larger contracts in those sectors that are more likely to be infiltrated by organised crime into multiple contracts smaller than 40,000 Euro.

After a dissolution, neighbouring municipalities do not reduce the amount of resources spent on contracts around the 40,000 Euro threshold. They make the expenditure in these vulnerable sectors less transparent and with fewer evidentiary requirements.

This paper has important policy implications. I show that the dissolution of a municipal government has unfortunate consequences on unmonitored public bodies as well, since it induces neighbouring municipalities to make part of their (more vulnerable) procurement activity less transparent and more discretionary.

2 Does decentralization matter? Evidence from Italian municipalities

with Maggie Shi

2.1 Introduction

In recent decades, there has been a movement toward fiscal decentralization across many countries. The fiscal autonomy of local governments has been increasing steadily – between 1995 and 2015, the share of tax revenue collected by state or local authorities increased in 25 out of 34 OECD countries (?). Proponents of decentralization argue that giving local governments more fiscal autonomy in raising revenue improves efficiency by improving public goods provision (e.g., Tiebout (1956); Musgrave (1959); Oates (1972)). The underlying premise of these arguments is that if local governments were given more fiscal autonomy, they would behave *differently* than the national government would, due to different preferences, information, or political incentives. In contrast, in a world without these differences or distorted incentives, a tax system of local taxes would be equivalent to a system of national taxes which are then transferred to local governments (Ambrosanio and Bordignon Ambrosiano and Bordignon (2006)). Thus, the question of whether devolving fiscal autonomy to local governments changes taxation (and expenditure) behavior, relative to what the national government would have done, is an empirical one.

The terms "fiscal federalism" and "fiscal autonomy" can be used to describe various dimensions of decentralization (Ahmad and Brosio (2015)). In this paper we study two specific (but common) ways countries decentralize: by giving local governments more *discretion* in raising revenue and more *responsibility* over their budget. In our setting, more discretion in raising revenue means giving them more autonomy to deciding how much tax revenue to collect. More responsibility means requiring that they raise a greater share of their budget from taxation as opposed to relying on transfers from a higher level of authority.

In this paper, we consider an increase in financial autonomy that occurred to over 7000 Italian municipalities. In 2012, the Italian national government expanded the municipal property tax. First, this reform gave municipalities more discretion over the tax by substantially expanding the range of tax rates a municipality could apply to the property. The reform expanded the range of possible tax rates from [0.4 - 0.7%] to [0.46 - 1.06%].¹ Second, it increased municipal financial responsibility by cutting transfers by an amount equal to the *expected* change in property tax revenue, leaving municipalities responsible for raising a larger share of their own budgets. We take the expected change in property tax revenue, equal to the value of transfers cut, to be a measure of how much revenue the national government *would* have raised if they did not give municipalities the discretion to pick tax rates. The source of variation in our study comes from the different values of the expected change in property tax revenue computed for each municipality.

This reform provides a useful setting for studying the effect of increased discretion on local taxation. The expected change in property tax revenue serves as a benchmark for a counterfactual in which the national government, rather than municipalities, has discretion to choose tax rates. Combining our novel data on the national government's *expected* change in revenue with data on the *actual* change under the municipality's discretion, we find that in response to increased discretion, municipalities deviated from what the national government would have done in terms of revenue collected. Only 20% of municipalities collected within 25% of what the national government suggested. On average, municipalities raised more than the national government would have – for every Euro of expected additional revenue, municipalities actually raised 1.25 Euros.

Then, we focus on the effect of greater fiscal autonomy on other aspects of the municipal budget. We use the expected additional property tax revenue (equal to the reduction in transfer) as an instrument for the change in budget share a municipality is responsible for raising. Combining this instrument with data on yearly municipal balance sheets between 2008 and 2014, we show two main findings.

First, we show that in response to a one percent increase in (instrumented) fiscal autonomy, municipalities increase their total expenditure by 0.4 percent on average. In particular, expenditure for services increases by 0.7 percent, while expenditure on administration decreases by 0.8 percent.² These results are consistent with previous literature demonstrating how increased fiscal autonomy is associ-

¹Specifically, this example is for "base" buildings, which comprise most of the property tax revenue for municipalities. There are also other ranges for other types of buildings, as described in Section 2. It also broadened the property tax base to include main residences in 2012, although this was repealed two years later. We do not consider the broadening of the tax base to be an increase in municipalities' discretion because municipalities had no choice in the tax base, and all municipalities' tax bases broadened in the same way.

²In the Appendix, we show that municipalities spend the additional resources to improve the provision of public goods (i.e., average increase in nursery schools, local police officers, and police cars they use).

ated with better provision of public goods (Martinez (2016), Gadenne (2017), and Bianchi et al. (2019)).

Second, we find that municipalities use part of the additional revenue from the increase in property tax to reduce borrowing. Municipalities respond to an increase of one percent in fiscal autonomy induced by the reform by decreasing the level of borrowing by about 8 percent. On net, municipalities responded to increased responsibility by increasing their budget size, despite decreases in borrowing and no increases in non-property tax revenue.

We then test whether credible fiscal rules can induce municipalities to limit debt accumulation, which has been suggested as a potential response to increases in local government autonomy (Dovis and Kirpalani (2020)). Exploiting the application of a fiscal rule limiting borrowing (the Domestic Stability Pact (DSP)) to all municipalities larger than 5,000 inhabitants, we find that only municipalities subject to fiscal rules reduce borrowing. This result demonstrates how fiscal rules can limit the over-borrowing response of municipalities to greater autonomy.

A key assumption underlying our identification strategy is the exogeneity of the decentralization reform. We rely on the fact that the timing of the reform is exogenous to a municipality, as well as the exact size of the transfer cut it faced. As we discuss in Section 2.2, the timing of this reform was unexpectedly moved forward – the national government had originally planned to introduce changes to the property tax in 2014, and unexpectedly decided to move it forward to 2012 in December 2011. Thus, we believe that our results are not marred by any anticipatory behavior by municipalities. Additionally, from the municipality's perspective, the expected additional revenue (equal to the municipality's transfer cut) is exogenous and not manipulable. The expected additional revenue was calculated by the national government and was based on a municipality's prereform tax base. The registry of taxable buildings and land is maintained by the Agenzia del Territorio, a national agency. Thus, any change in the own-revenue share of a municipality's budget captured by our instrument is exogenous to the municipality, as the level of transfer cuts was out of their control. We also argue that the variation in actual property tax revenue collected is due to differences in choices over the tax rate, and not due to variation in the level of tax enforcement across municipalities. This is because a centralized national agency (i.e. Agenzia *delle Entrate*) is in charge of the tax enforcement for the entire country, and this agency is not under the control of individual municipalities.

This paper contributes to several strands of literature on local public finance and fiscal federalism. First, we contribute to a classic literature on the optimal alloca-

tion of fiscal responsibilities across multiple levels of government. This literature generally supports decentralization, but for a variety of reasons: minimizing efficiency costs (Musgrave (1959)), matching preferences (Tiebout (1956); Oates (1972), Oates (2005)), the restraining power of tax competition across jurisdictions (Brennan and Buchanan (1980)), spillovers (Besley and Coate (2003)), and electoral incentives for local government officials (e.g. Persson and Tabellini (2002), Brollo et al. (2013) and Bordignon et al. (2020)).³ Our paper addresses a question underlying each of these arguments – does decentralization imply a different level of taxation and spending? In practice, all of the theories imply that increasing local autonomy changes revenue collection and expenditure relative to what a higher level of government would do. Otherwise, decentralization would not have any meaningful effect.

Second, this paper contributes to a growing empirical literature on the causal effects of fiscal autonomy for local governments. In terms of context, Bianchi et al (Bianchi, Giorcelli, and Martino (2019)) is closely related to our paper. They exploit a similar property tax reform implemented in Italy in the early 1990's. They use the location of the Allied bombings during the World War II as exogenous variation in the average age of the buildings across municipalities, and the consequent change as property tax base. They find that greater fiscal autonomy improves the provision of public goods (i.e. nursery schools) with consequences for the labour market, in particular on the gender gap in employment. Two recent papers by Martinez (Martinez (2016)) and Gadenne (Gadenne (2017)) address a question that is related to ours, which is whether local governments spend differently when the revenue source is internal (i.e., local taxes) as opposed to external (i.e., non-tax revenue). Comparing these two revenue sources in Colombia and Brazil respectively, they find that local governments tend to spend internally-raised revenue on public services and infrastructure to improve education and health. Similar to these papers, we find that increased autonomy results in more expenditure on services and less on administration. However, we also document the effect of increased autonomy on *revenue* collected relative to what the national government would have done, as well as the level of borrowing.

Finally, our paper contributes to large literature on the so-called *soft budget* $constraint^4$ (Kornai (1979), Maskin (1999), Bordignon and Turati (2009) and Pettersson-Lidbom (2010)), and on the effects of fiscal rules (Beetsma and Uh-

 $^{^{3}\}mathrm{Ahmad}$ and Brosio (2015) present an exhaustive review of the political economy of decentralization.

⁴The term is used to describe a wide range of cases where economic entities increase their debt level since they can expect their deficits to be covered by some form of "supporting organization" (i.e. the national government in our setting).

lig (1999), Grembi et al. (2016), Coviello et al. (2017), Daniele and Giommoni (2020)). In particular, we provide empirical evidence for the hypothesis suggested by Dovis and Kirpalani (2020). They show theoretically how fiscal rules can limit overborrowing by local public bodies, and under what conditions this holds. In line with their model, we show that municipalities subject to a credible fiscal rule respond to an increase in fiscal autonomy by decreasing borrowing at a higher rate than municipalities not subject to a fiscal rule.

The paper is organized as follows: Section 2.2 describes the policy setting and details of the reform. Sections 2.3 and 3.3 describe the data and identification strategy we use to exploit the reform in order to answer the research questions. Section 3.4 lays out our results. Finally, Section 2.6 describes the implications of our findings and concludes.

2.2 Institutional Framework

Italy is divided into 20 regions, 110 provinces, and approximately 8,000 municipalities.⁵ Historically, the national government held most of the fiscal autonomy on expenditure and tax decisions. In recent years, however, it has been devolving expenditure and revenue responsibilities from higher levels of government to lower ones.⁶

Our paper focuses on revenue and expenditure at the municipality level. In 2017, municipal government expenditure comprised 13.9% of Italy's GDP. Between 2005 and 2014, on average 26% of a municipality's revenue came from taxes. The Italian municipal tax system is comprised of three main taxes: property taxes (known as IMU from 2012; 54% of total municipal tax revenue between 2005 and 2014), waste disposal tax, and the municipal surcharge on personal income (*addizionale IRPEF*). In this paper, we leverage a reform on property taxes, which are raised by municipalities. We use a policy reform implemented in Italy in 2012 that increased the fiscal autonomy of municipalities by coupling an increase in the municipality's property tax revenue with a decrease of transfers from the national government.

The Italian national government laid out an administrative and fiscal decen-

⁵Some Italian regions have more autonomy compared to the others (i.e. Sicily, Valle D'Aosta, Trentino Alto Adige, Friuli Venezia Giulia, and Sardinia). We exclude them from the analysis since the IMU reform was implemented differently in these regions. Additionally, because these regions are semi-autonomous, they do not share property tax data with the national government.

⁶For example, provinces were also subject to a large reform in 2014. Provincial leadership is no longer elected, and some of their responsibilities were given to municipal and regional governments.

tralization plan starting from the first years of the 1990s.⁷ The decentralization process continued in the early 2000s with a constitutional reform that overhauled the responsibilities of the national and regional governments on important public sectors (e.g. the health sector). The plan was for the decentralization process to come to an end in 2014 with the introduction of a new property tax (*Imposta Municipale Propria*, or IMU) raised by municipalities, coupled with an equivalent reduction of the national transfers. The goal of the reform was to increase each municipality's revenue-raising ability without changing the level of their budget.

However in 2011, in response to Italy's economic condition following the recession, the national government implemented a fiscal adjustment program. Part of this program included moving the introduction of IMU forward from 2014 to 2012. The reform substantially increased the amount of property tax revenue municipalities collected, while reducing the amount of national transfers to municipalities.⁸ It essentially doubled the valuation of the tax base, added the main residence to the tax base, and introduced new tax rates by building type (Ambrosanio et al. (2014)). Each building type was assigned a "suggested" national tax rate, but municipalities could choose to set their own tax rate within a given range. For example, the suggested rate for base buildings was 0.76%, but municipalities could choose to set the tax rate between 0.46% and 1.06%.⁹ In subsequent years, details of how the IMU is calculated have changed, but for the purpose of this paper, we focus solely on the 2012 reform.¹⁰

Using the suggested tax rate for each building type, the national government calculated a municipality's expected additional property tax revenue. It then cut transfers to each municipality by this amount. In doing so, the national government intended for the 2012 reform to be budget-neutral. Figure 2.1 shows the average expected impact of the IMU reform on the municipalities' revenue for each Italian province.

The details of the reform are essential to our empirical strategy. Transfers from the national government were reduced by an amount equal to the additional

 $^{^7\}mathrm{The}$ first laws on administrative decentralization were issued in 1991-1992: D.L. 299/1991 and D.Lgs. 504/1992.

 $^{^{8}}$ The overall property tax revenue increased from 9.8 billions of Euros to 23.8 billion Euros (Ambrosanio et al. (2014)).

⁹The main residence rate was 0.4% (+/- 0.2), the rural buildings rate was 0.2 (+/- 0.1), and the rate for buildings constructed for sale was 0.72 (+/- 0.34).

¹⁰In particular, there have been two main changes: first, the main residence is excluded from the property tax base since 2014, but other types of buildings are included. Second, in 2013 the national state introduced the Solidarity Fund (*Fondo di solidarieta' comunale*) to distribute the resources from municipality would have increased their revenue with the introduction of IMU to those who reduced it.



