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Essays in Banking and Corporate Finance

Abstract

This dissertation studies the role of different types of frictions in preventing optimal resource allocation in the economy. In chapter 1, I focus on financial frictions and consider the distorted incentives of banks to lend to zombie firms. I show that bank supervision, in the form of on-site unexpected inspections, can reduce the misallocation of resources in the credit market with positive spillovers for the local economy. In chapter 2, I study the role of political frictions in explaining the divergence of the income-GDP ratio from the optimal level suggested by the optimal taxation literature. I review the literature on the topic and suggest that among other factors, political budget cycles play an important role. In chapter 3, I combine the two topics from before, by considering the role of political frictions in the context of zombie lending and show that electoral cycles can explain the persistence of this lending behavior by financial intermediaries.

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Introduction

This dissertation studies the role of different types of frictions — financial and political – in preventing optimal resource allocation in the economy.

In the first chapter I show that bank supervision reduces distortions in the credit market and generates positive spillovers for the real economy. Combining a novel administrative dataset of unexpected bank inspections with a quasi-random selection of inspected banks in Italy, I show that inspected banks are more likely to reclassify loans as non performing after an audit. This behavior suggests that banks are inclined to misreport loan losses and evergreen loans to underperforming firms unless audited. We find that this reclassification of loans leads to a temporary contraction in lending by audited banks. However, this effect is completely driven by a credit cut to underperforming firms, as the composition of new lending shifts toward more productive firms. As a result, these productive firms increase employment and invest more in fixed capital. We provide evidence of a mechanism for our results: a change in bank governance. Finally, we find positive spillovers from inspections: entrepreneurship increases, underperforming firms are more likely to exit and there is an overall increase in the productivity at the local economy as a result. Taken together, our results show that bank supervision is an important complement to regulation in improving credit allocation.

In the second chapter I review the literature which explains why and under which circumstances governments accumulate more debt than it would be consistent with optimal fiscal policy. I focus mostly on the role of political factors in explaining the divergence of the level of debt-GDP ratio from the optimal one proposed by the optimal taxation literature.

Among other things, I discuss the existence of political budget cycles, i.e. the use of deficit by incumbents to win elections, to explain this potential divergence.

The final chapter considers another potential reason for the existence of zombie lending, namely political influence by local politicians. Local politicians running for elections have an incentive to keep zombie firms alive around election years to increase their electoral support. To study this question I collect data on elections at the municipality level and combine it with a dataset on credit, banks and firms. First, I show that the electoral cycle affects lending activity. Credit growth increases by 1.7% in a municipality during an election year. This result is driven by increased lending to zombie firms, and especially during close race elections, i.e. where the margin of victory is small. Second, I show that the lending expansion during election years is driven by local banks. Finally, I can't reject the hypothesis that zombie firms increase employment around the election year.

Chapter 1

The Real Effect of Bank Supervision¹

1.1 Introduction

A weak banking sector can prolong economic stagnation by distorting the credit market. This market failure can arise if banks misallocate credit to impaired firms.

Existing research has shown that bank regulation and policy interventions are insufficient to prevent such distortions in credit allocation and, if anything, make these distortions worse. Blattner *et al.* (2017) show that stricter capital requirements increase banks' incentive to distort their lending decisions. Since banks have to satisfy a higher regulatory capital ratio, they try to avoid reporting new losses by extending additional credit to support ailing firms. Acharya *et al.* (2019b) show that a policy aimed at recapitalizing European banks has not translated into economic growth, as credit was allocated to impaired firms. The firms receiving these funds do not undertake real economic activity, such as employment and investment, but they use the new funds to build cash reserves. These distortions in the credit market have negative implications for the real economy, as impaired firms crowd out lending to better performing or new firms (Peek and Rosengren (1995); Caballero *et al.* (2008); Acharya *et al.*, 2019a; Acharya *et al.*, 2019b; Blattner *et al.*, 2017). Simply increasing the regulatory burden is not an effective way to reduce distortions in the credit market.

¹Co-authored with Paolo Angelini, Francesca Lotti and Giovanni Soggia.

In this paper, we consider an important complement to bank regulation in reducing market failures, bank supervision. We identify the causal effect of bank supervision on credit market allocation and the subsequent spillovers to the real economy. We exploit a shock induced by randomized bank inspections to a group of eligible banks. These inspections are unexpected, intrusive and thorough audits at the supervised bank's offices. Their main goal is to validate not only the quality of banks' assets, but also their reporting activity to the supervisor.² When necessary, the bank inspectors may also force measures upon inspected banks.³

These audits are performed every year. We exploit the two-step selection process employed by the bank supervisor to define the set of banks that are inspected. Every year, this selection process first identifies a group of eligible banks. Then, it selects a subset of these banks to be inspected in a quasi-random fashion. This selection is based on a computer-based unpublished algorithm. The algorithm selects and ranks the banks that are inspected. Banks are then inspected according to this ordering.

To estimate the causal effect of bank inspections, we leverage a novel dataset of on-site bank inspections, combining it with a comprehensive administrative dataset from the Bank of Italy on banks, credit, and firms. Specifically, we have detailed information on which banks are audited and the exact timing of the audit for a subset of banks, namely mutual banks. These banks are particularly important, as they are local and support mostly small and medium enterprises. We merge this information with data on banks' balance sheets from the Supervisory Reports, the universe of loans granted to Italian firms from the Credit Register, data on banks' corporate bodies, information on firms' balance sheets and income statements, and finally with data on employment and local economic activity indicators

²By law, at the end of each month banks have to report to the supervisor information about their balance sheets and lending activity. Inspections, among other things, are aimed at assessing whether banks misreport this information to the supervisory authority.

³The most common action is forcing banks to reclassify items in their balance sheets such as a loan from performing into non-performing. They can suggest the readjustment of the expected value of the loan by writing-off some of its amount. In case of violations of laws, inspectors can inflict sanctions either of pecuniary nature or that can cause bank administrators to temporarily or permanently lose their fit-and-proper status. In the most serious cases, inspectors can also suggest to take over the control of the bank.

from the National Institute for Social Security INPS and the National Institute of Statistics ISTAT.⁴ Our main empirical model is a dynamic Difference-in-Differences (DiD) model comparing inspected banks with eligible banks that are not inspected.

We provide three sets of results. First, on-site inspections have a direct effect on the loan classifications of inspected banks. We call this the *informational disclosure effect*. Following an inspection, audited banks increase the stock of loans classified as Non Performing Loans (NPL) by about 3%, which represents roughly 12% of the average of nonperforming loans across all eligible banks.⁵ Moreover, inspected banks are more likely to increase loan loss provisions. These effects are limited to the first quarter following the inspection. This short time lag provides evidence that the effect is driven by audits.

The main threat to a causal interpretation of these findings is the possibility of selection bias—eligible banks that are actually inspected may be different from eligible banks that are not inspected. We provide a variety of evidence showing that such selection does not drive our results. First, we show that there are no significant differences between the banks that are inspected and other banks that eligible for inspections. The selection rule depends on factors uncorrelated with banks' characteristics.⁶ Thus, within the sample of eligible banks, inspections are as good as randomly assigned. Moreover, the absence of pre-trend differences in the outcomes before the inspection supports a causal interpretation.⁷

⁴Specifically, we define the local economy as Italian provinces. These are roughly the size as US counties. In the period considered there are about 109 provinces.

⁵NPL is a macro-category that includes three types of loans. First, loans that are overdrawn and/or past-due by more than 90 days and above a predefined amount. Second, unlikely-to-pay exposure which are loans for which banks believe debtors are unlikely to meet contractual obligations in full, unless the bank takes action. Third, bad loans are exposures to debtors that are insolvent (or in substantially similar circumstances). <https://www.bancaditalia.it/media/views/2017/npl/index.html?com.dotmarketing.htmlpage.language=1>. In our paper, we refer to the last category, i.e. bad loans, unless otherwise mentioned.

⁶We confirm the anecdotal evidence of this fact.

⁷We further show robustness along a number of dimensions, including: using the ranking position of audited banks in the inspection plan as a sufficient statistic for the selection rule, and interacting it with the treatment dummy variable; comparing inspected banks ranked in the top quartile with inspected banks ranked in the bottom quartile; applying subsample analysis, including dropping the top-ranked inspected banks; using the ranking position to predict the quality of banks; using propensity score matching based on the probability to be inspected. These exercises provide further evidence that the selection is not an issue in this setting.

Our second set of results sheds light on the implications of inspections for the lending activity of audited banks—the indirect effect of bank inspections. We find that, aggregate lending shrinks following an inspection. However, the drop is temporary: after seven quarters, aggregate lending reverts to its pre-audit level. Given the supervisory-driven nature of the credit supply shock, we test whether there is a *compositional* effect. Do inspected banks readjust their portfolio? To answer this question we move to a loan-level analysis and employ a model in the spirit of Khwaja and Mian (2008). Specifically, we estimate credit growth for a firm that has lending relationships with both inspected banks and eligible, but not inspected, banks. Our specification allows us to control for unobserved heterogeneity in credit demand. To study the heterogeneous effect of bank inspections, we construct a new measure of the firm’s quality based on the outcomes of the bank audits. We consider a firm to be underperforming if its loan is reclassified as an NPL by an inspected bank within a quarter of the inspection. We argue that this measure is better at identifying impaired firms, since it is based on soft information used by inspectors to judge the quality of a firm.⁸ We find that the lending cut is driven *exclusively* by underperforming firms in the bank’s portfolio.

We find evidence of a *reallocation channel*. In particular, loans are reallocated towards either to healthy firms in the bank’s portfolio or to new firms that did not have a credit relationship with the inspected banks. Moreover, loans to new firms granted after the audit are, on average, less risky than loans to new firms before the inspection. Overall, this suggests that inspected banks change their lending policies in response to audits.

We provide evidence on the mechanism causing this change in lending policy. First, we show that inspections drive changes in bank governance. Specifically, board members are more likely to leave the board of a bank if it is inspected. Additionally, we show that inspected banks strengthen their internal monitoring efforts by hiring more white-collar workers in the supervision and control units. Second, we document that inspections lead banks to increase their equity. This reduces moral hazard concerns as banks become

⁸We validate our results by using different measures for firm’s quality.

important stakeholders in both upside and downside states of the world.

Our third and final set of results concerns the spillover effects of bank supervision to the real economy. We first shed light on the impact on corporate behaviour. We follow the literature and construct a firm-level measure of exposure to inspected banks based on their share of credit granted by inspected banks (Chodorow-Reich 2013). We find that underperforming firms are more likely to exit the market, leaving room for healthy firms to grow. Healthy firms benefit from greater credit availability: they invest more in fixed assets and grow their workforce. As a result, healthy firms increase their sales. We then focus on the aggregate effect on the local economy. We construct a similar measure of a province's exposure to bank inspections based on the share of credit granted by inspected banks in that particular province. We find that provinces more exposed to bank inspections experience an increase in entrepreneurship. Specifically, a one standard deviation increase in a province's exposure to bank inspections implies an increase of about 2% in the growth rate of new firms after one year. Aggregate employment suffers in the short term as results of zombie unproductive firms exiting the market. We find a negative effect for those provinces more exposed to bank inspections. However, the effect becomes positive after two years. Employment in new firms or in existing firms counterbalance the layoff generated by zombie firms going bankruptcy. We find a small positive effect in the value added per worker at the province level.⁹ This is probably due to the selection of firms remaining or entering the market which are on average more productive. In some ways bank inspections can overcome the problem of the "unnatural selection" of firms that are staying in the market (Peek and Rosengren 2005) and this has potential positive effects for the local economy.

Contribution to the Literature:

Our paper contributes to several strands of the literature. First, we relate to a body of literature studying the effect of bank supervision on bank performance, risk-taking and

⁹Value-Added Productivity per Employee is an indicator that measures the "value-added" per employee and is an measure of the extent to which you are utilizing your employee's strengths.

lending (Eisenbach *et al.*, 2016; Hirtle *et al.*, 2017). These papers exploit different sources of variation: changes in the entity of the supervisor (Granja and Leuz, 2019; Agarwal *et al.*, 2014), in the quasi-random assignment of inspectors (Ivanov and Wang, 2019), or the location of the supervisor (Kandrac and Schlusche, 2017); unexpected change in the coverage of the major syndicated loan supervisory program (Ivanov *et al.*, 2017); sharp changes in the frequency of supervisory examinations (Rezende and Wu, 2014) or in the volume of regulatory reporting due to a size threshold rule (Bisetti (2017)). We make two contributions to this literature. First, we are the first to use data on bank audits, which provides detailed information on supervisory activity.¹⁰ Unlike other works, we are able to estimate the causal effect of bank supervisions at the micro-level. Second, by matching this data with granular data at the loan level, we can precisely estimate the implications of the supervisory activity. Unlike other papers that look at the aggregate effect on lending, we move a step further by studying how banks react to supervisory activity. We find that there is a compositional effect, with credit pulled back from underperforming firms and reallocated to healthy firms or new firms.

Our paper is also related to a large literature documenting the real effects of credit supply shocks (Khwaja and Mian, 2008; Chodorow-Reich, 2013; Amiti and Weinstein, 2018; Bottero *et al.*, 2018). In particular, it is related to the strand of literature considering supervisory-driven credit supply shocks. We find that the credit supply shock has an important compositional effect, and show that the credit crunch is driven by underperforming firms. We also contribute to the literature on zombie lending. Seminal papers show that there is a relation between a weak banking sector and distortions in the credit market (Caballero *et al.*, 2008; Peek and Rosengren, 2005). Recent papers establish a causal link between a weak banking sector and distorted credit markets (Acharya *et al.*, 2019b; Blattner *et al.*, 2017;

¹⁰In a contemporaneous paper Bonfim, Cerqueiro, Degryse and Ongena (2019) use similar data on bank inspections for the largest Portuguese banks and show that bank inspections reduce zombie lending. Their setting is different as they look at one specific special event in which the eight largest banks are inspected. We confirm their results, i.e. inspections reduce the credit granted to zombie firms. In addition to this, we provide evidence on the spillover effects to the real economy, as well as the potential mechanism driving the change in the lending policies of inspected banks.

Schivardi *et al.*, 2017; Albertazzi and Marchetti, 2010). While this literature has shown that this problem exists, it is silent about potential solutions. We show that bank supervision—especially intrusive on-site inspections—affect the lending policies of inspected banks and force banks to stop lending to zombie firms.

Finally, our paper is related to the body of research that looks at the real costs of zombie lending. The main takeaway from this literature is that zombie lending has negative spillover effects on performing firms in the same industry (Caballero *et al.*, 2008; Adalet McGowan *et al.*, 2018; Schivardi *et al.*, 2017; Giannetti and Simonov, 2013; Acharya *et al.*, 2019b). We show that bank inspections can mitigate zombie lending and generate positive spillovers for healthy firms. In turn, healthy firms can invest more and stimulate the real economy. Moreover, bank inspections have an impact on firm dynamics. One of the most salient problems with zombie lending is that it prevents new firms from entering a market because they find it harder to obtain financial resources (Adalet McGowan *et al.*, 2018). We find positive spillovers from inspections. First, we show that underperforming firms are more likely to exit; second we document that provinces with more exposure to bank inspections experience an increase in entrepreneurship, in local aggregate productivity and a negative short term effect on aggregate employment.

The remainder of this paper is organized as follows. Section 1.2 describes the institutional setting. Section 1.3 details the data and variables. Section 1.4 describes the direct effect of bank inspections. Section 1.5 discusses the indirect effect on lending. Section 1.6 shows the spillover effects to the real economy. Section 1.7 concludes.

1.2 Institutional Background

This section provides an overview of the role played by bank supervision and its main differences when compared to bank regulation. We provide a primer on the different types of supervisory activities, i.e. off-site inspections vs. on-site inspections, and finally, we discuss the latter in the context of the Italian banking system. In particular, we explain the selection process of inspected banks and we provide details on why this is an ideal setting

to study the impact of bank supervision.

1.2.1 Supervision as a way to improve upon regulation

We discuss the main distinctions between bank regulation and bank supervision. We examine the potential flaws in bank regulations and why bank supervision can reduce the potential market failure, holding fixed the regulatory system.

Bank supervision is a critical tool available to the supervisor for maintaining the stability of the banking sector. It is closely related to, but distinct from, regulation of the banking industry. Regulation involves the development and promulgation of the *rules* under which banks operate as well as their enforcement in the court of law. By their nature, regulations can be coarse. It is impossible to write a complete contract contingent to every state of the world. Within a regulation system there are always missing contingencies. These missing contingencies create the opportunity for agents to take advantage of regulatory arbitrage.¹¹ Theoretically, bank supervision can improve upon regulation. The core activity of the bank supervisor is to ensure that banks do not engage in unsafe and unsound practices. The relevant features of bank supervision are: (i) the assessment of the safety and soundness of banks through monitoring and exams, and (ii) the use of this information to request corrective actions from banks in the case their conditions or management are considered unsafe or unsound (Eisenbach, Lucca and Townsend, 2016). Given the timing of supervision – after the agents take the decision – supervisors can learn about the potential missing contingencies within the regulatory system and fix them. Moreover, supervision can generate a behavioral response. Knowing that the supervisor may take corrective measures *ex-post*, agents are more likely to comply with the rules. The problem with bank supervision is that it involves judgment, for instance, in assessing whether a bank may be engaging in excessive risk. Given the highly discretionary role played by bank supervision and potential capturing problems there has been a movement in recent decades to convert many

¹¹For instance, this is blamed as of the main factors contributing to the 2007 financial crisis, according to a sample of economists. <http://www.igmchicago.org/surveys-special/factors-contributing-to-the-2008-global-financial-crisis>.

supervisory judgments about “safety and soundness” into bright-line rules, resulting in more regulation and less discretionary policy (Menand, 2017).

1.2.2 A primer on bank supervision

We provide an overview of the two types of supervisory activities, i.e. off-site and on-site inspections, as well as their targets and goals. Later, we discuss on-site inspections in detail, in the context of the Italian banking system.

Generally speaking, bank supervision can be divided into two main areas: off-site and on-site inspections.¹² The differences between the two are related to: (i) the target of the inspections, and (ii) the way in which supervision is performed. Off-site inspections target all financial intermediaries operating within the national border. Financial intermediaries are required to periodically report information about their balance sheet and income statement to the National Supervisory Authority (NSA, henceforth).¹³ This type of supervision does not require a direct interaction between the bank supervisor and the supervised bank. On-site inspections are targeted to a subset of financial intermediaries, which are chosen according to a selection rule. We describe in detail the selection process performed in the Italian banking system in subsection 1.2.3. It is worth mentioning that the discipline has changed since the introduction of the Single Supervisory Mechanism (SSM, henceforth) in November 2014. The SSM has transferred some of the supervisory activities from the NSA to the European Central Bank (ECB, henceforth). The ECB is now in charge of the supervision of the Significant Institutions (SI, henceforth).¹⁴ SI plan, together with the supervisor, a time to perform an audit. Given the change in the supervisor’s entity and in the way off-site

¹²Note that each country has its own specific rules, structure and organization of bank supervision. However, the two main sub-classes exist in most developed countries (Cihák and Tieman, 2008).

¹³Note that in the paper, we indistinctly refer to bank supervisor as the NSA, or specifically, the Bank of Italy. The Bank of Italy is the institution responsible for the supervision of the banking system in Italy.

¹⁴Financial institutions are selected to be part of the SI sample if at least one of the following criteria applies: 1) its total assets above €30 billion; 2) it has obtained public assistance in the past; 3) it is one of the top three banks in the country. With the introduction of the SSM, on-site inspections are no longer unexpected for SI under the ECB supervision (SSM Supervisory Manual, 2018).

inspections are performed, we focus only on the sub-sample of banks that are still under the supervision of the NSA and for which the discipline about on-site inspections has not changed. Specifically, we consider only a subset of Italian banks, Mutual banks, that in the period of consideration are always under the supervision of the NSA, namely the Bank of Italy.¹⁵

On-site inspections consist of a thorough auditing of selected banks at their office. These audits come as a surprise for supervised banks. Supervised banks know neither that they have been selected for inspections, nor when the inspections will take place.¹⁶ The main goal of these inspections is to check the quality and accuracy of the data submitted and gain a better understanding of their organization and operations.¹⁷ The main informational advantage of these audits, compared to the information obtained with off-site inspections, is the access to the complete information history of the bank-firm relationship. The supervisor can gain access to information that the supervised bank is not required to disclose for the purpose of the off-site inspection: for instance, the credit application by the firm, the documents related to the credit approval, the internal information and documents produced by the bank about the firm, as well as the email and mail exchanges between the bank and the firm. This information allows the supervisor to assess the quality of the reporting done by the supervised bank and to better understand whether the bank is assessing the risk of a specific loan in a fair way.¹⁸ When needed, an inspector can force inspected banks to take corrective measures. The most common of these is the forced the re-evaluation of a loan, which could generate its reclassification from performing to non-performing. Additionally,

¹⁵We consider the period between 2010 and 2017.

¹⁶In terms of expectation this is different from stress tests where supervised banks know exactly when they are assessed. The date is planned together with the bank supervisor (Bernanke *et al.*, 2013; Abbassi *et al.*, 2017).

¹⁷<https://www.bancaditalia.it/compiti/vigilanza/compiti-vigilanza/index.html?com.dotmarketing.htmlpage.language=1>

¹⁸For instance, in a recent news report involving a firm that eventually was condemned for fraudulent bankruptcy, the inspection revealed that bank lending to the firm, *Banco di Sardegna*, was reporting a credit position characterized by “excessive tolerance and lack of transparency” (<https://www.sardiniapost.it/cronaca/bancarotta-fraudolenta-le-parole-del-gip-insolvenza-del-gruppo-scanu-dal-2002/>).

the inspector can suggest the readjustment of the expected value of the loan by writing-off some of its amount. In more serious circumstances, the Bank of Italy may also discover potential or actual violations of administrative laws and of secondary regulations, or, in the worst case, of criminal state laws. If criminal violations are found, the Bank of Italy initiates a process, after which the Banking and Supervision and Regulation directorate proposes sanctions that are then administrated by the Board of the Bank of Italy. The sanctions are generally of pecuniary nature and are published on the Bank of Italy website.¹⁹ In the latter case, i.e. actual or potential violations of criminal state laws, the Bank of Italy alerts the competent prosecutors, who have judiciary powers and may autonomously decide to start an investigation. The Bank of Italy does not have the power to start a prosecution independently.²⁰ There are different types of on-site bank inspections. Given the type of banks we consider, i.e. mutual banks in which shareholders are depositors and the main bank's business is the lending activity to firms, the only type of inspection performed is the "broad spectrum" inspection which covers the overall corporate situation.²¹ However, for bigger and more complex financial institutions, inspections can be targeted on specific areas. There are: (1) "targeted" inspections, which focus on particular parts of the business, risk areas of governance profiles; (2) "thematic" inspections, which deal with issues of general importance for the entire credit and financial system; and (3) "follow-up" inspections, which are carried out to gauge the progress made in implementing corrective measures required by the Bank of Italy or proposed by the intermediaries themselves.

On-site inspections require, on average, a team of five inspectors.²² There are some rules in terms of composition of the team of inspectors. Three inspectors must come from the

¹⁹<https://www.bancaditalia.it/compiti/vigilanza/provvedimenti-sanzionatori/index.html?com.dotmarketing.htmlpage.language=102>.

²⁰This is similar to the USA, where financial crimes are managed by the Financial Crimes Enforcement Network (FinCEN), a bureau of the United States Department of the Treasury that collects and analyzes information about financial transactions in order to combat domestic and international money laundering, terrorist financing, and other financial crimes.

²¹This is the focus of our paper.

²²The number is proportional to the size of the bank inspected. However, for mutual banks, which are of the same size (i.e. total assets) on average, the total number of inspectors is usually five.

central office in Rome, and two from the local office. The latter two inspectors come from the same province where the supervised bank has its offices. The chief of the team cannot be from the local branch. This composition of the team is designed in a way to achieve two goals: first, having inspectors from the central office reduce any capturing-related problem;²³ and second, local officers have a deep knowledge of the local economy – soft information – that can be used for supervisory activity. When reviewing the files on the credit application on a particular firm, they can better assess the quality of their files given the previous knowledge acquired about that specific firm.

In theory, bank supervisors would prefer to inspect all banks in the banking system. However, given the high amount of resources employed for this activity – both in terms of time and number of people – on-site inspections are limited to a subset of banks each year, within a group of eligible banks. Figure 1.2D shows the average, the maximum and the minimum number of days it takes to complete an auditing.²⁴ A large set of banks are dismissed from the pool of eligible ones and are not considered for inspection in that particular year. Figure 1.2A shows the number of banks eligible for on-site inspections each year, together with those that are not eligible.

1.2.3 Two-step selection process

We discuss the selection process employed by the Italian bank supervisor to select audited banks. We argue and show that within a selected group of eligible banks, a quasi-random share are inspected. This reduces issues related to a selection bias. Moreover, audits come at a surprise, meaning that banks are unlikely to window-dress for the inspections.

It is tricky to estimate the causal impact of bank supervision; the two main problems are selection and anticipation. Unless completely randomized, supervision activity results

²³Capturing problem is a serious issue in the banking industry and one of the primary reasons for a convergence toward more regulations and away from discretionary supervisory power in the last decade, especially in the US (Menand, 2017). Moreover, stress tests have been designed in a way to reduce the discretionary power of supervisors and to convey this power into a well-identified rule (Tarullo 2017).

²⁴Bank inspections have to be completed within the year, and the chief of the inspection team cannot be employed for multiple auditing. This generates logistical constraints in the organization of the inspections.

from selecting banks that “need an inspection” most. Additionally, unless completely unexpected, banks may anticipate an audit and react before they actually take place. This would confound the true effect of inspections with the anticipation effect.²⁵ Given these challenges, it is very hard to estimate the causal effect of bank inspections on a bank’s behavior. We exploit the way in which the Bank of Italy selects the banks that are audited each year. This selection process offers us a great setting to overcome the two main issues of anticipation and selection. The anticipation problem is not an issue in our framework, since on-site inspections come at a surprise for inspected banks.²⁶ Regarding the potential selection bias, we leverage on the two-step selection process performed by the Bank of Italy. In the first step the supervisor identifies a group of banks that are eligible to be inspected based on their health status. There is selection here based on bank’s healthy. However, once the group of eligible banks is defined, some are selected in a quasi-random fashion.²⁷

Defining a set of eligible banks.

The first step consists of selecting a group of eligible banks based on their quality. We show that, on average, the eligible group is on average of lower quality compared to the non-eligible banks.

Within each macro area called *Area Territoriale e Circostrizionale* (ATC, henceforth) the supervisory authority selects a group of banks eligible to be inspected.²⁸ The selection is based on banks’ quality and it is performed in the spring preceding the year of the inspection.²⁹ Banks are evaluated using a standardized procedure called MARC (*Monitoraggio Andamento*

²⁵For instance, in the context of stress test, for which the date is known well in advance, (Abbassi *et al.*, 2017) show that banks adjust their portfolio toward safer investments, and they go back to their original levels after the stress tests are concluded.

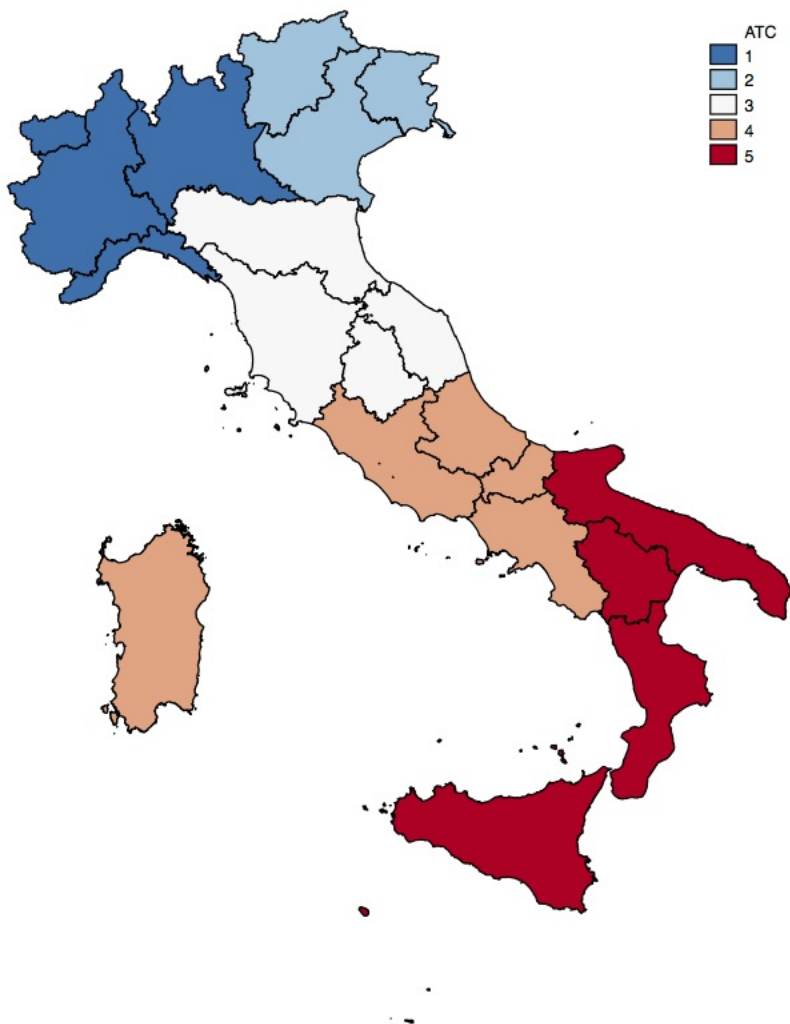
²⁶Even after the inspection is performed the information does not become public. We empirically confirm the anecdotal evidence that inspections are unexpected by running pre-trend tests and placebo tests.

²⁷While there are significant differences between eligible and non-eligible, we do not find any significant difference among banks in the eligible group.

²⁸An ATC is a macro area that includes from 3 to 5 different regions. There are 5 different macro areas in Italy, as shown in Figure 1.1. They roughly represent north-west, north-east, north-center, center, and south.

²⁹For instance, the selection of banks included in the 2010 inspection plan is done in the fall of 2009.

Figure 1.1: *Redistribution of Regions according to their ATC - Aree Territoriali e Circostrizionali*



Notes: This figure shows the spatial distribution of regions according to the ATC to which belong. There are five different ATC: 1. North-west (Piemonte, Liguria, Valle d'Aosta, Lombardia); 2. North-East (Trentino-Alto Adige, Friuli-Venezia Giulia, Veneto); 3. North-Center (Emilia Romagna, Toscana, Umbria, Marche); 4. Center (Lazio, Campania, Molise, Sardegna, Lazio); 5. South (Sicilia, Basilicata, Calabria, Puglia)

Rischiosita' Creditizio - Credit Risk Trend Monitoring), which evaluates for each bank the riskiness of all credit positions classified as problematic as well as a random share of the performing credit positions of each bank. This investigation, called the "pre-inspection phase," considers a random sample between 18% and 20% of the credit positions classified as performing. Evaluation of these credit positions also takes into account bank's balance

sheet information and borrower's information.³⁰ This process results in the definition of two groups of banks: first, banks that are considered risky enough and thus could be potentially inspected – we call this the set of eligible banks; and second, banks that are discarded from potentially being selected for inspections. This selection is based merely on the output generated by the MARC procedure and there is no space for manipulation by the supervisor.³¹

Figure 1.3(a) shows the distribution of eligible vs. not-eligible banks across years.³² The average number of banks that are eligible each year is about 143, and the number of those that are not eligible is about 148. Table A.4 shows balance tests for a set of covariates. We find that eligible banks have a higher stock of NPL, a lower capital ratio, and a lower liquidity ratio compared to banks that are not eligible. Figure 1.5 shows the graphical counterpart of it.