Figure 2.1: Impact of the IMU reform by Italian province The figure represents the impact of the IMU reform as share of the municipalities' revenue.

property tax revenue the national government *expected* municipalities to collect after IMU was introduced. The national government calculated the expected change in property tax revenue by picking a single tax rate for each building type, multiplying it by the value of all buildings of that type in a municipality, and then summing across all building types to arrive at a final expected property tax revenue amount (and transfer cut) for the municipality. The size of the transfer cut was determined using the suggested tax rates for each type of building, independent of any deductions or rate changes picked by the municipality.

We argue that the magnitude of the expected property tax revenue and transfer cut is exogenous to the municipality in that the municipality could not influence its size. First, municipalities had no control over the tax rate – the calculation was done with the same property tax rate by building type for each municipality. Second, municipalities had little control over the tax base in the time between announcement and implementation of the reform. Given that the reform was unexpectedly moved forward to 2012 in December 2011, we argue that municipalities did not have time to change the number of buildings in each municipality is collected by a national agency and the tax value of each type of building was set nationally in 1990.¹¹ The building and land registries are kept by a national agency (Agenzia del Territorio), and building owners report directly to

 $^{^{11}}$ D.Lgs. 347/1990

this national agency (Casaburi and Troiano (2016)).¹²

Our later analysis on deficit reduction leverage the differential application of fiscal rules across different municipalities. After the adoption of the European Stability Pact from the European Union in 1997, Italy also introduced a set of rules that constrained all municipalities in terms of fiscal discipline (i.e. the *Domestic Stability Pact*, DSP). In practice, municipalities were constrained to keep the growth of their fiscal gap (i.e. deficit, net transfers and level of debts) under control. We leverage this separate policy to test whether a fiscal rule affects how a municipality responds to newfound fiscal autonomy after the property tax reform. The punishment for not complying with the DSP was the following: first, a 5 percent cut in the annual transfers from central government, then a ban on municipality hiring and, finally, a cut on bonuses for the employees in the municipal administration. The exact details of the DSP and the population threshold for its implementation have changed frequently from its inception.¹³ In particular, we exploit a discontinuity in municipality population for the application of the DSP that was in place up to 2012. Municipalities with more than 5,000 inhabitants were subject to the DSP, while the other were not.¹⁴

2.3 Data and Descriptive Statistics

The data for this project draw from several Italian government sources. For data on municipal revenue, expenditure, and public goods provision we scrape municipal balance sheet data from the *Open Bilanci* website¹⁵, which has a variety of municipal-level information from 2007 to 2014. Among revenue variables, we scrape total revenue, municipal taxes (property tax, personal income tax (IR-PEF), taxes on services, and other taxes), revenues from fees, transfers from national/regional governments and other sources, non-tax revenues, loans, sales and capital transfers, and revenue from deposits paid by third parties. We use this to construct three sources of revenue for a municipality: own revenue, trans-

¹²Casaburi and Troiano (Casaburi and Troiano (2016)) consider a national anti-tax evasion policy led by Agenzia de Territorio in 2007, known as the "Ghost Buildings" program, which detected and added more than 2 million parcels to the national land registry.

 $^{^{13}}$ Grembi et al. (2016) describes the functioning of DSP in details.

¹⁴From 2013, municipalities with more than 1,000 inhabitants were subject to the DSP as well. We use the shift of the threshold in the Appendix as a robustness check.

¹⁵https://openbilanci.it/.

fers, and other sources.¹⁶ From *Open Bilanci*, we also collected information on the total municipal expenditure and on the expenditure by sectors of activity. We have information on the level of expenditure on the following sectors of municipal activity: administration, social, territory and environmental services, instruction, roads and transport, culture, sport, police and justice. Finally, we have information on the provision of public goods for some of these sectors; in particular, nursery schools, local police officers and general waste collection.

We collect data on the IMU reform and the other transfers cuts from the *Istituto* per la Finanza e l'Economia Locale (IFEL), which collects information on the size of transfer cuts/expected change in property tax revenue for each Italian municipality. Finally, we collect information on sociodemographic variables for each municipality from the Italian National Bureau of Statistics *ISTAT*.

Table 3.1 shows the descriptive statistics for the municipalities in the study. We report information on the average yearly value of expenditure and revenue, as well as the shares of expenditure and revenue by invoice account. The most relevant municipal expenditure categories are on services provided (57%), administration (27%), and debt repayment (7%). Property tax revenue is on average the largest source of tax revenue for the municipalities (14%), and transfers from the national government account for approximately 19% of the municipalities' budget.

2.4 Empirical Strategy

We use multiple empirical strategies to study the 2012 property tax reform which increased municipalities' discretion and responsibility over raising their own revenue. We leverage two dimensions of exogeneity: first, that the timing of the reform was unexpected, and second, that the level of the additional revenue the national government expected the municipality to raise (and thus, the size of the transfer cut) was exogenous and could not be manipulated by the municipality. While the plan to expand the property tax had been set into motion before 2012, it was originally planned for 2014. In December 2011, the implementation was unexpected moved forward to 2012.¹⁷ Therefore, we believe that our results are

¹⁶Our definitions of these revenue sources deviate from that of the national Department of Finance and Open Bilanci. We assign revenue from shared funds such as the experimental rebalancing fund and later the municipal solidarity fund (*Fondo di solidarieta' comunale*) as transfers, while the official definition assigns them as tax revenue. We do this to highlight what we believe to be the relevant difference between transfers and own revenue for a municipality. From a municipality's point of view, transfers from this fund are transfers from a higher level of government relative to the municipality. We have confirmed the validity of defining revenue in this way with subject matter experts at the Bank of Italy.

 $^{^{17} {\}rm The}~D.L.~2011/2011$ explicitly states: "The introduction of the IMU is anticipated to 2012 $[\ldots]$."

	All municipalities		
	Mean	Median	Std dev.
Total Expenditure (thousands of Euro)	5,707	2,873	(9,477)
Share of expenditure by sectors:			
Services	0.57		(0.09)
Administration	0.27		(0.07)
Debts repayments	0.07		(0.07)
Other expenditure	0.08		(0.03)
Total Revenue (thousands of Euro)	5,707	2,873	(9,477)
Share of revenue by source:			
Property tax	0.14		(0.07)
Transfers from national gov.	0.19		(0.07)
New loans	0.08		(0.08)
Other taxes	0.12		(0.05)
Other transfers	0.06		(0.04)
Other revenues	0.41		(0.11)
Reform			
Amount (thousands of Euro)	182	70.5	(307)
Amount (as share of 2011 mun. revenue)	0.03	0.03	(0.03)
Municipalities characteristics			
Population	5,228	2,403	(8, 194)
Sh. subject to DSP	0.75		(0.43)
N. of municipalities	6,323		

Table 2.1: Descriptive Statistics

The table shows the descriptive statistics of the variables used in this paper. We show respectively: the average yearly expenditure by sectors, the average yearly revenue by source, the average impact of the reform, the average population and the share of municipalities subject to the DSP at least once in the period.

not marred by any anticipatory behavior by municipalities. Additionally, the size of the impact of the reform is exogenous to the municipality because it is determined by the national government's calculation of the expected additional revenue. This calculation is based on two elements which municipalities could not manipulate in 2012: the national government's chosen tax rate, and the municipality's pre-reform tax base. The municipality has little say in deciding either of the inputs to the national government's calculation.

In order to study how municipalities responded to additional discretion over tax rates, our first empirical strategy is to directly compare the national government's expected change in property tax revenue to each municipality's actual change in property tax revenue. Given the exogeneity of the timing and level of the reform, this direct comparison reveals the causal effect of the reform on property tax collected. We thus first consider the correlation between the *one-year difference* in actual additional property tax collected to the expected property tax. The national government intended for the reform to be budget neutral, so the two should be equal to each other. In other words, if the coefficient is equal to one, then there is no difference between the municipalities' response and what the national government would have done. If it is different than one, it indicates that giving municipalities more discretion resulted in municipalities collecting a different level of property tax revenue collected than what the national government prescribed.

This interpretation of the correlation between actual and expected revenue relies on the assumption that differences in the amount of revenue collected by municipalities are driven by differences in municipal choices, rather than differences in the ability to collect taxes. We are argue that there is little difference across Italian municipalities in their ability to collect property taxes. Municipalities are not in charge of the tax collection, as it is the responsibility of a *Agenzia delle Entrate*, a national agency. In order for the results to be driven by differences in tax compliance, it would require that a centralized agency collect taxes differently across municipalities. Additionally, Brockmeyer et al. (Brockmeyer, Estefan, Arras, and Serrato (2019)) demonstrate that property tax evasion by citizens is not very responsive to changes in property tax rate. Thus, we assume that the observed differences in revenue collected stem from municipalities exercising their discretion and choosing different tax rates than what the national government suggested.¹⁸

¹⁸In principle, we could directly check this assumption by comparing tax rates chosen by municipalities to the national tax rates. However, after speaking with subject matter experts at the *Istituto perla Finanza e lEconomia Locale*, which tracked the expected transfer cuts from the IMU reform, data on subsequent tax rate changes by municipalities has not been collected.

We then consider the relationship between the expected property tax revenue and tax revenue collected in subsequent years. We include the value of the IMU reform (i.e. $ExpAddRev_{m,11-12}$) in the following regression specification to estimate the effect of the reform on average post-reform property tax collection in 2012-2014.

$$Y_{mt} = \kappa_{1t} ExpAddRev_{m,11-12} \times 1(Year \ge 2012) + \mathbf{X}_{mt}\kappa_2 + \alpha_m + \eta_t + \varepsilon_{mt} \quad (2.1)$$

where Y_{mt} is the level of the property tax revenue, η_t is a year fixed effect, α_m is a municipality fixed effect, \mathbf{X}_{mt} is a vector of controls including the level of the municipal population in a given year, the other changes in municipality transfers in a given year, and a dummy equal to 1 if the municipality is subject to the DSP.

Next, we use an instrumented difference-in-difference specification to study how municipalities responded to the responsibility of raising a larger share of their budget. We use the expected additional revenue as an instrument for the share of the budget the municipality is responsible for raising, which we call *fiscal autonomy* (i.e. *FiscAut*). Specifically, we define the fiscal autonomy of municipality m in year t as follows:

$$FiscAut_{mt} \equiv \frac{OwnRevenue_{mt}}{MunicipalRevenue_{mt}} = \frac{PropertyTax_{mt} + OtherTax_{mt}}{MunicipalRevenue_{mt}}$$

The value in the denominator, municipal revenue, is the sum of tax revenue, transfers, and other revenue sources. The value in the numerator, own tax revenue, is the sum of property tax, the tax on personal income (i.e. IRPEF), trash, taxes from public occupation, and other minor taxes.¹⁹ We would like to compare municipalities with a large change in $FiscAut_{mt}$ to a small change in $FiscAut_{mt}$ due to the reform.

Municipalities can adjust $FiscAut_{mt}$ in response to the national reform, or for reasons unrelated to the national reform – thus, $FiscAut_{mt}$ is likely to be correlated with time-varying unobserved variables that could also affect outcome variables. But by instrumenting for $FiscAut_{mt}$ using just the expected change prescribed by the property tax reform, we isolate the causal effect of additional fiscal autonomy on the outcome variables.

Thus, the instrumented difference-in-difference specification is:

¹⁹Property taxes contribute the largest proportion of own revenue (54% on average).

First stage:
$$FiscAut_{mt} = \gamma_1 ExpAddRev_{mt} \times 1(Year \ge 2012) + \mathbf{X}_{mt}\gamma_2 + \eta_t + \alpha_m + \nu_{mt}$$

Second stage: $Y_{mt} = \beta_1 FiscAut_{mt} + \beta_2 \mathbf{X}_{mt} + \eta_t + \alpha_m + \varepsilon_{mt}$

$$(2.2)$$

where η_t is a year fixed effect, α_m is a municipality fixed effect, X_{mt} is a vector of controls including the log of municipal population in a given year, and the log of other changes in municipality transfers in a given year.²⁰ β_1 represents the effect of a 1 percentage point increase in fiscal autonomy, or the budget share a municipality is responsible for raising, on outcome Y_{mt} .

The identifying assumption in these specifications is that absent the 2012 IMU reform, outcomes of municipalities affected more or less by the reform would have trended similarly. We can test this hypothesis by verifying the parallel trends assumption. To check for parallel trends, in Figure 2.2 we plot the results of an event study of the reform on property tax collected.²¹ We interact $ExpAddRev_{m,11-12}$ with a year dummies, and regress it on the total property tax collected, controlling for population, other transfers, and municipality fixed effects. The omitted year is 2011, the pre-reform year.²²

Before 2012, the coefficient is statistically insignificant, indicating that municipalities affected more by the reform trended parallel to municipalities affected less in terms of property tax collection. After 2012, we see that the coefficient is positive and statistically significant, reflecting that municipalities more affected by the reform collected more property tax revenue.

Finally, we use Equation 2.2 to study whether being subject to the DSP affects a municipality's response to additional fiscal autonomy. In 2012, municipalities with a population greater than 5,000 inhabitants were subject to the DSP, while municipalities below this threshold were not. Similar to previous work on the effect of fiscal rules (e.g. Grembi et al. (2016), Coviello et al. (2017)), we exploit the sharp discontinuity in the application of more binding fiscal rules. Focusing only on observations up to 2012 and on municipalities around the 5,000 threshold, we study the differential effect of fiscal decentralisation on municipalities subject

 $Y_{mt} = \kappa_{1t} (ExpAddRev_{m,11-12} \times Year_t) + \kappa_2 Pop_{mt} + \kappa_3 OthTransf_{mt} + \alpha_m + \varepsilon_{mt}$

²⁰In Figure B1 in the Appendix, we show the correlation between the other transfers implemented by the national government or any other public body in any year and the IMU transfers cut. They are uncorrelated. This shows that the national government did not use other reforms to strategically compensate the municipalities affected by the IMU reform.

²¹Figure B2 and B3 in the Appendix show the same analysis for tax revenue and expenditure on services.