Step 2: Select a group of banks to be inspected

The second step consists of selecting banks to audit among those in the eligible group. We describe the computer-based selection rule employed by the supervisor which is based on an unpublished algorithm and we show that it is not correlated with bank's health. Thus, we argue that conditional on the group of eligible banks, inspections are as good as randomly assigned within the group of eligible banks.

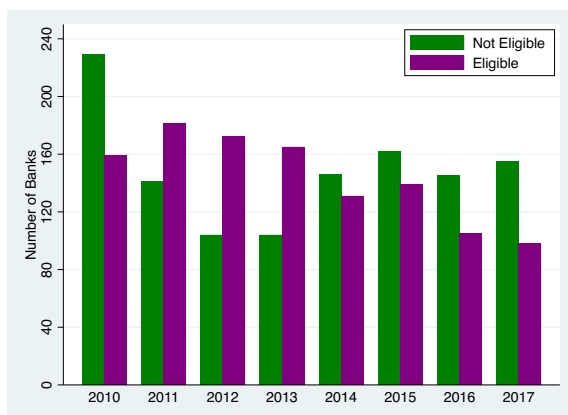
Given the inability to inspect all banks, the supervisor adopts a rule to define which banks to inspect within the group of those eligible. The supervisory authority selects banks according to an unpublished algorithm that takes into account several bank-level variables related to both bank's characteristics from the balance sheet and other information on its

³⁰The supervisor has access to the Credit Registry, the bank's balance sheets and income statements as well as information about the borrowers.

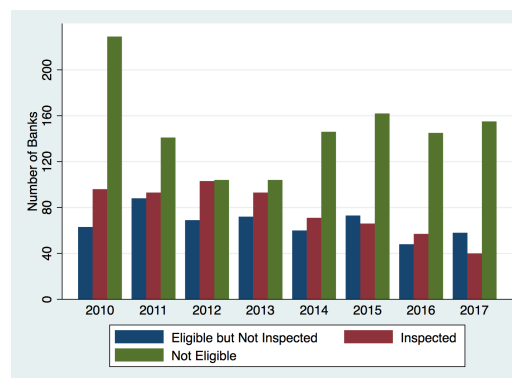
³¹In other words, supervisors cannot include banks in the eligible group based on soft information or any other unobserved information by the econometrician.

³²Given that not-eligible banks are quite different from eligible banks, we drop them in all our analysis. Specifically, when studying the effect of on-site bank inspections we compare only banks among the group of eligible ones.

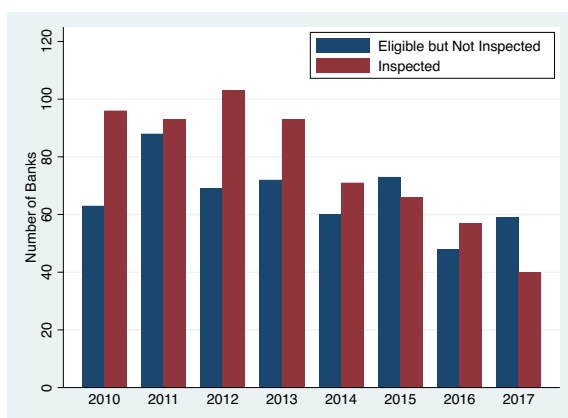
Figure 1.2: On-site inspections over time



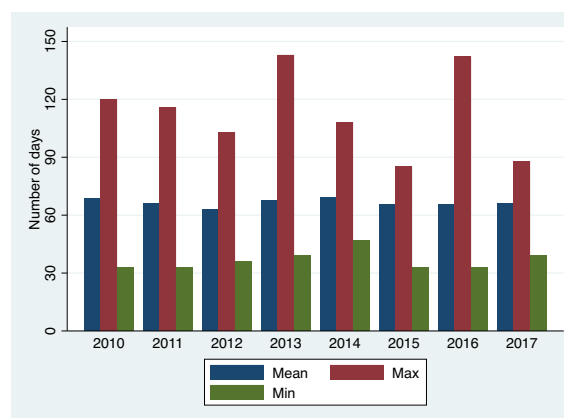
(a) Eligible Banks and Not Eligible Banks over time



(b) Eligible-Inspected, Eligible-Not Inspected and Not-eligible



(c) Inspected (Treated) and Eligible but Not Inspected (Control) over Inspection Plan

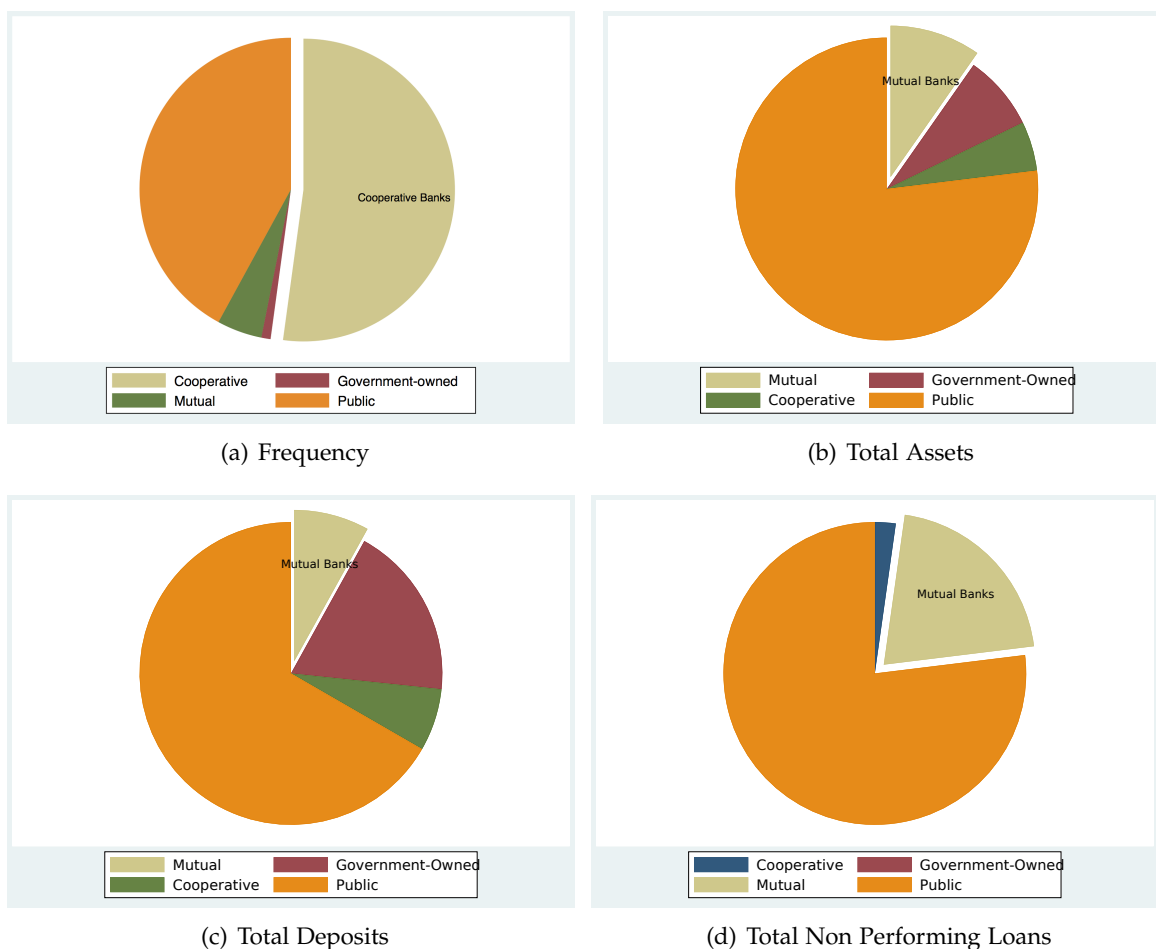


(d) Length of Inspections in Days

Notes: This figure shows some descriptive statistics on bank inspections. Panel A shows the distribution of eligible banks and not-eligible banks over time. Panel B shows the distribution of banks into the three groups. The blue bar represents the group of banks that are eligible but not inspected (i.e. the control group). The red bar represents the group of banks that are inspected (i.e. treated group). The green bar represents the group of banks that are not eligible to be inspected. Panel C shows the frequency of banks in the two groups Inspected and eligible to be inspected. Each year, the Supervisor construct these two groups based on the selection by the score system and by considering the human and other resources available to perform the on-site inspections. Panel D shows the distribution of the duration of inspections (in days) across the different years. We report by year the mean (blue bar), min (green bar) and max (red bar) in days of duration of banking inspections. *Source:* Data on on-site Inspections.

organizational structure. The exact composition of the algorithm is unknown – it is private information kept by the supervisor. Examples of variables taken into account are whether the bank has opened up new branches, the last time the bank was inspected, and the

Figure 1.3: *Distribution of Banks according to their Legal Form*



Notes: This figure shows the distribution of banks according to their type of ownership. There are four different type of banks in the Italian banking system. Public (orange) includes banks that are traded in the public market. Mutual (green) refers to mutual banks. Cooperative (yellow) stands for cooperative banks. Panel A shows the frequency of banks according to their different legal ownership. Panel B shows the distribution according to total assets. To compute this, we first take the mean of total assets for each bank for the year 2010. We then sum up the total assets according to the different legal form. The total assets of Cooperative banks account for the 5.3%. Public banks account for the 77%, Mutual banks for the 9.6% and government-owned banks for the 8.1%. Panel C show the distribution in terms of deposits. To compute this, we first take the mean of total assets for each bank for the year 2010. We then sum up the total assets according to the different legal form. The total assets of cooperative banks account for the 7.2%. Public banks account for the 66.5%, Mutual banks for the 8.1% and government-owned banks for the 18.2%. Panel D shows the distribution of Non Performing Loans (NPL). To compute it we first take the mean of total assets for each bank for the year 2010. We then sum up the total assets according to the different legal form. The total amount of Non-Performing Loans (NPL) of mutual banks account for the 20.8%; for Public banks account for the 76.9%; for Cooperative banks, for the 2.1%; and government-owned banks, for the 0.2%. Source: Supervisory Records and Credit Registry. Reference Year: 2010

bank's geographical location (macro area).³³ This is combined with information from the Supervisory review and evaluation process (SREP, henceforth) concerning its score for the

³³The supervisor must supervise banks from each geographical macro area.

bank.³⁴ The output of the computer-based selection is a rating of inspected banks which is then used to rank banks. Ranking banks is a way to define a clear and computer-based rule on which banks are inspected. However, the rating is not a predictor of a bank's quality.³⁵ Higher rank position according to the rating means greater probability of being inspected. But we show that this does not translate in worse bank's performance. The exact number of banks inspected each year within the macro area-eligible group depends on human resource constraints. Specifically, given the fact that audits are done by both inspectors from the central office in Rome and the local branch near the bank's headquarters, there are constraints in the number of inspections that can be done within a year in a specific macro-area. This implies that some banks are eligible for an inspection, but for reasons related to logistical issues, they are not inspected the year after.³⁶ The different macro-area-specific groups of eligible banks are then assembled together to define the inspection plan for the next year.

In finalizing the inspection plan, the supervisory authority can include some additional banks that were not selected among the initial group. These banks that are arbitrarily picked by the supervisor because the authority may have insider information.³⁷ The final list of inspected banks, as well as the date when the inspections are planned, is confidential information and is not shared with supervised banks or it does not become

³⁴The SREP is a methodology developed to provide a first evaluation of the riskiness of the bank. The procedure assesses four different areas: They are: 1. business model analysis; 2. assessment of internal governance and institution-wide control arrangements; 3. assessment of risks to capital and adequacy of capital to cover these risks; and 4. assessment of risks to liquidity and adequacy of liquidity resources to cover these risks. Each of these steps leads to a score on a scale of 1 (best performance) to 4. Partial scores are then integrated into an overall SREP assessment, which summarizes the institution's risks and viability and forms the basis for subsequent supervisory measures. The overall SREP score uses the same scale as partial scores; performances below "4" are rated "F", meaning that an institution is "failing or likely to fail" and may be subjected to resolution (<https://www.bancaditalia.it/compiti/vigilanza/normativa/applicazione-regolamentazione/processo-revisione/index.html?com.dotmarketing.htmlpage.language=1>).

³⁵In other words, the rating is a function of many variables. Most are related to the bank's organizational structure and are not correlated with a bank's quality. We show in Section 1.4.1 that, conditional on the sample of eligible banks, inspections are as-randomized.

³⁶This group of banks will consist in the control group since these banks are relatively similar to inspected banks (see Figure 1.4).

³⁷For instance, a typical case is "soft information" coming from whistle-blowers. In our data we find that about 7 banks in each inspection plan are picked arbitrarily by the supervisor.

public information even after the inspections are performed.³⁸

1.2.4 The selection process

We discuss the selection process employed by the Italian bank supervisor to select audited banks. We argue and show that within a selected group of eligible banks, a quasi-random share are inspected. This reduces issues related to a selection bias. Moreover, audits come at a surprise, meaning that banks are unlikely to window-dress for the inspections.

It is tricky to estimate the causal impact of bank supervision; the two main problems are selection and anticipation. Unless completely randomized, supervision activity results from selecting banks that “need an inspection” most. Additionally, unless completely unexpected, banks may anticipate an audit and react before they actually take place. This would confound the true effect of inspections with the anticipation effect.³⁹ Given these challenges, it is very hard to estimate the causal effect of bank inspections on a bank’s behavior. We exploit the way in which the Bank of Italy selects the banks that are audited each year. This selection process offers us a great setting to overcome the two main issues of anticipation and selection. The anticipation problem is not an issue in our framework, since on-site inspections come at a surprise for inspected banks.⁴⁰ Regarding the potential selection bias, we exploit the way in which on-site inspections are organized. In particular, we take advantage of a specific mechanism used by the Bank of Italy to select banks that are going to be on-site inspected.

Each year the Bank of Italy defines the list of supervised banks that are inspected in the upcoming year, i.e. an inspection plan (*Piano Ispettivo*). The inspection plan is composed of only banks that are *eligible* to be inspected. The screening employed by the supervisor is

³⁸We confirm also in the data that this is the case as there are no pre-trends and the results are robust to additional placebo tests.

³⁹For instance, in the context of stress test, for which the date is known well in advance, (Abbassi *et al.*, 2017) show that banks adjust their portfolio toward safer investments, and they go back to their original levels after the stress tests are concluded.

⁴⁰Even after the inspection is performed the information does not become public. We empirically confirm the anecdotal evidence that inspections are unexpected by running pre-trend tests and placebo tests.

aimed at discarding banks that passed standard test used in the pre-inspection phase. We refer to this group as the set of not-eligible banks.⁴¹ Figure 1.3(a) shows the distribution of eligible vs. not-eligible banks across years.⁴² Eligible banks are rated according to an unpublished selection rule that combines information from off-site supervision, last inspection (vintage), organizational structure of the bank and their geographical macro-area.^{43,44}

The output of the computer-based selection is a *rating of inspected banks* which is then used to rank banks. Ranking banks is a way to define a clear and computer-based rule on which banks are inspected. However, the rating is not a predictor of a bank's quality.⁴⁵ Higher rank position according to the rating means greater probability of being inspected. But we show that this does not translate in worse bank's performance.

The exact number of banks inspected each year within the macro area-eligible group depends on human resource constraints. Specifically, given the fact that audits are done by both inspectors from the central office in Rome and the local branch near the bank's headquarters, there are constraints in the number of inspections that can be done within a year in a specific macro-area. This implies that some banks are eligible for an inspection,

⁴¹Pre-inspection phase is a standard procedure aimed at assessing bank's resilience and riskiness. It evaluates the sample of credit classified as NPL and a random sample of performing credits together with information on bank's balance sheets. Table A.4 shows balance tests for a set of covariates. We find that eligible banks have a higher stock of NPL, a lower capital ratio, and a lower liquidity ratio compared to banks that are not eligible. Figure 1.5 shows the graphical counterpart of it.

⁴²Given that not-eligible banks are quite different from eligible banks, we drop them in all our analysis. Specifically, when studying the effect of on-site bank inspections we compare only banks among the group of eligible ones. The average number of banks that are eligible each year is about 143, and the number of those that are not eligible is about 148.

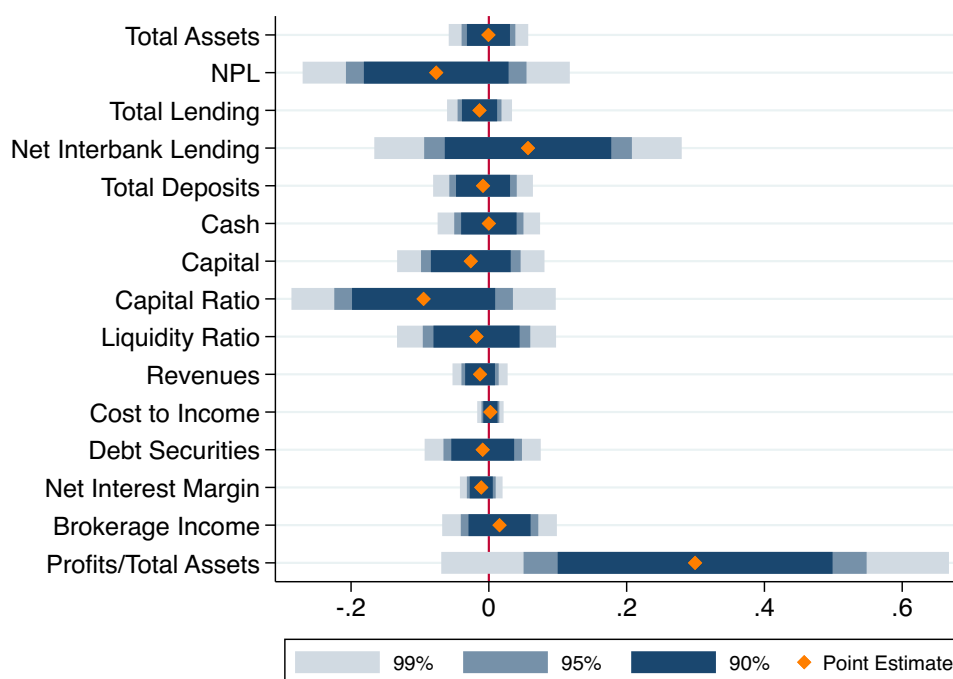
⁴³One of the condition that has to be satisfied is the geographical representation of each macro-area called *Area Territoriale e Circostrizionale* (ATC, henceforth). The supervisor has to select eligible banks to be inspected from each ATC. An ATC is a macro area that includes from 3 to 5 different regions. There are 5 different macro areas in Italy, as shown in Figure 1.1. They roughly represent north-west, north-east, north-center, center, and south.

⁴⁴We do not have access to the exact details about the selection rule as it is an unpublished and extremely confidential information. However, in our discussions with the supervisors they argued that the selection rule gives more weight on other factors than bank's quality, within the group of eligible banks.

⁴⁵In other words, the rating is a function of many variables. Most are related to the bank's organizational structure and geographical information and are not correlated with a bank's quality. We show in Section 1.4.1 that, conditional on the sample of eligible banks, inspections are as good as randomly assigned.

but for reasons related to logistical issues, they are not inspected the year after.⁴⁶ The different macro-area-specific groups of eligible banks are then assembled together to define the inspection plan for the next year. We use the fact that the computer-based selection rule is not a predictor of bank's quality as well as that resource constraints drive the decision on the number of inspected banks within each macro-area to argue that, within the group of eligible banks inspections are as good as randomly assigned.

Figure 1.4: Balance Test: Inspected vs. Eligible but Not Inspected

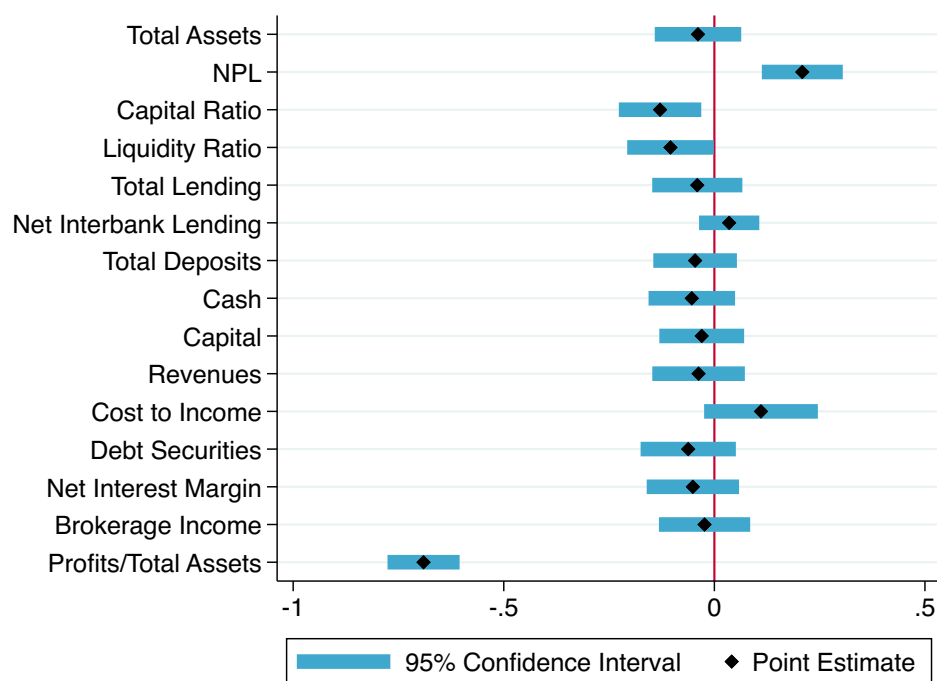


Notes: Figure 1.4 shows balance tests for covariates among inspected vs. eligible but not inspected. The regression of interest is the following: $Y_{bp,t-4} = \beta Inspected_{bp} + \gamma_p + \epsilon_{bp}$ where the outcome variables are a series of bank-level variables. The darkest shades represent 90% confidence intervals and the lightest shades represent 99% confidence intervals. This is the graphical counterpart of Table A.5.

In finalizing the inspection plan, the supervisory authority can include some additional banks that were not selected among the initial group. These banks that are arbitrarily

⁴⁶This group of banks will consist in the control group since these banks are relatively similar to inspected banks (see Figure 1.4).

Figure 1.5: Balance Test: Eligible vs. Not Eligible



Notes: Figure 1.4 shows balance tests for covariates among inspected vs. eligible but not inspected. The regression of interest is the following: $Y_{bp,-4} = \beta Inspected_{bp} + \gamma_p + \epsilon_{bp}$ where the outcome variable are a series of bank-level variables. This is the graphical counterpart of Table A.4.

picked by the supervisor because the authority may have insider information.⁴⁷ The final list of inspected banks, as well as the date when the inspections are planned, is confidential information and is not shared with supervised banks or it does not become public information even after the inspections are performed.⁴⁸

1.3 Data and Descriptive Statistics

For our analysis we leverage a high quality dataset from multiple sources. We use proprietary administrative data from the Bank of Italy as well as data from the Italian National Institute

⁴⁷For instance, a typical case is “soft information” coming from whistle-blowers. In our data we find that about 7 banks in each inspection plan are picked arbitrarily by the supervisor.

⁴⁸We confirm also in the data that this is the case as there are no pre-trends and the results are robust to additional placebo tests.

of Statistics ISTAT (*Istituto Nazionale di Statistica*) and the National Institute for Social Security INPS (*Istituto Nazionale della Previdenza sociale*). The datasets are described below. The period considered is 2008–2018.

1.3.1 Information on bank inspections

To identify the effect of bank inspections we use a novel proprietary dataset from the Bank of Italy. The dataset contains detailed information about on-site bank inspections performed by the National Supervisory Authority (i.e. Bank of Italy) during the period 2010–2017.⁴⁹ We only have information on the sample of Italian mutual banks, *Banche Cooperative di Credito* (BCC). Mutual banks are special banks since their depositors are also bank's shareholders. On average, they are smaller compared to public banks, but they are very popular in the Italian banking system. Moreover, by law they are supposed to lend their resources mostly to the local economy where headquarter are located.⁵⁰ Figure 1.3 shows the main characteristics of Italian banks according to their type of ownership. Mutual banks are, in general, smaller in terms of total assets but they have a relatively important stock of Non Performing Loans.⁵¹ Given their inability to diversify the risk as well as their legal obligation to invest locally, they are more exposed to shocks affecting the local economy.

⁴⁹Note that at the end of 2014 the European Union adopted the Single Supervisory Mechanism (SSM), which transferred some of the supervisory activities to the ECB and changed how supervision is performed for banks under the control of the ECB, i.e. Significant Institutions (SI). Our sample contains only banks that are Less Significant. These banks are still under the supervision of the National Supervisory Authority (NSA) and the introduction of the Single Supervisory Mechanism has not affected the ways that inspections are performed. Refer to Section 1.2 for more information.

⁵⁰In fact, "at least 95% of their risky investments (i.e. loans) must be invested in the area of competence". http://www.creditocooperativo.it/template/default.asp?i_menuID=35356

⁵¹Panel A highlights that mutual banks are extremely popular in Italy. In 2010 (i.e. the first year available in our dataset), they account for more than 50% of overall branches. Panel B shows that they are small and local in their nature. In 2010, they account for just 5.3% of total assets compared to 77% of public banks. Panel C shows that Mutual banks account for about 7.2% of total deposits. Finally, Panel D shows that even if they are small, mutual banks have a relatively large stock of Non Performing Loans – about 20.8%. Two things account for these results: first, they are local and, thus, find hard time to diversify their lending activity; and second, they are small and tend to lend to small, riskier firms with little or no collateral (Petersen and Rajan, 1995). Figure A.2 shows the distribution of different technical forms of credits according to a bank's legal form. Mutual banks are mostly involved in the supply of revocable credit lines. This type of credit best approximates a bank's credit supply, since banks can revoke it anytime on short notice.

This is an additional reason why bank supervision is especially critical among this subset of banks.

Descriptive Analysis

Figure 1.2 illustrate the time variation of the inspection activity. Panel **A** shows the distribution of eligible vs. not eligible banks over time. On average every year, 148 banks are not eligible and 143 are eligible for a bank inspection. Panel **B** shows the distribution of three set of banks over time: (i) inspected; (ii) eligible to be inspected but not; and (iii) not eligible to be inspected.⁵² On average, 77 banks are audited every year, and 66 are eligible but not audited. Panel **C** shows the distribution of inspected banks and eligible but not inspected banks (i.e. control group). The number of banks is similar across the years with the exception of 2011 and 2016: in 2011 the European Sovereign crisis put a lot of pressure on banks (Bofondi, Carpinelli and Sette, 2017; Bottero, Lenzu and Mezzanotti, 2018), and this resulted in an increase in inspections; while in 2016, it is mostly a consequence of mergers and acquisitions, which were promoted by a banking reform (Coccoresse and Ferri, 2019).⁵³ Figure **D** shows some statistics of the length of inspections. The number of days per inspection can vary greatly, from a minimum of 32 days to a maximum of 142 days. The mean is 66.43 days, and the median is 66 days.

Figure A.1 shows the geographical variation of the bank inspections in a particular year (2010 Inspection). Panel **A** shows the spatial distribution of eligible and inspected banks, and panel **B** shows the distribution of eligible but not inspected banks. Darker colors means

⁵²Note that this last group is composed of mutual banks that are neither inspected nor eligible to be inspected. Section 1.2 discusses the way in which the three groups are formed.

⁵³This is also highlighted in the final year report by the Bank of Italy to the Italian Government. https://www.bancaditalia.it/pubblicazioni/relazione-gestione/2011/Rel_Parlamento_Governo_2011.pdf, https://www.bancaditalia.it/pubblicazioni/relazione-gestione/2010/Rel_Parlamento_Governo_2010.pdf?language_id=1, https://www.bancaditalia.it/pubblicazioni/relazione-gestione/2010/Rel_Parlamento_Governo_2008.pdf?language_id=1.

more concentration of bank branches belonging to the specific group in a specific province.⁵⁴

1.3.2 Information on bank's balance sheet

The data from the bank's balance sheet comes from the Supervisory Reports. By law, banks have to provide information on their balance sheet to the Bank of Italy every month. We consider the data at the quarterly level. Among variables, we have total assets, capital and reserves, sovereign bonds, total loans and Non Performing Loans (NPL, henceforth). We also have data about a bank's organizational structure, such as the distribution of bank branches at the province level.⁵⁵ Table 1.1 provides summary statistics.

Table 1.1: *Bank-level Descriptive Stats*

	Mean	SD	Median	p25	p75	Number Banks
NPL	30.545	41.512	15.367	6.351	36.296	397
log(NPL)	2.705	1.197	2.765	1.952	3.525	397
Tot Loans	602.288	816.406	355.785	152.694	745.070	399
log(Tot Loans)	5.789	1.135	5.867	5.020	6.580	399
Corporate Loans	441.713	547.377	265.084	113.193	574.704	399
log(Corporate Loans)	5.483	1.133	5.538	4.690	6.323	399
SME Loans	174.489	180.609	118.313	55.126	231.839	399
log(SME Loans)	4.674	1.038	4.749	3.974	5.444	399

Notes: This table shows the summary statistics of the main outcome variables used in the bank-level regressions for eligible banks for the period 2010-2017.

1.3.3 Information on firms

We collect detailed information on balance sheets, income statements, and registry variables from the CERVED dataset. This dataset is collected by the CERVED group SpA and contains information on the universe of only incorporated businesses (i.e. limited liability companies, LLC), but not sole proprietorship and other-non incorporated firms. Information is collected

⁵⁴Specifically the measure of bank branches concentration is constructed in the following way: $share_{t,p} = \frac{\sum_p \#bank\ branches \in B^{treated,p}}{\sum_p \#bankbranches_p}$, where $t = \{\text{inspected, eligible but not inspected}\}$ and p stands for province.

⁵⁵An Italian province is roughly the same size as a US county.

yearly and thus the unit of observation is firm-year.⁵⁶ Each firm has its unique identifier (i.e. Social Security Number), which allows us to link the balance sheet data to the credit data. We apply standard filters common in the literature using this dataset (Bottero, Lenzu and Mezzanotti, 2018, Lenzu and Manaresi, 2019, Schivardi, Sette and Tabellini, 2017). Specifically, we drop observations of firms operating in industries such as the financial and insurance sector, utilities and government-related industries.⁵⁷

1.3.4 Information on credit

We use granular data at the borrower-technical form of credit level obtained from the Italian Credit Registry. This dataset is collected by the Bank of Italy and contains detailed information on credit exposure for all borrowers and for all the outstanding loans granted above €30,000 euros. In our analysis we focus only on non-financial borrowers. Credits are divided into three different technical forms: revocable credit lines, term loans and loans backed by account receivables (LBR). For each, we have information on both granted and drawn credit. Following the literature on credit supply shocks (Khwaja and Mian, 2008; Schivardi, Sette and Tabellini, 2017; Cingano, Manaresi and Sette, 2016; Bofondi, Carpinelli and Sette, 2017 Accornero, Alessandri, Carpinelli and Sorrentino, 2017), we consider granted loans instead of outstanding loans because the former better captures a decision of banks to supply credit. We also have information about whether a loan becomes non performing. Contrary to performing loans, we do observe the universe of loans that become non-performing.

1.3.5 Additional Data Sources

We rely on a variety of complementary data sources.

⁵⁶As highlighted by Lenzu and Manaresi (2019), compared to other popular publicly available datasets (such as Orbis and Amadeus by Bureau van Dijk), CERVED has no selection bias, no issues with merging different vintages, and a substantially richer set of balance sheet, income statement, and registry variables. The drawback is that it does not include informations on companies that are not in the form of LLC.

⁵⁷Note that we exclude firms operating in the education sectors and utilities because the government either runs them directly or indirectly subsidizes their activity. Thus, they do not respond to market incentives.

INPS data

First, we use data from the Italian Social Security INPS. This dataset contains yearly data on all firms with at least one employee active in manufacturing, construction, or market services, as well as their employment level and their legal form.⁵⁸ This dataset gives us a detailed picture on firm dynamics. We also use data from the Italian National Institute of Statistics ISTAT. Specifically, we obtain information on GDP, and other socio-economic indicators all measured at the province level. This data is publicly available.⁵⁹

TAXIA data

We also use data on loan prices from the TAXIA database. This dataset is reported at quarterly frequency; it consists of granular information about the loans granted by a representative sample of Italian intermediaries (about 200 Italian banks). For each bank-firm relationship, we have information about the size of the granted loan, the cost and maturity of the loan (i.e. loans with maturity up to one year versus loans with maturities over one year), the repricing date of the loan (i.e. floating-rate versus fixed-rate), and whether or not the loan is subsidized.

ORSO data

We obtain information on bank boards from ORgani SOciali (ORSO) dataset. ORSO contains exhaustive current and historical information on the members of the governing bodies of banks and financial intermediaries and their specific appointments (e.g. president, executive director, members of the boards of directors, members of supervisory boards, etc.).

⁵⁸The use of this dataset overcomes issues related to CERVED dataset which identifies only well-established firms, i.e. corporations.

⁵⁹<https://www.istat.it/en/>.

1.4 The direct effect of Banking inspections - Informational disclosure effect

The first part of our analysis is to test whether bank inspections have a direct impact on a bank's balance sheet. We run the analysis at the bank level comparing eligible and inspected banks vs. a group of eligible but not-inspected banks. We show that, following a bank inspections, audited banks are more likely to reveal losses in their balance sheet. Specifically, we show that bank inspections force inspected banks not only to reclassify loans into NPL, but also to increase loan loss provisions.⁶⁰ We call this an *informational disclosure effect* as banks are forced to review the information disclosed in their balance sheet.

1.4.1 Empirical Design

In this part, we describe in detail our experimental design and how it helps us to reduce endogeneity concerns in the estimation.

Our goal is to estimate the causal effect of bank inspections. When studying the effect of banking inspections the key identification concerns are twofold. First, the problem of selection bias. Second, the problem of anticipation. Regarding the former, by comparing the performance of banks that are inspected to that of banks that are not inspected, we may just pick up the different quality of banks instead of the true effect of the inspections. Our setting provides a good laboratory because we can compare two otherwise similar groups of banks that differ only in whether they are audited (i.e. treated) or not. We confirm the anecdotal evidence that the ranking is a function of many variables of a bank's characteristics and organizational structure, and it is not a predictor of bank quality. See section 1.4.1 for the tests on this condition. Thus, in our analysis, we consider that conditional on the sample of being eligible, banks are randomly selected for an inspection. Regarding the latter, given that audits come at a surprise, there is less concern that banks anticipate them and react in

⁶⁰Loan loss provision is an expense set aside as an allowance for uncollected loans and loan payments. This provision is used to cover a number of factors associated with potential loan losses, including bad loans, customer defaults, and renegotiated terms of a loan that incur lower than previously estimated payments.

advance.

The empirical analysis is structured in the following way. In the first part we focus on the impact of bank inspections on a supervised bank's balance sheet. We show that these banking inspections can be reasonably considered as an exogenous shock to supervised banks.⁶¹

The two-step approach used by the supervisory authority to select the banks to be audited reduce concerns related to selection bias. Each year, the supervisor defines a set of homogeneous eligible banks, and within this sample, the supervisor picks some banks to be inspected. Naturally, this framework leads to a comparison of the banks inspected and banks eligible but not inspected within each inspection plan. Moreover, the fact that audits come at surprise for supervised banks reduce any concern related to anticipation effect, i.e. banks anticipating the future inspection adjust their balance sheet beforehand.⁶²

Estimating equation

We estimate both non-parametric and parametric Difference-in-Difference (DiD, henceforth) models. The basic non-parametric DiD specification is the following:

$$y_{bptm} = \alpha_t + \alpha_b + \alpha_{pm} + \sum_{\tau=-4}^{+8} \beta_{\tau} \text{Inspected}_{bptm} \times \{1_{\tau=t}\} + \sum_{\tau=-4}^{+8} \gamma_{\tau} X_{PRE,b,p,m} \times \{1_{\tau=t}\} + \varepsilon_{bptm} \quad (1.1)$$

where b , p , t and m stands for bank, inspection plan, quarter and macro-area. $\{1_{\tau=t} \times \text{Inspected}_{bptm}\}$ are event time indicator variables interacted with a dummy variable *Inspected*. *Inspected* takes value 1 if bank b is inspected at time t . The interaction term takes value 1 if it is quarter τ relative to the quarter in which the bank is inspected and captures the relative effect of banking inspections. These indicator variables are always 0 for banks

⁶¹We run several robustness tests to show that our estimates are causal. See 1.4.1. Specifically, to reduce concerns about selection bias we run a set of balanced tests and show that banks in the two groups are not significantly different. To reassure that banking inspections are truly exogenous and unexpected, we show that there are no pre-trends, and we run a set of placebo tests, where we set an artificial date of the inspections and show that there is no effect (Tables A.6 and Figure A.5).

⁶²Regarding this point both pre-trends and placebo tests show that banks do not anticipate the future audit.

that are eligible but not inspected. In our experimental design we compare only banks that are included in the inspection plan. That is, we compare banks that are included in the inspection plan and are inspected with those that are included in the inspection plan but are not inspected. We exclude banks that are not eligible according to the first step of the selection process since these banks are very different.⁶³ $X_{PRE,b}$ is a set of pre-specified control variables interacted with quarter dummies. We follow the literature (Schnabl, 2012) and include in $X_{PRE,b}$ the following variables: size (natural logarithm of lagged total assets), ROA, liquidity ratio, deposit ratio, equity ratio and NPL ratio.⁶⁴ We choose a window of 3 years around the event. In particular, we follow banks 4 quarters before the inspection and 8 quarters after the inspection. The specification includes bank fixed effects (α_b) and quarter fixed effects (α_t), which absorb fixed differences across banks and across years. We also include inspection plan \times macro area fixed effects (α_p) which takes into account differences across different inspection plans.⁶⁵ ε_{btpm} are standard errors two-way clustered at the level of the bank and inspection plan (Petersen, 2009). Our coefficient of interest is β_τ . We consider also the parametric version of equation 1.1. The parametric specification allows us to analyze the magnitude of the estimates. We estimate the effect at impact of bank inspections by limiting the period of observation to 4 quarters before and 4 quarters after the inspection. We consider the following specification:

$$y_{btpm} = \alpha_t + \alpha_b + \alpha_{pm} + \beta^{ATE} Post\ Inspection_{bpt} + \gamma X_{b,PRE} + \varepsilon_{btpm} \quad (1.2)$$

⁶³We confirm this in balance test. Eligible banks have a significantly higher stock of NPL, and they have lower capital ratio and liquidity ratio (Figure 1.5). Moreover, we run the same event study as equation 1.1 and show that indeed there is a pre-trend when we compare inspected banks with those that are not eligible (Figure A.3).

⁶⁴We use pre-defined variables as controls to avoid the problem of bad controls (Angrist and Pischke, 2009). Specifically all the variables are computed 4 quarters before the inspection.

⁶⁵In some specifications, we include inspection plan-quarter fixed effects (α_{pt}) to take into account that banks are included in inspection plans multiple times. In fact, since banks can be included in multiple inspection plans, each bank can enter the sample multiple times as part of different “natural experiments”. Thus, the inclusion of inspection plan-quarter-macro area fixed effects ensures that the outcomes of banks inspected in quarter t and included in inspection plan p are compared to outcomes of banks in the control group in the same quarter t and included in the same inspection plan p .

where b , p , t and m stands for bank, inspection plan, quarter and macro-area respectively. y_{btpm} is our outcome of interest which refers to bank b from inspection plan p located in the macro area m .⁶⁶ $Post\ Inspection_{bpt}$ is a dummy variable taking value 1 for all quarters after the inspection of bank b included in inspection plan p and inspected. It takes value 0 for banks included in inspection plan p and not inspected, i.e. eligible but not inspected banks. The parameter of interest is β^{ATE} , which measures the change in the outcome variables of the inspected banks compared to the banks that are eligible but not inspected in the same inspection plan-macro area, conditional on a set of pre-defined controls $X_{b,PRE}$ and a set of bank, quarter and inspection plan by macro area fixed effects.

Identifying Assumption

The interpretation of β_k in equation 1.1 (or the β^{ATE} of equation 1.2) as the causal impact of banking inspections requires two conditions. First, the timing of the bank inspection is uncorrelated with the bank's economic outcomes, conditional on the set of fixed effects and other control variables. For example, a banking inspection that is preceded by a decrease in a banks' quality and a change in the economic opportunity for firms would violate the identifying assumption. Another potential concern is that the results are driven by the demand-side instead of the supply-side. A potential situation in line with a demand-side story is that firms that borrow from inspected banks experience a shock that compromises their ability to repay the loan to the inspected banks.⁶⁷ Given that we show there are no pre-trends, this is unlikely to be the case since the timing of the credit demand shock has to coincide exactly with the start of the inspection. Second, the two set of banks (treated and control) are similar on observables. If banks that are inspected are extremely different from those not inspected, we may only estimate the effect of these pre-differences instead of the impact of banking inspections. This could potentially be the case if we compare public

⁶⁶Since banks can enter in multiple inspection plans over the years that is they enter in a different natural experiment – we need to take this into account in our model.

⁶⁷In other words, cases in which an economic shock affects economic opportunities and thus the results are driven by the demand side, i.e. firms are not able to repay their loan.

banks with mutual banks. The former, on average, are bigger and more able to diversify the risk. Third, eligible and inspected banks do not differ in their probability to be inspected compared to eligible banks. For instance, if audited banks expect to be inspected, they may react in advance to the audit, confounding the effect of bank inspections.

Our experimental design helps us to overcome these potential threats. First, bank inspections come at a surprise for inspected banks. Indeed, banks do not have any information on whether they are included in the set of eligible banks. This reduces any concern related to potential anticipation effect. Moreover, we can test it in the data by evaluating the dynamics in the $\{\beta_\tau\}$ coefficients of equation 1.1, as we show in subsection 1.4.1. For our research design to be valid, inspected and eligible but not inspected banks should follow parallel trends in the quarters prior to the inspection, which implies that the pre-period β_τ (for $\tau = -4, \dots, -1$) should not be statistically different from zero. We show that this is the case. Additionally, we run several placebo tests in which we set a construct an artificial inspection at a different date in the pre-period and show that there is no effect.

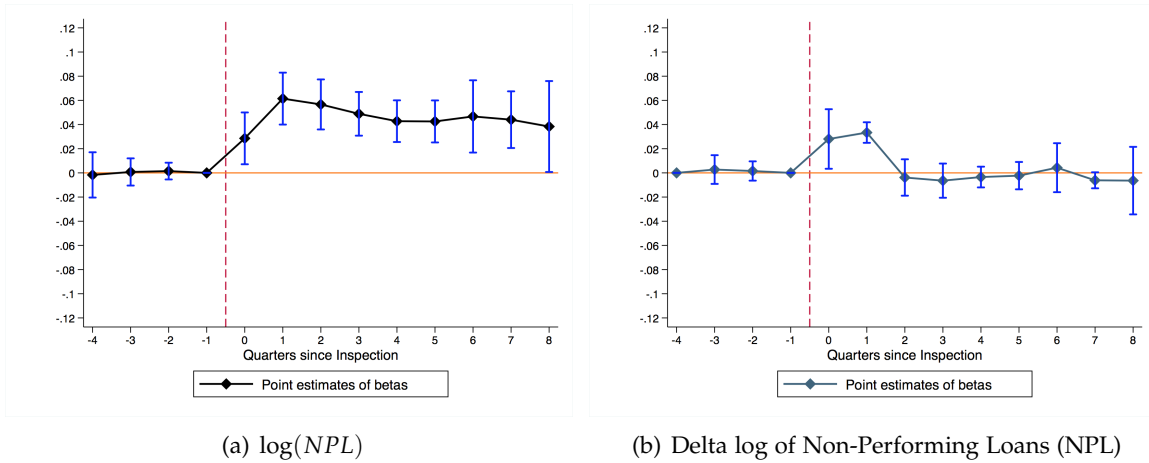
To reduce concerns related to a potential selection bias, we again take advantage of our experimental design. First, as described in Section 1.2 we only consider banks with the same type of ownership, namely mutual banks. Thus, we consider banks that have a very similar business model – they have to comply to the same legal requirements, and are exposed to similar challenges.⁶⁸ Second, we rely on the selection process done by the supervisory authority to construct the treated and control group. Following this idea, we discard any bank that is not included in the eligible group, and the analysis is based only on the comparison of two groups that, according to the algorithm used by the Bank of Italy, look similar. Third, we run several balance tests to confirm that: (1) banks eligible to be inspected are very different from not-eligible banks, and (2) banks eligible and inspected are not significantly different from banks eligible but not inspected. We discuss these and additional tests in Section 1.4.1.

⁶⁸By law, they need to lend at least 95% of their resources in the local economy. This poses a challenge in terms of diversifying their risk.

Result

The first part of our analysis investigates the impact of banking inspections on a bank's balance sheet. Specifically, we answer the question about whether the supervisor finds and reveals wrongdoing in bank's balance sheet, i.e. informational disclosure effect. We focus on two main dimensions of a bank's balance sheet: the amount of NPL and loan loss provisions.

Figure 1.6: *Dynamic DiD: Informational Disclosure Effect (1)*



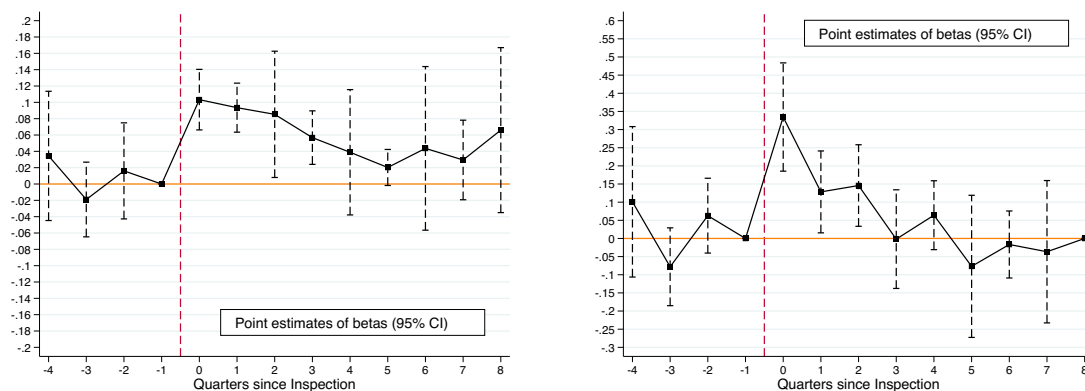
Notes: This graph plots the result of the following regression: $y_{bptm} = \alpha_t + \alpha_b + \alpha_{pm} + \sum_{\tau=-4}^{+8} \beta_{\tau} \text{Inspected}_{bptm} \times \{1_{\tau=t}\} + \sum_{\tau=-4}^{+8} \gamma_{\tau} X_{PRE,b,p,m} \times \{1_{\tau=t}\} + \varepsilon_{bptm}$. In panel A the outcome variable is $\log(NPL)$. In panel B the outcome variable is $\Delta \log(NPL) = \log(NPL_{bt+1}) - \log(NPL_{bt})$. We include bank, quarter, and inspection plan-macro area fixed effects. Standard errors are two-way clustered at the bank and inspection plan level. We also include pre-defined bank-level controls: size (natural logarithm of lagged total assets), ROA, liquidity ratio, deposit ratio, capital ratio and NPL ratio. Note that we normalize $\beta_{-1} = 0$ so that all coefficients represent the differences in outcomes relative to the quarter before the inspection. For a full description of the empirical equation refer to equation 1.1. Data comes from bank's balance sheet (Supervisory Reports).

Figure 1.6 shows the dynamic effect on the natural log of outstanding NPL.⁶⁹ We find that bank inspections force banks to reclassify some loans into NPL. As a result the levels spike after the first quarter in which the inspection is performed. Figure 1.8 shows similar results by looking at other types of NPL (i.e. unlikely-to-pay and past-due exposures).⁷⁰

⁶⁹When we consider NPL, we refer to bad loans unless differently specified. In contrast to from other types of NPL, once a loan is classified as NPL, it is very unlikely to return to performing.

⁷⁰Unlikely-to-pay and past-due exposures data are not included in the Credit Registry. They come from the Supervisory Reports (SR).

Figure 1.7: Dynamic DiD: Informational Disclosure Effect (2)



(a) Loan Loss Provision for Bad Loans

(b) Delta log of Non-Performing Loans (NPL)

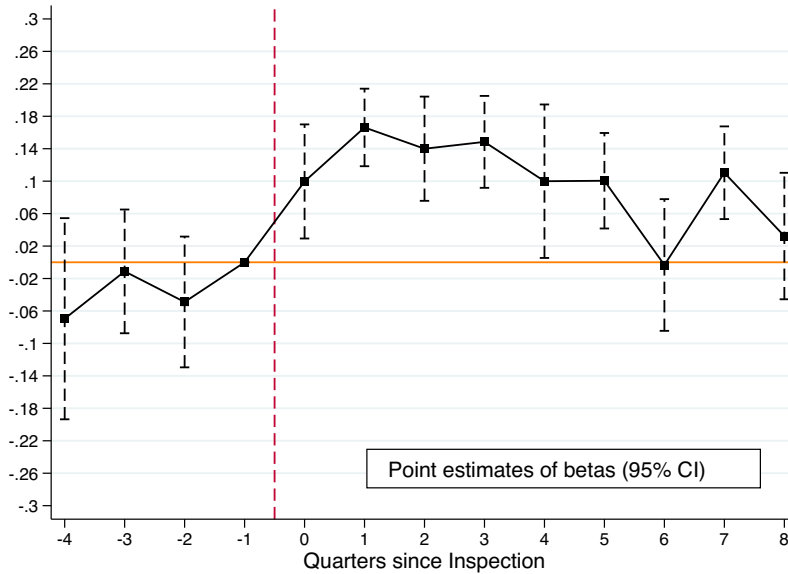
Notes: This graph plots the result of the following regression: $y_{bptm} = \alpha_t + \alpha_b + \alpha_{pm} + \sum_{\tau=-4}^{+8} \beta_{\tau} \text{Inspected}_{bptm} \times \{1_{\tau=t}\} + \sum_{\tau=-4}^{+8} \gamma_{\tau} X_{PRE,b,p,m} \times \{1_{\tau=t}\} + \varepsilon_{bptm}$. In panel **A** the outcome variable is the log of loan loss provision for bad loans. In panel **B** the outcome variable is the log of loan loss provision for other types of NPL, i.e. unlikely-to-pay exposure and overdrown/past-due exposure.. We include bank, quarter, and inspection plan-macro area fixed effects. Standard errors are two-way clustered at the bank and inspection plan level. We also include pre-defined bank-level controls: size (natural logarithm of lagged total assets), ROA, liquidity ratio, deposit ratio, capital ratio and NPL ratio. Note that we normalize $\beta_{-1} = 0$ so that all coefficients represent the differences in outcomes relative to the quarter before the inspection. For a full description of the empirical equation refer to equation 1.1. Data comes from bank's balance sheet (Supervisory Reports).

Figure 1.7(b) highlights that the timing coincides with the on-site inspections. The growth rate becomes positive just immediately after the beginning of the inspections and then goes back to zero. Overall, bank inspections force banks to truthfully disclose information on their balance sheets by reclassifying loans into NPL. Similar patterns are found when considering other NPL, i.e. unlikely to pay and past-due-exposure (Figure 1.7).⁷¹ We find similar patterns for loan loss provisions to bad loans (Figure 1.8(a)) and to other NPL (i.e. unlikely to pay and past-due exposure (Figure 1.8(b))). It is important to note that from the plot, there is no evidence of significant differences between the two groups before the inspections. This reduces both concerns of selection and anticipation effect.

Table 1.2 shows the effect at impact of on-site bank inspections. Inspected banks' NPL wedge *vis-a-vis* eligible but not inspected banks is about 3.115% ($^{0.031} - 1$). This means

⁷¹Data on unlikely-to-pay and past-due-exposure comes from the Supervisory reports. Unlike with bad loans, it is not from the Credit Registry.

Figure 1.8: Dynamic DiD: $\log(\text{otherNPL})$



Notes: This graph plots the result of the following regression: $y_{bptm} = \alpha_t + \alpha_b + \alpha_{pm} + \sum_{\tau=-4}^{+8} \beta_{\tau} \text{Inspected}_{bptm} \times \{1_{\tau=t}\} + \sum_{\tau=-4}^{+8} \gamma_{\tau} X_{PRE,b,p,m} \times \{1_{\tau=t}\} + \varepsilon_{bptm}$. The outcome variable is the log of other NPL, i.e. unlikely-to-pay and past-due exposures. We include bank, quarter, and inspection plan-macro area fixed effects. Standard errors are two-way clustered at the bank and inspection plan level. We also include pre-defined bank-level controls: size (natural logarithm of lagged total assets), ROA, liquidity ratio, deposit ratio, capital ratio and NPL ratio. Note that we normalize $\beta_{-1} = 0$ so that all coefficients represent the differences in outcomes relative to the quarter before the inspection. For a full description of the empirical equation refer to equation 1.1. Data comes from bank's balance sheet (Supervisory Reports).

that for the average bank in the control group with $\text{€NPL} = 38.28$ millions this means an increase of about $\text{€}1.19$ millions each quarter. In other words, the total effect in the first 4 quarters – the effect at impact – is about $\text{€}4.76$ million, about 12% of the stock of NPL. The effect is relatively important. Column (2) considers loan loss provision for bad loans and column (3) loan loss provisions for other NPL.⁷² We find similar statistically significant results for loan loss provision on bad loans but not for other types of NPLs.

Summing up we find that there is an important information disclosure effect by on-site inspections. This is in line with the idea that inspectors enforce stricter supervision. Banks

⁷²Banks can account for losses on non-performing loans through two different methods. The first consists in the devaluation of the part of the exposure deemed not recoverable. The second is based on the direct “write-off” of the loss component (write-off). In general, intermediaries resort to writing off if the loss is proven by certain and precise elements, while they make use of the devaluation in other cases. For instance, a typical case to write-off a credit is when the borrower is subjected to bankruptcy procedure, or when there are conditions (according to the IFRS/IAS) to write-off, even just for a portion of the credit from the balance sheet.

Table 1.2: *Bank-level Regression: Informational Disclosure Effect*

VARIABLES	(1) NPL	(2) Loan Loss Provision on bad loans	(3) Loan Loss Provision on other NPLs
post × inspection	0.031*** (0.005)	0.038*** (0.008)	0.032 (0.027)
Observations	21,870	11,197	11,206
R-squared	0.980	0.945	0.968
bank FE	Y	Y	Y
IP × macro-area FE	Y	Y	Y
Quarter FE	Y	Y	Y
bank controls	Y	Y	Y
Cluster	bank-IP	bank-IP	bank-IP

Notes: This table shows the results of the following equation: $y_{btpm} = \alpha_t + \alpha_b + \alpha_{pm} + \beta^{ATE} Post_{itb} \times Inspection_{bp} + \gamma X_{b,PRE} + \varepsilon_{btpm}$. We include bank FE, Inspection plan-macro area FE, and quarter FE. The time dummy variables refer to quarters relative to the banking inspection. We omit event time 1. Note that we normalize $\beta_{\tau=-1} = 0$ so that all coefficients represent the differences in outcomes relative to the quarter before the inspection. Column (1) considers the log(NPL). Column (2) the log(loan loss provision on bad loans). Column (3) the log(loan loss provision on other NPL). IP stands for Inspection Plan. * $p < 0.10$. ** $p < 0.05$, *** $p < 0.01$.

are forced to reclassify some loans into NPL and increase the resources used for future loan losses.⁷³

Threat to Identification

In this part we discuss the main threats to our identification strategy, as well as how we address these concerns. We provide several robustness tests showing that, conditional on the sample of eligible banks, inspections are randomly assigned.

The main concern with our identification is that there is a selection bias. That is, inspected banks are different and in particular worse than not-inspected banks. To reduce concern about the selection driving the results, we rely on the two-step selection process. In fact, in our experiment, we only compare banks that are eligible, and within this group, some are inspected as if they are randomly picked. This is because the selection, as well as the ranking generated by the selection, are not correlated with bank's quality. Instead, it considers

⁷³This is in line with the result found Granja and Leuz (2019).

other components of a bank's characteristics more related to its organizational structure. We do not exactly know the components of the algorithm, because it is unpublished, private information kept by the supervisor. However, we know that it takes other information into account, such as organizational structure of the bank, and whether the bank has opened a new branch. On this point we show that the ranking, which can be consider a sufficient statistics of the selection rule, is neither a predictor of bank's quality, nor it explains the results we find.

Robustness Test

In this part, we provide a battery of robustness tests to confirm the validity of the baseline results. We find statistically significant differences among the eligible banks; moreover we confirm that the ranking neither drives the results nor is correlated with a bank's health. Finally, we run a set of placebo tests to confirm that inspections come at a surprise.

Balance Tests: To reduce concerns related to selection bias, we run a battery of balance tests. First, we show that the first-step selection process of eligible banks leads to a homogeneous group of banks. Figure 1.5 shows balance test comparing the group of eligible vs. not eligible. Eligible banks have, on average a higher stock of NPL, a lower capital ratio, and a lower liquidity ratio. They are also less profitable. This is in line with anecdotal evidence that the first screening is based on a bank's quality, and in line with this story, we find that eligible banks are relatively worse.⁷⁴ Second, in Figure 1.4 we show that, among the set of eligible banks, those that are inspected are not significantly different from those not inspected. Inspected and eligible but not inspected banks are not significantly different along several dimensions. They only significantly differ in terms of profitability. In all our specifications, we include it as a control to residualize its effect on bank's activity.⁷⁵ Overall, balance tests confirm that while the first-step selection of eligible banks is based on quality,

⁷⁴Table A.4 shows the table counterpart of Figure 1.5.

⁷⁵Table A.5 shows the table counterpart of figure 1.4.

the second-step selection is not correlated with a bank's quality.

Controlling for the ranking does not have an impact: We run the same regressions as in equation 1.2 including an interaction term for the ranking position of inspected banks. We divide banks into quartiles according to their ranking position and interact this variable with our treatment, i.e. *post* variable. If ranking predicts some effect, we should observe it in the triple difference. Tables 1.3 and 1.4 show that the effect of inspections is driven by whether a bank is inspected. The triple interactions with the ranking of the bank does not have any other significant effect.

Table 1.3: *Bank-level Regression: Placebo test ranking*

VARIABLES	(1)	(2)	(3)
	NPL	Loan Loss Provision bad Loans	Loan Loss Provision other NPLs
post × inspected	0.028** (0.010)	0.086** (0.025)	-0.005 (0.040)
post × inspected × 3rd ranking quartile	-0.030 (0.022)	-0.135** (0.039)	0.079 (0.054)
post × inspected × 2nd ranking quartile	0.032 (0.024)	0.011 (0.033)	0.037 (0.089)
post × inspected × 1st ranking quartile	0.025 (0.021)	-0.086* (0.039)	0.029 (0.091)
Observations	21,463	12,235	11,206
R-squared	0.998	0.965	0.968
bank FE	Y	Y	Y
IP × macro area FE	Y	Y	Y
Quarter FE	Y	Y	Y
Cluster	bank-IP	bank-IP	bank-IP
Bank controls	Y	Y	Y

Notes: This table shows the results of the following equation: $y_{btpm} = \alpha_t + \alpha_b + \alpha_{pm} + \beta^{ATE} Post_{tb} \times Inspection_{bp} + \delta Post_{tb} \times Inspection_{bp} \times \{1_{ranking\ quartile=i}\} + \gamma X_{b,PRE} + \varepsilon_{btpm}$. We include bank FE, Inspection plan-macro area FE and quarter FE. The time dummy variables refer to quarters relative to the the banking inspection. $\{1_{ranking\ quartile=i}\}$ is a categorical variable that takes value 1 if inspected bank *b* in inspection plan *p* belongs to the ranking quartile *i*. We include pre-defined bank-level controls: size (natural logarithm of lagged total assets), ROA, liquidity ratio, deposit ratio, capital ratio, and NPL ratio. We normalize $\beta_{t=-1} = 0$ so that all coefficients represent the differences in outcomes relative to the quarter before the inspection. Column (1) considers the log(NPL). Column (2) the log(loan loss provision on bad loans). Column (3) the log(loan loss provision on other NPI). IP stands for Inspection Plan. * p < 0.10, ** p < 0.05, *** p < 0.01.

Placebo test ranking: We run the same model as 1.1 but only on the set of inspected banks. In particular we compare inspected banks ranked in the top quartile according to their

Table 1.4: Bank-level Regression: Placebo test ranking

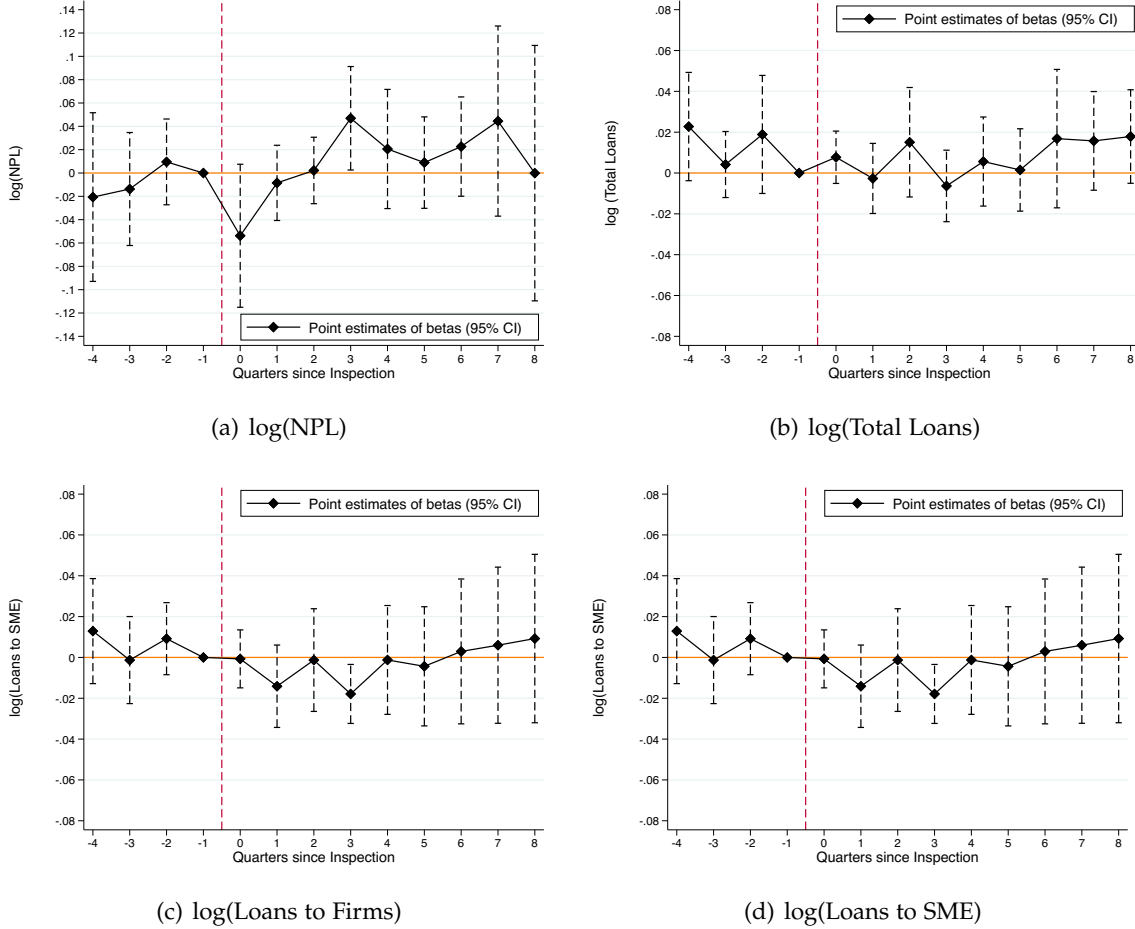
VARIABLES	(1) log(<i>tot loans</i>)	(2) log(<i>Loans to Firms</i>)	(3) log(<i>Loans to SME</i>)
post×inspected	-0.023** (0.009)	-0.020** (0.008)	-0.016* (0.008)
post×inspected×3rd ranking quartile	-0.005 (0.009)	0.008 (0.008)	0.001 (0.006)
post×inspected×2nd ranking quartile	-0.001 (0.009)	0.001 (0.009)	0.006 (0.015)
post×inspected×1st ranking quart	0.012 (0.008)	0.008 (0.008)	0.011 (0.009)
Observations	21,779	21,751	21,779
R-squared	0.993	0.995	0.993
bank FE	Y	Y	Y
IP× macro area FE	Y	Y	Y
Quarter FE	Y	Y	Y
Bank controls	Y	Y	Y
Cluster	bank-IP	bank-IP	bank-IP

Notes: This table shows the results of the following equation: $y_{btpm} = \alpha_t + \alpha_b + \alpha_{pm} + \beta^{ATE} Post_{tb} \times Inspection_{bp} + \delta Post_{tb} \times Inspection_{bp} \times \{1_{ranking\ quartile=i}\} + \gamma X_{b,PRE} + \varepsilon_{btpm}$. We include bank FE, Inspection plan-macro area FE and quarter FE. The time dummy variables refer to quarters relative to the the banking inspection. $\{1_{ranking\ quartile=i}\}$ is a categorical variable that takes value 1 if inspected bank b in inspection plan p belongs to the ranking quartile i . We include pre-defined bank-level controls: size (natural logarithm of lagged total assets), ROA, liquidity ratio, deposit ratio, capital ratio and NPL ratio. Column (1) considers the log(total loans), column (2) the log(loans to firms) and column (3) the log(loans to Small and Medium Enterprises). IP stands for Inspection Plan. * $p < 0.10$. ** $p < 0.05$, *** $p < 0.01$.

rating and inspected banks ranked in the bottom quartile. Figure 1.11 shows that ranking does not predict any effect. We find no significant differences between the two groups of banks after the inspection. This confirms once again the idea that the results are driven by supervisory activity rather than unobserved differences among banks. In other words, inspections do not have a significant different effect among inspected banks whose rating is high vs. inspected banks whose rating is low.