 $^{^{22}}$ The specification of the event study is as follows:



Figure 2.2: Event study of reform on property tax collected (Euros). This specification interacts $ExpAddRev_{m,11-12}$ with a dummy for the year variable. Controls: population, other transfers, and municipality fixed effects. Outcome is the value of property tax collected. Omitted year: 2011.

to binding fiscal rules.

2.5 Results

Our first empirical strategy focuses on the effect of greater discretion on municipalities' behaviour. We compare the national government's expected change in property tax revenue for each municipality to each municipality's actual change in revenue due to the reform. Figure 2.3 plots the correlation between the national government's expected change between 2011 and 2012, equal to the reform transfer cut (x-axis), against the actual change in property tax between 2011 and 2012 (y-axis). The solid line represents the fitted line in the scatter plot from a regression of expected change on actual change with no constant. The slope of this fitted line is 1.56, and it is statistically different from 1. The dotted line represents the 45 degree line; if municipalities acted exactly as the national government expected them to, we would see that all the points are on this line. Instead, the average municipality collects 1.56 Euros for every Euro the national government expected them to, indicating that given additional discretion, the municipalities collected more property tax than the national government would



Figure 2.3: Scatterplot of the municipalities' response to higher discretion. The scatterplot represents on the x-axis the expected increase in the property tax revenue, and the actual increase in property tax revenue between 2011 and 2012 on the y-axis. Solid line represents the fitted line of a regression without constant, and dashed line represents the 45 degree line. The slope of this fitted line is 1.56 (SE = 0.014).

have.

Figure 2.4 shows the relative deviation from the expected increase of the actual change in property tax revenue in 2012. Although Figure 2.3 shows that the municipalities collect on average more additional property tax revenue than the expected amount, Figure 2.4 highlights that there is substantial heterogeneity in the response. Only 20 percent of the municipalities collect an amount of property tax revenue within 25 percent of what was expected from the national government. 49 percent of the municipalities collect at least 25 percent more, and 31 percent at least 25 percent less, than the amount expected by the national government.

We next extend these results to all post-policy years beyond just 2012 and control for time-varying factors that could affect property revenue collection: population, transfer cuts, and whether the municipality was subject to the DSP. Table 2.2 shows the results of Equation 2.1, which directly regresses $ExpAddRev_{mt}$ on property tax revenue between 2007 and 2014. The results demonstrate that on average in the post-policy years (2012-2014), municipalities responded to their



Figure 2.4: Relative change of the property tax from the expected revenue. The figure shows the distribution of the relative deviation of the actual property tax response from the expected increase. The x-axis is computed as $(PropertyTaxRev_{m,12}-PropertyTaxRev_{m,11})-ExpAddRev_{m,11-12}$ The dotted line shows the average

 $\frac{(1 + operty f a x he v_{m,12} - 1 + operty f a x he v_{m,11}) - ExpAdd Rev_{m,11-12}}{ExpAdd Rev_{m,11-12}}$ The dotted line shows the average deviation.

newfound discretion by collecting 25 percent more than the national government would have. Note that this is lower than the one-year difference, as the IMU was changed in subsequent years. The coefficient in Equation 2.1 represents the average of the initial 2012 policy as well as subsequent changes in 2013 and 2014.

Next, we turn to the question of how municipalities responded to the additional revenue-raising responsibility. We use an instrumented difference-in-difference approach to isolate the effect of the property tax reform on the share of the budget the municipality must raise via tax revenue. This is captured by the coefficient on $\widehat{FiscAut}_{mt}$, the instrumented own tax share of total municipal revenue.

We first demonstrate that the expected additional property tax revenue is associated with an increase in $FiscAut_{mt}$, the own tax revenue share of total municipal revenue – the "first stage." Table 2.3 reports the coefficient from the first stage of Equation 2.2, or the relationship between $ExpAddRev_{mt}$ and fiscal autonomy. We see that a 1000 Euro increase in expected additional property tax is associated with a 0.4% increase in $FiscAut_{mt}$.

We then use the instrumented fiscal autonomy in a difference-in-difference regression to study the effect of increased municipal responsibility induced by the reform on municipal revenue and expenditure categories. Table 2.4 shows the

	(1)	(2)	(3)
	Property tax rev	Property tax rev	Property tax rev
$ExpAddRev_{mt} \times 1(Year \ge 2012)$	$1.38^{***} \\ (0.05)$	1.25^{***} (0.06)	$1.24^{***} \\ (0.05)$
Population	X	Х	Х
Other transfer cuts		Х	Х
Subject to the DSP			Х
N. of observations	41,323	41,323	41,323

Table 2.2: Effect of the IMU reform on the actual property tax revenue

The table shows the effect of the IMU reform on the amount of property tax collected. We control for municipality and year fixed effects, log of population, logarithm of the level of other transfers cuts and a dummy taking value 1 if the municipality is subject to the DSP. Standard errors are clustered at municipality level.

	(1)	(2)	(3)
	Fisc. Aut.	Fisc. Aut.	Fisc. Aut.
$ExpAddRev_{mt} \times 1(Year \ge 2012)$	$\begin{array}{c} 0.0041^{***} \\ (0.0003) \end{array}$	$\begin{array}{c} 0.0039^{***} \\ (0.0003) \end{array}$	$\begin{array}{c} 0.0037^{***} \\ (0.0003) \end{array}$
Population	Х	Х	Х
Other transfer cuts		Х	Х
Subject to the DSP			Х
N. of observations	42,752	42,752	42,752

Table 2.3: Effect of the IMU reform on fiscal autonomy

The table the first stage of the Equation 2.2. We control for municipality and year fixed effects, log of population, logarithm of the level of other transfers cuts and a dummy taking value 1 if the municipality is subject to the DSP. Standard errors are clustered at municipality level.

Panel A				
	(1)	(2)	(3)	(4)
	Tot. Rev.	Other taxes	Net Loans	Other Rev.
$\widehat{FiscAut}$	0.007^{**}	0.005	-0.085***	-0.001
	(0.002)	(0.005)	(0.017)	(0.002)
N. of observations	41,423	41,317	29,336	41,423
F stat.	128.285	128.813	98.589	128.285
Panel B				
	(5)	(6)	(7)	
	Tot. Exp.	Services	Administration	
$\widehat{FiscAut}$	0.004^{**}	0.007^{***}	-0.008***	
	(0.002)	(0.002)	(0.002)	
N. of observations	41,423	41,419	41,419	
F stat.	128.285	128.323	128.323	

Table 2.4: Effect of the IMU reform on the budgetary behaviour of municipalities

The table shows the results of Equation 2.2. *Panel A* shows the results on the logarithm of following outcome variables: the total level of revenue, the tax revenue from all taxes but IMU, the net loans (i.e. new loans minus debts repayments) and, finally, the other revenue. *Panel B* shows the results on the logarithm of following outcome variables: total expenditure, expenditure for services and expenditure for administration. We control for municipality and

year fixed effects, log of population, logarithm of the level of other transfers cuts and a dummy taking value 1 if the municipality is subject to the DSP. Standard errors are clustered at municipality level.

results of Equation 2.2.²³ A 1 percent increase in (instrumented) fiscal autonomy increases total municipal revenue by 0.7 percent and expenditure by 0.4 percent. On average, municipalities do not increase other tax revenue, but they respond to greater autonomy by reducing the level of borrowing. On the expenditure side (i.e. *Panel B*), municipalities use the additional resources to increase expenditure on services (0.7%) and decrease administration costs (0.8%).

Finally, we further explore the finding in Table 2.4 that on average, municipalities responded to additional responsibility by decreasing borrowing. Specifically, we test whether the response differed depending on whether a municipality was subject to binding fiscal rules, as suggested by Dovis and Kirpalani (2020). We

 $^{^{23}}$ In the Appendix, we show the robustness checks of our results. Specifically, we show that the results are robust to the inclusion of province linear trends, population × year fixed effects, and an alternative instrument using the share of additional revenue municipalities were expected to collect. We also demonstrate that the 2012 IMU reform was uncorrelated with other transfer cuts.



Figure 2.5: Effect of the DSP on share of municipalities increasing loans The outcome variable is the share of municipalities that increase the net borrowing (i.e. loans minus debts repayments) in 2012 with respect to 2011 by at least one percent of the municipal revenue in 2011. The solid line represents the 5,000 population threshold. Municipalities larger than the threshold were subject to fiscal rules.

focus on the implementation of the DSP, in particular by exploiting its implementation at the 5,000 inhabitants threshold. Municipalities larger than 5,000 are subject to more binding fiscal rules in 2011 and 2012.

Figure 2.5 plots the share of municipalities in each population bin that decrease net borrowing²⁴ from 2011 to 2012 by more than 1 percent of municipal revenue. On average about 60 percent of the municipalities larger than 5,000 inhabitants, who were subject to the DSP, decreased net borrowing by more than 1 percent. In contrast, the average is around 40 percent for smaller municipalities not subject to the DSP. Importantly, the share increases discontinuously, jumping at the 5,000 inhabitant threshold for the DSP.

Figure 2.5 demonstrates a relationship between the DSP and the overall reduction in borrowing between 2011 and 2012. Next, we establish a link between the DSP and the reduction in borrowing *induced by the reform*. In Table 2.5, we use Equation 2.2 to test whether the reform had a differential effect on municipalities subject to the DSP. We focus on municipalities between 1,000 and 10,000

²⁴Defined as new loans minus debts repayments

	(1)	(2)	(3)
	Net Loans	Net Loans	Net Loans
$\widehat{FiscAut}$	0.016	0.017	0.015
	(0.015)	(0.015)	(0.015)
$\widetilde{FiscAut \times DSP_m}$	-0.044***	-0.045***	-0.035***
	(0.011)	(0.011)	(0.016)
Log of Population	Х	Х	Х
Cubic of Population		Х	Х
Population \times Year FE			Х
N. of observations	14,386	14,386	14,386
F Stat.	95.331	89.344	105.600

Table 2.5: Effect of the IMU reform and DSP on loans

The outcome is the logarithm of the net loans. DSP_m is a dummy taking value 1 if the municipality had a population larger than 5,000 inhabitants in 2008, and therefore it is subject to the DSP up to 2012. We control for the logarithm of the change of non-IMU transfers, and for different smooth functions of population, respectively: linear approximation, cubic, and population times year fixed effects.

inhabitants, and restricting the post-period to just 2012, as the DSP application rules changed in 2013. The outcome variable is the logarithm of net loans.²⁵ A one percent increase in fiscal autonomy due to the IMU reform decreases the net loans by 4 percent, but only for the municipalities subject to the DSP. Instead, greater decentralisation has no effect on the borrowing behaviour of municipalities not subject to the DSP. This suggests that binding fiscal rules can attenuate the over-borrowing response to greater fiscal autonomy, as suggested by Dovis and Kirpalani (2020).

2.6 Conclusion

In the recent decades, many governments have delegated greater discretion and responsibility to local public bodies in the form of decentralization reforms. This tendency poses the empirical question of whether local governments behave similarly to how the national government would have, and whether this has consequences on outcomes such as the provision of public goods and amount of debt

 $^{^{25}}$ In the Appendix, we show the following two robustness checks of our results. First, we run Equation 2.2 using samples of municipalities closer to the 5,000 inhabitants threshold. Then, we demonstrate that the results are not driven by a mayor salary threshold at 5000.

the government takes on.

In this paper, we study a decentralization reform implemented in Italy in 2012 that coupled a decrease in national transfers to municipalities with increased municipal fiscal autonomy through the property tax. This reform has features that are common to many decentralization reforms. First, it gave municipalities more discretion over the tax by substantially expanding the range of tax rates a municipality could apply. Second, it increased municipal financial responsibility by cutting transfers, leaving municipalities responsible for raising a larger share of their own budgets. In this case, it cut transfers by an amount equal to the ex*pected* change in property tax revenue. We take the expected change in property tax revenue as the amount of additional property tax revenue that the national government would have raised if it did not give municipalities the discretion to pick the tax rate. By comparing what the national government would have collected in a counterfactual centralized property tax reform versus what municipal governments actually collected in the decentralized reform, we can study whether decentralizing fiscal autonomy to municipalities actually changed the amount of revenue collected and how it was spent.

We find large heterogeneity in the amount of additional property tax revenue that municipalities actually collected, compared to the national government suggestion. Only 20 percent of the municipalities deviates at most by 25% of the government expected increase. On average in the years following the reform, for every Euro of expected additional increase, municipalities collected an additional 25 cents.

Then, we study whether municipalities change their budgetary behaviour as result of the increased responsibility in raising municipal revenue. We show two different responses. First, municipalities respond to the increase in fiscal autonomy by increasing total revenue, as well as increasing spending in services and decreasing spending on administration, in line with findings in prior work (Gadenne (2017), Martinez (2016), Bianchi et al. (2019)). Second, municipalities spend part of the additional revenue on decreasing the level of borrowing. We then document a heterogeneous borrowing response depending on whether a municipality is subject to a binding fiscal rule. Municipalities subject to the Domestic Stability Pact, which punished municipalities for high levels of debt, reduce their borrowing in response to increased responsibility. Municipalities not subject to the pact did not reduce their borrowing, suggesting that credible fiscal rules can attenuate the over-borrowing response to fiscal autonomy.

In summary, when given discretion over how much revenue to collect, most mu-

nicipalities deviate from what the national government would have collected. We find that on average, municipalities collect more than suggested. When given the responsibility to collect a greater share of their budget from own taxation, municipalities increased overall revenue, spent more on services, and spent less on administration. Finally, we show that greater decentralization coupled with binding fiscal rules can incentivize municipalities to reduce their deficit in response to fiscal autonomy. Taken together, the results in this paper indicate that decentralization does indeed make a difference for the revenue collection and expenditure of local governments, and the response to decentralization can be influenced by fiscal rules set by a higher level of government.

3 How do Fiscal Rules influence Public Spending? Evidence from Italian municipalities

with Audinga Baltrunaite

3.1 Introduction

In recent decades, many countries have experimented with fiscal rules in the public sector. In 2015, 95 countries had some type of long-lasting fiscal rules (?), that limit the budgetary discretion of the public body. Given the popularity of such rules, we are interested in the impact on the aggregate levels of revenue and spending (Grembi et al. (2016)), and consequences for how municipalities use their resources.

We study the impact of the *Domestic Stability Pact* (DSP) on the procurement behaviour of the Italian municipalities. In particular, we exploit the following change in the application of the DSP. From 2013, the national government moved the threshold so that the DSP would apply to municipalities with populations above 1,000. The previous threshold was 5,000. The limitations imposed by the DSP differ and have changed over time, but the goal is always to limit the debt that the municipalities can accumulate.¹

First, we focus on the contracts for public works larger than 40,000 Euro issued by the Italian municipalities from 2008 to 2015. These contracts account for 23 percent of the average yearly expenditure on procurement contracts. We study the impact of the DSP on the number of contracts issued every year.

Then, we study the execution of the public works and we focus on time and cost overruns of public works. We limit our analysis to contracts larger than 150,000 Euro, since the information on the execution of public works is compulsory only for contracts larger than 150,000 Euros. The share of contracts subject to either time or cost overruns is respectively 40 and 33 percent of those larger than 150,000 Euro. Time overruns can be the result of a suspension of the public work. The firm can suspend the execution of the public work for unpredictable circumstances (e.g. adverse weather conditions) or for technical (or administrative) problems. Time and cost overruns can also occur when the original contract is renegotiated. Contracts can be renegotiated, when the firm hits an unforeseen obstacle that prevents the completion of the work. Renegotiating a contract implies a direct

 $^{^{1}}$ Chiades and Mengotto (2013) describe in details the specific rules of the DSP in every year.

award of additional resources from the municipality to the firm. Therefore, a renegotiation has direct consequences for the size of the project and the duration of the public works (Decarolis (2014), Decarolis and Palumbo (2015)).²

We use a difference-in-difference estimation strategy, comparing the change in procurement behaviour of the municipalities smaller than 1,000 (i.e. never subject to the DSP), to the same change for municipalities between 1,000 and 5,000 inhabitants (i.e. subject to the DSP after 2012). We show that fiscal rules have two effects on public works. First, we show that the probability that a municipality will issue a public works contract in a given year is reduced by 4 percent on average. This is true especially for larger contracts. This result suggests that fiscal rules have a negative impact on the investment behaviour of the municipalities. We show that the implementation of fiscal rules dampens municipality's investment by approximately 18 percent. This result is in line with Coviello et al. (2017).

Second, we study whether fiscal rules affect how contracts are executed. We use an analysis at contract level to study if overruns are affected, conditional on issuing the contract. We show that contracts issued by municipalities subject to fiscal rules have time overruns that are shorter on average. In particular, delays are by approximately 40 percent shorter, meaning that they are completed about three months earlier on average.

For robustness, we show that the results are not driven by municipalities issuing *less complex* projects that are less likely to overrun. We focus both on the average size of the contracts and on the average number of words used in the description of the object.

These results suggest that fiscal rules affect municipalities' spending in two ways. On one hand, implementing fiscal rules that tighten the municipality's budget constraint dampens investment by the municipality. In particular, treated municipalities decrease the level of investment by approximately 15 percent. This result is consistent with the evidence that fiscal rules are imposed to discipline the spending behaviour of the municipalities. On the other hand, fiscal rules have also an effect on how municipalities spend their available resources. The treated municipalities issue a contract for more than 150,000 Euros and the effectiveness of the execution of public work is executed improves, because time overruns are reduced by approximately 40 percent.

 $^{^{2}}$ The direct award of additional public resources to firms might just be due to corruption (Ferraz and Finan (2011), Tulli (2020)).

Our paper contributes to two strands of literature. First, we contribute to the literature on the effect of fiscal rules on the behaviour of public bodies (Grembi et al. (2016), Coviello et al. (2017), Gamalerio (2017), Heinemann et al. (2018), ? and Dovis and Kirpalani (2020)). We focus on the procurement sector, which represents approximately ten percent of the Italian GDP ?. We show how fiscal rules impact the public spending of municipalities in two different ways. First, they tighten the budget constraint on municipalities. Treated municipalities respond by decreasing the level of investment by approximately 15 percent. Secondly, fiscal rules impact how public works are executed. Indeed, they have a positive effect on the execution of the public spending by decreasing the duration of the time overruns.

Finally, our second contribution to the literature on why municipalities incur overruns. Cost overruns occurs more often when there are smaller electoral incentives (Ferraz and Finan (2011) and Coviello and Gagliarducci (2017)). Otherwise, overruns are more likely when bidding procedures are less competitive or the project is more complex (D'Alpaos et al. (2013), Decarolis (2014) and Decarolis and Palumbo (2015)). We show that fiscal rules have an impact on the effectiveness of the works, since their time overruns are reduced.

The remainder of the paper proceeds as follows. Section 3.2 describes the institutional framework and the data, Section 3.3 discusses the estimation strategy, Section 3.4 shows the results and the robustness checks. We close with the Conclusion.

3.2 Institutional framework and data

3.2.1 Institutional Framework

Our study is based on the expansion of the *Domestic Stability Pact* (DSP) to all municipalities larger than 1,000 inhabitants. The DSP is a set of fiscal rules imposed by the Italian national government on municipalities. From 1999, the Italian national government introduced a set of fiscal rules that constrained all municipalities.

Our identification comes from the extension of the DSP in 2013 to all municipalities larger than 1,000 inhabitants. Before 2013, only municipalities larger than 5,000 inhabitants were subject to the *DSP* (Grembi et al. (2016)).

The exact obligations of the DSP changed year by year, but over our sample period it restricted the actual current and capital expenditure (Chiades and Mengotto (2013)). The level of current expenditure and investment had to be proportional to a moving average of balances from the previous years in the same municipality.

Sanctions for not complying with the DSP include: reduced reimbursement from the central government, ban on municipal hires, cut on reimbursement of the municipal government. Municipalities that comply benefit from lower interest rates for loans from the central government.

3.2.2 Data

The analysis relies on multiple sources of information. First, we use information on procurement contracts collected by *Telemat*. The data contains information about contracts for public works costing more than 40,000 Euro, awarded by all the Italian municipalities from 2008 to 2015.³ The data include: the name of the procuring municipality, the tender date, the project value, a description of the object and a 9-digits code classifying the object of the contract (called the *CPV*). The information on the execution of the public works for contracts larger than 150,000 Euro, is collected by the Italian Anti-Corruption Authority (i.e. *ANAC*). This data contains information on all the renegotiations and suspensions of public works. For renegotiations, we have information on how long the work was delayed, and the renegotiation amount. For the suspensions, we have information on the length of the suspension.

We collect budgetary information to compare the behaviour of similar municipalities. We collect information on the amount that each municipality would need for providing their services *Fabbisogni Standard*, *FBS*. The national government (*SOSE*) computed this value for each municipality in 2010. The calculation takes into account all the factors influencing the financial needs of the municipality (e.g. population, altitude, average age of the population), which are out of the control of the municipality itself.

Finally, we collect municipalities' characteristics from the Italian National Bureau of Statistics (ISTAT) and the information on mayor characteristics from the Italian Home Department.

Table 3.1 shows the descriptive statistics for our sample. There are several things to highlight from the summary statistics. First, we focus on municipalities smaller

 $^{^{3}\}mathrm{Tulli}$ (2020) explains in details the legal differences and the changes in the level of information for contracts under 40,000 Euro.

	All municipalities		
	Mean	Median	Std dev.
Procurement characteristics			
Number of contracts per year	0.63	0	(1.07)
Size of the project (hundred thousands Euro)	1032	152	(25,900)
Number of contracts $\geq 150,000$ Euro	0.28	0	(0.62)
Share of cost overruns	0.33		(0.48)
Size of cost overruns (as share of contract value)	0.11		(0.15)
Share of time overruns	0.42		(0.49)
Length of time overruns	204		(243)
Mun. characteristics			
Population	2,207		(1,283)
Share mayors with at least a degree	0.4		(0.49)
Share mayors with at least a highschool degree	0.42		(0.49)
Share mayors with other degrees	0.18		(0.39)
FBS per capita	592.12		(158.14)
N. of municipalities	5.137		

Table 3.1: Descriptive statistics

The table shows the descriptive statistics of the variables used in this paper. We show respectively: the average number of contracts issued every year, the average size of the project, the number of contracts larger than 150,000 Euro. Then, we show respectively the share of public works (larger than 150,000 Euro) with a cost overrun and their average size, and the same information for the time overruns. Then we have information on the average size of the municipalities, the share of mayors with different degrees and the average *FBS* per capita.

than 5,000 inhabitants to increase the similarity between treated and control groups.

These municipalities do not have a lot of contracts for more than 40,000 euros, but in those for more than 150,000 Euros overruns are still common. One in three contracts goes over budget, by an average of 11 percent. Time overruns occur in 42 percent of contracts and the average duration of the overrun is more than six months (204 days).

By construction, the average population is relatively small, since we consider only municipalities with fewer than 5,000 inhabitants. To increase the comparability of the municipalities, we also control for municipalities having a similar financial needs in 2010. The average FBS of the municipalities is approximately 592 Euro per capita per year.

Figure 3.1 shows the geographical distribution of the financial needs of the Italian municipalities with fewer than 5,000 inhabitants in 2010. There is substantial geographical dispersion of the FBS throughout Italy. Many exogenous factors influence the computation of the FBS. For example, the altitude seems to be a relevant parameter, since municipalities in mountainous areas a have higher FBS on average.





The figure shows the geographical distribution of the financial needs of the municipalities in 2010. The value of the FBS is computed by the national government, based on all the exogenous factors influencing the financial needs of the municipality (e.g. the average height, the population).

3.3 Estimation Strategy

In our study we use two different specifications. First, we use an analysis at municipality-year level to identify the effect of the DSP on the number of contracts issued by treated municipalities. We exploit the implementation of the DSP in 2013 on municipalities with a population between 1,000 and 5,000 inhabitants. Our estimation strategy is a local difference-in-difference. We measure the change over time of the variables of interest in the municipalities with fewer than 1,000 inhabitants (i.e. never subject to the DSP), then we compare them to those of the municipalities between 1,000 and 5,000 inhabitants.

Therefore, we compute the following equation:

$$Y_{mt} = \alpha_m + \alpha_t + \beta_0 DSP_m \times \mathscr{W}(Year \ge 2013) + \mathbf{X}_{mt}\beta_1 + \epsilon_{mt}$$
(3.1)

 α_m is a municipality fixed effect, α_t is a year fixed effect, DSP_m is a dummy taking value one if the municipality is subject to the DSP, and \mathbf{X}_{mt} is a vector of controls including the logarithm of the population and a dummy for whether the mayor has a university degree. Therefore, the coefficient of interest (β_0) shows the average effect of the implementation of the DSP on the municipalities' procurement behaviour.

Then, we carry out an analysis at contract level to see whether the implementation of the DSP affects the execution of the public works. Studying the response at contract level solves the issue of understanding whether any change in the execution is due to a reduction in the number of contracts or to a real change in the effectiveness of the execution. Therefore, we compute the following equation:

$$Y_{g,m,t} = \alpha_g + \alpha_m + \alpha_t + \beta_0 DSP_m \times \mathscr{W}(Year \ge 2013) + \mathbf{X}_{mt}\beta_1 + \epsilon_{g,m,t} \quad (3.2)$$

 α_g are a good fixed effects. We distinguish 12 different categories of public works, they are derived from the first 4 digits of the object classification. α_m and α_t are respectively municipality and year fixed effects, DSP_m is a dummy taking value one if the municipality is subject to the DSP, and \mathbf{X}_{mt} is a vector of municipality's controls including the logarithm of the population and a dummy for whether the mayor has a university degree.

The identifying assumption in these specifications is that absent the 2013 reform on the DSP, outcomes of municipalities affected (or not) by the reform would have been comparable. We can test this hypothesis verifying the parallel trends assumption. To check for parallel trends, in Figure 3.2, we plot the results of an event study of the reform on the probability of issuing a contract for public works.⁴ We interact DSP_m with a year dummy, and regress it on a dummy taking value one if the municipality issues a contract for public works, controlling for the logarithm of the population and a dummy for whether the mayor has a university degree. The omitted year is 2012, the pre-reform year.⁵

$$Y_{mt} = \kappa_{1t} (DSP_m \times Year_t) + \mathbf{X}_{mt} \kappa_2 + \alpha_m + \varepsilon_{mt}$$

 $^{^4\}mathrm{The}$ results of the event study for the total amount of expenditure for public works is in the Appendix.

⁵The specification of the event study is as follows:


Figure 3.2: Event study of reform on the likelihood of issuing a contract.

Before 2013, the coefficient is not statistically significant, indicating that municipalities affected by the DSP trended parallel to municipalities not affected. In 2013, we see that the coefficient is negative and statistically significant, reflecting that municipalities affected by the reform issued fewer contracts, on average.

Similarly, Figure 3.3 verifies the common trends assumption on the variables describing the execution of the public works.⁶ We focus on two types of overruns: time overruns (top figures), which implies delays in the execution of the public work, and cost overruns (bottom figures), which implies a greater monetary cost for the municipality. The figures on the left-hand side show the extensive margin of the time and cost overruns. Instead, the figures on the right-hand side show the intensive margin.

The common trend assumption holds for all of the variable of interest. We observe a negative (and statistically significant) reduction in the length of the time overruns after the fiscal rules are introduced in treated municipalities. There is no substantial change in any of the other variables. Therefore, in the following section, we focus on the average probability of issuing a contract for public works and on the length of the time overruns.

 $Y_{g,m,t} = \kappa_{1t}(DSP_m \times Year_t) + \mathbf{X}_{mt}\kappa_2 + \alpha_m + \alpha_g + \varepsilon_{g,m,t}$

⁶The specification of the event study is as follows:



Figure 3.3: Event study of reform on the execution of the contracts.