Propensity Score Matching: To further reduce any concerns related to selection bias we run a propensity score matching model. The idea is that we want to match inspected banks with eligible but not inspected banks that have similar probability to be inspected, or in other words similar propensity score. Based on this matched sample, we run similar regressions as before. We follow the standard approach in the literature to construct our

Figure 1.9: Placebo Test Ranking



Notes: The sample includes only inspected banks ranked in the top quartile and inspected banks ranked in the bottom quartile. This graph plots the result of the following regression: $y_{bptm} = \alpha_t + \alpha_b + \alpha_{pm} + \sum_{\tau=-4}^{+8} \beta_{\tau} Top\ quartile\ Ranking_{bptm} \times \{1_{\tau=t}\} + \sum_{\tau=-4}^{+8} \gamma_{\tau} X_{PRE,b,p,m} \times \{1_{\tau=t}\} + \varepsilon_{bptm}$. We include bank, quarter and inspection plan-macro area fixed effects. Standard errors are two-way clustered at the bank and inspection plan level. We also include pre-defined bank-level controls: size (natural logarithm of lagged total assets), ROA, liquidity ratio, deposit ratio, capital ratio and NPL ratio. Note that we normalize $\beta_{-1} = 0$ so that all coefficients represent the differences in outcomes relative to the quarter before the inspection. In panel **A** the outcome variable is the log of NPL. In panel **B** the outcome variable is the log of Total Loans. In panel **C** the outcome variable is the log of loans to firms. In panel **D** the outcome variable is the log of loans to Small and Medium Enterprises (SME). Data comes from bank's balance sheet (Supervisory Reports).

matched sample. Specifically, for each inspection plan, we compute the propensity score by running a logit model of the following type:

$$\log(\text{insp}_{b,p}) = \alpha_0 + \beta X_{b,p} + \varepsilon_{b,p} \quad (1.3)$$

where $X_{b,p}$ is a vector of bank-level characteristics computed three quarters before the inspections – i.e. around the time in which the supervisory authority decides the inspection plan for the next year – and we match banks in the treated group with banks in the control group based on one-to-one nearest neighbor matching within a caliper of 0.25 standard deviations of the estimated propensity score with replacement.⁷⁶ Figure A.4 provides a visual representation of the result of the propensity score matching. Figure A.5(a) shows the common support between the treated and control group. Figure A.5(b) provides a visual inspection of the densities of propensity scores of treated and non-treated groups. From the figure, it does not seem that there are sizable differences between the maxima and the minima of the density distributions. All units from both groups lie on the same common support.

Table A.8 reinforces the results found in Tables 1.2 and 1.5. In all cases, compared to the baseline regressions, the magnitude is larger as well as the statistical significance. For instance, column (1) assesses the effect of on-site bank inspections on NPL. We find that inspected banks increase their NPL by 3.3 percent. This is a stronger effect compared to the 3.1 percent in the baseline model. For loans to firms we find a drop by 3.4 compared to 2.5 percent in the baseline model. The gap is especially important for loans to small and medium enterprises (SME, henceforth) for which the drop in lending activity is about 2.5 percent and it is statistically significant at the 1% level.

This empirical strategy is designed to compare pairs of banks that are exposed to a similar probability of being audited. We do this by matching banks based on observable characteristics. However, there is still some space for concern. For instance, if matched banks differ on unobserved characteristics that are known to the supervisor, and she uses them in the selection process, then their probability to be inspected may be very different. We believe this is not the case, since the selection process is done relying on algorithms and

⁷⁶Specifically, we use the following matching algorithm:

$$A_{rj} = \left\{ k_{j'} \in I_0 : \text{ins}\hat{p}_{k_{j'}} = \min_{k_{j'} \in I_0} \left| \text{ins}\hat{p}_{rj} - \text{ins}\hat{p}_{k_{j'}} \right| < 0.25\hat{\sigma}_e \right\} \quad (1.4)$$

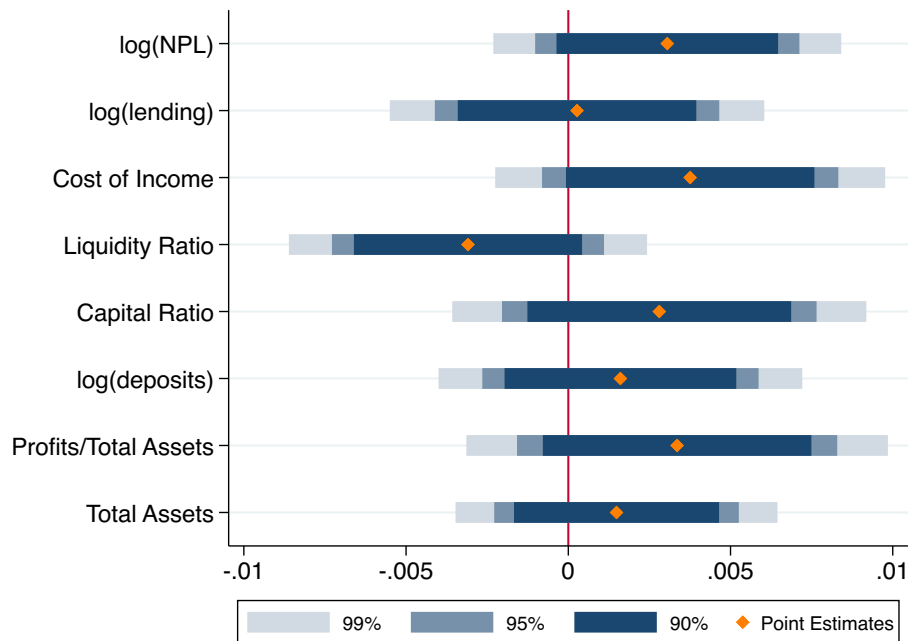
computer-based decisions. There is no space for arbitrary decisions by inspectors. Some information is factored into the scoring algorithm related to bank's organizational structure: for example, whether a bank has opened up new branches recently. But these characteristics are not directly correlated to a bank's quality. Overall, the findings confirm that selection bias is not a relevant concern. We show that by matching banks within the same inspection plan based on their propensity score (i.e. their probability to be inspected), the results are similar both in terms of magnitude and statistical significance compared to the baseline model.

Ranking does not predict bank's quality: If ranking is correlated with a bank's quality, we may expect it to be a good predictor of a bank's health. Figure 1.10 shows that this is not the case. In all cases considered, the ranking position is not a good predictor of bank's quality.

Dropping top quartile of ranked banks: We show that the results are not driven by inspected banks ranked at the top. To do so, we drop banks included in the top quartile of the ranking distributions and run the same baseline model comparing inspected banks vs. eligible but not inspected banks (Figure 1.11). We find similar patterns compared to the baseline model in which we include the full sample of inspected banks. Moreover, we show that there is no clear pattern in terms of NPL according to ranking position of inspected banks (Figure 1.12).

Comparing Eligible vs. Not Eligible Banks: Figure A.3 plots coefficients of a regression similar to equation 1.1, in which we compare eligible vs. not-eligible banks. From the figure, it is evident that the selection process employed by the supervisory authority does a great job in selecting banks that are similar. Compared to Figure 1.6 we find a substantial pre-trend before inspections take place. This is in line with what we find in Table 1.5 running balance tests among these two groups.

Figure 1.10: Ranking Prediction

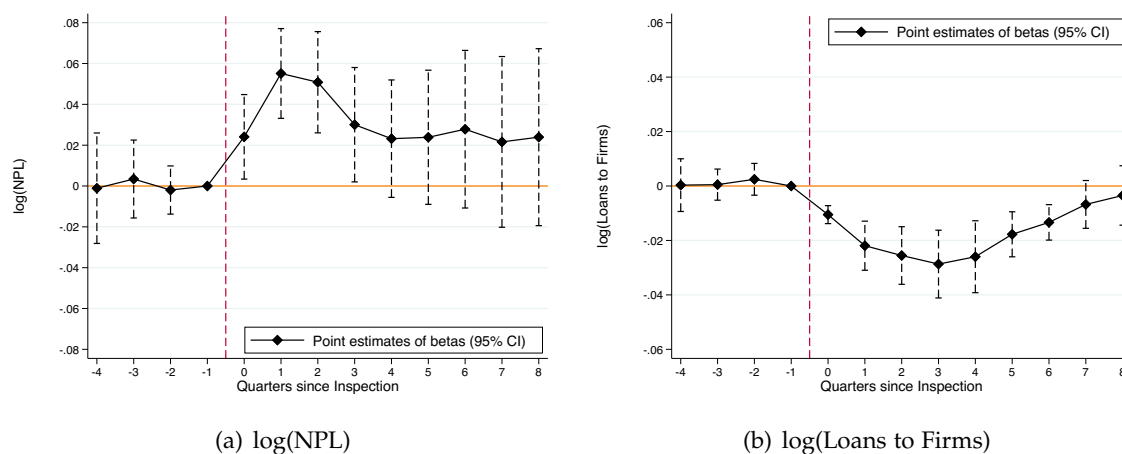


Notes: Figure 1.10 shows the results of the following regression: $y_{bpa} = \beta \text{Ranking}_{bpa} + \gamma_p + \gamma_a + \epsilon_{bp}$ where γ_p are inspections plan fixed effects and γ_a are ATC fixed effects. We consider bank-level variables 4 quarters before the inspection, which is roughly the timing when the inspection plan for the next year (and the ranking) is decided. The darkest shades represent 90% confidence intervals and the lightest shades represent 99% confidence intervals. Coefficients are standardized. This is the graphical counterpart of Table A.3.

Bounding the size of selection bias: One way to understand the size of the selection bias due to unobserved heterogeneity is to compare banks that are arbitrarily selected by the supervisor, i.e. without the mean of the computer algorithm, with the control group. Our setting allows to do so. As pointed out in Section 1.2, after the computer-based selection process is completed, the supervisor still has the opportunity to select some additional banks to be included in the list of audited banks. These banks are selected arbitrarily by the supervisor according to some unobserved information.⁷⁷ We have 310 banks that are inspected without the computer-based selection process. This means that for each macro area about 7 banks are picked arbitrarily by the supervisor every year. We run the same set

⁷⁷Consistent with anecdotal evidence, this can include cases of whistle-blowers within a bank who have revealed some information to the supervisor. Other cases involve banks that have undergone several changes between the time in which the supervisor finalize the inspection plan and its implementation.

Figure 1.11: Placebo Test Ranking



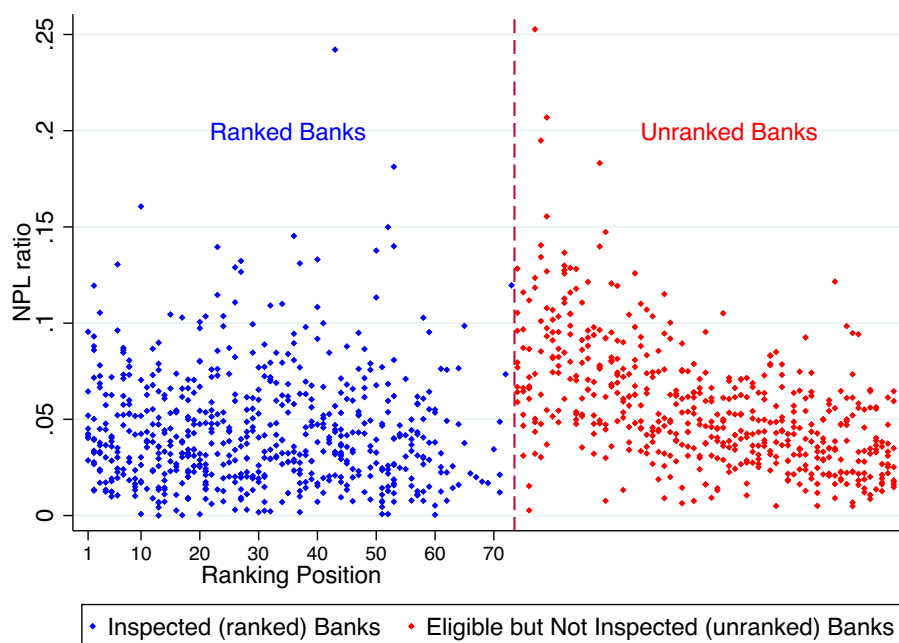
Notes: The sample does not include inspected banks that are ranked in the first quartile of the ranking distribution. This graph plots the result of the following regression: $y_{bptm} = \alpha_t + \alpha_b + \alpha_{pm} + \sum_{\tau=-4}^{+8} \beta_{\tau} Top\ quartile\ Ranking_{bptm} \times \{1_{\tau=t}\} + \sum_{\tau=-4}^{+8} \gamma_{\tau} X_{PRE,b,p,m} \times \{1_{\tau=t}\} + \varepsilon_{btptm}$. The outcome variable is the log of loans to firms. We include bank, quarter and inspection plan-macro area fixed effects. Standard errors are two-way clustered at the bank and inspection level. We also include pre-defined bank-level controls: size (natural logarithm of lagged total assets), ROA, liquidity ratio, deposit ratio, capital ratio and NPL ratio. Note that we normalize $\beta_{-1} = 0$ so that all coefficients represent the differences in outcomes relative to the quarter before the inspection. In panel A the outcome variable is the log of NPL. In panel B the outcome variable is the log of loans to firms. Data comes from bank's balance sheet (Supervisory Reports).

of regressions as in Table 1.2, considering only banks arbitrarily selected by the Supervisor as the treated group. Table A.7 shows the result of this regression.

Placebo Tests: unexpected inspections We further test the robustness of these results by confirming that audits are truly unexpected by inspected banks. We run a set of placebo tests in the pre-bank inspection period. Table A.6 shows the regressions of equation 1.2 where we artificially assign the date in which the inspection is conducted either to time $t = (-2; -1)$ or $t = (-3; -2)$, rather than to period $t = -0$. Specifically, in Panel A, we assume that the inspection takes place between event time -2 and -1.⁷⁸ In panel B, we assign artificial bank inspections between event time $(-3; -2)$. In both cases, we find no effect either in magnitude or significance coming from these artificial banking inspections on the outcome variables. The coefficients are very close to 0 and not statistically significant. Figure

⁷⁸Note in reality, banking inspections happen between event time $(-1; 0)$. We can't precisely set the inspection at time 0, since inspections happen continuously over the quarter. Some are performed at the beginning and some at the end.

Figure 1.12: *NPL ratio plot*



Notes: This graph plots the NPL ratio of banks that are eligible. Specifically the blue dots represent inspected (ranked) banks. Top to bottom ranking is from left to right. Red dots plot the NPL ratio of eligible but not inspected banks. For this group there is no ranking position available.

A.5 plots the coefficients of equation 1.1 in the case the artificial inspection is set between event time $\tau = (-2; -1)$ (panel A) or event time $\tau = (-3; -2)$ (panel B). We normalize the coefficient in the quarter before the inspection to be equal to 0 so that we can interpret the results relative to that period. We find the coefficients in the post period to be not significantly different from zero.

1.5 The indirect effect on Lending

In this section, we study the possible implications for the lending activity of inspected banks. In the first part, we examine the effect of audits on the aggregate lending. To do so, we run a bank-level analysis comparing inspected banks with the group of eligible but

not-inspected banks.⁷⁹ We show that lending activity contracts in the first few quarters after the inspection. In the second part, to uncover potential heterogeneous effects based on a firm’s characteristics, we conduct a bank-firm level analysis. We show that there is a compositional effect, namely, the credit cut is driven by underperforming firms.

1.5.1 The effect on the aggregate lending

Ex-ante it is not clear what could be the overall effect. From one side, by forcing supervised banks to reclassify loans into NPL, bank inspectors generate pressure on the bank’s balance sheet. Banks are forced to either increase the capital or cut their lending activity. In other words, bank supervision generates a bank capital shock which has negative implications for the lending activity.⁸⁰ From the other side, bank inspections may generate a positive effect on lending. Inspectors, by revealing wrongdoing and providing guidelines on how to improve the internal management and monitoring, can reduce moral hazard and agency frictions at the supervised bank. This theoretically could free up resources used for the lending activity.⁸¹ Thus, what effects prevail is an empirical question.

Estimating equation

The empirical model is the same as the one explained in equation 1.1. We run a DiD model, comparing banks that are eligible and inspected to banks that are eligible but not inspected.

$$y_{bptm} = \alpha_t + \alpha_b + \alpha_{pm} + \sum_{\tau=-4}^{+8} \beta_{\tau} \text{Inspected}_{bptm} \times \{1_{\tau=t}\} + \sum_{\tau=-4}^{+8} \gamma_{\tau} X_{PRE,b,p,m} \times \{1_{\tau=t}\} + \varepsilon_{bptm} \quad (1.5)$$

where b , p , t and m stands for bank, inspection plan, quarter and macro-area. $\{1_{\tau=t} \times \text{Inspected}_{bptm}\}$ are event time indicator variables interacted with a dummy variable *Inspected*.

⁷⁹This is the same model as to the one used in section 1.4.

⁸⁰For instance, Peek and Rosengren (1995) study the direct link between regulatory enforcement actions and the shrinkage of bank loans to sectors likely to be bank dependent. They find that banks involved in regulatory enforcement actions reduce their lending.

⁸¹This is in line with Granja and Leuz (2019). They find that stricter supervision generates a positive credit supply shock.

Inspected takes value 1 if bank b is inspected at time t . The interaction term takes value 1 if it is quarter τ relative to the quarter in which the bank is inspected and captures the relative effect of banking inspections. As before, the identification strategy relies on the fact that conditional on the set of eligible banks, inspected banks are randomly picked.

Result

Figure 1.13 shows the effect of the aggregate lending activity for inspected vs. eligible but not-inspected banks for the different type of borrowers. Panel 1.14(a) considers the overall lending activity. Panel 1.14(b) focuses only on corporate loans, while panel 1.14(c) considers loans to small and medium enterprises (SME). We find that lending activity is cut after the inspection. Considering Table 1.5 we find that at impact total loans drop by about 2.5%. For the average bank in the control group with Total Loans of €384.19 millions this means a drop of about €9.61 millions each quarter; thus, the total effect for the first 4 quarters is €38.44 million. This is roughly 10% of total lending for the average bank in the control group. Looking at the plots, we do not find substantial differences between banks before the inspections take place. Moreover the lending activity goes back to baseline levels after around 7 quarters. The drop in the lending activity in the short period can be explained by this increase in the loan loss provision to bad loans (Accornero, Alessandri, Carpinelli and Sorrentino, 2017). Banks have to offset the reduction in profits and the value of their assets due to the increase in potential losses from the existing loans. They readjust their capital slowly, as suggested by Figure A.7. Thus, they overcome the need to satisfy the regulatory capital in the short period by cutting the lending activity.

Contrary to a standard bank capital shock due to unforeseen reasons (e.g. failure of Lehman Brothers), this event is induced by supervisory activity. Thus, it is natural to ask whether banks readjust to a better equilibrium after the shock. We investigate this question by considering whether inspected banks change their lending decisions. Specifically we look at whether banks reduce credit to underperforming firms.⁸²

⁸²This is the the content of Section 1.5.2

Table 1.5: Bank-level Regression: Indirect Effect on Lending - effect at impact

VARIABLES	(1) log(<i>tot loans</i>)	(2) log(<i>Loans to Firms</i>)	(3) log(<i>Loans to SME</i>)
post × inspection	-0.023*** (0.006)	-0.025*** (0.007)	-0.012* (0.005)
Observations	22,051	22,051	22,051
R-squared	0.993	0.993	0.993
bank FE	Y	Y	Y
Inspection Plan Year × macro area FE	Y	Y	Y
Quarter FE	Y	Y	Y
Bank controls	Y	Y	Y
Cluster	bank-IP	bank-IP	bank-IP

Notes: This table shows the results of the following equation: $y_{btpm} = \alpha_t + \alpha_b + \alpha_{pm} + \beta^{ATE} Post_{tb} \times Inspection_{bp} + \gamma X_{b,PRE} + \varepsilon_{btpm}$. We include bank FE, Inspection plan-macro area FE and quarter FE. We include pre-defined bank-level controls: size (natural logarithm of lagged total assets), ROA, liquidity ratio, deposit ratio, capital ratio, and NPL ratio. Column (1) considers the log(total loans), column (2) the log(loans to firms) and column (3) the log(loans to Small and Medium Enterprises). IP stands for Inspection Plan. We consider only the four quarters before and the four quarters after the inspection. * p < 0.10. ** p < 0.05, *** p < 0.01.

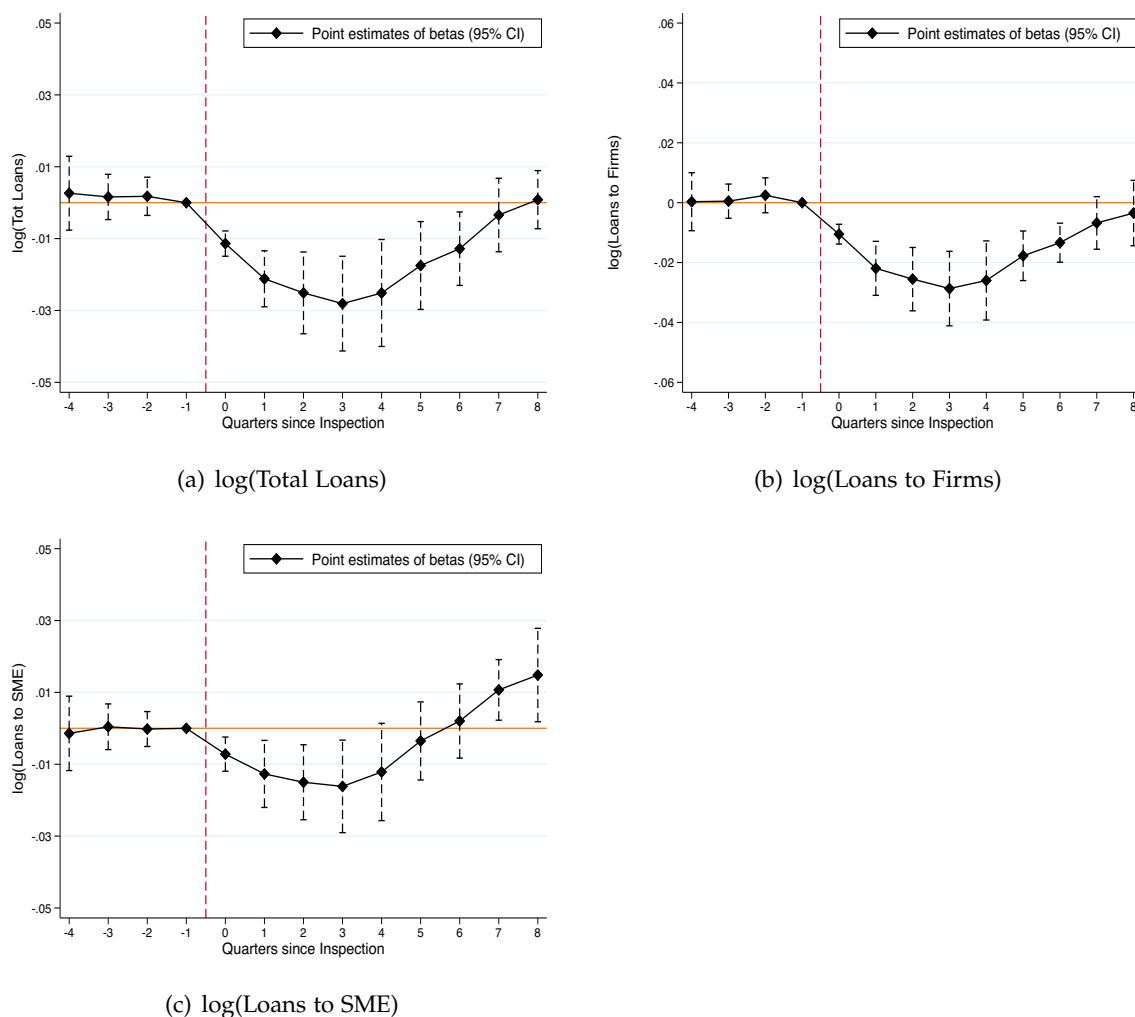
1.5.2 The impact of banking inspections at the firm level: Compositional Effect

In this section we study the heterogeneous effect of bank inspections according to firm quality. Given the supervisory-driven credit supply shock, we test whether inspected banks cut credit across all firms or whether they reallocate it to healthy firms. We introduce a novel method to identify underperforming firms based on inspectors' activity. We show that the credit cut established in the previous section is driven only by underperforming firms. Healthy firms in the inspected banks' portfolio experience a positive credit supply growth.

The previous section highlights several important facts. First, we find a substantial impact of bank inspections both in levels and in terms of growth rates. Second, the timing of the change in the NPL reassures us that the effect is driven by this micro-level channel, i.e. by inspectors' activity, rather than other indirect mechanisms. Third, the effect is not driven by either pre-inspection differences among banks or anticipation effect; that is, banks do not anticipate that they are inspected and adjust their portfolio some quarters before the inspection takes place.⁸³

⁸³Inspections come at a surprise. This is different from stress tests, where the date of the assessment of a

Figure 1.13: Dynamic DiD: Indirect Effect on Lending



Notes: This graph plots the result of the following regression: $y_{bptm} = \alpha_t + \alpha_b + \alpha_{pm} + \sum_{\tau=-4}^{+8} \beta_{\tau} \text{Inspected}_{bptm} \times \{1_{\tau=t}\} + \sum_{\tau=-4}^{+8} \gamma_{\tau} X_{PRE,b,p,m} \times \{1_{\tau=t}\} + \varepsilon_{bptm}$. The outcome variable is the log of total loans. We include bank, quarter and inspection plan-macro area fixed effects. Standard errors are two-way clustered at the bank and inspection plan level. We also include pre-defined bank-level controls: size (natural logarithm of lagged total assets), ROA, liquidity ratio, deposit ratio, capital ratio and NPL ratio. Note that we normalize $\beta_{-1} = 0$ so that all coefficients represent the differences in outcomes relative to the quarter before the inspection. In panel **A** the outcome variable is the log of Total Loans. In panel **B** the outcome variable is the log of Loans to Firms. In panel **C** the outcome variable is the log of loans to Small and Medium Enterprises (SME). Data comes from bank's balance sheet (Supervisory Reports). For a full description of the empirical equation refer to equation 1.1. Data comes from bank's balance sheet (Supervisory Reports).

Now, we study the impact of bank inspections on zombie lending. The question we answer is whether supervisory activity can reduce the misallocation of credit toward underperforming

bank's assets is known by the bank.

firms. Specifically, we study the effect of this “supervisory induced” shock (i.e. on-site bank inspections) on the ability of firms to obtain credit. From the previous analysis, we find that there is a drop in lending activity by banks. However, this drop may be driven by firms with particular characteristics. We therefore move to a firm-bank analysis tracking the credit relationship over time. We follow the literature and employ an empirical model in which we control for credit demand (Khwaja and Mian, 2008). Specifically, we consider the sample of firms that have multi-lending relationships.⁸⁴ Moreover, we consider only the sample of firms that have only performing credits before the inspection (Bofondi, Carpinelli and Sette, 2017).⁸⁵ This exercise compares the growth of credit for a firm borrowing from a bank exposed to the inspection vs. a bank in the control group (i.e. eligible but not inspected).⁸⁶ This is helpful, since we can control for unobserved changes in borrower characteristics.⁸⁷ We employ the following empirical model at the firm-bank level:

$$credit\ growth_{ibt} = \beta Post\ Inspected_{bpt} + \alpha_{it} + \gamma X_{b,PRE} + \delta W_{ib,PRE} + \epsilon_{ibp} \quad (1.6)$$

where i , b , p and t stand respectively for firm, bank, inspection plan and quarter. $credit\ growth_{ibt}$ is our outcome variable and it measures the credit growth of firm i borrowing from bank b .⁸⁸ $Post_{bpt}$ is a dummy variable equal to 1 for the quarters after bank b , included in inspection

⁸⁴Note that multi-lending relationship is common in the Italian banking system. Compared to the United States in which the share of firms with one bank relationship is 55.5%, in Italy the share of firms with multilending relationship is 89% (Detragiache, Garella and Guiso, 2000; Sette and Gobbi, 2015).

⁸⁵That is, we exclude firms with outstanding NPL at the beginning of the period and we focus only on firms that are in good standing according to the Credit Registry.

⁸⁶In robustness checks, we consider the full sample of firms, i.e. we also include firms with only one lending relationship.

⁸⁷As discussed in Section 1.4.1 for our results to be driven by credit demand factors, it must be the case that firms ask for less credit exactly in the same quarter as the bank is inspected – not before because we show there are no pre-trends. While this could be possible, it is very unlikely. Someone may argue that banks are inspected because their poor performance is driven by a local recession. If this is the case, however, we still should see firms demanding less credit even before the inspection. The fact that we do not observe any pre-trend can help rule out this possibility. In Section 1.6 we show that provinces that experience more bank inspections are not preceded by local economic downturn.

⁸⁸Note that we focus only on committed credit instead of drawn credit. Committed credit is a variable that better represents a bank’s willingness to grant a credit. Instead drawn credit responds to a firm’s business decisions – the firm decides how much/when to use the credit that was granted before (Bofondi *et al.*, 2017).

plan p is inspected. $Inspected_{bp}$ is a dummy equal to 1 if bank b included in inspection plan p is inspected, 0 if it is eligible but not inspected. $X_{b,PRE}$ is a set of pre-determined bank-level controls. These are the same as the ones included in regressions in Section 1.4.1.