3.4 Results

In this section, we start showing the effect of Equation 3.1 on the probability of issuing a contract of public works. First, we study the effect of the implementation of the DSP on the number of contracts issued by the municipalities.⁷ Table 3.2 shows the results of Equation 3.1 using as outcome a dummy taking value 1 if the municipality awards at least one contract for public works during the year. The implementation of the DSP reduces by 4 percent on average the probability that a municipality issues a contract for public works. This finding is consistent with that of ? that shows how municipalities reduce investments when subject to the DSP.

Next, we study whether municipalities respond to fiscal rules by decreasing disproportionately contracts of different sizes. Table 3.3 shows the results of Equation 3.1, focusing on contracts of different sizes. The decrease in the number of contracts comes exclusively from larger contracts, in particular between 150,000 Euro and 500,000 Euro. This result confirms the hypothesis that fiscal rules reduces municipality's spending on larger public works contracts(e.g. infrastructure). The introduction of fiscal rules has the effect of reducing the number of public works projects, especially larger projects.

⁷In the Appendix, we show the following robustness checks: we study the differential effect of DSP in regions with (and without) EU funds, which alleviate the budget constraint imposed by the DSP. Then, we use the aggregate level of expenditure as outcome.

	(1)	(2)	(3)	(4)	(5)
	Contract D.				
$DSP_m \times 1(Year \ge 2013)$	-0.031**	-0.028**	-0.043***	-0.029*	-0.016
	(0.135)	(0.014)	(0.014)	(0.015)	(0.017)
Province linear trends		Х			
Province \times Year FE			Х		
FBS linear trends				Х	
FBS \times Year FE					Х
N. of observations	26,433	26,433	26,433	26,433	26,433
Baseline mean	0.278	0.278	0.278	0.278	0.278

Table 3.2: Effect of the DSP on contracts issued.

The Table shows the results of Equation 3.1. The outcome is a dummy taking value 1 if the municipality has issued at least a contract for public works in the year, zero otherwise. The controls are logarithm of population, and a dummy for whether the mayor has a university degree. FBS are dummies respectively for the municipalities with 20 % highest FBS in 2010, between the 20% and the 40%, between 40% and 60% and 20% smallest FBS. All standard errors are clustered at municipality level.

	(1)	(2)	(3)
	Contract D.	Contract D.	Contract D.
$DSP_m \times 1(Year \ge 2013)$	0.013 (0.011)	-0.043^{***} (0.009)	-0.001 (0.006)
$40,000 \le \text{Proj. Value} \le 150,000$	Х		
$150,000 \le Proj.$ Value $\le 500,000$		Х	
Proj. Value $\geq 500,000$			Х
N. of observations	26,433	26,433	26,433
Baseline mean	0.18	0.11	0.03

Table 3.3: Effect of the DSP on the issue of a contract of different sizes.

The Table shows the results of Equation 3.1. The outcome is a dummy taking value 1 if the municipality has issue at least a contract for public works in the year, zero otherwise. The controls are logarithm of population, dummies for whether the mayor has a university degree and province times year fixed effects. All standard errors are clustered at municipality level.

	(1)	(2)	(3)	(4)	(5)
	Time Over.	Time Over.	Time Over.	Time Over.	Time Over.
	Length	Length	Length	Length	Length
$DSP_m \times 1(Year \ge 2013)$	-0.396*	-0.257	-0.173	-0.454^{*}	-0.528^{**}
	(0.223)	(0.233)	(0.269)	(0.246)	(0.258)
Province linear trends		Х			
Province \times Year FE			Х		
FBS linear trends				Х	
$FBS \times Year FE$					Х
N. of observations	2,288	2,288	2,288	2,288	2,288
Baseline mean	225	225	225	225	225

Table 3.4: Effect of the DSP on the length of the time overruns.

The Table shows the results of Equation 3.2. The outcome variable is the logarithm of the length of the time overruns. The controls are good, year and municipality fixed effects, logarithm of population, dummies for whether the mayor has a university degree. *FBS* are dummies respectively for the municipalities with 20 % highest *FBS* in 2010, between the 20% and the 40%, between 40% and 60% and 20% smallest *FBS*. All standard errors are clustered at municipality level.

Could public works issued by the municipalities have been executed more effectively? We focus on time overruns, using the analysis at contract level of Equation 3.2. Table 3.4 shows the effect of the DSP on the logarithm of the length of the time overruns.⁸

Table 3.4 shows that fiscal rules affect the execution of the public works in the treated municipalities. Time overruns are reduced by about 40 percent on average. This is a sizeable effect, since the average time overrun in the control municipalities is 225 days. Introducing fiscal rules to treated municipalities shortens the delays by approximately 3 months. This result implies that fiscal rules have also a positive effect on the effectiveness of public spending, not just on the level. For contracts costing more than 150,000 Euro, time overruns are shorter on average.

In the next section, we show two different robustness checks. First, we show that the improved effectiveness of public works is not driven by a reduction in the complexity of the works. We show that municipalities do not change the average size of the contract nor the number of words used to describe the object. We show that results are similar if we include municipalities with a population closer to the 1,000 inhabitants threshold.

⁸In the Appendix, we show the average effect of the DSP on all the variables related to the execution of the public works.

	(1)	(2)	(3)	(4)
	Proj. Size	Proj. Size	N. words	N. words
$DSP_m \times 1(Year \ge 2013)$	0.198^{**} (0.085)	0.064 (0.042)	-0.018 (0.052)	-0.028 (0.062)
Proj. Value $\geq 150,000$	Х			
$150,000 \le Proj.$ Value $\le 500,000$				
N. of observations	6,336	4,752	6,336	4,752
Baseline mean	394,851	9.08	$254,\!653$	9.08

Table 3.5: Effect of the DSP on the logarithm of project size

The Table shows the results of Equation 3.1. The outcome is the logarithm of the average project size of the contracts issued during the year and the logarithm of the number of words used in the description of the good. The controls are good, year and municipality fixed effects, logarithm of population, dummies for whether the mayor has a university degree, a dummy for whether it is the year close to the election and *FBS* times year fixed effects. All standard errors are clustered at municipality level.

3.4.1 Robustness

This section shows two robustness checks. First, we study whether the results in Table 3.4 can be explained by the treated municipalities issuing more straightforward projects, since they decrease the level of investment. In this case, the decrease in complexity would explain the reduction in the overruns.

Table 3.5 shows the results of Equation 3.2, focusing on the logarithm of the average project size and the logarithm of the number of words used in the description of the object of the contract. We use these measures as a proxy for the project's complexity. For example, larger projects are likely to be more complex than smaller contracts. We observe an increase in the average size of the project if we consider all the contracts. Since these contracts are all larger than 150,000 Euro, the increase in the average project size is due to the decrease in the number of contracts between 150,000 Euro and 500,000 Euro shown in Table 3.3. Indeed, there is no change in the average size of the project if we contracts larger than the 500,000 Euro threshold. At the same time, we do not observe any change in the length of the description of the work being contracted. We conclude that municipalities do not reduce the complexity of projects, when subject to the DSP.

Finally, we show that results of Table 3.2 and 3.4 are similar, if we consider municipalities closer to the 1,000 population threshold. Panel A of Table 3.6 shows the results for Equation 3.1 using municipalities of different sizes. Instead, Panel B shows the results of Equation 3.2. The first column in each panel includes

PANEL A			
	(1)	(2)	(3)
	Contract Dummy	Contract Dummy	Contract Dummy
$DSP_m \times 1(Year \ge 2013)$	-0.043***	-0.038**	-0.035**
	(0.014)	(0.015)	(0.017)
$Population \leq 5,000$	Х		
$Population \leq 3,000$		Х	
$Population \le 2,000$			Х
N. of observations	26,433	19,933	14,743
Baseline mean	0.278	0.278	0.278
PANEL B			
	(4)	(5)	(6)
	Time Over.	Time Over.	Time Over.
	Length	Length	Length
$DSP_m \times 1(Year \ge 2013)$	-0.528**	-0.530*	-0.693**
	(0.258)	(0.278)	(0.288)
$Population \leq 5,000$	Х		
$Population \leq 3,000$		Х	
$Population \le 2,000$			Х
N. of observations	2,288	1,321	801
Baseline mean	225	225	225

Table 3.6: Effect of the DSP using different population intervals

The controls are logarithm of population, dummies for education attainment of the mayor and province times year fixed effects. All standard errors are clustered at municipality level. In *PANEL A*, we also control for province times year fixed effects. Instead, in *PANEL B*, we control for *FBS* times year fixed effects.

all the municipalities in the sample, the second only includes municipalities with a population under 3,000 inhabitants. The last column is for municipalities smaller than 2,000 inhabitants.

Results both in Panel A and B are similar, if we focus only on municipalities with a population closer to the 1,000 threshold.

3.5 Conclusion

Fiscal rules have become a popular tool of national and local governments in recent decades. We study whether they have an impact on public spending and show that they have two effects.

First, the probability that a municipality will issue a contract is reduced by

about 4 percent. This is especially true of larger contracts valued at more than 150 000 Euro. This is consistent with the hypothesis that fiscal rules dampen municipalities' spending (Coviello et al. (2017)). We calculate that fiscal rules reduces municipalities' spending by approximately 18 percent.

Finally, we show that fiscal rules impact how municipalities spend their resources. Treated municipalities spend more effectively when fiscal rules are applied. In particular, delays in the completion of public works contracts are significantly reduced. The length of the delays decreases by approximately 40 percent, meaning that projects are completed on average three months sooner.

Taken together, our results indicate that fiscal rules do impact local governments' budget decisions, resulting in fewer contracts being issued, and an increase in the effectiveness of public spending.

Appendix A (for Chapter 1)

A1 General graphs

In this section, I show all the figures and tables that clarify the context and explain the details of the analysis.

Figure A1 shows the distribution of the number of municipalities that each Italian municipality has in a 10 kilometre radius (i.e. the radius chosen for the Conley standard errors). Every municipality has on average other 14 municipalities within a distance of 10 kilometres.



Figure A1: Distribution of the number of municipalities in a 10 kilometre radium. The figure shows the distribution of the number of municipalities in a 10 kilometre radium. Municipalities have on average other 14 municipalities within 10 kilometres.

Figure A2 shows the distribution of the size of the procurement contracts in the data, without dropping the contracts larger than 100,000 Euros.



Figure A2: Distribution of contracts by face value The figure shows the distribution of the procurement contracts by face value. There is a substantial bunching at the 40,000 Euro threshold (dashed line). The figure does not include contracts larger than 1,000,000 Euros.

Figure A3 shows the most frequent words used to describe the object of the contracts. This figure can be helpful in understanding why the municipalities issued the contracts, since there is no additional information specifying the type of good procured for contracts smaller than 40,000 Euros.

A2 Analysis on the dissolved municipalities

In this Section, I show all the additional analysis on the dissolved municipalities. First, Figure A4 shows how long the commissioners ruled dissolved municipalities during the period of my analysis. Most of the dissolutions lasted between two and three years.

Figure A5 shows the geographical distribution of the arrests of public officials between 2011 and 2016 (left panel) and compares it to the one of the dissolutions in the same period (right one). Some dissolutions followed an arrest (26 out of 73), but many arrests of public officials did not conclude with a dissolution. Therefore, I argue that the arrest of a public official is not a good signal anticipating the future dissolution.

Figure A6 shows the most common evidence that law enforcement used to prove the infiltration of organised crime into the dissolved municipality. There are two extremely common motivations: either the municipality awarded a contract to



Figure A3: Wordcloud using the good descriptions of the contracts The wordcloud graphically shows the most frequent words used for describing the good in each contract. Since I cannot use the above-mentioned CPV, I exploit the description that municipality has to provide to ANAC when issuing each contract. The biggest and darkest words are the most commonly used in the descriptions.





The figure shows the lengths (in months) of the dissolutions in the period of my analysis (2011-2016). The duration of the dissolution is computed from when the commissioners begin their duties in the dissolved municipality to the day of the next election.



Figure A5: Geographical distribution of the arrests and dissolution by Italian province

The figure compares the number of arrests of public officials and dissolutions implemented between 2011 and 2016 in the Italian provinces. The left-hand side figure shows the Log(Number of arrests + 1) in the Italian provinces, the right-hand side shows the Log(Number of dissolutions + 1). There are a total of 171 arrests of public officials in the period, whereas the dissolutions are 73. Furthermore, 47 out of 73 (64 percent) dissolutions did not have any arrested public official before the implementation. a firm owned by a mafia member or the municipality used inappropriately the emergency clause to directly award a procurement contract.

Figure A7 shows the sectors in which criminal organisations infiltrated more often in the dissolved municipalities. In more than 70 percent of the dissolution cases, organised crime infiltrated in construction and waste management.





The histogram shows the motivations that the law enforcement bodies use most frequently to justify the dissolutions. Approximately 60 percent of the motivations were one of the following: first, municipality did not verify whether the firm was owned by a mafia related individual, or the municipality verified and decided to award the contract to the firm anyway (33 percent), or municipalities exploited the emergency clause to award a procurement contract to a specific firm even when there was no emergency (28 percent).



Figure A7: Infiltrated sectors in the dissolved municipalities The histogram shows in which sectors criminal organisations infiltrated in the dissolved municipalities. In 72 percent of the cases, organised crime infiltrated either the construction sector (52 percent) or the waste management (20 percent). The waste management category includes also cleaning and sewage services.

I also study what are the consequences of the dissolution on the procurement behaviour of the dissolved municipalities. I estimate the following equation at municipality-year level.

$$Y_{m,t} = \alpha_m + \alpha_t + + \beta_0 Diss_{m,t} + \beta_1 A fter Diss_{m,t} + + \gamma'_0 X_{m,t} + \epsilon_{m,t}$$
(3.3)

 $Y_{m,t}$ is a dummy taking value one if the municipality issued in a year at least a contract of the following size: larger than 300,000 Euro, between 20,000 Euro and 60,000 Euro, between 20,000 and 40,000 Euro and between 40,000 and 60,000 Euro. First, Table A1 show the results of estimating Equation 3.3 on the different outcomes. I restrict the sample of municipalities to only the one in the South of Italy (as in Galletta (2017) to have more comparable results.