⁸⁹ $W_{ib,PRE}$ is a set of pre-determined bank-firm relationship controls. We follow the literature (Khwaja and Mian, 2008) and include: relationship length (number of quarters in which we observe a lending relationship between the firm and the bank); the firm's credit share (i.e. share of the firm's loan balance in the bank's loan portfolio); main lender, a dummy equal to 1 if the bank is the firm's largest lender; and bank share, which refers to the share of the bank in the firm's loan portfolio. ϵ_{ibpt} is the error term. Our coefficient of interest is the β . A positive value would imply that the firm's credit growth from inspected banks is higher compared to banks in the control group (i.e. eligible but not inspected).

1.5.3 Theory: Capital Shock Channel vs. Reallocation Channel

In this part we discuss the two competing theories behind the potential effect of the credit supply shock, i.e capital shock channel vs. reallocation channel. We construct a new measure on a firm's quality based on supervisory activity. We show that the effects are consistent with the reallocation channel. Inspected banks cut lending to underperforming firms, and reallocate it to healthy firms in their portfolio or to new firms.

The experimental setup we employ is quite different from what is used in the vast literature studying the real effect of credit supply shocks. Indeed, this literature has extensively discussed the effect of these shocks coming from unforeseen "natural experiments" such as the Lehman Brothers collapse (Chodorow-Reich, 2013), the Russian oil crisis (Schnabl, 2012), the Greek bailout (Bottero, Lenzu and Mezzanotti, 2018), the Japanese banking crisis (Peek and Rosengren, 2000, and the Japanese land market collapse (Gan, 2007)).⁹⁰ The type

⁸⁹Specifically, we follow the literature (Schnabl, 2012) and include: size (natural logarithm of lagged total assets), ROA, liquidity ratio, deposit ratio, equity ratio and NPL ratio. Note that both firm-bank relationship controls and bank-level controls are computed four quarters before the banking inspection to avoid any issue related to bad controls.

⁹⁰The bottom line of these papers is that a credit supply shock derived from a period of unforeseen financial instability may reduce the ability for banks to supply credit with implications for the real economy.

of shock we study has a different connotation. It is driven by the supervisory activity and it aims at reducing the inefficiencies in bank's management. Thus, *ex-ante* it is not clear how the supply of credit is affected. From one side, the supervisors, by forcing the reclassification of a large amount of loans, put pressure on banks to either raise capital or reduce their lending.⁹¹ Thus, in this scenario, unless banks are able to raise capital to cover recognized losses during the bank inspections, supervisory activity results in a reduction in the credit supply ("capital shock channel") to all firms in the bank's portfolio (Bernanke *et al.*, 1991; Peek and Rosengren, 1995). On the other side, since bank inspections are targeted to clean up a bank's balance sheet from specific unprofitable investments, this may induce banks to almost completely cut credit lines to underperforming firms. There is evidence showing that banks, especially weak banks, have the tendency to misreport or delay the report of loan losses (Blattner, Farinha and Rebelo, 2017). Lending could increase if on-site bank inspections reduce existing agency frictions and/or adverse selection problems that prevented bank managers from lending and adopting better practices unviable before the inspection. Thus, looking from the perspective of the firms, bank inspections may potentially have a double-edged effect: a negative effect on the credit growth of underperforming firms and a positive effect on the credit growth of performing firms ("reallocation channel").⁹²

The idea behind the reallocation channel comes directly from the literature on zombie lending (Peek and Rosengren, 2005; Caballero, Hoshi and Kashyap, 2008).⁹³ The main takeaway is from this literature is that banks (especially weak banks) have an incentive to keep lending to under-performing firms. In fact banks with a weak balance sheet (i.e. low capital ratio close to the regulatory limit) want to avoid recognizing new losses that may force them to raise new capital. This is especially true for weak banks whose capital ratio is

⁹¹A similar question is asked by Granja and Leuz (2019). They study how a change in the strictness of bank supervision affects bank lending and in turn local business activity.

⁹²Bian (2019) shows that credit reallocation is an important mechanism to boost aggregate productivity in the aircraft sector.

⁹³There is a growing literature discussing the role of a weak banking sector and its interaction with "zombie firms" (Peek and Rosengren, 2005; Caballero, Hoshi and Kashyap, 2008; Schivardi, Sette and Tabellini, 2017) and the implication for the economy (Acharya, Eisert, Eufinger and Hirsch, 2019b; Blattner, Farinha and Rebelo, 2017)

very close to the minimum required by law. Recognizing new losses would force them to raise new capital. This would be especially costly in periods of financial instability (Hanson, Kashyap and Stein, 2011). This ever-greening has been shown to have negative effects in the credit market with implication for the real economy (Acharya, Eisert, Eufinger and Hirsch, 2019b, Blattner, Farinha and Rebelo, 2017). Bank inspections can help break this circle by forcing banks to clean up their balance sheets by reporting true losses. Once losses are reported and banks have internalized their costs, they may have an incentive to permanently remove these loans from their portfolio or at least re-optimize their portfolio toward more productive investments.

A new proxy for a firm's quality

To test the reallocation channel hypothesis we interact our regressor with a variable that proxies for firm's quality. It is a bit tricky to identify zombie firms, mostly because it is difficult to identify whether a firm is going under temporary financial distress or if there are more fundamental issues.⁹⁴ Our paper contributes to the literature also on this dimension. Leveraging from the bank inspection data, we develop a new measure that is the result of bank inspections. Specifically, we identify firms that are under-performing based on the result from bank inspections. A firm is flagged as truly under-performing if the bank reclassifies its loans from performing to non-performing in the first quarter after the inspection.⁹⁵ We believe this is a valid measure to identify "zombie firms" because this reclassification is driven by the bank supervisor and bank inspections are exactly

⁹⁴The literature offers different strategies. Peek and Rosengren (2005) uses a definition based on the productivity at the industry level. While this is a great first attempt it is also true that a measure at the industry level hides a huge heterogeneity within the industry. One recent and most credible attempt is done by Schivardi *et al.* (2017). By taking advantage of a very detailed data at the firm-level, they consider a firm to be zombie if two conditions are satisfied. First, the Return on Assets (ROA) is lower than the prime rate (i.e. the interest paid to banks by the safest firm). This can be considered as a proxy for a risk-free investment. Second, the leverage of the firm is higher than the median of the sample of firms.

⁹⁵We consider the first quarter, since, as it is highlighted in Figure 1.7(b), the increase in NPL is limited to the first quarter after the inspection. The growth rate is positive between time 0 and 1 and then goes back to 0. We use this fact as evidence that the increase in the NPL is driven by the inspection activity.

meant to identify loans that are “misclassified” by banks.⁹⁶ We support this assumption by confirming that 98.07% of the loans of firms that are reclassified during an inspection period by inspected banks are not reclassified by eligible but not inspected banks in the first year after the inspection.⁹⁷ Additionally, among the set of firms whose loans are reclassified as NPL, only 0.02% are not reclassified by inspected banks.⁹⁸ Table A.10 shows that reclassified firms are significantly different from other firms - we call them healthy firms - along several dimensions. On average bigger, they have more leverage, have less liquidity, are performing worse (according to different indicators such as cash flow) and invest less in intangible as well as tangible assets.

To test the reallocation channel, we augment equation 1.6 with an interaction term between bank inspection and reclassified. The latter variable is a dummy variable equal to 1 if firm i has its loan reclassified as NPL as a consequence of the bank inspection.

The model we use is the following:

$$\begin{aligned} credit\ growth_{ibt} = & \beta(Post\ Inspected_{bpt}) + \eta(Post\ Inspected_{bpt} \times reclassified_{ip}) + \\ & \alpha_{it} + \delta W_{b,PRE} + \gamma X_{ib,PRE} + \epsilon_{ibpt} \end{aligned} \quad (1.7)$$

where the outcome variable is the credit growth for firm i borrowing from bank b where bank b is included in inspection plan p .⁹⁹ The additional element in equation 1.7 is given

⁹⁶As discussed, before banks do have an incentive to keep these loans as performing, because otherwise they would have to recognize losses. Recognizing losses means that banks need to raise additional capital, which is particularly costly during financial instability or in a post financial crisis.

⁹⁷In other words, loans to the same firm are reclassified as NPL by inspected banks and are not reclassified by banks in the control group in 98% of the cases. Note also that the sample we consider in this analysis includes only firms that have no NPL in the year before the inspection. That is, firms that look good on paper according to the supervised bank.

⁹⁸In other words, considering loans of firms that borrow from multiple inspected banks, only the 0.02% of those loans are not reclassified by some inspected banks. This is in line with the fact that banking inspectors provide only suggestions to banks. They can decide to comply with it or not.

⁹⁹The credit growth is defined in two ways. The first is the following:

$$growth(credit_{ibt}) = \frac{credit_{ibt} - credit_{ibt-1}}{0.5(credit_{ibt} + credit_{ibt-1})} \quad (1.8)$$

which is a second-order approximation of the log difference growth rate around 0; it is bounded in the range $[-2, 2]$, limiting the influence of outliers; and it accounts for changes in credit along both the intensive and

by the interaction between $Post \times Inspected_{bpt}$ and $Reclassified_{ibp}$. This interaction term identifies those firms classified by the supervisor as under-performing. Thus, this model compares the credit growth of firms that borrow from inspected and not inspected but eligible banks, and whose loan is reclassified as NPL by bank inspectors. Robust standard errors are two-way clustered at the bank and inspection plan level (Petersen, 2009).

1.5.4 Results

Table 1.6 shows the results on the intensive margin for the equation 1.6, while Table 1.7 presents the results on the extensive margin. For the intensive margin we use a sample of firms that we observe at least one quarter in the pre-period and one quarter after the inspection. For the extensive margin analysis we use only firms that we observe at least one period before the banking inspection. Moreover, all the analysis here considers only the sample of firms that do not have any NPL in the two years before the inspection.

In Table 1.6, column (1), we test the capital shock channel. According to this theory, we expect that bank inspections have a negative effect on the credit growth of firms. By reclassifying loans into non-performing, banks are forced to recognize losses on their balance sheets and increase the amount of write-offs. This forces them to raise capital and/or cut their lending.¹⁰⁰ We find a negative effect of the coefficient on $Post \times inspected$. Specifically, firms borrowing from both inspected and eligible but not-inspected banks have a positive effect on their credit growth. Their credit growth from inspected banks decreases by 0.1% compared to the credit growth from eligible but not inspected banks. The effect is not significant.

extensive margins. The second one is $\Delta \log(credit_{ibt}) = \log(credit_{ibt}) - \log(credit_{ibt-1})$ ((Haltiwanger, Schuh and Davis, 1996; Chodorow-Reich, 2013). The second outcome variable is a pure measure of the intensive margin.

¹⁰⁰This is also found by (Cingano, Manaresi and Sette, 2016) and (Bottero, Lenzu and Mezzanotti, 2018) for Italian Banks. The former shows that banks that are more exposed to the dramatic liquidity drought in the interbank market that followed the 2007 financial shocks are more likely to cut credit vis-à-vis banks less exposed to it. The latter uses the European Sovereign Crisis as natural experiment, showing that banks that are more exposed to the shock (i.e. that hold more sovereign debt) are more likely to cut credit vis-à-vis banks that are less exposed. In both cases the exogenous shock generated a liquidity shock to banks.

Table 1.6: Effect on Credit growth - Zombie= NPL_{post}

VARIABLES	(1) gr(tot Loans)	(2) gr(tot Loans)	(3) gr(tot Loans)	(4) $\Delta \log(\text{tot Loans})$	(5) $\Delta \log(\text{tot Loans})$
inspected	-0.001 (0.012)	0.034*** (0.012)	0.029** (0.012)	0.037*** (0.014)	0.032** (0.014)
inspected \times reclassified		-0.668*** (0.025)	-0.668*** (0.025)	-0.714*** (0.029)	-0.713*** (0.029)
Observations	1,837,968	1,837,968	1,837,968	1,829,005	1,829,005
R-squared	0.421	0.426	0.434	0.392	0.399
bank FE	Y	Y	Y	Y	Y
firm \times quarter FE	Y	Y	Y	Y	Y
bank \times quarter FE	N	N	Y	N	Y
Inspection Plan FE	Y	Y	Y	Y	Y
bank controls	Y	Y	Y	Y	Y
bank-firm relat	Y	Y	Y	Y	Y
Cluster	bank	bank	bank	bank	bank

Notes: This table shows the results of the following equation: $credit\ growth_{ib,t} = \beta Post_{bpt} \times Inspected_{bp} + \eta (Post_{bpt} \times Inspected_{bp} \times reclassified_{ip}) + \alpha_{it} + \gamma X_{b,PRE} + \delta W_{ib,PRE} + \epsilon_{ibp}$. In columns (1)-(3) the outcome variable is $growth(credit_{ib,t}) = \frac{credit_{ib,t} - credit_{ib,t-1}}{0.5(credit_{ib,t} + credit_{ib,t-1})}$. In columns (4) and (5), the outcome variable is the following: $\Delta \log(credit_{ib,t}) = \log(credit_{ib,t}) - \log(credit_{ib,t-1})$. $Post_{bpt}$ is a dummy variable equal to 1 for the quarters after bank b , included in inspection plan p is inspected. $Inspected_{bp}$ is a dummy equal to 1 if bank b included in inspection plan p is inspected, 0 if it is eligible but not inspected. $reclassified_{ip}$ is a dummy that is equal to 1 if a loan belonged to firm i is reclassified as NPL within a quarter from the inspection. $X_{b,PRE}$ is a set of pre-determined bank-level controls. These are: size (natural logarithm of lagged total assets), ROA, liquidity ratio, deposit ratio, equity ratio, and NPL ratio. We include bank FE, Inspection plan-macro area FE and quarter FE. We include pre-defined bank-level controls: size (natural logarithm of lagged total assets), ROA, liquidity ratio, deposit ratio, capital ratio and NPL ratio. $W_{ib,PRE}$ is a set of pre-determined bank-firm relationship controls. These are: relationship length (number of quarters in which we observe a lending relationship between the firm and the bank; firm's credit share (i.e. share of the firm's loan balance in the bank's loan portfolio); main lender is a dummy equal to 1 if the bank is the firm's largest lender; bank share refers to the share of the bank in the firm's loan portfolio. We include the following fixed effects: bank, firm \times quarter, Inspection plan, quarter. The sample includes only firms that have no NPL before the inspections and it is conditional only on firms that we observe at least one period before the inspection and one period after the inspection. * $p < 0.10$. ** $p < 0.05$, *** $p < 0.01$.

Columns (2)-(3) test for the heterogeneous effect of bank inspections among different types of firms, i.e. the reallocation channel. Specifically we introduce our variable of "reclassified" based on whether the loan is reclassified as NPL immediately after the inspection.¹⁰¹ The results are in line with the reallocation channel. We find that reclassified firms experience a drop in the credit growth. The coefficient on the triple interaction is negative and statistically significant. The magnitude is also quite large. Reclassified banks have a drop in the credit growth of almost 66%. On the other side, the coefficient on $Post \times inspected$

¹⁰¹As discussed in Section 1.5.3 we only consider loans that are reclassified as NPL in the first quarter after the inspection by inspected banks.

changes sign and increases both in magnitude and in its significance. Column (4)-(5) consider a different outcome variable, i.e. $\Delta \log(\text{credit}_{ibt}) = \log(\text{credit}_{ib,t}) - \log(\text{credit}_{ib,t-1})$. This is a pure measure of intensive margin. We find similar results also by using this outcome variable.

Table 1.7: *Effect on Credit Growth: Extensive Margin*

VARIABLES	(1) pr(cut)	(2) pr(cut)	(3) pr(cut)	(4) pr(cut)
inspected	-0.002** (0.001)	-0.001 (0.002)	-0.007** (0.003)	-0.005* (0.003)
inspected \times reclassified			0.056*** (0.010)	0.056*** (0.011)
Observations	1844127	1857447	1844127	1844127
R^2	0.212	0.476	0.319	0.331
bank FE	Y	Y	Y	Y
firm \times quarter FE	Y	Y	Y	Y
Inspection Plan FE	N	Y	N	Y
bank controls	Y	Y	Y	Y
bank-firm relat	Y	Y	Y	Y
Cluster	bank	bank	bank	bank

Notes: This table shows the results of the following equation: $\text{credit growth}_{ib,t} = \beta \text{Post}_{bpt} \times \text{Inspected}_{bp} + \eta (\text{Post}_{bpt} \times \text{Inspected}_{bp} \times \text{reclassified}_{ip}) + \alpha_{it} + \gamma X_{b,PRE} + \delta W_{ib,PRE} + \epsilon_{ibp}$. In columns (1)-(3) the outcome variable is $\text{growth}(\text{credit}_{ib,t}) = \frac{\text{credit}_{ib,t} - \text{credit}_{ib,t-1}}{0.5(\text{credit}_{ib,t} + \text{credit}_{ib,t-1})}$. The outcome variable $\text{pr}(\text{cut})$ is a dummy variable equal to 1 if the bank-firm relationship is cut in quarter t , 0 otherwise. Post_{bpt} is a dummy variable equal to 1 for the quarters after bank b , included in inspection plan p is inspected. Inspected_{bp} is a dummy equal to 1 if bank b included in inspection plan p is inspected, 0 if it is eligible but not inspected. reclassified_{ip} is a dummy that is equal to 1 if a loan belonged to firm i is reclassified as NPL within a quarter from the inspection. $X_{b,PRE}$ is a set of pre-determined bank-level controls. These are: size (natural logarithm of lagged total assets), ROA, liquidity ratio, deposit ratio, equity ratio, and NPL ratio. We include bank FE, Inspection plan-macro area FE and quarter FE. We include pre-defined bank-level controls: size (natural logarithm of lagged total assets), ROA, liquidity ratio, deposit ratio, capital ratio and NPL ratio. $W_{ib,PRE}$ is a set of pre-determined bank-firm relationship controls. These are: relationship length (number of quarters in which we observe a lending relationship between the firm and the bank; firm's credit share (i.e. share of the firm's loan balance in the bank's loan portfolio); main lender is a dummy equal to 1 if the bank is the firm's largest lender; bank share refers to the share of the bank in the firm's loan portfolio. We include the following fixed effects: bank, firm \times quarter, Inspection plan, quarter. The sample includes only firms that have no NPL before the inspections. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 1.7 studies the effect of bank inspections on the extensive margin, namely the probability that banks cut a lending relationship. This is a linear probability model in which the outcome variable is a dummy variable equal to 1 if the bank stops lending to the firm and 0 otherwise. Columns (1)-(2) tests the capital shock channel. We find that the probability of cutting a lending relationship is actually *negative* for banks that are inspected (column 1) or not significant. This is somehow against the capital channel story in which we expect

that the bank capital shock increases the likelihood for a bank to cut a lending relationship. Columns (3)-(5) test the reallocation channel of equation 1.7. We find that the probability of cutting a relationship becomes highly positive and significant for underperforming firms, while it is significant and negative for other firms.¹⁰² This is in line with the idea that inspected banks, once they are forced to recognize loan losses (i.e. reclassify loans from performing into non-performing), are more likely to completely cut the credit lines to those firms.

Table 1.8: *Effect on New Bank-Firm lending Relationship*

VARIABLES	(1) $\Delta \log(\text{New Loans})$	(2) $\Delta \log(\text{New Loans})$	(3) $\Delta \log(\text{New Loans})$
Post \times Inspected	0.560*** (0.190)	0.483*** (0.181)	0.446** (0.177)
Observations	11,953	11,953	11,880
R-squared	0.343	0.346	0.379
Bank FE	Y	Y	Y
Quarter FE	Y	Y	Y
Province FE	Y	Y	Y
Inspection Plan \times macro area FE	N	Y	Y
Bank Controls	N	N	Y
Cluster	bank	bank	bank

Notes: This table shows the results of the following equation: $\Delta \log(\text{NewLoans}) = \beta \text{post} \times \text{Inspected}_{bt} + \gamma_t + \gamma_b + \gamma_p + \gamma_m + \eta X_{b,PRE} + \epsilon_{bt}$. The outcome variable is $\Delta \log(\text{Loans new firms}_{b,t}) = \log(\text{Loans new firms}_{b,t}) - \log(\text{Loans new firms}_{b,t-1})$. The variable is multiplied by 100. We include bank, quarter and inspection plan-macro area fixed effect. We include pre-defined bank-level controls: size (natural logarithm of lagged total assets), ROA, liquidity ratio, deposit ratio, capital ratio, and NPL ratio.

Table 1.8 provides evidence that inspected banks are more likely to start a brand-new credit relationship with a firm that was not previously in the bank's portfolio. The outcome variable is the change in the total number of new loans by bank b . The coefficient is positive and statistically significant. Moreover, we find that these loans are of better quality *ex-ante*.

Table 1.9 shows that on average new loans initiated after the inspections are less risky. To measure the risk of a firm we use two different measures. In columns (1)-(2) we use a risk-score based on the Altman Z-score (Altman, 1968; Altman *et al.*, 1994). This information

¹⁰²All these regressions control for bank-firm relationship characteristics such as whether or not the bank is the main lender.

Table 1.9: Quality of New Loans

VARIABLES	(1) Score	(2) Score	(3) $\sigma(\text{growth sales})$	(4) $\sigma(\text{growth sales})$
Post \times inspected	-0.046** (0.021)	-0.050** (0.022)	-0.008* (0.005)	-0.009* (0.005)
Observations	11,452	11,253	10,513	10,323
R-squared	0.136	0.767	0.109	0.713
Bank FE	Y	Y	Y	Y
Quarter FE	Y	Y	Y	Y
Inspection Plan Year \times macro area FE	Y	Y	Y	Y
Bank Controls	N	Y	N	Y
Cluster	bank	bank	bank	bank

Notes: This table shows the results of the following equation: $y_{bt} = \beta \text{post} \times \text{Inspected}_{bp} + \gamma_b + \gamma_{pm} + \eta X_{b,PRE} + \epsilon_{bp}$. In columns (1)-(2) the outcome variable is $\text{Average Score}_{b,t} = \frac{\sum \text{Score}_{i,t} \{1_{\text{New loan}_{ib}=1}\}}{\sum \{1_{\text{New loan}_{ib}=1}\}}$ is the average score for firms that start a new brand credit relationship with bank b in quarter t . In columns (3)-(4) we consider the average volatility in sales growth in the three years before. To compute the averages, we consider only new loans created 4 quarters before the inspection and 4 quarters after the inspection. Score is the Altman-score for firm i at time t . It takes value from 1 (safest company) to 9 (riskiest company). We include bank, quarter, and inspection plan-macro area fixed effect. We include pre-defined bank-level controls: size (natural logarithm of lagged total assets), ROA, liquidity ratio, deposit ratio, capital ratio and NPL ratio.

comes from CERVED. In columns (3)-(4) we use a measure based on the volatility of the growth sales of firms. Specifically, we follow (Neuhann and Saidi, 2018) and we construct annual growth rates that accommodate entry and exit using the measure developed in Davis *et al.* (2006):

$$\gamma_{i,t} = \frac{(x_{i,t} - x_{i,t-1})}{0.5 \times (x_{i,t} + x_{i,t-1})} \quad (1.9)$$

We use these growth rates to compute the standard deviation of firm i 's sales growth over four years. The main difference between the two measures is that the Z-score is a measure available to the bank and it is likely they take this information into account when deciding whether to grant or not a new loan. The second measure instead may not be directly available to the bank. In both cases the results show that inspected banks initiate new loans with less-risky firms.

In line with this results, in table 1.10 we show that the interest rate charged on new loans is lower. Inspected banks lend to safer firms and thus reduce the interest charged.

From a policy perspective, this is extremely instructive of the benefits of the banking

Table 1.10: Interest rate

VARIABLES	(1) Interest Rate	(2) Interest Rate
post inspected	-0.008* (0.004)	-0.011** (0.005)
Observations	1,153	1,120
R-squared	0.146	0.587
Bank FE	Y	Y
Quarter FE	Y	Y
Inspection Plan Year \times macro area FE	Y	Y
Bank Controls	N	Y
Cluster	bank	bank

Notes: This table shows the results of the following equation: $y_{bt} = \beta post \times Inspected_{bp} + \gamma_b + \gamma_{pm} + \eta X_{b,PRE} + \epsilon_{bp}$. The outcome variable is $Average\ interest\ rate_{b,t} = \frac{\sum interest\ rate_{i,t} \{1_{New\ loan_{it}=1}\}}{\sum \{1_{New\ loan_{it}=1}\}}$ is the average interest rate charged to firms that start a new brand credit relationship with bank b in quarter t . In columns (3)-(4) we consider the average volatility in sales growth in the three years before. To compute the averages, we consider only new loans created 4 quarters before the inspection and 4 quarters after the inspection. Score is the Altman-score for firm i at time t . It takes value from 1 (safest company) to 9 (riskiest company). We include bank, quarter, and inspection plan-macro area fixed effect. We include pre-defined bank-level controls: size (natural logarithm of lagged total assets), ROA, liquidity ratio, deposit ratio, capital ratio and NPL ratio.

supervision in the reduction of financial frictions in the credit market. By forcing banks to recognizing losses, banks are more likely to cut these lending relationship.

In robustness tests in the Appendix we confirm these results by running similar regressions with different proxies for a firm's quality. In Table A.9 we use Total Factor Productivity (TFP, henceforth), a proxy for firm's productivity which is constructed according to the revenue approach (Wooldridge, 2009).¹⁰³

Overall, we find that on-site bank inspections generate an effect in line with the reallocation channel. Inspected banks do cut credit to underperforming firms. They reallocate this credit to either healthy firms in their portfolio or to new startups. We find evidence that after an on-site bank inspections, audited banks change their lending policies and invest more on healthy firms and new firms that are, on average, less risky.

¹⁰³There are two main approaches to computing the TFP: the value-added approach and the revenue approach. We use the latter, because it reduces the number of observations that are missing.

1.5.5 Potential mechanism

We discuss the two potential mechanisms explaining the change in the lending policy by inspected banks: first, a change in the governance of the bank; and second, a forced recapitalization of the inspected bank. Both of these mechanisms are consistent with banks becoming more conservative in their lending decisions.

From the previous section, we show that on-site bank supervision forces banks to clean up their balance sheet. They are forced to report losses from their trouble loans. As a consequence, there is a negative effect on a bank's profitability in the short term due to the stress put on its balance sheet. However, at the same time we find that inspected banks do adjust their portfolio toward more productive investments. They cut the lending to trouble firms and invest more in healthy or new firms. A natural question, then, is why do inspected banks change their lending policies? We show that this is related to structural changes carried out by the bank after an inspection. We explore two different mechanisms that may explain the change in their lending behavior. First, on-site bank inspections lead to structural changes at the bank governance (i.e. institutional changes). Second, on-site inspections force banks to raise capital, moving them away from minimal regulatory capital threshold.

Change in corporate governance

Changes in the governance of a bank after a scandal is not something unusual.¹⁰⁴ We show that inspections reveal wrongdoing in the bank's balance sheets. This has potentially negative implications for the reputation of the bank and it may reduce the trust of their shareholder. The latter can induce them to reduce or withdraw their deposits and disinvest in the bank. Inspected banks need to make structural reforms to avoid this negative implication.

Table 1.11 shows that the results on the impact of bank audits on the governance of the

¹⁰⁴For instance, Wells Fargo changed four members of its sixteen-member board after a fraud scandal (<https://www.nytimes.com/2018/02/02/business/wells-fargo-federal-reserve.html>).

Table 1.11: *Effect on the Governance of the Inspected Bank*

VARIABLES	(1) Tot Elective Members	(2) Tot Not-Elective Members	(3) Tot Supervision Members
Post × Inspection	-0.030** (0.011)	-0.002 (0.010)	0.020** (0.007)
Observations	5,453	5,453	5,453
R-squared	0.989	0.995	0.414
bank FE	Y	Y	Y
Inspection Plan FE	Y	Y	Y
Year FE	Y	Y	Y
Bank controls	Y	Y	Y
Cluster	bank-IP	bank-IP	bank-IP

Notes: This table shows the results of the following equation: $\Delta Tot\ Members_{b,t} = \beta post \times Inspected_{bp} + \gamma_t + \gamma_b + \gamma_{mp} + \gamma_m + \eta X_{b,PRE} + \epsilon_{bt}$. The outcome variable is the change in the total members belonging to a specific category between $t - 1$ and $t + 1$. We include bank, quarter, and inspection plan-macro area fixed effect. We include pre-defined bank-level controls: size (natural logarithm of lagged total assets), ROA, liquidity ratio, deposit ratio, capital ratio, and NPL ratio.

bank. We there is a decrease in the number of executive members following an inspection. Some board members are forced to exit once wrongdoing are revealed. At the same time it forces the bank to strenghten the internal monitoring by hiring more people in the internal supervisory units. We find no effect on the management side. The results complement a line of research in accounting showing that after a serious accounting restatement, a firm take reparative actions to rebuild its reputation.¹⁰⁵ In a similar way, audited banks have to take structural reforms – firing board members – to regain the trust of their shareholders.

Recapitalization and change in Bank incentives

We find that audited banks are more likely to undergo a recapitalization. Raising equity is costly when banks are in financial distress; this is one of the main reasons why banks avoid revealing their true losses and continue their evergreening. However, once they are recapitalized and their capital ratio is above the regulatory threshold, banks may change

¹⁰⁵Chakravarthy *et al.* (2014) shows that public listed firms take reputation-building actions after an accounting fraud. The actions are targeted at both capital providers and other stakeholders are associated with improvements in the restating firm's financial reporting credibility.

incentives in their lending policies. The increase in the equity side makes the bank a stakeholder not only in good times but also in the unfavorable state of the world. They stop lending to trouble firms and start lending to healthier ones. This idea is related to the literature looking at the optimal level of recapitalization by the government. The takeaway is that a minimum threshold must be reached in order to have a positive effect of recapitalization. In particular, this has to be large enough to solve banks' debt overhang problems (Philippon and Schnabl, 2013; Bhattacharya and Nyborg, 2013). Diamond and Rajan (2000) and Diamond and Rajan (2001) point out that recapitalizations that are too small may even damage bank lending policies. In their setting, while recapitalizations that remedy bank capital inadequacy also restore incentives to sound lending policies, banks that remain undercapitalized evergreen bad loans to avoid writing them off and becoming officially insolvent. Capital injections allow undercapitalized banks to lend more to impaired borrowers. Such banks may even recall loans to their creditworthy borrowers, as new capital puts the goal of meeting capital requirements within reach. Thus, too small recapitalizations encourage banks' bad lending policies, and may even decrease the availability of loans for borrowers with valuable investment opportunities.¹⁰⁶

Even if our setting is different since there is no active role of the government in bailing out banks, the bank supervisor indirectly force banks to inject capital. Figure A.7 shows that after on-site inspections, treated banks increase the stock of their capital. The increase in capital level is high enough to reduce banks' incentives to evergreen, since now they do not have a binding condition in terms of capital ratio.

1.6 Spillover effect to the Real Economy

This section explores the consequences of bank inspections to the real economy. In the first part we focus on the impact on firms. We provide evidence that bank inspections have a

¹⁰⁶According to the results in Acharya *et al.* (2019b) this is what happened in 2012 with the "Whatever it takes reform" promoted by Mario Draghi. Weak banks kept lending to impaired borrowers is one of the main reasons explaining stable low economic growth in the euro area in that period.

positive effect for the total credit of firms, i.e. a credit channel. Healthy firms obtain more credit, while underperforming firms are not able to substitute credit with other banks. We show that this has implication for real outcomes. Specifically, healthy firms invest more in fixed assets, and they grow their workforce. Additionally, we find that this leads to increase their sales/revenues. To run these analysis, we match data on credit with annual information on firms' balance sheet and income statement. We also construct a firm-level measure of the degree of exposure of firms to inspected banks based on the share of credit they grant from them. The second part of this section studies the implications of bank inspections for the local economy. Consistent with previous results, we find that provinces more exposed to inspections experience pace of business dynamics and more entrepreneurship.

1.6.1 Credit effect at the firm level

We find that inspected banks cut credit to underperforming firms. We now study two related questions. First, are underperforming firms able to substitute this credit cut by borrowing from not inspected banks? Second, what happens to the total credit of healthy firms? Are they able to obtain more credit? In other words we want to shed light on whether the credit supply shock highlighted in the previous section results in underperforming firms borrowing less credit from the banking system and healthy firms being able to borrow more credit.

Estimating equation

To test the implication of bank inspections for the total credit of firms we run a dynamic difference-in difference (DiD) model collapsing the data at the firm level and tracking firm-level outcomes over time. Specifically, we employ the following equation:

$$\Delta \log(y_{it}) = \beta_1 Post Exposure_{i,PRE} + \beta_1 Post Exposure_{i,PRE} \times Healthy_{ip} + \quad (1.10)$$

$$+ \alpha_i + \eta_l + \eta_t + \eta_c + \gamma S_{iPRE} + \epsilon_{itp}$$

where i, t, p, l and c are respectively firm, quarter, inspection plan, industry and province.¹⁰⁷ The outcome variable is either the growth rate of total credit to firm i defined as $gr(TotLoans)_t = \frac{(Tot/Loans_t - Tot/Loans_{t-1})}{Tot/Loans_t}$ or a measure capturing the intensive margin, i.e. $\Delta \log(TotCredit)_t = \log(TotCredit)_t - \log(TotCredit)_{t-1}$. S_{iPRE} is a set of predetermined firm-level characteristics computed one to three quarters before the shock. These variables are the natural logarithm of assets, capital/assets, interest paid/ebitda, and the current ratio. Note that the big drawback of this specification is that we cannot fully control for credit demand as before. Thus, the inclusion of these firm-level controls account for potential long-term trends at the firm-level that could affect credit demand. $Healthy_{it}$ is a dummy equal to 1 if the loan of the firm is not reclassified.¹⁰⁸ ϵ_{ib} are standard errors clustered at the level of the industry.¹⁰⁹ $\Delta \log(y_i)$ is the main outcome variable of interest for firm i , and it is regressed on a measure of exposure to the banking shock to firm i . We follow the literature (Chodorow-Reich, 2013) and construct our main regressor of interest as a pre-determined exposure of firms to bank inspected. Specifically our measure is constructed as follows:

$$Exposure_{ip} = \frac{\sum_{b=1}^{b \in B^{inspected}} credit_{ibp}}{\sum_{b=1}^{b \in B^{all}} credit_{ib}} \quad (1.11)$$

where we consider the credit granted by firm i before the banking inspection. The numerator is the sum of the credit granted to firm i by banks that are inspected according to inspection plan p . The denominator is the sum of the credit granted to firm i by all banks for which the firm has a lending relationship. Our coefficient of interest is β , which we standardize to be able to interpret the coefficient as the percentage change in credit in response to a standard deviation increase in the borrowing share from inspected banks.

¹⁰⁷Note that province is the geographical area of reference in Italy. it is of comparable size of a county in the USA. Province is the “relevant geographic markets” according to the Antitrust Authority (Guiso, Sapienza and Zingales, 2004).

¹⁰⁸In other words, it is equal to $Healthy_{it} = 1 - Reclassified_{it}$ where $Reclassified_{it}$ is a dummy for whether the inspector forces the bank to reclassified the loan.

¹⁰⁹In robustness tests we cluster at the level of the firm and/or two-way cluster at the level of the province and industry.

Results

Table 1.12 reports the effects on the credit channel. Columns (1) and (2) consider the effect on the average surviving firm. Columns (3)-(5) include an interaction term for whether or not the firm is healthy. We find that the growth rate of credit for the average firm is negative (column 1). This is true even when we control for firm-level controls and an extensive set of fixed effects (column 2). In column (3)-(5) we include a dummy variable for whether a firm is healthy (i.e. its loan is not reclassified by the supervisor). We find that by including this new interaction variable, the effect on the credit growth for healthy firms is positive and significant. A one standard deviation increase in the firm's exposure to inspected banks increases the credit growth for healthy firms by 3.6%.¹¹⁰

Table 1.12: Spillover to Healthy Firms: Credit Channel

VARIABLES	(1) $\Delta \log(\text{Tot Loans})$	(2) $\Delta \log(\text{Tot Loans})$	(3) $\Delta \log(\text{Tot Loans})$	(4) $\Delta \log(\text{Tot Loans})$	(5) $\Delta \log(\text{Tot Loans})$
Post Exposure	-0.002*** (0.000)	-0.002*** (0.000)	-0.046** (0.023)	-0.042** (0.017)	-0.041** (0.017)
Post Exposure×Healthy			0.082*** (0.025)	0.078*** (0.017)	0.077*** (0.017)
Post×Healthy			-0.028*** (0.003)	-0.021*** (0.002)	-0.018*** (0.002)
<hr/>					
$H_0 : \text{Post Exposure} + \text{Post Exposure} \times \text{Healthy} = 0$					
$\beta_1 + \beta_2$.037 (0.006)	.036 (.002)	.036 (0.001)
p-value			0.000	0.000	0.000
Observations	1,382,736	1,382,736	1,382,736	1,382,736	1,382,736
R-squared	0.036	0.036	0.114	0.124	0.124
Firm FE	Y	Y	Y	Y	Y
Quarter FE	Y	Y	Y	Y	Y
Province FE	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y
Firm controls	N	Y	N	Y	Y
Inspection Plan Year FE	Y	Y	N	N	Y
Cluster	industry	industry	industry	industry	industry

Notes: This table shows the results of the following equation: $\Delta \log(\text{total credit}_{it}) = \beta_1 \text{Post Exposure}_{i,PRE} + \beta_2 \text{Post Exposure}_{i,PRE} \times \text{NonReclassified}_{ip} + \alpha_i + \eta_l + \eta_c + \gamma S_{i,PRE} + \epsilon_{itp}$. The outcome variable is $\Delta \log(\text{total credit}_{it}) = \log(\text{total credit}_{it}) - \log(\text{total credit}_{it-1})$. We include firm, quarter, province, and sector and inspection plan fixed effect. $S_{i,PRE}$ is a set of predetermined firm-level characteristics computed one to three quarters before the shock. These variables are the natural logarithm of assets, sales growth, capital/assets, interest paid/ebitda and the current ratio. $Healthy_{it}$ is a dummy equal to 1 if the loan of the firm is not reclassified. $Exposure_{i,PRE} = \frac{\sum_{b=1}^{b \in \text{inspected}} \text{credit}_{ibp}}{\sum_{b=1}^{b \in \text{all}} \text{credit}_{ib}}$ is our treatment, which is the share of credit coming from inspected banks computed in the pre-period. Standard errors are clustered at the industry level. Coefficients are standardized.

¹¹⁰This is the sum of the two coefficients on the interaction with exposure: $-0.041 + 0.077 = 0.036$

1.6.2 Effects on Employment and Investment

We study how this credit supply shock is passed-through into employment and investments at the annual firm-level.¹¹¹

Estimating equation

We run the following model in reduced-form:

$$\Delta y_{itpc} = \beta Exposure_{ip} + \alpha_i + \eta_l + \eta_c + \gamma S_{i,PRE} + \epsilon_{itpc} \quad (1.12)$$

where i, t, p, l and c are respectively firm, inspection plan, industry and province. *Exposure* is our treatment variable as defined in equation 1.11. We include the same controls at the firm-level as in equation 1.10.¹¹² Our coefficient of interest is β . We standardize it in order to interpret it as the percentage change in our outcome variable in response to a standard deviation increase in the borrowing share from inspected banks. We compute robust standard errors clustered at the industry level.

Result

Table 1.13 shows the effect on the employment and fixed capital investments. Columns (1) and (2) reports respectively the changes in employment after one and two years from the inspection. Columns (3) and (4) report the changes in investments in fixed capital after one and two years. We find a positive effect on both employment and investments in fixed capital after controlling for a set of fixed effects and firm level controls. The effect is stronger in the second year after the inspection is performed. Specifically for employment we find that one standard deviation increase in the firm's exposure to inspected banks leads to 2 pp

¹¹¹We match the surviving firms used in the analysis in subsection 1.6.1 with balance sheet and income statement data at the annual level. This dataset is available for only incorporated businesses (limited liability companies), not sole proprietorship or other non-incorporated firms. More details on this dataset can be found in Section 1.3.

¹¹²These variables are the natural logarithm of assets, sales growth, capital/assets, interest paid/ebitda and the current ratio.

increase in employment and investments in fixed capital. Combining this with the effect on credit for healthy firms we can compute a back-of-the-envelope calculation. After two years healthy firms increase their employment by about $0.036 \times 0.0200 \approx 1$ employee. In robustness tests we run the same regressions and control for the firm fixed effects estimated from the baseline regression of the credit channel in equation 1.10.

Table 1.13: *Real Effect on Employment Investments and Sales for Healthy Firms*

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	$\Delta\text{Employment}_{t+1}$	$\Delta\text{Employment}_{t+2}$	$\Delta\text{Fixed Assets}_{t+1}$	$\Delta\text{Fixed Assets}_{t+2}$	ΔSales_{t+1}	ΔSales_{t+2}
Exposure	0.015*** (0.003)	0.020*** (0.004)	0.011*** (0.002)	0.019*** (0.004)	0.045*** (0.016)	0.034* (0.018)
Observations	82,296	82,296	71,668	71,668	56,668	56,668
R-squared	0.041	0.043	0.012	0.020	0.026	0.028
Province FE	Y	Y	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y	Y	Y
Inspection Plan Year FE	Y	Y	Y	Y	Y	Y
Firm controls	Y	Y	Y	Y	Y	Y
Cluster	industry	industry	industry	industry	industry	industry

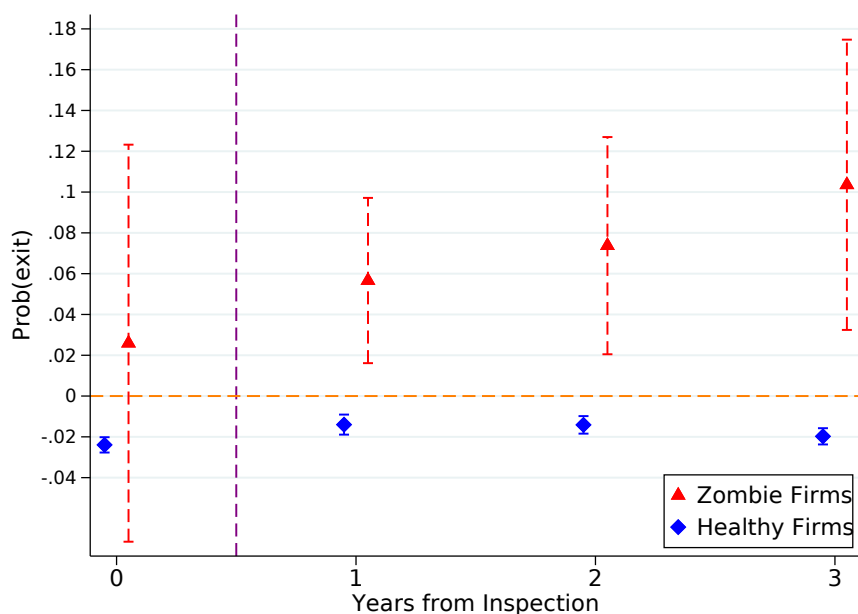
Notes: This table shows the results of the following regression: $\Delta y_{itp} = \beta \text{Exposure}_{ip} + \gamma X_{i,PRE} + \alpha_i + \eta_l + \eta_c + \gamma S_{i,PRE} + \epsilon_{itp}$. The outcome variable is $\Delta \log(y_{it}) = \log(y_{i,t}) - \log(y_{i,t-1})$, i.e., we compute the change in y between the year before the inspection and the year after. $S_{i,PRE}$ is a set of predetermined firm-level characteristics computed one to three quarters before the shock. These variables are the natural logarithm of assets, sales growth, capital/assets, interest paid/ebitda, and the current ratio. $\text{Exposure}_{i,PRE}$ is our treatment, which is the share of credit coming from inspected banks computed in the pre-period. We cluster the standard errors at the industry level. Coefficients are standardized.

Figure 3.1 shows the effect of bank inspections on the probability for a firm to exit the market τ years after the market. We find that healthy firms have a consistent negative and statistically significant probability to exit the market. For zombie firms the picture is different. We find that in the year before the inspection takes place, the probability to exit the market is not significantly different from zero. After one year, the probability becomes positive and statistically significant. It is about 6%. It grows steadily with the years. After three year from the inspection, the probability of exit for a zombie firm is about 11%.¹¹³

We find that underperforming firms more exposed to bank inspections are more likely to exit the market. The effect is statistically significant. One standard deviation increase in the

¹¹³In Table A.12 in the Appendix consider the probability of exit within two years. The outcome variable is equal to 1 if firm i exits the market within two years from the inspection. Column (1) and (2) consider the effect on the sample of zombie firms (i.e. firms whose loan is reclassified as NPL during the inspection). Column (3) and (4) consider the sample of other firms.

Figure 1.14: Effect on the Probability of Exit over time



Notes: This figure shows the results of the following regression: $Prob(exit_{i,\tau}) = \beta Exposure_{ip} + \eta_l + \eta_c + \eta_t + \gamma S_{i,PRE} + \epsilon_{itp}$. The outcome variable is $Prob(exit_{i,\tau})$ and represents the probability that the firm i exists the market τ years after the inspection. $S_{i,PRE}$ is a set of predetermined firm-level characteristics computed one to three quarters before the shock. These variables are the natural logarithm of assets, capital/assets, interest paid/ebitda, and the current ratio. $Exposure_{i,PRE}$ is our treatment, which is the share of credit coming from inspected banks computed in the pre-period. We include province, industry, and year fixed effects. We cluster the standard errors at the industry level. Coefficients are standardized.

exposure to bank inspections result in about 10% increase in the chances to exit the market. The result is robust after controlling for firm level controls, province, industry and year fixed effect. On the contrary, healthy firms are more likely to stay in the market. Overall, this is evidence that bank inspections have an impact on firms' dynamic.

1.6.3 Spillover effects to the local economy

This section studies the impact of bank supervision on the local economy. Precisely, we consider whether the positive effect on firms and new startups spillover to the local economy.¹¹⁴ To sheds light on it, we construct a measure of province's exposure to banking

¹¹⁴With local economy, we refer to a unit of geographical aggregation. Precisely we consider a province. Provinces are about the same size as a US county. They correspond to the NUTS 3 level of Eurostat classification. In the period under exam, there were 103 provinces in Italy, with a minimum of 89 thousand and a maximum of 3.5 million inhabitants. A region corresponds to the NUTS 2 level.

inspections similarly to the method used in Section 1.6. We consider a measure based on a province's degree of dependence to the set of banks being inspected in a given year. To avoid any endogeneity problem of post-inspection sorting between bad banks and bad provinces, we compute this measure two years before the inspection. Our measure of province exposure to inspected banks is the following:

$$Exposure_{cp} = \frac{\sum_{b \in B^{inspected}} credit_{cbp}}{\sum_{b \in B^{all}} credit_{cbp}} \quad (1.13)$$

where c stands for province, p for inspection plan and b for bank. The numerator is the sum of credit granted in province c by bank b that is inspected according to the inspection plan p . The denominator is the sum of credits granted by all banks operating in province c .

Identifying assumption

The identifying assumption, as in other Bartik instruments, relies on the idea that each bank is a small contributor to a province overall credit supply and is therefore unlikely to drive province level outcomes. Moreover, in a reduced-form model the estimation is valid if the bank-level shocks are uncorrelated with the average province-level characteristics that determine the outcome variable (i.e. employment) in the provinces most exposed to each bank. The identifying assumption is that banks did not sort to provinces such that unobservable characteristics of the province were correlated with the bank inspections and the change in the outcome variable within that province.

Correlation between geographical characteristics and bank exposure One potential concern is that our measure of exposure is correlated with geographical location. For instance, it may be the case that provinces more exposed to bank inspections have experienced a negative shock, and thus, they are more likely to have a larger share of banks that are inspected. A typical case that would confound the results is when provinces have experienced a bust in the pre-period and a boom in the post-period. Table A.13 shows that our measure of exposure is not correlated with any covariates at the geographical level in the pre-period,

such as change in the local GDP, the importance of mutual banks in a particular province – which is computed as the share of total credit from mutual banks over total credit from any bank in province c – as well as average income in province c . Moreover, we show that there are no significant differences in the years before the inspection.

Estimating Equation

To test the implications of banking inspections at the province level we employ the following empirical model:

$$\Delta \log(y_{ct}) = \beta_1 Exposure_{c,p,PRE} + \alpha_c + \eta_t + \gamma S_{c,PRE} + \epsilon_{ip} \quad (1.14)$$

where c , p and t are respectively province, inspection plan, and year. $Exposure_{c,PRE}$ is the measure of exposure at the province level as we define in equation 1.13. α_c are province fixed effects, η_l are industry fixed effects, η_p are inspection plan fixed effects, η_t are year fixed effects. $\gamma S_{c,PRE}$ are time-varying controls at the province level that are measured a year before the inspection.¹¹⁵ We standardize our coefficient β_1 to interpret it as the percentage change in our outcome variable in response to a standard deviation increase in the credit exposure share from inspected banks.

Result

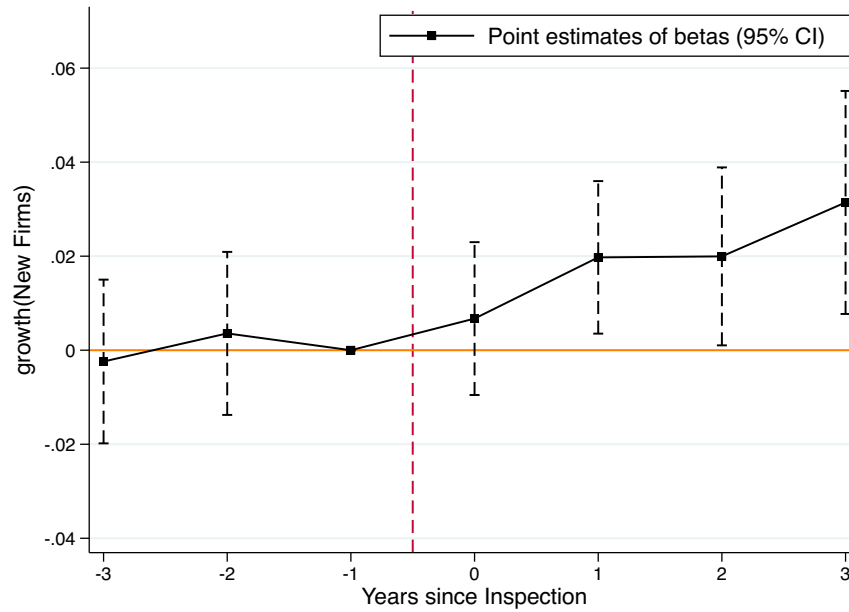
Figure 1.15 shows the results of banking inspection on entrepreneurship.¹¹⁶

We find that bank inspections have a positive effect on the local economy. Specifically, one standard deviation increase in the treatment exposure causes an increase in entrepreneurship by 2.1% after the first year and by about 3% after three years. The results are statistically significant and are robust to the inclusion of province fixed effect, year fixed effect, and

¹¹⁵These consist of employment rate, and GDP at the province level.

¹¹⁶We define entrepreneurship as the number of new businesses that are created. We use the data from the Chamber of Commerce which includes all new type of businesses that are registered, including the single entrepreneur starting her own company.

Figure 1.15: Effect on Entrepreneurship



Notes: This graph plots the result of the following regression: $\Delta \log(y_{ct}) = \beta_1 Exposure_{c,p,PRE} + \alpha_c + \eta_t + \gamma S_{c,PRE} + \epsilon_{ip}$ where c , p and t are respectively province, inspection plan and year. $Exposure_{c,p,PRE}$ is the measure of exposure at the province level as we define in equation 1.13. α_c are province fixed effects, η_t are industry fixed effects, η_p are inspection plan fixed effects, η_t are year fixed effects. $\gamma S_{c,PRE}$ are time-varying controls at the province level that are measured two years before the inspection. They consist of employment rate, GDP at the province level. We standardize our coefficient β_1 to interpret it as the percentage change in our outcome variable in response to a standard deviation increase in the credit exposure share from inspected banks.

province level controls. Moreover, we find that the effect is not driven by pre-defined differences across provinces. Overall, the results show that bank inspections can increase firm dynamics in the local economy. This is a major improvement given the lack of dynamics that the Euro zone area has been experiencing during the last decade (Adalet McGowan *et al.*, 2018).

Table 1.14 shows that bank inspections generate a cost in the local economy in the short term. Aggregate employment goes down as a result of inspections. Provinces more exposed to inspections have a decrease in the growth rate of employment by about 1.8 percentage point one year after inspections. The effect becomes positive after two years as more firms enter the market. In line with this result we find a similar dynamics in the measure of value

Table 1.14: Effect on Aggregate Employment

VARIABLES	(1)	(2)	(3)
	Δ Aggreg Employ $_{t+1}$	Δ Aggreg Employ $_{t+2}$	Δ Aggreg Employ $_{t+3}$
Exposure	-0.018** (0.009)	0.012* (0.007)	0.013* (0.007)
Observations	39,840	31,748	23,710
R-squared	0.057	0.088	0.061
province FE	Y	Y	Y
Industry FE	Y	Y	Y
province controls	Y	Y	Y
Cluster	province	province	province

Notes: This table shows the results of the following regression: $\Delta(Employment_{ct}) = \beta Exposure_{cp} + \eta_l + \eta_c + \gamma S_{c,PRE} + \epsilon_{ct}$. The outcome variable is $\Delta(y_{ct}) = \log(y_{c,t}) - \log(y_{c,t-1})$, i.e., we compute the change in y between the year before the inspection and the year after. $S_{c,PRE}$ is a set of predetermined province-level characteristics computed one year before the shock. These variables are the population, average income, share of deposits by mutual banks. $Exposure_{c,PRE}$ is our treatment, which is the share of credit coming from inspected banks computed in the pre-period. We cluster the standard errors at the province level. Coefficients are standardized.

added per worker in table 1.15.¹¹⁷ We find that the productivity at the province level is increasing for those provinces more exposed to inspections two years after the inspection.

Table 1.15: Effect on Value Added per Worker

VARIABLES	(1)	(2)	(3)
	Δ Value Added per worker $_{t+1}$	Δ Value Added per worker $_{t+2}$	Δ Value Added per worker $_{t+3}$
Exposure	-0.003 (0.003)	0.005* (0.003)	0.004* (0.002)
Observations	526	437	345
R-squared	0.397	0.498	0.490
province FE	Y	Y	Y
province controls	Y	Y	Y
Cluster	province	province	province

Notes: This table shows the results of the following regression: Δ Value Added per Worker $_{ct} = \beta Exposure_{ip} + \eta_c + \gamma S_{i,PRE} + \epsilon_{ct}$. The outcome variable is $\Delta \log(y_{ct}) = \log(y_{c,t}) - \log(y_{c,t-1})$, i.e., we compute the change in y between the year before the inspection and the year after. $S_{i,PRE}$ is a set of predetermined province-level characteristics computed one year before the shock. These variables are the population, average income, share of deposits by mutual banks. $Exposure_{i,PRE}$ is our treatment, which is the share of credit coming from inspected banks computed in the pre-period. We cluster the standard errors at the province level. Coefficients are standardized.

¹¹⁷Value added per worker is a proxy for the productivity and it is an outstanding measure of the extent to which you are utilizing your employee's strengths.

1.7 Conclusion

This paper studies the effect of bank supervision. We take advantage of unexpected on-site bank inspections to estimate the causal effect of bank supervision. We uncover three set of results. First, there is an informational disclosure effect. We find that after an inspection, audited banks increase the stock of NPL and the loan loss provision. This effect is limited to the first quarter after the inspection. Second, there is an indirect effect on the lending activity. Inspected banks cut their lending as a result of the inspection activity. However, contrary to a standard bank capital shock we uncover an important compositional effect. The credit cut is driven mainly by underperforming firms. We find evidence of a reallocation channel. Inspected banks re-optimize their portfolio of loans by investing more on healthy firms in their portfolio or new startups. We show that the change in the lending policy is driven by structural changes at the inspected banks; these banks set radical changes to their governance structure, and they also inject new equity. Finally, we find positive spillover effects in the real economy. Healthy firms in the bank's portfolio have more credit (credit channel), increasing their employment their investments in fixed capital, and their sales. At the local economy, we find an increase in entrepreneurship with underperforming firms more likely to exit the market. There are important policy implications from this exercise. The policy debate in Europe is centered around the productivity slowdown due to various reasons: the widening productivity dispersion across firms (Andrews *et al.*, 2016), rising capital misallocation (Gopinath *et al.*, 2017), and declining business dynamism (Decker *et al.*, 2016). These reasons are all related to the role of zombie firms (Banerjee and Hofmann, 2018; Acharya *et al.* (2019b); Blattner *et al.*, 2017) due to distortions in the credit market. We show that this problem can be attenuated by a more stringent role of bank supervision at the very micro-level. From the other side, it is also true that "too much" bank supervision may have potentially negative effects in the short term for the local economy. By forcing banks to stop lending to zombie firms this may results in higher rate of exit of unproductive firms and a negative effect for local aggregate employment in the short term. This can potentially affect local demand and consumption. Thus, enforcing more bank supervision may be a

very costly action especially if considering the short term effects in terms of employment. Eventually it depends on how much weight is put on short-term costs vs. long-term benefits. In future work, it may be interesting to explore what is the optimal level of bank supervision.

Chapter 2

The Political Economy of Government Debt¹

2.1 Introduction

Fiscal policy is deeply intertwined with politics since it is mostly about redistribution across individuals, regions and generations: the core of political conflict. The redistributive role of governments has been increasing over time starting with the welfare programs introduced during the Great Depression and then with the additional jumps in the sixties and seventies of last century. But even recently the size of social spending (as defined by the OECD²) in 18 OECD countries jumped from 18 per cent of GDP in 1980 to 26 per cent in 2014.³ In addition, the provision of public goods, which is therefore not classified as directly redistributive, has a redistributive component to the extent that public goods are used more

¹Co-authored with Alberto Alesina.

²OECD defines Social Expenditure as the provision by public (and private) institutions of benefits to, and financial contributions targeted at, households and individuals in order to provide support during circumstances which adversely affect their welfare, provided that the provision of the benefits and financial contributions constitutes neither a direct payment for a particular good or service nor an individual contract or transfer. Such benefits can be cash transfers, or can be the direct (“in-kind”) provision of goods and services.

³Source: OECD (2014). The list of countries is: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, UK, USA.

or less intensively by individuals in different income brackets. The structure of taxation, such as the progressivity of the income tax brackets, also implies redistributions.⁴ Politics matter for other macro policy areas, such as monetary policy and financial regulation. The recent financial crisis, for example, has reopened issues regarding the desirable conduct of monetary policy and the connection between monetary and fiscal policy. The ECB is at the center stage of the political discussion about institutional building in the Euro area. In the present paper we focus exclusively on fiscal policy.⁵

The politics of fiscal policy could cover issues as diverse as the level of centralization versus decentralization, the structure of taxation, pension systems, the design of insurance programs like health care and unemployment subsidies, the optimal taxation of capital, international coordination of tax systems, just to name a few topics. In this paper we focus on debt. Many countries have been struggling with large debt over GDP ratios even before the financial crisis: countries which faced the Great Recession starting with large debt risked (or experienced) debt crises, like Greece, Italy, and Portugal putting at risk even the survival of the Monetary Union. Japan has a public debt held by the private sector of at least 140 per cent of GDP.⁶ The political debate on how and at what speed to reduce the public debt after the Great Recession is at the center stage of the political debate.⁷ When adding expected future liabilities of entitlements and pensions the public budget of most OECD countries, including the United States, look bleak. Debt problems in developing countries, especially in Latin America have been common. Any attempt to explain all of these phenomena leaving politics out is completely pointless.

In particular we ask two broad questions. First, is there a tendency in democracies to pursue sub optimal fiscal policies which lead to the accumulation of excessive debt, where “excessive” is in reference of what a benevolent social planner would do? In other

⁴Alesina and Giuliano (2012) review the vast literature which has investigated the political and social determinants for the demand of redistribution.

⁵Alesina and Stella (2010) address old and new issue regarding the politics of monetary policy.

⁶The gross figure is well above 200 per cent but it includes debt held by various public institutions.

⁷Reinhart and Rogoff (2010) and Rogoff (1990) have emphasized the cost of debt burden for long run growth.

words, how far are the observed pattern of debt accumulation and fluctuations in line with normative prescription of the literature on debt management like, in particular, Barro (1979), Lucas and Stokey (1983) and Aiyagari *et al.* (2002)? What explains substantial departure from optimality?⁸ Second, are fiscal rules (and which ones) a possible solution to limit the extent of the problem of excessive deficits? The balanced budget rule is the most famous one, but many others have been proposed, especially in the Euro area. Two are the key issues in this debate. The trade off between the rigidity of a rule and the lack of flexibility which these rules create. More flexible rules may be superior but harder to enforce because they have too many escape clauses. Finally, assuming that a rule would work, would a country adopt it? Or would political distortions prevent it?⁹

We shall begin with a brief sketch of the prescriptions of the optimal debt management in order to identify the normative implication against which to confront actual policies. The goal of this paper is not to review in detail the optimal debt literature. We will exclusively focus on models with distortionary taxation and we will not enter the discussion of the Ricardian equivalence. We will not discuss issues regarding governments' defaults on their liabilities, a topic which would deserve an entire paper on its own. After having described which are the implications of the optimal taxation theory regarding debt management, we show that even a cursory look at the empirical evidence suggest substantial deviations from these prescriptions even amongst OECD countries. In fact, in terms of empirical evidence we will focus almost exclusively on OECD economies. Then, we discuss several different approaches which have tried to explain these deviations from optimality, in introducing political variables in debt management models. Finally, we return to a normative question. Given the presence of all of the potential political distortions examined above, which rules, institutions, procedures or a combination of them is more likely to bring actual fiscal policy

⁸For a review of an early literature on this point see Alesina and Perotti (1995). For more recent surveys see Persson and Tabellini (2000) and Drazen (2000).

⁹An issue which we do not consider in this paper is the question of procyclicality of budget deficits and the political distortions which may lead to this problem. See Gavin and Perotti (1997) and Alesina, Tabellini and Campante (2008).

closer to the social planner ideal policy? In addition, are these rule and procedures likely to be chosen? Have they worked in the past?.

This chapter is organized as follows. In section 2.2 we briefly review the theories of optimal deficit management and the related empirical evidence. In section 2.3 to 2.7 we address the first question, namely whether or not there is a deficit bias in modern economies, and what explains it. In sections 2.7 to 2.10 we cover the question of fiscal rules and of which institutional arrangement would be more suitable to limit sub optimal conduct of fiscal policy. The last section discusses open issues for future research.

2.2 Optimal debt policies: a brief review

2.2.1 Tax smoothing

The theory of tax smoothing is due to Barro (1979) in a model where debt is not contingent and risk-free, spending needs are exogenously given and known, taxes have convex costs. The public debt takes the form of one-period, single-coupon bond and the rate of return on public and private debt is constant over time. The government raises in each period tax revenues τ_t . Government spending is indicated with G_t and debt with b_t and the interest rate on debt with r . Thus the government budget constraint in each period is given by:

$$G_t + rb_{t-1} = \tau_t + (b_t - b_{t-1}) \quad (2.1)$$

The lifetime government budget constraint is given by:

$$\sum_{t=1}^{\infty} \left[\frac{G_t}{(1+r)^t} \right] + b_0 = \sum_{t=1}^{\infty} \left[\frac{\tau_t}{(1+r)^t} \right] \quad (2.2)$$

Raising taxes generates some extra costs which can be interpreted as collection costs, or more in general deadweight losses or excess burden of taxes and the timing in which taxes are collected. Let Z_t be this cost which depends on the taxes of that period τ_t and negatively

on the pool of taxable income/resources Y_t . In particular, let Z_t be defined as:

$$Z_t = F(\tau_t, Y_t) = \tau_t f\left(\frac{\tau_t}{Y_t}\right) \quad (2.3)$$

with $f'(\cdot) > 0$ and $f''(\cdot) < 0$. The present discounted value of these costs is:

$$Z = \sum_{t=1}^{\infty} \tau_t \frac{f\left(\frac{\tau_t}{Y_t}\right)}{(1+r)^t} \quad (2.4)$$

The social planner chooses τ_t in order to minimize (2.4) subject to the budget constraint (2.2). From the first order conditions one can find that the tax-income ratio $\frac{\tau}{Y}$ is equal in all periods. Given that, the level of taxes in each period is determined from the values of income (Y_1, Y_2, \dots), government expenditure (G_1, G_2, \dots), interest rate r and the initial debt stock b_0 . The properties of the solution are considered under different assumptions about the time paths of income Y and government expenditure G . With constant income and government expenditure (i.e. $Y_t = Y_{t+1} = \dots = Y$ and $G_t = G_{t+1} = \dots = G$) since the tax-income ratio is constant, this implies that τ is also constant and the government budget is always balanced. With transitory income and government expenditure (e.g. transitory expenditure during wartime or during recessions) deficits are larger the longer and the larger is the transitory shock. The debt-income ratio would be expected to be constant on average, but would rise in periods of abnormally high government spending or abnormally low aggregate income.