In line with results from Galletta (2017), dissolved municipalities reduce the number of larger projects during the dissolution. Afterwards, the probability of having a larger project increases again.

	$\begin{pmatrix} 1 \\ Y \end{pmatrix}$	(2) Y	(3) Y	$ \begin{pmatrix} (4) \\ Y \end{pmatrix} $
$Treat_{m,t}$ $AfterTreat_{m,t}$	$\begin{array}{c} -0.106^{*} \\ (0.068) \\ 0.252^{**} \\ (0.125) \end{array}$	-0.054 (0.064) -0.026 (0.144)	$\begin{array}{c} -0.050 \\ (0.054) \\ 0.068 \\ (0.123) \end{array}$	-0.070 (0.067) -0.028 (0.138)
Contract size \geq 300,000 Euro	Y	Ν	Ν	N
$20,000 \text{ Euro} \leq \text{Contract size} \leq 60,000 \text{ Euro}$	Ν	Υ	Ν	Ν
$20,000 \text{ Euro} \leq \text{Contract size} \leq 40,000 \text{ Euro}$	Ν	Ν	Υ	Ν
40,000 Euro \leq Contract size \leq 60,000 Euro	Ν	Ν	Ν	Υ
Observations	10,440	10,440	10,440	10,440

Table A1: Effect of the dissolution on the dissolved municipalities.

From the first column, the outcome variables is a dummy taking value one if respectively there is at least a contract issued in the year larger than 300,000 Euro, between 20,000 and 100,000 Euro, between 20,000 and 40,000 Euro and between 40,000 and 100,000 Euro. All the regressions include the following controls: population, indicator whether the mayor is born in the municipality, the number of years until the next election, year fixed effects and province specific linear trends.

A3 Methods to compute the similarities between two descriptions

In this section, I illustrate more in details the two methodologies that I use to determine whether two contracts are about the same object. Since, the data does not contain information on whether a project is split in multiple contracts, I have to identify these cases in an indirect way. Therefore, I compare the descriptions of the good that the municipality has to provide to ANAC every time that it issues a contract. Figure A8 shows the distribution of the number of words used by the municipalities to describe their contracts smaller than 40,000 Euro.



Figure A8: Distribution of the number of words in descriptions of the contracts The Figure shows the distribution of the number of words in the descriptions of the contracts smaller than 40,000 Euro. The dotted line represents the average number of words used in the description.

First, I cleaned all the descriptions of those words that do not provide a specific meaning to the sentence such as articles and propositions (i.e. the stopwords). I also transform all the words in lower case to avoid a mismatch due to wrong typing and consider only those words with at least two letters. Finally, I tokenise the words. In this way I try to minimise the possibility to incur in spelling and common mistakes.

When the descriptions are cleaned, I exploit two different strategies for identifying the split projects. First, I compare the descriptions of the contracts with four different measures to assess the approximate string matching. This technique measures in different ways how many changes are required to make a description of a contract identical to the other one. The four measures are the following:

- The Levenshtein distance is the minimum number of single-character edits (i.e. insertions, deletions and substitutions) between two strings (Levenshtein (1966)).
- The **Demerau-Levenshtein distance** is the minimum number of operations between two strings. In this case the possible edits are: insertions, deletions and substitutions of a single character or permutation of two adjacent one (Demerau (1964)).
- The **Jaro distance** between two strings of lengths s_1 and s_2 is computed in the following way (Jaro (1989)):

$$d_w = \begin{cases} 0 & \text{if } m = 0\\ \frac{1}{3}(\frac{m}{|s_1|} + \frac{m}{|s_2|} + \frac{m-t}{m}) & \text{otherwise} \end{cases}$$

Where m is the number of matching characters and t is half the number of the transpositions.

• The Jaro-WInkler distance starts from the Jaro distance and uses a prefix scale p (i.e. 0.1) which gives more favorable ratings to strings that match from the beginning for a set of prefix length l. Therefore the Jaro-Winkler measure is the following:

$$d_{jw} = d_j + lp(1 - d_j)$$

Figure A9 shows the distribution of the similarity score for all the couples of contracts below 40,000 Euro issued by the same municipality in the same year using approximate string matching. A similarity of 1 implies that the two contracts are described in the same way.

The drawback of using approximate string matching for identifying split projects is that it heavily relies on exactly what words the municipality uses in the descriptions. Synonyms, spelling mistakes or different order of the words would affect the similarity score between two contracts' descriptions. Therefore, I also rely on word embedding, which is a more sophisticated technique.

Word Embeddings is a language modelling technique from natural language processing which is based on the co-occurrence of words. This technique represents in a low dimensional euclidean space the meaning of the words and it specifies their meanings based on the words co-occurring with them. This implies that



Figure A9: Distribution of similarities with approximate string matching The Figure shows the distribution of the similarity of the contracts using approximate string matching. The dotted line represents the average similarity between two contracts.

synonyms (which often do not appear in the same sentence) have a similar vector representation, since they occur in similar contexts. Second, the direction of the difference between two words also conveys meaning. For example, going from the vector representing a country to the vector representing its capital city means taking a step in the 'capital city' direction, and taking the same step for vectors related to other countries brings us close to the 'capital city' vector as well.

The specific model I use is Word2Vec (Mikolov et al. (2013)). The training objective is to find word representations that are useful for predicting the surrounding words in a sentence or document. Given a sequence of training words w_1, \ldots, w_T , the objective of Word2Vec is maximising the following average log probability.

$$\frac{1}{T} \sum_{t=1}^{T} \sum_{-c \le j \le c, j \ne 0} \log[p(w_{t+j}|w_t)]$$

where c is the size of the training context. I train 300-dimensional vectors for 20 iterations and set a learning rate of 0.05. Figure A10 shows the distribution of similarities using Word2Vec. Comparing it to Figure A9, Word2Vec provides a more stringent comparison between descriptions, since the distribution is more skewed towards left. The difference is partially mechanical, since a limited number of changes in the letters are required to make a description identical to the other, but similar words can still provide different meanings.

Finally, I verify whether Word2Vec provides reliable results and how different they are from the results derived with approximate string matching. In particular, I show the similarity scores of a sample of contracts in the dataset.

Word2Vec Score	App. String Matching	Description 1	Description 2
0.70	0.92	Management of gym XXX Sep 2009-Aug2014	Management of gym YYY Sep 2009-Aug2014
0.68	0.92	Meals for school XXX academic year 2014-2015	Meals for school YYY academic year 2014-2015
0.96	0.52	Shelter for the elderly year 2011	Service for shelter for the elderly
0.97	0.40	Snow clearing	Service of snow clearing 2011/2012

Table A2: Sample of similarity scores

Table A2 shows two differences between approximate string matching and Word2Vec. The first two examples show how Word2Vec detect whether the same service is provided in two different places. Therefore, the similarity score of Word2Vec correctly award a lower score two the similarity of the two example of contracts, even though the words used in the description are basically the same. Word2Vec also scores high two contracts describing the same good with different words.



Figure A10: Distribution of the similarities with Word2Vec The Figure shows the distribution of the similarity of the contracts using Word2Vec. The dotted line represents the average similarity between two contracts.

	(1) 0 to 70,000 €	(2) 0 to 80,000 €	(3) 0 to 90,000 €
$Treat_{m,t} \times (25,000 \le \text{Bin} \le 40,000)$ $AfterTreat_{m,t} \times (25,000 \le \text{Bin} \le 40,000)$	$\begin{array}{c} 0.141^{***} \\ (0.029) \\ 0.273^{***} \\ (0.071) \end{array}$	$\begin{array}{c} 0.157^{***} \\ (0.030) \\ 0.278^{***} \\ (0.075) \end{array}$	$\begin{array}{c} 0.167^{***} \\ (0.032) \\ 0.282 \\ (0.079) \end{array}$
Observations	593,926	680,648	637,288

Table A3: Effect on the number of contracts below 40,000 with contracts of different size.

The table shows the results of Equation 1.1 including procurement contracts for furniture and services of different sizes. The first column reports the results with all contracts smaller than

70,000 Euro, the second column includes procurement up to 80,000 Euro, 90,000 Euro the third one. Finally, column four shows the same results excluding the contracts just above the 40,000 Euro threshold (i.e. between 40,000 Euro and 70,000 Euro). The outcome variable is the inverse hyperbolic sine of the number of procurements in each bin. The following controls are included: population, indicator whether the mayor is born in the municipality, number of years until the next election, the average of the controls for neighbouring municipalities, year fixed effects and province-specific linear trends. I use the Conley standard errors to account for spatial HAC errors. Conley standard errors are computed for all the municipalities within a ten kilometre radius. Figure A1 shows the distribution of the number of municipalities

within ten kilometres for all Italian municipalities.

A4 Additional Robustness checks of the main results

In this section, I show other robustness checks of the main results of Section 1.5. In particular, I show the results including procurement of different sizes from the one used in the main analysis.

Table A3 shows the results of Equation 1.1 using different sets of bins around the 40,000 Euro threshold. Column 1 shows the results of Table 1.2, whereas column 2 and 3 extend it to all the procurement contracts up to 80,000 Euro and 90,000 Euro respectively. Finally, Column 4 computes Equation 1.1 without on all the contracts smaller than 100,000 Euro but those between 40,000 Euro and 70,000 Euro.

Table A4 shows the differential effect of the neighbouring dissolution on a different set of bins below the 40,000 Euro. Results are stable irrespective of whether I study the differential effect on all the contracts between 15,000 Euro and 40,000 Euro or only those between 35,000 Euro and 40,000 Euro.

Table A5 shows the results of estimating Equation 1.1 using Poisson conditional fixed-effects quasi-maximum likelihood (QML). This estimator has several desir-

	(1)	(2)	(3)	(4)
	Num. Proc.	Num. Proc.	Num. Proc.	Num. Proc.
$Treat_{m,t} \times (25,000 \le \text{Bin} \le 40,000)$ $AfterTreat_{m,t} \times (25,000 \le \text{Bin} \le 40,000)$ $Treat_{m,t} \times (20,000 \le \text{Bin} \le 40,000)$ $AfterTreat_{m,t} \times (20,000 \le \text{Bin} \le 40,000)$ $Treat_{m,t} \times (30,000 \le \text{Bin} \le 40,000)$ $AfterTreat_{m,t} \times (30,000 \le \text{Bin} \le 40,000)$ $Treat_{m,t} \times (35,000 \le \text{Bin} \le 40,000)$ $AfterTreat_{m,t} \times (35,000 \le \text{Bin} \le 40,000)$	0.122*** (0.027) 0.266*** (0.065)	0.157*** (0.030) 0.175*** (0.069)	0.104*** (0.030) 0.305*** (0.069)	$\begin{array}{c} 0.126^{***} \\ (0.038) \\ 0.442^{***} \\ (0.087) \end{array}$
Observations	507,204	507,204	507,204	507,204

Table A4: Effect on the number of contracts below 40,000

The outcome variable is the inverse hyperbolic sine of the number of procurements in each bin. The following controls are included: population, indicator whether the mayor is born in the municipality, number of years until the next election, the average of the controls for neighbouring municipalities, year fixed effects and province-specific linear trends. I use the Conley standard errors to account for spatial HAC errors. Conley standard errors are computed for all the municipalities within a ten kilometre radius. Figure A1 shows the distribution of the number of municipalities within ten kilometres for all Italian municipalities.

	(1) OLS	(2) OLS	(3) Poisson	(4) Poisson
$Treat_{m,t} \times (25,000 \le \text{Bin} \le 40,000)$ $AfterTreat_{m,t} \times (25,000 \le \text{Bin} \le 40,000)$	$\begin{array}{c} 0.121^{***} \\ (0.027) \\ 0.266^{***} \\ (0.065) \end{array}$	$\begin{array}{c} 0.122^{***} \\ (0.027) \\ 0.266^{***} \\ (0.065) \end{array}$	$0.246^{***} \\ (0.071) \\ 0.492^{***} \\ (0.121)$	0.260^{***} (0.046) 0.502^{***} (0.057)
	(0.003)	(0.003)	(0.121)	(0.057)
Province Linear Trends	Ν	Υ	Ν	Υ
Observations	507,204	507,204	359,875	359,875

Table A5: Effect on the number of contracts below 40,000

The table shows the results of Equation 1.1 estimated with the OLS (column 1 and 2) and Poisson QML (third and fourth columns). The outcome variable of the OLS is the inverse hyperbolic sine of the number of procurements in each bin. The following controls are included: population, indicator whether the mayor is born in the municipality, number of years until the next election, the average of the controls for neighbouring municipalities, year fixed effects and province-specific linear trends. I use the Conley standard errors to account for spatial HAC errors. Conley standard errors are computed for all the municipalities within a ten kilometre radius. Figure A1 shows the distribution of the number of municipalities

within ten kilometres for all Italian municipalities.

able properties, including consistency of the coefficient estimates independently on any assumption on the conditional variance as long as the mean is correctly specified (Wooldridge (1997)).

Table A6 shows the results of Equation 1.1 with different definitions of treated group. The first column shows the results of Table 1.2, in which the treated group is only the neighbouring municipalities. In column 2, I extend the treated group to all those municipalities sharing a border with a neighbouring municipality. Finally, in column 3 I extend the definition of the treatment group to all the neighbours up to the third degree of connection. Results are similar if I broaden the definition of neighbouring municipalities.

Table A7 shows the results of Equation 1.1 using different thresholds for the Conley standard errors. The first column shows the results of Table 1.2, in which the threshold for the Conley standard errors is of 10 kilometre radius. Columns 2 and 3 increases it respectively to 20 and 50.