2.2.2 Keynesian stabilization

This is not the place to discuss the potential benefits of discretionary countercyclical fiscal policy actions, namely increases in discretionary spending during recessions and reductions during booms. According to Keynesian theories, higher government spending or lower taxes during a recession may help economic recovery. The reason is that under high unemployment and low capacity utilization, higher government spending and lower tax rates may increase aggregate demand. Note that Keynesian models would prescribe that deficits should be countercyclical (that is, increase in recessions), but should not lead to

a secular increase in debt over GDP. The reason being that spending increases during recessions should be compensated by discretionary spending cuts during booms.

We only note that the “long and variable lags” argument raised by Milton Friedman regarding monetary stabilization policy applies even more to fiscal policy where the lags are even longer and less predictable than for monetary policy. Friedman’s original argument was applied to monetary policy. He argued that the lags in between the uncovering of the need of, say, a stimulus, the discussion of it, the implementation and the realization of its effects were “long and variable”. Therefore, by the time the expansionary policy came into action it was too late and it was counterproductive. This argument applies even more strongly to fiscal policy since the latter requires also an explicit political process, debate and approval in parliaments. The recent Great Recession and the lower bound issue for monetary policy has made popular the view that in this scenario, aggressive discretionary fiscal policies are necessary since automatic stabilizers are not enough. We do not enter in the zero lower bound debate in the present paper.

2.2.3 Contingent Debt

Lucas and Stokey (1983) build on Ramsey (1927) and show that Barro’s intuition does not generally apply. The main difference with Barro (1979) is in the set of instruments available to the government to smooth the distortionary cost of taxation. While Barro (1979) focuses in only one instrument, namely non-contingent one-period bonds, Lucas and Stokey (1983) consider a model with complete markets, no capital, exogenous Markov government expenditures, state-contingent taxes and government debt. In this environment optimal tax rates and government debt are not random walks, and the serial correlations of optimal taxes are tied closely to those for government expenditures. Moreover, they find that taxes should be smooth, not by being random walks, but in having a smaller variance than a balanced budget would imply. Thus, to some extent, the idea of tax smoothing holds but not in the extreme version as in Barro (1979).¹⁰

¹⁰Interestingly, Klein, Krusell and Ríos-Rull (2008) address the same issue raised in Lucas and Stokey (1983)

2.2.4 Accumulation of government assets

Aiyagari *et al.* (2002) reconsider the optimal taxation problem in an incomplete markets setting. They begin with the same economy as in Lucas and Stokey (1983), but allow only risk-free government debt. Under some restrictions on preferences and the quantities of risk-free claims that the government can issue and own, it is possible to obtain back Barro's random walk characterization of optimal taxation. However, by dropping the restriction on government asset holdings (or modifying preferences) generates different results.

More specifically, under the special case of utility linear in consumption and concave in leisure, the authors show that as long as the government can use lump-sum transfers and spending shocks are bounded, than distortionary labor taxes converge to zero in the long run. The optimal solution prescribes reducing debt in good times, so that eventually the government has accumulated enough assets to finance the highest possible expenditure shock with the interest earned on its stock of assets. This is the so-called "war chest of the government". Instead, if one set a binding upper bound on the government asset level ("Ad Hoc Asset Limit"), the Ramsey solution for taxes and government debt will resemble the results stated in Barro (1979).¹¹

2.2.5 Evidence on Optimal Policy

The very basic principles of optimal debt policies, namely the debt-income ratio would be expected to be constant on average, but would rise in periods of abnormally high government spending or abnormally low aggregate income, are generally not satisfied by

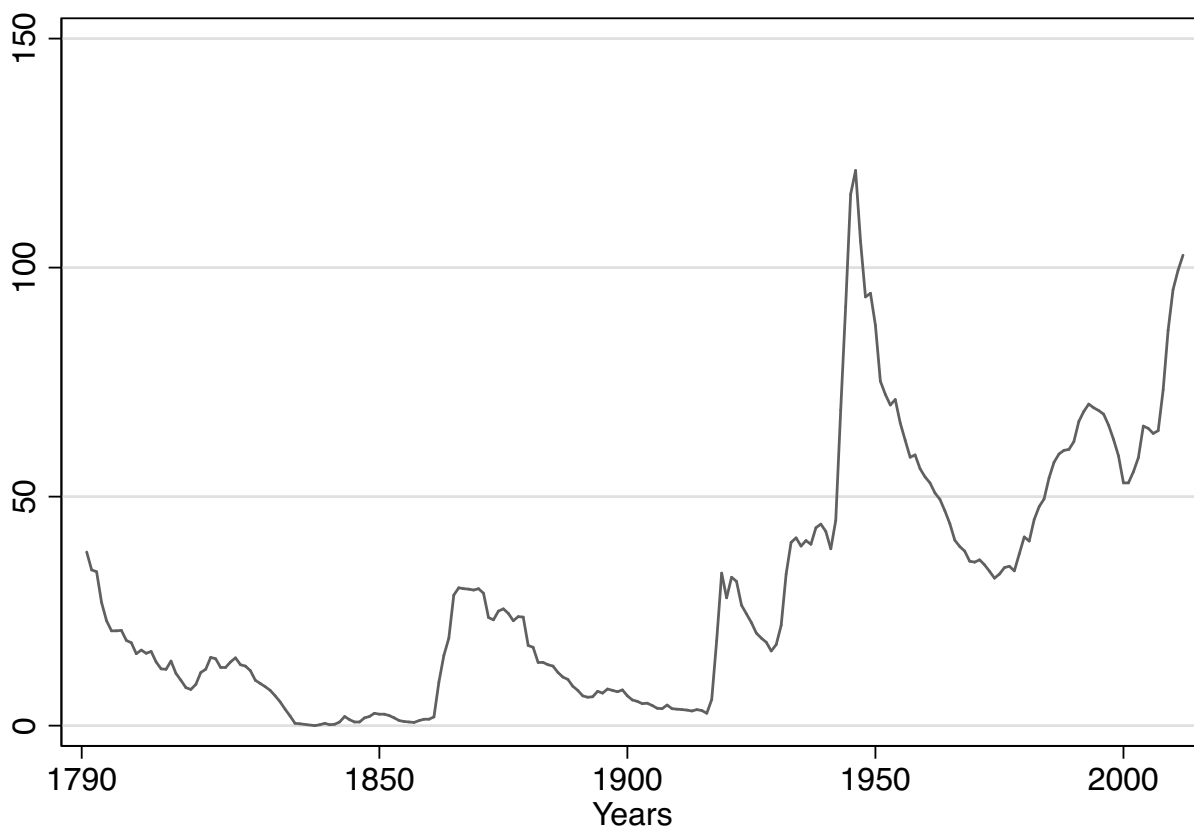
but find different and strikingly results. In particular, they find that the time series of debt in the economy without commitment is extremely similar to that with commitment. Welfare is very similar as well. This result is surprising: under commitment, there is always an incentive for a once-and-for-all tax cut/debt hike, thus suggesting ever-increasing debt under lack of commitment. However, they show that the incentives that naturally arise in the dynamic game between successive governments actually help limit the time-consistency problem: they lead to very limited debt accumulation, and long-run debt levels can even be lower than under commitment. This incentive mechanism is a result of forward-looking and strategic use of debt.

¹¹By imposing a time-invariant ad hoc limit on debt, the distribution of government debt will have a non-trivial distribution with randomness that does not disappear even in the limit. In particular, rather than converging surely to a unique distribution, it may continue to fluctuate randomly if randomness on government expenditures persists sufficiently.

the data.

Government debts do go up during wars and major recessions, but beyond that, deviations from optimal policy are widespread. Figure 2.1 and 2.2 clearly show that government debts do go up in wars and recessions in the UK and US.

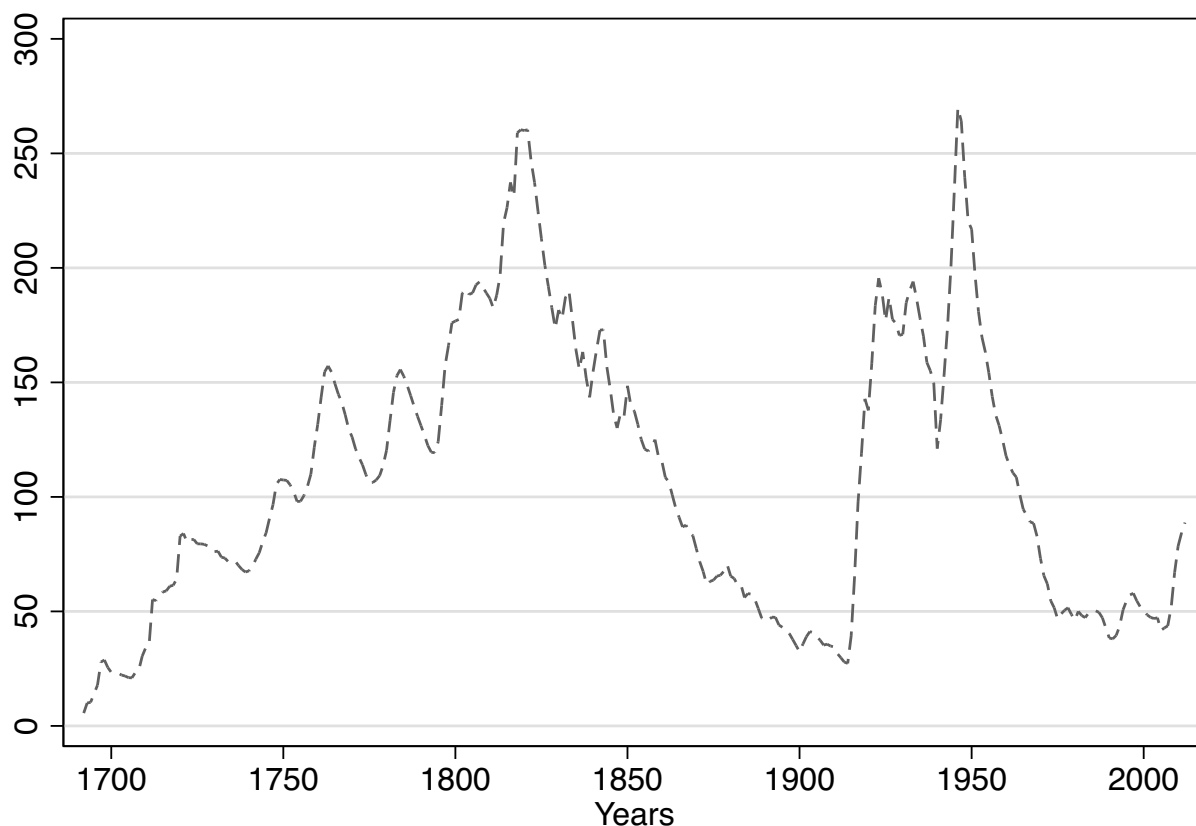
Figure 2.1: *Ratio of Public Debt to trend real GDP, USA, 1790-2012*



Source: Abbas et al. (2010)

The major role played by wars is evident in these graphs. However even the US shows anomalous features, like the accumulation of debt in the eighties, which is a period of peace. This episode (the so-called "Reagan deficits") in fact inspired a few papers reviewed below and that, at the time, generated a major policy debate about the political forces which lead

Figure 2.2: *Ratio of Public Debt to trend real GDP,
United Kingdom, 1692-2012*



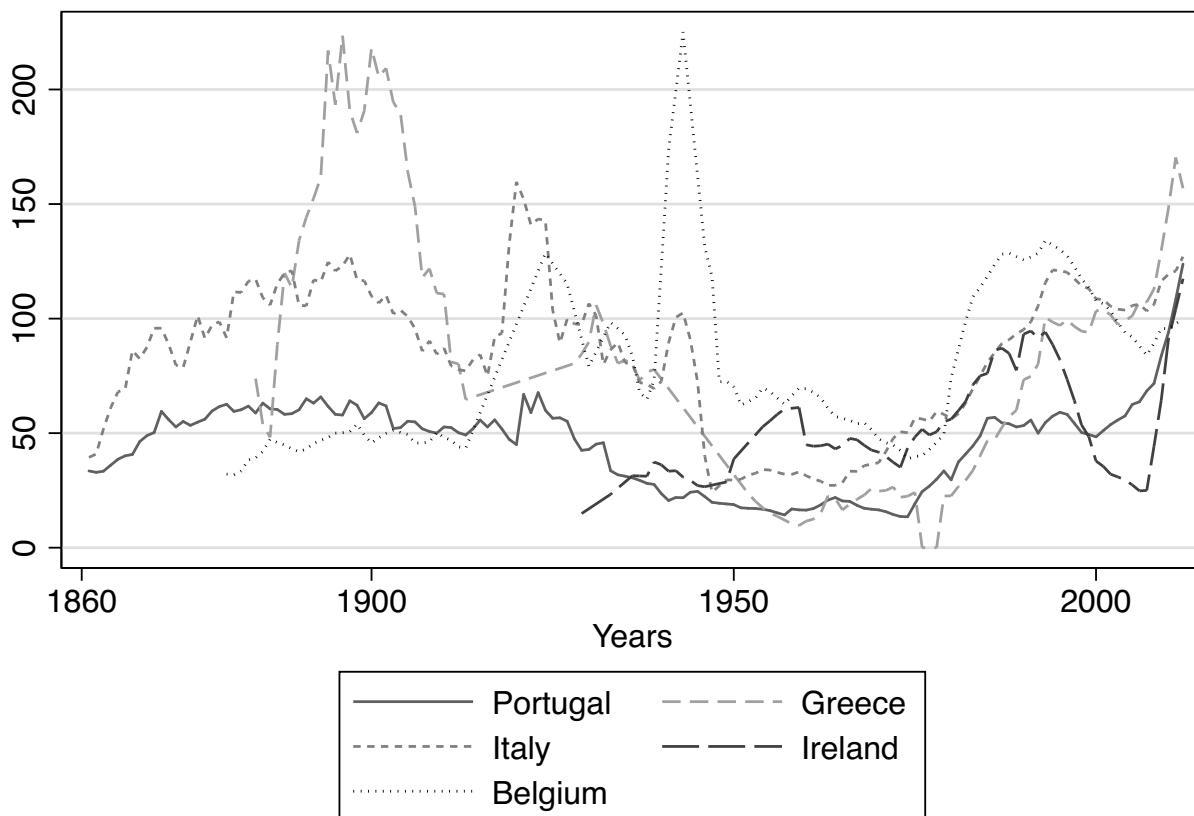
Source: Abbas et al. (2010)

to these deficits. Other OECD countries show remarkable deviation from optimality.

We show in figure 2.3 and 2.4 two graphs for a group of relatively high and low debt countries.

Several observations are in order. First, the decline in the debt ratios after the Second World War in both groups of countries stopped in the seventies. In both groups of countries it increased for several decades in peace time, obviously much more in the high debt group. For instance, in Italy and Greece the debt to GDP ratio skyrocketed in the eighties and nineties in a period of relatively rapid growth for these countries. Belgium and Ireland as

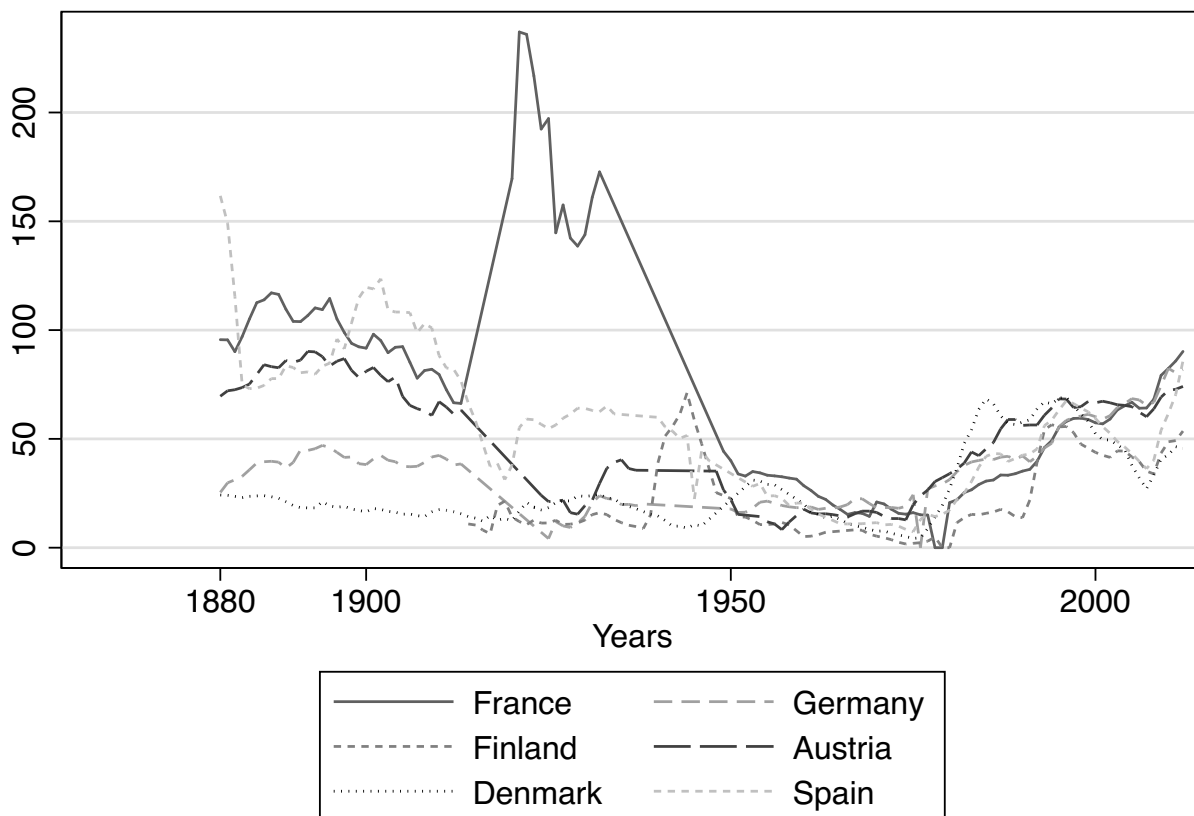
Figure 2.3: High Debt Countries, Ratio of Public Debt to trend real GDP



Source: Abbas et al. (2010)

well entered the nineties with debt level normally typical of post war periods well above 100 per cent of GDP. Second, several countries (i.e. Ireland, Belgium, Denmark) had massive variations up and down of their debt ratios in peace time. Third, very few countries when they adopted the Euro satisfied the requirement of a less than 60 per cent debt over GDP ratio. In addition, in the first decade of the Euro, up to the financial crisis, there was not much of an effort to converge to the prescribed target of 60 per cent. Fourth, no country comes even close to a policy as prescribed by Aiyagari *et al.* (2002) which would imply the accumulation of assets to build a “war chest”. Fifth, the Great Recession has led to very large accumulation of government debts and this is, at least in large part, consistent

Figure 2.4: *Low Debt Countries, Ratio of Public Debt to trend real GDP*



Source: Abbas et al. (2010)

with the tax smoothing hypothesis. However, countries which had already accumulated large debts for no obvious reasons before the crisis were constrained in how much they could accumulate more. Some additional accumulation created market panics; Greece had a partial default; Italy in 2011 was on the brink of a major crisis. Fifth, a few countries like Ireland and Spain entered the Great Recession with relatively low debt/GDP ratio but their fiscal position looked better than they really were due to extraordinarily and temporary tax revenues, namely the housing boom. When this became apparent these countries also faced debt panics. In fact, public debt problem in Europe almost degenerated to the point of a collapse of the Euro.

A table in Wyplosz (2014) shows that out of 20 OECD countries only 4 had a deficit for less than 50 per cent of the time since 1960, and 11 countries had a deficit for more than 80 per cent of the years. Italy and Portugal achieved a “perfect” 100 per cent! These data do not distinguish between primary and total deficit, do not account for the cycle but nevertheless raise a significant flag about government profligacy. After the first oil shock of 1973-74, surpluses close to disappear. Easterly (1993) suggests that at that time (early seventies) many countries did not internalize a secular downturn of their growth process which would have required a reduction in the growth of government spending to keep the size of government constant. This led to an accumulation of debt. Whether this misperception was an “honest mistake” or it was due to political distortions is a topic of discussion. In fact, it is pretty common for governments to justify large spending programs with very optimistic growth forecasts.

Table 2.1: *Percent Years of Deficit over 1960-2011*

	Australia	Austria	Belgium	Canada	Germany
Percent	80	82	96	76	78
Last Surplus	2008	1974	2006	2007	2008
	Denmark	Spain	Finland	France	UK
Percent	48	78	20	90	84
Last Surplus	2008	2007	2008	1974	2001
	Greece	Ireland	Italy	Japan	Netherlands
Percent	80	80	100	68	88
Last Surplus	1972	2007		1992	2008
	Norway	New Zealand	Portugal	Sweden	USA
Percent	4	46	100	42	92
Last Surplus	2011	2008		2008	2000

Source: Wyplosz (2014).

When considering the future liabilities of government, the picture regarding debt levels, appears substantially worse. The aging of the population (and the retirement of the baby boomers) will induce substantial strains over the social security budgets. In different degrees, in various countries health expenses (also related to the aging of the population) are rising at phenomenal rates. The US Congressional budget office (CBO (2014)) predicts

that with unchanged legislature, the debt over GDP ratio in the US will never fall in the most optimistic scenarios in the next couple of decades. With “middle range” assumptions, the (net) debt over GDP ratio may be well above 100 per cent. The forecasts of the social security administration have been called into question for being too optimistic and not transparent (Kashin, King and Soneji (2015)). Similar considerations apply to Japan and European countries. There is a large difference between US versus European countries, and also within European countries. Specifically, in the US these entitlement programs are about 18.5 per cent of the GDP, while in the European countries between 20 and 30 per cent of GDP. Within the European countries, Norway is the leading country which spent about 30 per cent of the GDP in Entitlement programs. Regarding the type of entitlement programs, pension expenditures account for more than half of the entitlements in Italy and Greece, while they are less than 20 per cent in Ireland and Denmark.¹² In countries like Italy we are reaching paradoxes in which youngsters do not find jobs because of high labor taxes and high labor cost for firms to collect tax revenues needed to pay pensions for the parents who then support the unemployed children.

The intergenerational accounting procedure for evaluating liabilities of the government offers an alternative measure to federal budget deficit to gauge intergenerational policy. It was developed by Auerbach, Gokhale and Kotlikoff (1991) and it computes the net amount in present value that current and future generations are projected to pay to the government now and in the future. If one thinks that the government has an intertemporal budget constraint, then this constraint would require that the sum of generational accounts of all current and future generations plus existing government net wealth be sufficient to finance the present value of current and future government consumption. The generational accounts can be viewed simply as a tabulation of the net effect of future taxes paid and transfers received by various generations, assuming that current policy remains unchanged into the indefinite future. Auerbach, Gokhale and Kotlikoff (1991) compute the “lifetime

¹²Specifically, in 2011 pensions account for 51.9 per cent of total Entitlement programs in Italy, 51.1 per cent in Greece, 19.6 per cent in Denmark and 16.8% in Ireland. Source: OECD.

net tax rate”, which measures the burden of taxes minus transfer payment on a generation over its lifetime. The Generational accounting criteria presumes that fiscal policies should be generational balanced. This would imply that the net tax rate for current and future generations should be the same. If the net tax rate for future generations exceeds the net tax rate for newborns, then according to this criteria, fiscal policy is not in generational balance. Haveman (1994) provides an excellent discussions of the pros and cons of generational accounting methods.

2.3 Deficits and elections

2.3.1 Fiscal illusion

The idea of “fiscal illusion” is due to the public choice school (see in particular Buchanan and Wagner (1977)). According to this argument voters do not understand the notion of intertemporal budget constraint for the government, therefore when (especially close to elections) voters see pending hikes or tax cuts (the public choice schools was especially concerned with the former) they reward the incumbent, and remain unaware of the consequences of such policies on public debt and the future costs of taxation needed to service it. The problem, according to the Public Choice school, is aggravated by the “Keynesian” policy stand. Politicians are eager to follow the Keynesian rule of increasing discretionary spending during recessions, but then they do not counterbalance it with cuts during booms. Thus, the result of keynesianism and fiscal illusion leads to persistent deficits and explosive debt levels.

In general the view that the best way to please the voters is to spend more and tax less is so pervasive that it is assumed to be an obvious fact. As we show below, the evidence is much more nuanced than it would appear. In addition, given the extensive discussion of the deficits, the pros and cons of austerity policies in the US and Europe, it is hard to believe that today’s voters are unaware of the potential cost of deficits because of fiscal illusion, even though there may be disagreement on what policies to follow to respond to deficits.

The fiscal illusion argument is overly simplistic although it does raise important warning bells on the conduct of fiscal policies in democracies.

2.3.2 Political budget cycles: Theory

The traditional fiscal illusion argument rely on some form of irrationality or ignorance on the part of the voters. However, political budget cycles can be derived also in models where voters are fully rational but imperfectly informed as in Rogoff (1990) and Rogoff and Sibert (1988). What leads to these cycles is a combination of delays in the acquisition of information on the part of the voters regarding the realization of certain policy variables and different degrees of “competence” of policymakers.¹³

In Rogoff and Sibert (1988) more competent governments can tax less to provide public goods, because they introduce less wastage in the fiscal process. However, the full combination of income taxes, spending, seigniorage and government wastage (i.e. negative competence) is learned with one period delay by the voters. A higher level of competence implies that the government can provide public goods with lower taxes (or seigniorage). Suppose that before an election voters see a tax cut. They cannot distinguish whether the cut is due to a high realization of competence (which is unobservable by them immediately) or transitory deficit which they do not fully observe. After the election a less competent government would have to increase seigniorage generating also an inflation cycle. With a finite time horizon the only equilibrium that exists is a separating equilibrium, i.e. the one in which voters are able to infer exactly the incumbent’s level of competency from the tax she selects in order to signal her competence. The competent policymaker cut taxes before election to a level that cannot be matched by the less competent one. A somewhat unpleasant feature of these models is that the more competent policymakers engages in budget cycles by cutting taxes before elections to signal their competence and distinguish themselves from the less competent ones who cannot afford such a large tax cut. Rogoff

¹³For a review of political business cycles in general see Alesina, Cohen and Roubini (1993) and Drazen (2000).

(1990) adds a distinction between two types of public goods, those that are clearly visible before an election, say fixing the holes in the street, and those less immediately visible, like increasing the quality of the training of teachers. In this model politicians have an interest in overspending in more visible but not necessarily the most productive public goods close to election time.

While, in principle, the implication of rationally-based modern theories of political business cycles may be similar to the traditional one, they differ in two ways. First, the rationality of voters output a limit on the extent of these policies. Second, and this will be revealed by the empirical evidence, the more the voters are informed and understand the incentive of policymakers, the less they reward them for their behavior; thus for instance more freedom of the press in established democracies would be a constraint on this behavior.¹⁴

Drazen and Eslava (2010b) present models of political budget cycles in which the incumbent favors with certain spending projects specific and critical to constituencies and/or localities. By varying the composition of government spending the incumbent can target swing voters before elections. Incidentally, this imply that a political budget cycles may imply distribution of spending from one district to another, holding constant the total amount of government spending.¹⁵

2.3.3 Political budget cycles: Evidence

Are political budget cycles common? Persson and Tabellini (2000) argue that the answer depends upon the nature of the political institutions of the country. In particular, they argue that political budget cycles are less likely to occur in majoritarian systems rather than proportional representation systems. Brender and Drazen (2005) however, challenge these

¹⁴For instance Besley and Prat (2006) develop a model in which more press freedom reduces the space for policymakers to extract rents. For a review of the political economy of mass media refer to Prat and Stromberg (2013).

¹⁵Hassler *et al.* (2005) show an interesting result, namely that the introduction of political distortions would reduce, instead of exacerbate, oscillations in tax rates. This is contrast with the predictions of the literature on political business cycles.

results. They find that the existence of political budget cycles do not depend on voting rules. Political budget cycles exist only in “new democracies,” where fiscal manipulation may work because voters are inexperienced with electoral politics or may simply lack information, which may be one of the main factors generating the political budget cycle, as implied by the models reviewed above.

The role of information is tested by Brender (2003) for local elections in Israel. Peltzman (1992), and Drazen and Eslava (2010a) perform an analogous analysis in the United States and Colombia, respectively.¹⁶ Gonzalez (2002) and Shi and Svensson (2006) test the importance of transparency, which ultimately means the probability that voters at no costs learn the incumbent’s characteristics. They find that the higher the degree of transparency, the smaller the political budget cycle. Moreover, while the proportion of uninformed voters may be initially large, it is likely to decrease over time, thus decreasing the magnitude of the budget cycle. Akhmedov and Zhuravskaya (2003) find that measures of the freedom of the regional media and the transparency of the regional governments are important predictors of the magnitude of the cycle. Alt and Lassen (2006) find that, in the sample of OECD countries, higher fiscal transparency eliminates the electoral cycle.¹⁷

The other important aspect is whether or not governments which generated political budget cycles are more easily reelected. Brender and Drazen (2008) consider the effect of deficits on the probability of reelection and show that voters are (weakly) likely to punish rather than reward budget deficits over the leader’s term in office. Their results are robust by considering different sub-samples: (i) developed countries and less developed countries; (ii) new and old democracies; (iii) countries with presidential or parliamentary government systems; (iv) countries with proportional or majoritarian electoral systems; (v) countries with different levels of democracy.

¹⁶Schuknecht (2000) presents evidence of cycles in 35 developing countries, Buti and Van Den Noord (2004) some evidence on European Union countries.

¹⁷Alesina and Paradisi (2014) show evidence of political budget cycles in Italian cities. Foremny *et al.* (2015) provide evidence on political budget cycles using data on two German regions. Arvate, Avelino and Tavares (2009) find evidence on localities in Brazil.

A related literature directly tests the political consequences of large fiscal adjustments, i.e. whether large reductions of budget deficit have important negative political consequences. Alesina, Perotti and Tavares (1998) consider a sample of OECD countries and they find that fiscal austerity has a weakly positive, rather than negative, electoral effect. However, they focus on cabinet changes and opinion polls, rather than on election results. Alesina, Carloni and Lecce (2012) fill this gap, by looking directly at the election results. They find no evidence of a negative effect on the election results due to a fiscal adjustment. Buti *et al.* (2010) find that the probability of reelection for the incumbent politicians are not affected by their efforts in implementing pro-market reforms. This literature however suffers from a potential sort of reverse causality problem, namely governments which are especially popular for whatever reasons, manage to get reelected despite their deficit reduction policies, not because of them. While the authors are aware of this issues and try to asses it, measuring the “popularity” of a government is not always straightforward.