A5 Robustness checks on similarity results

In this section, I show the robustness checks of the results in Section 1.6.1. First, I show the results of equation 1.2, using different thresholds of similarity between contracts' descriptions to classify two contracts as part of the same project. Table A8 shows the results using Word2Vec for comparing the descriptions. Column

	(1) Neigh.	(2) Neigh. ² .	(3) Neigh. ³
$Treat_{m,t} \times (25,000 \le \text{Bin} \le 40,000)$ $AfterTreat_{m,t} \times (25,000 \le \text{Bin} \le 40,000)$	$\begin{array}{c} 0.122^{***} \\ (0.027) \\ 0.266^{***} \\ (0.066) \end{array}$	$\begin{array}{c} 0.186^{***} \\ (0.028) \\ 0.048 \\ (0.060) \end{array}$	$\begin{array}{c} 0.123^{***} \\ (0.028) \\ 0.154^{***} \\ (0.050) \end{array}$
Observations	507,204	503,140	503,140

Table A6: Effect of the dissolution on farther municipalities

The first column shows the result of Table 1.2, the second one includes in the treatment group the neighbours of the municipalities sharing a border with a dissolved one. Finally, the last column also includes the third degree of conection (i.e. the neighbours of the neighbours of the neighbours). The outcome variable is the inverse hyperbolic sine of the number of procurements in each bin. The following controls are included: population, indicator whether the mayor is born in the municipality, number of years until the next election, the average of the controls for neighbouring municipalities, year fixed effects and province-specific linear trends. I use the Conley standard errors to account for spatial HAC errors. Conley standard errors are computed for all the municipalities within a ten kilometre radius. Figure A1 shows the distribution of the number of municipalities.

	(1) Num Proc	(2) Num Proc	(3) Num Proc
	0.100***	0.100***	0.100***
$Treat_{m,t} \times (25,000 \le Bin \le 40,000)$	0.122^{***} (0.027)	0.122^{***} (0.033)	0.122^{***} (0.038)
$After Treat_{m,t} \times (25,000 \le \text{Bin} \le 40,000)$	0.266^{***} (0.066)	0.266^{***} (0.068)	$\begin{array}{c} 0.266^{***} \\ (0.070) \end{array}$
Observations	507,204	507,204	507,204

Table A7: Results using different distances for Conley standard errors

The first column shows the results of Table 1.2, in which the threshold for the Conley standard errors is of 10 kilometre radius. Columns 2 and 3 increases it respectively to 20 and 50 kilometre. The outcome variable is the inverse hyperbolic sine of the number of procurements in each bin. The following controls are included: population, indicator whether the mayor is born in the municipality, number of years until the next election, the average of the controls for neighbouring municipalities, year fixed effects and province-specific linear trends.

	(1) $95 \% \text{ sim.}$	(2) $90 \% \text{ sim.}$	(3) $85 \% \text{ sim.}$	(4) 80 % sim.
$Treat_{m,t}$ $AfterTreat_{m,t}$	$27,645^{**} \\ (12,092) \\ 39,286^{*} \\ (20,993)$	$36,222^{***} \\ (14,312) \\ 45,573^{*} \\ (26,637)$	$36,997^{**}$ (15,376) $50,175^{*}$ (27,486)	$39,549^{***}$ (16,597) $54,844^{*}$ (29,111)
Observations	37,973	37,973	37,973	37,973

Table A8: Effect on the expenditure for split projects using different similarity scores.

The outcome variable is the expenditure on split projects for furniture and services identified using Word2Vec to compare the objects' descriptions. Two contracts are considered to be part of the same project if the similarity is respectively 95, 90, 85, 80 percent or higher. The following controls are included: population, indicator whether the mayor is born in the municipality, number of years until the next election, the average of the controls for neighbouring municipalities, year fixed effects and province-specific linear trends. I use the Conley standard errors to account for spatial HAC errors. Conley standard errors are computed for all the municipalities within a ten kilometre radius. Figure A1 shows the distribution of the number of municipalities within ten kilometres for all Italian municipalities.

1 shows the results of Section 1.6.1, whereas in the other column I consider the yearly expenditure on contracts with similarities higher than 90, 85 and 80 percent respectively. Results are very stable irrespective of what level of similarity two contracts need to have to be considered part of the same project.

Similar results apply when I use approximate string matching as method to compare contracts' descriptions. Table A9 shows the results of Equation 1.2, using different thresholds of the string approximate matching to establish when two contracts are part of the same project.

Second, Table A10 shows the results of Section 1.6.1 but focussing only on contracts of public works. As shown in Figure 1.4, municipalities do not change the number of contracts below the 40,000 Euro. Therefore, if the mechanism through which municipalities move contracts of services and furniture below the 40,000 Euro is through splitting a single project in multiple (smaller) contracts, we should not observe any response on the expenditure on split projects for public works. Results of Table A10 confirms this hypothesis, since there is not a statistically significant difference in the expenditure on split projects of public works, during and after a neighbouring dissolution.

	(1)	(2)	(3)	(4)
	95 % sim.	99 % sim.	90~% sim.	80~% sim.
$Treat_{m,t}$	14,362**	$11,\!687^*$	$16,\!169^*$	$27,776^{**}$
	(7, 196)	(6,233)	(8,790)	(11, 964)
$AfterTreat_{m,t}$	$25,738^{**}$	$20,\!458*$	$26,\!417^*$	$40,\!629^*$
	(11,751)	(11, 861)	(14, 460)	(21,029)
Observations	$37,\!973$	$37,\!793$	$37,\!793$	37,793

Table A9: Effect on the expenditure for split projects using different similarity scores.

The outcome variable is the expenditure on split projects for furniture and services identified using string matching to compare the objects' descriptions. Two contracts are considered to be part of the same project if the similarity is respectively 95, 90, 85 and 80 percent or higher. The following controls are included: population, indicator whether the mayor is born in the municipality, number of years until the next election, the average of the controls for neighbouring municipalities, year fixed effects and province-specific linear trends. I use the Conley standard errors to account for spatial HAC errors. Conley standard errors are computed for all the municipalities within a ten kilometre radius. Figure A1 shows the distribution of the number of municipalities within ten kilometres for all Italian municipalities.

Table A10: Effect of the dissolution on the expenditure for split projects of public works.

	(1) Word2Vec	(2) Word2Vec	(3) String Matching	(4) String Matching
	80~%	90%	95~%	99~%
$Treat_{m,t}$ $AfterTreat_{m,t}$	-5,384 (4,437) 8,162 (9,886)	$ \begin{array}{r} -1,318\\(2,872)\\4,681\\(6,687)\end{array} $	$1,383 \\ (1,304) \\ -4,260 \\ (2,274)$	$ \begin{array}{r} 626 \\ (1,114) \\ -3,622 \\ (1,929) \end{array} $
Observations	37,973	37,973	37,973	37,973

The outcome variable is the expenditure on split projects for public works identified using Word2Vec and approximate string matching to compare the objects' descriptions. Two contracts are considered to be part of the same project if the similarity is respectively 80, 90, 95 and 99 percent or higher. The following controls are included: population, indicator whether the mayor is born in the municipality, number of years until the next election, the average of the controls for neighbouring municipalities, year fixed effects and province-specific linear trends. I use the Conley standard errors to account for spatial HAC errors. Conley standard errors are computed for all the municipalities within a ten kilometre radius. Figure A1 shows the distribution of the number of municipalities.

	(1)	(2)	(3)
	Expenditure	Expenditure	Expenditure
$Treat_{m,t}$ $AfterTreat_{m,t}$	$23,026 \\ (23,765) \\ 55,685 \\ (34,079)$	$\begin{array}{c} 10,995 \\ (20,966) \\ 59,549^* \\ (32,927) \end{array}$	$14,238 \\ (17,957) \\ 64,003^{**} \\ (29,335)$
$\begin{array}{l} 20,000 \; \text{Euro} \leq \text{Contract Size} \leq 200,000 \; \text{Euro} \\ 20,000 \; \text{Euro} \leq \text{Contract Size} \leq 300,000 \; \text{Euro} \\ 20,000 \; \text{Euro} \leq \text{Contract Size} \leq 100,000 \; \text{Euro} \end{array}$	Y	N	N
	N	Y	N
	N	N	Y
Observations	$46,327 \\ 401,639$	46,327	46,327
Baseline mean		355,649	246,792

Table A11: Effect of the dissolution on total expenditure, including larger contracts.

The outcome variable is the yearly expenditure on contracts for services and furniture around the 40,000 Euro threshold. The following controls are included: population, indicator whether the mayor is born in the municipality, number of years until the next election, the average of

the controls for neighbouring municipalities, year fixed effects and province-specific linear trends. I use the Conley standard errors to account for spatial HAC errors. Conley standard errors are computed for all the municipalities within a ten kilometre radius. Figure A1 shows

the distribution of the number of municipalities within ten kilometres for all Italian municipalities.

Finally, I show that results of Table 1.4 are stable to the inclusion of larger projects. Table A11 shows the results of Equation 1.2 with the yearly expenditure on contracts for furniture and services as outcome.

A6 Robustness checks on results by type of good

Table A12 shows the results of Equation 1.2 and use as outcome variable the number of contracts issued by sectors (i.e. construction and waste management or others) and types of good (i.e. furniture and services or public works). Since the relevant change in the 40,000 Euro threshold applies only for services and furniture, it is not surprising to observe a response only for contracts of services and furniture in waste management and construction sectors.

Finally, Table A13 shows the results of Equation 1.2 focussing on contracts for services and furniture of different sizes.

A7 Additional informations on the renegotiations

Since public procurement is a long and complex process, irregularities can happen at different stages of the process. Therefore, the Italian monitoring authority (ANAC) lists the features of the procurement process to consider as indicators

	Services and Furniture			Public Works					
	Constructi	ion and waste man.	Otl	Others Cons		Construction and waste man.		Others	
	(1) N	(2) N	(3) N	(4) N	(5) N	(6)	(7) N	(8) N	
	IN	1N	IN	IN	IN	1N	IN	IN	
$Treat_{m,t}$	-0.120*	-0.202***	0.055	0.138	0.014	-0.095	0.078*	0.098**	
AfterTreat	(0.062)	(0.071) 0.116	(0.175) 0.279	(0.173) 0.238	(0.105) 0.154	(0.104) 0.344**	(0.044)	(0.046) 0.124	
After T reat m, t	(0.110)	(0.126)	(0.268)	(0.238) (0.289)	(0.167)	(0.168)	(0.030 (0.078)	(0.089)	
Province linear trends	Ν	Y	Ν	Y	Ν	Y	Ν	Y	
Observations	11,178	11,178	11,178	11,178	11,178	11,178	11,178	11,178	

Table A12: Effect on number of contracts larger than 40,000 Euros by type of good and sector

The outcome variable in the first four columns is the number of contracts for services and furniture in the two categories of sectors. The following four columns show the results for the contracts of public works larger than 40,000 Euros respectively for construction and waste management and other sectors. Contract size is between 40,000 Euro and 70,000 Euro. The waste management category includes the following types of services: waste management, removal of sewage, cleaning and environmental services. The following controls are included: population, indicator whether the mayor is born in the municipality, number of years until the next election, the average of the controls for neighbouring municipalities, year fixed effects and province-specific linear trends. I use the Conley standard errors to account for spatial HAC errors. Conley standard errors are computed for all the municipalities within a ten kilometre radius. Figure A1 shows the distribution of the number of municipalities within ten

kilometres for all Italian municipalities.

	Contracts smaller than 60,00	0 Euro	Contracts smaller than 80,000 Euro		
	Construction and Waste man.	Others	Construction and Waste man.	Others	
	(1) N	(2) N	(3) N	(4) N	
$Treat_{m,t}$ $AfterTreat_{m,t}$	-0.157^{**} (0.065) -0.217^{**} (0.100)	$\begin{array}{c} 0.043 \\ (0.141) \\ 0.209 \\ (0.232) \end{array}$	-0.202^{***} (0.071) -0.116 (0.126)	$\begin{array}{c} 0.138 \\ (0.173) \\ 0.238 \\ (0.289) \end{array}$	
Observations	11,178	11,178	11,178	11,178	

Table A13: Effect on number of contracts larger than 40,000 Euros by type of good and sector

The outcome variable is the number of contracts for services and furniture in the construction and waste management sectors. Contract size is between 40,000 Euro and 60,000 Euro in the

first two columns, and contracts between 40,000 Euro and 80,000 Euro in the last two columns. The waste management category includes the following types of services: waste management, removal of sewage, cleaning and environmental services. The following controls are included: population, indicator whether the mayor is born in the municipality, number of years until the next election, the average of the controls for neighbouring municipalities, year fixed effects and province-specific linear trends. I use the Conley standard errors to account for spatial HAC errors. Conley standard errors are computed for all the municipalities within a ten kilometre radius. Figure A1 shows the distribution of the number of municipalities within ten kilometres for all Italian municipalities. of potential irregularities. This report is published annually and it should guide the law enforcement body in the evaluation of the procurement contracts. For the monitoring authority, the public body can pursue some illicit activities if the contract has the following features:

- Emergency clause.
- Same winner firm of many other contracts awarded by the same institution.
- Discriminatory requirements for bidding.
- A single bid auction.
- A subcontract.
- A renegotiation.
- The object of other contracts issued in a close period of time is the same (i.e. splitted projects).
- No advertisement of the tender.

The renegotiation is the only feature of the list that I have in the data, therefore I study the reaction of the municipalities to a neighbouring dissolution on this dimension, considering it as one of the first outcomes that the law enforcement body would look at and it is also easy to monitor. The law enforcement body faces more difficulties in detecting whether two contracts are related to the same object, since it would need to compare all the contracts issued by the municipality in a specific time frame (e.g. in the same year like in Section 1.6.1).

Figure 1.3 shows how amendments are common in areas where organised crime is infiltrated the most (e.g. Sicily). Figure A11 shows the average size of the amendments in each Italian province as share of the value of the corresponding contracts. Renegotiations should not be larger than 20 percent of the contract value. Some provinces where criminal organisations have historically infiltrated (as the Province of Naple) show an average size of the renegotiations above the 15 percent of the contract value, that is very close to the legal threshold.



Figure A11: Value of the renegotiations as share of the contract values.

Appendix B (for Chapter 2)

In the Appendix we verify the validity of our results. First, we analyse whether there might be some strategic interaction between the level of the IMU reform and all the other transfers cut implemented by the national government. The first approach we have to solve the potential omitted variable bias induced by the other transfers is to include their value in the estimation. However, our interest is in understanding whether municipalities affected by the IMU reform received systematically greater (or smaller) transfers cuts during the other reforms.

Figure B1 shows that there is no correlation between the transfers cuts implemented during the IMU reform and any other subsequent transfer cut.

Then, we show in Figure B2 the results of the analysis on the event study described in Section 3.3, using the municipal tax revenue as outcome instead of the property tax revenue. While Figure B3 shows the same for the expenditure on services.

Then, we use information on some services provided to verify if the increase in the expenditure on services corresponds to an overall improvement in the provision of public goods. Indeed, an average increase in the expenditure does not necessarily imply an improvement of the services that municipalities provide to their citizens. Therefore, in Table B1 we estimate the specification in Equation 2.2 on two different public goods (i.e. nursery schools and local police). The outcomes are respectively, a dummy for whether there is a nursery school (Column 1), a dummy



Figure B1: Correlation between IMU reform and other transfers cuts



Figure B2: Event study of reform on municipal tax revenue. This specification interacts $ExpAddRev_{m,11-12}$ with a dummy for the year variable. Controls: population, other transfers, and municipality fixed effects. Outcome is the municipal revenue. Omitted year: 2011.



Figure B3: Event study of reform on municipal expenditure on services. This specification interacts $ExpAddRev_{m,11-12}$ with a dummy for the year variable. Controls: population, other transfers, and municipality fixed effects. Outcome is the municipal expenditure on services. Omitted year: 2011.

for whether the municipality has a local police officer (Column 2), and a police car (Column 3).

The results of Table B1 show how an improvement in the expenditure on services corresponds to an increase in (some of) the public goods that municipalities provide. An increase of one percent in (instrumented) fiscal autonomy increases the probability of having a nursery in a municipality by 2 percent, increases the probability of having at least a local police officer by 1.4 percent, and increases the probability that the local police have a car by 0.4 percent.

Then, we study whether common shocks different from the IMU reform and that affect differently municipalities in different regions can explain our results. Therefore, we estimate the results of Equation 2.2, including province linear trends. Table B2 shows the results of Equation 2.2 including province linear trends. The only different result from our main specification is that municipalities respond to the larger responsibility by increasing the revenue from other taxes as well. All the other results are unchanged.

Then, in Table B3 we estimate Equation 2.2 controlling for population times year

	(1)	(2)	(3)
	Nursery	Police Empl.	Police Car
FiscAut	0.020^{***} (0.002)	0.014^{***} (0.002)	0.004^{**} (0.002)
N. of observations	42,586	42,586	31,961
F stat.	128.285	128.285	128.285

Table B1: Effect of the IMU reform on public good provision

The outcome variable of column 1 is a dummy taking value 1 if there is a nursery school in the municipality. The outcome in Column 2 is a dummy taking value 1 if there is at least an local police officer in the municipality, while Column 3 estimates the effect on having a car for the local police department. In all the regressions we control for municipality and year fixed effects, logarithm of the population and logarithm of the transfer cuts that are not due to the IMU reform, both from the national government and other public bodies.

Panel A				
	(1)	(2)	(3)	(4)
	Tot. Rev.	Other taxes	Net Loans	Other Rev.
Fiscal Autonomy	0.005^{***}	0.011^{**}	-0.073***	-0.001
	(0.002)	(0.005)	(0.018)	(0.002)
N. of observations	41,423	41,423	29,336	41,423
F stat.	119.658	120.084	89.255	119.658
Panel B				
	(5)	(6)	(7)	
	Tot. Exp.	Services	Administration	
Fiscal Autonomy	0.005^{***}	0.007^{***}	-0.006***	
	(0.002)	(0.002)	(0.002)	
N. of observations	41,423	41,419	41,419	
F stat.	119.665	119.665	119.665	

Table B2: Effect of the IMU reform on the budgetary behaviour with province linear trends

The table shows the results of Equation 2.2. Panel A shows the results on the logarithm of following outcome variables: the total level of revenue, the tax revenue from all taxes but IMU, the net loans (i.e. new loans minus debts repayments) and, finally, the other revenue. Panel B shows the results on the logarithm of following outcome variables: total expenditure, expenditure for services, and expenditure for administration. We control for municipality and year fixed effects, log of population, logarithm of the level of other transfers cuts and a

dummy taking value 1 if the municipality is subject to the DSP and province linear trends. Standard errors are clustered at municipality level.

Panel A				
	(1)	(2)	(3)	(4)
	Tot. Rev.	Other taxes	Net Loans	Other Rev.
Fiscal Autonomy	0.003^{*}	0.015^{**}	-0.085***	0.001
	(0.002)	(0.006)	(0.016)	(0.002)
N. of observations	42,586	42,474	29,478	42,586
F stat.	147.304	147.193	104.634	147.304
Panel B				
	(5)	(6)	(7)	
	Tot. Exp.	Services	Administration	
Fiscal Autonomy	0.004^{**}	0.005^{***}	0.002	
	(0.002)	(0.001)	(0.002)	
N. of observations	42,586	42,582	42,582	
F stat.	147.304	147.314	147.314	

Table B3: Effect of the IMU reform controlling for population times year FE

The table shows the results of Equation 2.2. Panel A shows the results on the logarithm of following outcome variables: the total level of revenue, the tax revenue from all taxes but IMU, the net loans (i.e. new loans minus debts repayments) and, finally, the other revenue. Panel B shows the results on the logarithm of following outcome variables: total expenditure, expenditure for services, and expenditure for administration. We control for municipality and year fixed effects, log of population, logarithm of the level of other transfers cuts and a dummy taking value 1 if the municipality is subject to the DSP and population times year fixed effects. Standard errors are clustered at municipality level.

fixed effects for controlling for any trends that affects municipalities of similar size. Results are similar to the one of Table 2.4.

Instead, Table B4 shows the results of Equation 2.2 using as instrument the share of the municipality revenue affected by the IMU reform. The results are similar to the one used in the main specification.

Then, we verify our local difference in difference results by using samples with different population intervals. Table B5 shows how the results are unchanged if we compare municipalities closer to the 5,000 inhabitants threshold.

Panel A				
	(1)	(2)	(3)	(4)
	Tot. Rev.	Other taxes	Net Loans	Other Rev.
	0.000**	0.007**	0.052***	0.009
Fiscal Autonomy	0.002	0.007	-0.053	0.003
	(0.001)	(0.003)	(0.008)	(0.002)
N. of observations	42.479	42.363	29.656	42,479
F stat.	634.671	637.110	449.486	634.671
Panel B				
	(5)	(6)	(7)	
	Tot. Exp.	Services	Administration	
Fiscal Autonomy	0.002**	0.003**	0.002	
	(0.001)	(0.001)	(0.001)	
N. of observations	42,479	42,475	42,475	
F stat.	643.371	635.062	635.062	
	1. 0			

Table B4: Effect of the IMU reform, instrumented using share of municipal revenue

The table shows the results of Equation 2.2 using as instrument the share of the municipality

revenue affected by the reform. Therefore, the instrument is the following: $\frac{ExpAddRev_{mt}}{TotalRevenue_{m,2011}} \times 1(Year \ge 2012).$ Panel A shows the results on the logarithm of following outcome remember of the state o outcome variables: the total level of revenue, the tax revenue from all taxes but IMU, the net loans (i.e. new loans minus debts repayments) and, finally, the other revenue. Panel B shows the results on the logarithm of following outcome variables: total expenditure, expenditure for services, and expenditure for administration. We control for municipality and year fixed effects, log of population, logarithm of the level of other transfers cuts and a dummy taking value 1 if the municipality is subject to the DSP. Standard errors are clustered at municipality level.

	(1)	(2)	(3)
	Net Loans	Net Loans	Net Loans
$\widehat{FiscAut}$	-0.016	-0.032	-0.024
	(0.018)	(0.024)	(0.034)
$\widehat{FiscAut \times DSP_m}$	-0.048^{***} (0.013)	-0.057^{***} (0.017)	-0.082^{***} (0.024)
	(01020)	(01021)	(010-1)
$2,000 \le \text{Population} \le 9,000$	Х		
$3,000 \le \text{Population} \le 7,000$		Х	
$4,000 \le \text{Population} \le 6,000$			Х
N. of observations	9,557	5,421	2,575
F Stat.	70.791	40.200	26.250

Table B5: Effect of the IMU reform and DSP on loans

The outcome is the logarithm of the net loans. DSP_m is a dummy taking value 1 if the municipality had a population larger than 5,000 inhabitants in 2008, and therefore it is subject to the DSP up to 2012. We control for the logarithm of the change of non-IMU transfers, and for linear function of the logarithm of population.

Finally, we verify that the results on the debt level are driven by the implementation of the DSP, rather than any other law applying on municipalities larger than 5,000 inhabitants. In particular, we are worried of the impact of another law on mayor salaries, which changes discontinuously for municipalities larger than 5,000 inhabitants as well. As described in Grembi et al (Grembi, Nannicini, and Troiano (2016)), a mayor's salary increases sharply at the 5,000 threshold. This can be a threat to our identification of the effect of the DSP if mayors that are paid more behave differently than those who are paid less for the same increase in responsibility.

We exploit the change in the threshold of applicability of the DSP implemented from 2013. The national government moved the threshold for the application of the DSP to 1,000. Figure B4 shows the change in the share of municipalities that decrease (net) borrowing in 2013/2014, with respect to 2011, more than 1 percent of 2011 municipal revenue. There is no longer a difference in the borrowing behaviour between municipalities above and below 5000 when the DSP threshold at 5000 is removed but the mayor salary threshold still applies, indicating that gap in borrowing observed in Figure 2.5 is a result of the DSP and not the mayor salary threshold.

Table B6 estimates Equation 2.2 excluding the 2012 from the analysis. After



Figure B4: Effect of the DSP on share of municipalities increasing loans The outcome variable is the share of municipalities that increase the net borrowing after 2012 (i.e. loans minus debts repayments) with respect to 2011 by at least one percent of the municipal revenue in 2011. The solid line represents the 5,000 population threshold. Municipalities larger than the threshold were subject to fiscal rules.
2012, both municipalities smaller and larger than 5,000 inhabitants were subject to the DSP. Indeed, we do not observe any statistical difference in the change in the net loans between the two groups.

	(1)	(2)	(3)
	Net Loans	Net Loans	Net Loans
_			
$\widehat{FiscAut}$	0.121	0.005	0.48
	(0.088)	(0.06)	(0.664)
$\widehat{FiscAut \times DSP_m}$	-0.094	0.072	-0.556
	(0.164)	(0.089)	(0.68)
Log of Population	Х	Х	Х
Cubic of Population		Х	Х
Population \times Year FE			Х
N. of observations	16,180	16,180	16,180
F Stat.	0.248	0.460	0.263

Table B6: Effect of the IMU reform and DSP on loans

The outcome is the logarithm of the net loans. DSP_m is a dummy taking value 1 if the municipality had a population larger than 5,000 inhabitants in 2008, and therefore it is subject to the DSP up to 2012. We control for the logarithm of the change of non-IMU transfers, and for different smooth functions of population, respectively: linear approximation, cubic, and population times year fixed effects.

Appendix C (for Chapter 3)

In the Appendix, we show all the robustness checks and different figures relevant for this study.

Figure C1 shows the results of the event study focusing on the yearly expenditure on public works. The outcome variable is the inverse hyperbolic sine of the yearly expenditure on public works. The yearly expenditure on public works decreases by approximately 18 percent in 2013. There is no difference in the trend between treated and control municipalities before and after 2013.

Figure C2 shows the provinces that received an higher share of EU funds. Municipalities in the south of Italy had a less binding budget constraint, since they received EU funds, which are not counted in the DSP. Awarding additional EU funds is not a discretional choice of the European governments. Indeed, EU funds



Figure C1: Event study of reform on the yearly expenditure on public works. This specification interacts DSP_m with a dummy for the year variable. Controls: logarithm of the population, party dummies, and municipality fixed effects. Outcome is the inverse hyperbolic sine of the yearly expenditure on public works. Omitted year: 2012.

were awarded to European regions with a GDP per capita below the 75% of the EU average.



Provinces receiving disproportionately larger EU funds

Figure C2: Map showing provinces receiving additional funds from the EU The figure shows the region receiving a disproportionately larger share of EU funds. The regions are: Apulia, Basilicata, Calabria, Campania, Sardinia and Sicily.

	(1)	(2)	(3)
	Contract D.	Contract D.	Contract D.
$DSP_m \times 1(Year \ge 2013)$	-0.044***	-0.035**	-0.020
	(0.015)	(0.016)	(0.017)
$DSP_m \times 1(Year \ge 2013) \times EU \text{ funds}_m$	-0.033	-0.046	-0.032
	(0.037)	(0.038)	(0.037)
N. of observations	26,433	26,433	26,433
Baseline mean	0.278	0.278	0.278

Table C1: Effect of the DSP considering the EU funds

Table C1 shows the results taking into account this information. In particular, we study whether the DSP has a differential effects on regions that received a greater amount of EU funds. The $EUfunds_m$ is a dummy taking value 1 if the municipality is in a region receiving more EU funds, 0 otherwise. Therefore, we regress the following equation:

$$Y_{mt} = \alpha_m + \alpha_t + + \beta_0 DSP_m \times 1(Year \ge 2013) + \beta_1 DSP_m \times 1(Year \ge 2013) \times EUfunds_m + \beta_2 1(Year \ge 2013) \times EUfunds_m + \mathbf{X}_{mt}\beta_3 + \epsilon_{mt}$$

$$(3.4)$$

We show the results on number of contracts. There is no differential effects of the fiscal rules on municipalities that received EU funds.

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