The bottom line is that political budget cycles may explain relative small departures from optimal policy around election times, especially in new democracies. However, they cannot be the main explanation for large and long lasting accumulation of public debt, as we documented above. Also, the cross country empirical evidence seems to have been exhausted. Perhaps natural experiments at the local level might be interesting.

2.4 Social conflict: war of attrition and riots

2.4.1 War of attrition: Theory

War of attrition models do not explain “why” a deficit occurs, but they explain why deficit reduction policies are postponed Alesina and Drazen (1991) focus on the case of a country that for whatever reason, due a permanent shock on revenues (or on expenditures), is on a “non sustainable” path of government debt growth. The debt is held by foreigners and the interest rate is constant and exogenously given and there is no default. The longer the country waits to raise tax rates to stop the growth of debt, the more the interest burden

accumulates and the more expensive the stabilization will be. The latter implies a reduction to zero of total deficits.

There are two equally sized groups of equal (exogenous) income which cannot agree on how to share the costs of the stabilization. The social planner would choose an equal division of costs for each group since the groups have the same income and size. In this case stabilization would occur immediately since delays only create inefficient costs, namely higher interests on the accumulated foreign debt. The critical feature of the model is that without a social planner political polarization leads to an uneven distribution of the costs of the stabilization. In particular, one group has to pay more than $1/2$ of the taxes needed for the stabilization and in every period after that. When both groups perceive the possibility of shifting this burden elsewhere, each group attempts to wait the other out. In order for this to happen there has to be some uncertainty about the costs of each group to wait the other out, namely how long a group can bear the costs of delaying the stabilization. These costs are modeled as the economic costs of living in the distorted pre-stabilization economy (for instance with inflation) or the political cost of "blocking" attempts of the opponent to impose an undesired stabilization plan. This war of attrition ends, and a stabilization is enacted, when a group concedes and allows its political opponents to be the winner. The loser then pays more than half of the costs of the stabilization, allowing the winner to pay less. The condition which determines the concession time is the one which equals the marginal cost living an extra moment in the unstable economy to the probability that in the next moment the opponent group will concede, multiplied by the differences the costs of being the winner rather than the loser. This is why uncertainty about the strength of the groups is critical. If one group knew from the beginning that its cost of living in an unstable economy were larger than those of the other group, it would know that it may end up losing the war of attrition and therefore it would concede immediately; this would be cheaper than postponing the inevitable loss. The passage of time reveals the type of the groups, namely which one is stronger. The more unequal are the divisions of the cost of the stabilization, which can be interpreted as a degree of polarization of a society, the longer

the war of attrition and the higher the level of debt accumulated since the relative benefit of winning increase.

The war of attrition implies that individually (group level) rational strategies lead to a sub optimal accumulation of debt. The group which will end up being the loser is the one with the highest cost of prolonging the war of attrition. This is why uncertainty about these cost are critical. If it was common knowledge which was the weaker groups, the latter would capitulate immediately, since waiting adds to the costs and this group would lose anyway. Therefore anything that eliminates this uncertainty ends the war of attrition.

2.4.2 War of attrition: Empirical evidence

The model has several empirical implications. The first one is that the passage of time may lead a country to stabilize even if nothing observable happens, simply because one group has reached the condition of “conceding” namely has learned its relative strength to that of the opponent. Second, an electoral or legislative victory of one of the groups may signal its superior political strength and may lead the opponent to concede. Third, longer delays and higher debt should occur in polarized societies which cannot reach a “fair” and acceptable distribution of costs. In addition, delays are longer when many groups have a “veto power” to block policy decisions which they do not like. Fourth, a worsening of the economic crisis may lead to a resolution of the war of attrition. When the costs of delay increase for one of the groups the latter may concede sooner. Drazen and Grilli (1993) show that in their case a “crisis” can be beneficial, since it worsens the utility level of one of the groups in the short run, but it may be welfare improving for all in the long run since the war of attrition ends sooner. Fourth, for the opposite reason foreign aid can be counterproductive (Casella and Eichengreen (1996)). If foreign aid makes life easier before the stabilization, delays are longer and in the long run welfare is lower. The result, however, depends on how aid is disbursed; for instance foreign aid that implicitly “picks” a winner would end the war of attrition sooner. Finally, an external commitment, say an IMF conditionality agreement, may accelerate the resolution of the war of attrition making it more costly to “fight it.”

Several authors have suggested empirical observations consistent with the implications of the war of attrition model. Alesina and Drazen (1991) discuss a few historical examples of cases in which the same government first fails to stabilize because it encounters political opposition then it succeeds because the opposition is defeated. The idea that multiple veto players delay the elimination of deficits is consistent with the evidence by Grilli *et al.* (1991) and Kontopoulos and Perotti (1999). The former argue that in the eighties, debt accumulated more in parliamentary democracies with multiparty systems. The latter argue that the number of spending minister is associated with looser fiscal controls, an issue upon which we return later. Volkerink and De Haan (2001) and Elgie and McMennamin (2008) provide evidence on a sample of 22 advanced economies showing that more fragmented governments with smaller majorities in parliaments have larger deficits. Persson and Tabellini (2000) review and add to this line of research with additional evidence. These authors and Milesi-Ferretti, Perotti and Rostagno (2002) show also that coalition governments spend more on welfare, a point analyzed also by Alesina and Glaeser (2005) in a comparison of US versus Europe. As we discussed above, Easterly (1993) noted that countries accumulated debt because they did not adjust their spending programs to the secular reduction of growth which started in the late seventies. These delays in adjusting to a permanent shock is consistent with the general message of the war of attrition. Various constituencies objected to reducing the growth of their favorite spending programs.

A second line of inquiry has focused on the idea that “crisis generates reforms”, as in Drazen and Easterly (2001). Needless to say, the evidence suffers from problems of reverse causality: why would you need a reform if you did not have a problem to begin with?¹⁸ Alesina, Ardagna and Galasso (2010) combine these institutional hypothesis with the crisis hypothesis, making a step closer toward testing the war of attrition model. In particular, they test whether certain institutions are more likely and rapid to resolve crisis, a result consistent with the model by Spolaore (2004). Alesina, Ardagna and Galasso (2010) define a country as being in a “crisis” if at time t the country is in the “worst” 25 per cent of

¹⁸Similar issues arise on the huge literature on foreign aid, which we can not even begin to survey here.

the countries in the (large) sample in terms of budget deficits.¹⁹ They find support for the view that “stronger governments” stabilize more in time of crisis, i.e. when a crisis comes, strong governments adjust more and exit more quickly from the state of “crisis.” Strong governments are presidential systems and amongst parliamentary systems those in which the majority has a greater share advantage over the minority. They also find that stabilization (i.e. exit from crisis) are more likely to occur at the beginning of a term of office of a new government. These results are consistent with the war of attrition model in the sense that in an unstable situation (i.e. a crisis), a stabilization occurs sooner with fewer veto players or with a clear political winner. Results on the effect of IMF programs are inconclusive but, as discussed above, causality problems are especially serious in this case.

2.4.3 War of Attrition: Summing up

The war of attrition model has proven to be successful as an explanation of observed characteristics of run away debts and the timing of stabilization. One issue with this model is that it has been proven difficult to extend it. In particular, the division of costs of the stabilization is taken as exogenous and not bargained amongst groups. Moving in that direction would lead to bargaining models where institutional details on how the game occurs are critical. Perhaps one may think about connecting this approach with the one discussed below on voting in legislatures. Also the extensions to n rather than 2 groups implies results which are not clear cut and the formation of coalitions amongst n groups are intractable (thus far) problems. Finally, in the model, a stabilization is a zero-one event. Partial or failed attempts are not explicitly modeled even though in reality are quite common.

2.4.4 Riots

Passarelli and Tabellini (2013) provide a model of political competition which has some connection to the war of attrition although with substantial differences and a “behavioral”

¹⁹In their paper these authors also consider inflation crisis, not only deficit crisis.

bend. In their model several social groups have views about what is a "fair" allocation of resources. The sum of those views about what is fair for each groups may be larger than the available resources. In addition groups are willing to engage in costly political actions (riots) when they feel that they have not obtain their fair allocation. When a group perceives that fairness (according to this group's view) has been violated, individuals are willing to engage in costly political actions, like riots, because of this emotional reaction to a perceived unfair behavior. The groups which are more homogeneous are also more likely to be more successful in organizing riots. This feeling of "anger" when perceived fairness has been violated solves the free rider problem of political actions. In a dynamic setting the threats of riots pose constraints to the government. In particular, even a benevolent government may be forced to accumulate excessive debt (above the optimal level) to reduce the threats of riots. Empirically, Woo (2003) shows that public debt accumulation is associated with the occurrence of riots. Ponticelli and Voth (2011) and Passarelli and Tabellini (2013) show how budget cuts are sometimes followed by riots.

It is interesting to compare this evidence on riots and the one reviewed above by Brender and Drazen (2008) and Alesina, Carloni and Lecce (2012) which suggest that, at least in democracies fiscal adjustments are not associated with consistent electoral losses for the incumbent. Perhaps homogeneous and organized groups organize riots while the less organized median voter is much more prone to accept fiscal retrenchments when necessary. In other words, a government may face strikes and riots organized by specific homogeneous constituencies and those actions may bloc fiscal adjustment policies and increase public debt. However the unorganized voters (which may be the majority) may not approve of those policies.

It would be interesting to expand Passarelli and Tabellini (2013) framework to incorporate these features in which part of the electorate is organized and has this behavioral bend about fairness, and another part of the electoral is unorganized and does not have self serving feelings of fairness.

2.5 Debt as a strategic variable

Government debt is a state variable which “links” several successive governments. Different governments may have different preferences over fiscal policy, say the level and/or composition of public spending. If the current government is not sure of its reappointment, it may want to choose a level of deficit while in office (thus a level of debt) in order to influence the fiscal choices of future governments. In these models, deficits do not affect the probability of reelection since the voters are fully rational, fully informed and forward-looking, but deficits serve the purpose of insuring that future governments follow policies closer to the preference of the current government by constraining future governments’ actions. The asymmetry of information that would lead to political business cycles, as we discussed above, are assumed away here, and the strategic manipulation of the debt by the current government or majority in office is fully in the interest of those who supported the current government. Another way to put this is the following. Given the inability of current government to control future public spending, it may prefer to take a \$1 of tax revenue away from the future government by borrowing because it may not be in power and be able to decide how that \$1 is spent in future, but it can decide how it can be spent today. Clearly, this logic applies only if there is political turnover and heterogeneity of preferences over fiscal policy amongst the different potential governments.

In Alesina and Tabellini (1990) two parties, with exogenously given preferences, stochastically alternate in office. They care about the level of income of the representative individual and care about two different public goods, say military spending versus domestic spending (more generally they place different weights on these two public goods). In the model there is a representative voter/citizen in terms of his/her choices of labor and leisure but with a distribution of preferences about the type of public goods that they prefer, so they would vote for different parties depending on the parties’ choice of public goods. Private and public goods enter separately in the utility function. If a party is unsure of being reappointed, it will issue debt. By doing so it “forces” the following government (possibly of a different party) to spend less on the public good the current government does not care as

much. In other words, the current government chooses to distort the path of income taxation in order to spend more on the public goods that it prefers leaving future governments with the task of reducing the debt since default is ruled out by assumption. The future government will do so, at least in part, by cutting spending on the public good the current government does not care much about.²⁰ The lower is the probability of reappointment of the current government the higher the level of debt chosen. Only a government sure of reappointment would issue no debt. The social planner would issue no debt since there is no reason to do so and would choose a stable combination of the two public goods in order to satisfy, say, utilitarian social preferences. Tabellini and Alesina (1990) provide analogous results in a model in which fiscal decisions are taken by the median voter. The current median voter is uncertain about the preferences of future median voters, because of shocks to the distribution of preferences. Today's median voter choose to issue debt for the political incentives of creating "facts" for future majorities. Alesina and Tabellini (1989) extend this type of model to a small open economy and show a connection between excessive public debts and private capital flights.

Persson and Svensson (1989) provide a related model which however does not imply a deficit bias but non obvious implications about which government would lead a deficit and which would run a surplus. In their model, there are two parties, one of the left who likes a large amount of public goods even at the cost of high taxes, and a party of the right which, on the contrary dislikes public spending and taxation. The public debts links the two alternating parties in office. When the left is in office it chooses to leave a surplus by taxing more in order to generate an incentive for the right when in office to spend more on public goods. The right, when in office, will cut taxes creating a deficit in order to prevent easy spending when the left comes in to office.²¹

In a similar vein Aghion and Bolton (1990) consider the commitment effect of debt in

²⁰When both parties care (with different weights) about the two public goods the result about excessive deficit require a weak condition on the third derivative of the utility function on the public goods.

²¹Pettersson-Lidbom (2001) presents supporting evidence for this model using Swedish data on localities.

two ways. First, by limiting future expenditure on public goods. Second, in forcing to raise higher tax revenues to repay the debt. Lizzeri (1999) uses similar insights, linking excessive debt accumulation and redistributive policies. In his model, two candidates, motivated purely by the desire of winning elections, can redistribute to some citizens and cannot make promises on future redistribution. In the first period, by running deficits they can target with “excessive” redistribution of transfer skewed in favor of a majority and against a minority.

2.6 The common pool problem

In these types of models agents do not fully internalize the tax burden of spending decisions leading to “excessive” spending. The most widely studied “common pool problem” is the one of legislators (like the United States Congress) which would like to approve spending programs for their districts without fully internalizing the cost of taxation; in fact, the latter are spread on all (or many other) districts. As we discuss below, similar political distortions arise in different institutional settings.

2.6.1 Bargaining in legislatures

Weingast, Shepsle and Johnsen (1981) provide a model of excessive spending on pork barrel projects which was later extended to various voting rules and applied to study debt accumulation. These authors show how representatives with a geographically based constituency overestimate the benefits of public projects in their districts relative to their financing costs, which are distributed nationwide. The voters of district i receive benefits equal to B_i for a project, but have to pay $1/N$ of the total costs if taxes are equally distributed among districts. Thus, a geographically based representative does not internalize the effect of his proposals on the tax burden of the nation. The aggregate effect of rational representatives facing these incentives is an oversupply of geographically based public projects. Specifically, the size of the budget is larger with N legislators elected in N districts than with a single legislator elected nationwide, and the budget size is increasing in N , the number of districts.

Baron and Ferejohn (1989) substantially improve upon this model by considering voting on the distribution of taxes rather than assuming that every district pays $1/N$ of the cost of every project. They study decisions with majority rule with various alternative procedural rules. In their model there are n members (they can be interpreted as people, districts, or States) in the legislature. The task of the legislature is to choose the distribution of one unit of benefits among the n districts, with no side payments outside the legislature. A “recognition rule” defines who, at each session is going to be the agenda setter with the task of making a proposal. In each session, member i is chosen with probability p_i . Member i then puts forward a bargaining proposal a proposal of the form $x^i = (x_1^i, x_2^i, \dots, x_n^i)$ such that $\sum_j^n x_j^i \leq 1$. If no proposal is approved, each member of the legislature gets zero benefits, the status quo. Members of the legislature have a common discount factor δ .

These authors distinguish between a “close amendment rule” and an “open amendment rule”. In the first case, the proposal on the floor is voted upon against the status quo, with no amendments. If the proposal is approved, then the benefits are distributed and the legislature adjourns. If the proposition is rejected the benefits are not distributed and the legislature moves to the next turn. In this case the process starts over, but the benefits are discounted by the factor δ . With an “open amendment rule”, after the member is randomly chosen to make the proposal, another member can be recognized at random and may either offer an amendment (i.e. an alternative allocation) or move to vote. If the proposal is seconded, the legislature votes as previously. If the proposal is amended, a runoff election is held to determine which proposal will be on the floor. The process is repeated until a recognized member moves the previous question and a yes vote is reached.

In the case of closed amendment Rule, the subgame perfect equilibrium has the following characteristics: (i) the equilibrium distributions of benefits is majoritarian, i.e. only a minimum majority gets something; (ii) the agenda setter can get a strictly greater allocation, and (iii) the legislature completes its task in the first session. In the case of open amendment rule, the agenda-setting power of the first proposer is diminished. Indeed, each member must consider the fact that her proposal may be pitted against an amendment. Thus, she has

to take this into account when making the proposal. In particular, the proposing member must make a proposal acceptable for at least m out of $n - 1$ other members in the legislature. By choosing m , the original proposer determines the likelihood of acceptance. The higher is m , the higher the probability that the section rule will choose one of the m legislators and the proposal is accepted, but also the lower the benefits that the agenda setter can keep for himself.

2.6.2 Bargaining in legislatures and government debt

In Velasco (1999, 2000) several interest groups benefit from a particular kind of government spending. Each group can influence the central fiscal authorities to set net transfers on the group's target item at some desired level. The equilibrium implies a debt level at the maximum feasible level. In fact each group demands transfers large enough to cause fiscal deficits and a sustained increase in government debt. Eventually, the government hits its credit ceiling, and is locked forever in a position of paying sufficient taxes to service the associated maximal debt level. The intuition for this result is simple. Property rights are not defined over each group's share of overall revenue or assets. A portion of any government asset, which is not spent by one group, will be spent by the other group. Hence, there are incentives to raise net transfers above the collectively efficient rate. Groups do not fully internalize the costs of public spending, namely each of them uses the whole stock of resources instead of a fraction, as the basis for consumption of spending decisions. Krogstrup and Wyplosz (2010) provide a related common pool model of deficit bias in an open economy.

Battaglini and Coate (2008) adopt the Baron and Ferejohn (1989) framework described above and study how such bargaining leads to deviations from the optimal path of debt. They focus on the case in which a social planner would implement the solution by Aiyagari *et al.* (2002). Battaglini and Coate (2008) link the Baron and Ferejohn (1989) model of bargaining in a legislature with the insight of the literature on strategic debt which we have reviewed above, in particular the model by Tabellini and Alesina (1990). Current majorities

in the legislature will bargain over spending with uncertainty about the nature of future majorities and the debt becomes, as above, a strategic tool to control future fiscal decisions.²² While in Tabellini and Alesina (1990) the will of the majority is simply represented by the optimal policy of the median voter, Battaglini and Coate (2008) provide a much richer institutional setting to characterize decision making.

Battaglini and Coate (2008) model a continuum of infinitely lived citizens located in n identical districts. A single (non-storable) consumption good z and a public good g are produced using labor. Citizens maximize their lifetime utility which depend on consumption, labor supply, and a parameter A_t , which is the realization at time t of a random variable, which represents the value of the public good for citizens at time t . If, for instance, the public good is defense spending, we value it a lot higher during a war. The legislature provides the public good g and it can finance targeted-district specific transfers s_i , i.e. “pork-barrel” spending. To finance its activities, the legislature can either set a proportional tax on labor τ or issue one-period risk free bonds x . The legislature faces three different constraints. A feasibility constraint, which imposes that the government revenues have to be high enough to cover expenditures. The “District Transfer Constraint”, which imposes that the district-specific transfers must be non-negative. This constraint excludes lump negative transfers (lump sum taxes) to finance government spending. Finally, the government has to satisfy the Borrowing Constraint, which implies setting an upper and lower bound on the amount of bonds that can be issued or bought back each period. The lower bound is set without loss of generality. Indeed, the government would never need more than the assets the lower bound implies so the constraint never binds. An upper bound is necessary to avoid the government to issue an amount of debt which is unable to pay back the next period. A lower bound is defined by the level according to which it is possible to finance the optimal level of

²²In a related work Barseghyan, Battaglini and Coate (2013) consider, as a driver of fiscal policy persistent tax revenue shocks, which come from business cycle impacts on the private sector. Battaglini and Coate (2015, forthcoming) consider an economic model with unemployment and the distinction between private and public sector jobs. They explore the relationship between debt, unemployment, and the relative size of the public and private sector.

public good just with the interests on the assets the government has accumulated.²³ The legislature, consisting of a representative from each of the n districts, make decisions with closed rules. The legislature meets at the beginning of each period knowing both b_t and A_t . One representative is randomly selected to make the government policy proposal, which consists of the tax rate on labor r_t , the level of public good g_t , the level of bonds x_t and the district-specific transfers (s_1, \dots, s_n) . The proposal requires consensus of a minimum winning coalition of $q < n$ legislators to be accepted and implemented. If the proposal is rejected another legislator is randomly chosen to make a new proposal. If, after τ rounds, all the proposals are rejected, then the government implements the “Default Policy”, which has to satisfy the feasibility constraint and has to treat all the districts equally, i.e. $s_1 = \dots = s_n$.

In this model a social planner would choose the optimal debt path as in Aiyagari *et al.* (2002). More specifically, the social planner takes as given (b, A) and chooses a policy $\{r, g, x, s_1, \dots, s_n\}$ which maximizes the utility of citizens in all district. Given (b, A) there are two possible cases, namely with or without transfers to the districts. In the first case, with positive pork-barrel transfers, the optimal tax rate on labor is set to zero and the optimal level of public good is set to $g_S(A)$, i.e. the level that satisfies the Samuelson’s Rule. The reason is straightforward. Suppose that the tax rate is positive. Then, the Social planner finds strictly dominant to reduce the pork-barrel transfers and to reduce the (distortionary) tax. If the Social Planner does not make any pork-barrel transfer, it must be the case that the tax rate is positive, the level of public good provided is less than $g_S(A)$ and the level public debt exceeds the one with transfers. Thus, pork-barrel transfers depend upon the realization of the value for the public good, A . In particular, for high enough values of A , the optimal policy has no transfers: g is high and no room is left for pork barrel. Instead, if the government has resources left to provide pork-barrel transfers, then the level of debt must be the lowest possible, i.e. the lower bound \underline{x} . (Remember that the lower bound implies accumulation of assets). Intuitively, if the planner is willing to give revenues back to

²³The optimal level of public good is the one which satisfies the Samuelson Rule, i.e. the level at which the sum of marginal benefits is equal to the sum of marginal costs.

citizens through district transfers (s_1, \dots, s_n) , then it must expect not to be imposing taxes in the next period; otherwise, he would be better off reducing transfers and acquiring more bonds. This suggests that the steady state debt level must be such that future taxes are equal to zero, implying it to be equal to \underline{x} .

Consider now bargaining in the legislature. The agenda setter has to find $q - 1$ supporters for his proposal to pass. The equilibrium policies are driven by the realization of the value of the public good, A , and the value of the public debt left from the previous period. For high enough values of A and/or b , the marginal value of the public good is so high that the proposer does not find it optimal to make positive pork-barrel transfers. Thus, the equilibrium policy consists of the outcome as the proposer maximize the utility of all representatives. In other words, we are back to the Social Planner solution with no transfer. For low levels of b and/or A , there may be resources left that can be transferred to the q districts. This implies there exists a cutoff value A^* which divides the space into two different regimes. For $A > A^*$ the economy is in the “Responsible Policy Making” regime (RPM). In this case, the optimal level of the tax rate, the public good and the debt to issue are defined by the Social Planner’s optimal conditions with no pork-barrel. For $A < A^*$ the economy is in the “Business-As-Usual” regime (BAU). In this case the proposer defines $(r^*, g^*(A), x^*)$ by maximizing the utility for the q districts included in the “Minimum Winning Coalition”. This equilibrium includes also transfers (s_1, \dots, s_q) high enough to induce the member of the coalition to accept the proposal.

The same optimal conditions can be defined in terms of the public debt. In particular, the equilibrium debt distribution converges to a unique invariant distribution whose support is a subset $[x^*, \bar{x}]$. When the debt level is x^* , then the optimal conditions for the tax rate and the public good are those defined by the BAU, with the proposer who makes pork-barrel transfers to the q districts. If instead the debt level exceeds x^* , then the economy is in the RPM regime where the tax rate is higher than the one defined in BAU, the provision of public good is lower, and no districts receive transfers.

In the long-run, the economy oscillates between BAU and RPM regimes, depending on the

realization of the value of the public good A . For instance, pork barrel would disappear during a war when A is large.²⁴

In summary, the political distortions which make the social planner solution differs from the political equilibrium arises for two specific reasons. The first one, which can be related to the “Common Pool problem” discussed in the previous section. The minimum winning coalition does not fully internalize the costs of raising taxes or reducing the public good but it fully enjoys the benefit of receiving the pork-barrel transfers. The other distortion comes from the uncertainty suffered by the legislators. They do not know *ex-ante* whether they are going to be included in the minimum winning coalition next period. Thus, they do not fully internalize costs and benefits across periods. In particular, they compare $\frac{1}{q}$ benefit today by belonging to the coalition, versus $\frac{1}{n}$ expected costs tomorrow. This intuition is similar to the strategic model of debt of Tabellini and Alesina (1990) reviewed above. In conclusion, this paper makes two important contributions. First, it merges the results found in Tabellini and Alesina (1990) by using Baron and Ferejohn (1989) type of model. Second, it shows that taxation smoothing “a la Barro” is still an important factor in a political economy model, but distortion smoothing through debt is inefficient, and therefore not only this results in excessive accumulation of debt, but also in excessive volatility of the policies in the steady state. From an empirical standpoint, Baqir (2002) shows results consistent with the common pool problem using data from US cities. He shows that larger city council, where the common pool problems may be larger, are associated with more public spending, holding other determinants of the latter constant.

There is also a potential connection with the war of attrition model discussed above. In these bargaining models the passage of time is not considered. With a closed rule agreement is immediate but even with an open rule to the extent that proposals and amendments can be made instantaneously time does not matter. In reality, bargaining in legislatures takes time, and the passage of time is critical in the war of attrition models to allow the

²⁴Battaglini (2014) illustrates an extension of that model, which includes two-party competition in a legislature modeled as above.

game to be resolved. At the same time the passage of time leads to the accumulation of debt. Allowing for a realistic consideration of time in these bargaining model could be an interesting avenue for theoretical and empirical research.

2.6.3 The common pool problems in other institutional settings

The general idea of the common pool problem with strategic debt is relevant for other institutional settings beyond the US Congress.

In particular, in many democracies the budget is crafted by a government (possibly formed by more than one party), it is presented in the legislature and approved, if the parties of the government have a majority, with or without amendments. In this case, we may have a common pool problem with the spending ministers in the government even before the budget reaches the legislature. Each spending minister would generally like to obtain more spending for its own ministry, often pushed by the bureaucracy of the latter. A winning coalition of spending ministers may lead to the approval of a budget which, like in the BAU regime of Battaglini and Coate lead to a sort of “pork-barrel” transfers to a minimum winning coalition of spending ministers. These pork-barrel spending may be geographically or functionally defined and the bargaining may get especially complicated when different spending ministers belong to different competing parties. In this institutional setting normally the Treasury Minister has the task of preventing spending ministers to overspend but he or she may be overruled by a minimum winning coalition of spending ministers. In fact, as we shall discuss below, different institutional settings attribute different levels of prerogatives to spending ministers versus the Treasury, making the problem arising in the BAU regime more or less serious. In addition, even in parliamentary democracies, legislatures have the ability of proposing and voting upon amendments on the budget presented by the government.²⁵

²⁵Tornell and Lane (1999) develop a model of a sort of common pool problem applicable more directly to developing countries with poorly developed institutions and large informal sectors. They develop a dynamic model of the economic growth process that contains two common characteristics of those developing countries that have grown slowly in the last decades, namely (i) the absence of strong legal and political institutions; (ii) the presence of multiple powerful groups in society. The focus is on the fiscal process as it is the mechanism

Often budget deficits at the national levels originate at subnational levels of governments. Some famous examples are both from Latin America (i.e. Argentina) and European countries (Italy and Spain, for instance). This is related to suboptimal allocation of spending and taxing prerogatives amongst various level of governments. Suppose that spending is decided by local governments and revenues are collected by the national government and allocated to localities on the basis of their spending decisions. Obviously, in this case localities do not internalize the full cost of taxation of their spending decisions since taxes are levied nationally. Most countries have arrangements which attempt to put a limit on these incentives, such as having some local taxes required to finance some type of spending, or having budget rules on local governments (as we will discuss below). In many cases, however, these arrangements are imperfect and a common pool problem remains. The relationship between local governments and the Central Government may also imply a case of soft budget constraint (see Kornai, Maskin and Roland (2003)). Localities expect Central Government to bail them out and overspend. Pettersson-Lidbom (2010) provides a test using Swedish data.

This discussion is of course related to the fundamental issues of fiscal federalism.²⁶ The trade off is well known. On the one hand, one wants to allow to federal countries some freedom of choice on their localities. On the other hand, such freedom should not imply a deficit bias at the national level.

2.7 Intergenerational redistribution

Current generations, by means of government debt, redistribute from future generations to themselves. The argument is very appealing. However, it needs to take into account the fact that private bequest are positive, thus one needs to account for negative “public” bequest

through which powerful groups interact with the society (which is characterized by weak legal and political institutions) and where they can enforce discretionary fiscal redistribution - a kind of pork-barrel transfer - as a way to appropriate national resources for themselves

²⁶See Oates (2011) for the classic work.

(government debt) and private positive bequests. In this respect Cukierman and Meltzer (1986) consider the standard framework with overlapping generation model, lump-sum taxes and intergenerational transfers from parent to child, and no uncertainty. Individuals differ in their abilities, (and therefore in wage earnings) and in their nonhuman wealth. Some of them desire to leave positive bequests, and others would prefer to borrow resources from future generations. Individuals who would choose to leave negative bequests are “bequest-constrained” individuals. These individuals favor any fiscal policy that increases their lifetime income at the expense of future generations. Individuals who are not bequest-constrained are indifferent to an intergenerational reallocation of taxes. In fact they can adjust up or down their private bequest when public bequests (government debt or assets) move up or down. By majority rule, if the decisive voter is bequest-constrained, he will choose lower current taxes financed by additional debt, which cannot be defaulted. If instead the decisive voter is not bequest-constrained, he is indifferent to a reallocation of taxes and social security over time that maintains present value. Thus, in this model by majority rule we will easily have an accumulation of debt. The likelihood to have deficits increases with an extension of the franchise to low wealth individuals who are likely to be bequest-constrained. This is a simple but very powerful idea which strikes us as just right.

Tabellini (1991) explores a different argument, that is the redistribution consequences of debt repudiation in an overlapping generation framework implying both intra and intergenerational redistributions. The main idea is that issuing debt creates a constituency in support of repaying it. Thus, issuing debt makes a coalition of voters favorable to repaying it in order to avoid intragenerational redistributive consequences of the debt repudiation. In particular, parents have a first-mover advantage since they can vote on how much debt they want to be issued (i.e. how much resources they want to extract from future, yet-unborn generation), without the future generation to have a word. Issuing government debt results in intergenerational redistribution to be tight to intragenerational consequences of choosing how much debt to repay. In particular, debt repudiation harms the old, but it harms the wealthy more than the poor. Young voters (specifically the children of the wealthiest debt

holder parents) want to avoid intragenerational redistribution (i.e. repudiation would result in redistributing wealth from rich to poor families) and for this reason they are willing to accept to repay some debt (i.e. transferring resources to the parents), an action that would have been opposed by them *ex-ante*.²⁷ Therefore, there is a coalition that includes both old and young voters (the wealthiest) who vote in favor of debt repayment. The most interesting and valuable aspect of this paper is the joint consideration of intra and intergenerational redistribution, a topic which is surprisingly understudied both theoretically and empirically. In many countries pension systems redistribute both across and within generations, to the extent that poor citizen get proportionally more than rich ones from pensions. This is an excellent topic for further theoretical and empirical research.

Song, Storesletten and Zilibotti (2012) develop a dynamic general equilibrium model of small open economies where voters in each period choose domestic public goods and the financing via taxes and debt. Within each country, old agents support high spending on public goods, high labor taxes and large debt. Instead, the young dislike debt, since it crowds out public good provision when they will be old. Specifically, the model consists of a set of small open economies populated by overlapping generations of two-period-lived agents who work in the first period and live off savings in the second period. In each country j there two types of goods: a private good c and a domestic public good g provided by each economy's government. There are two types of agents, the young and the old, each with a different preference towards the public good, which are represented respectively by the parameters θ_j and $\lambda\theta_j$. λ represents a preference weight that old put on the public good. Intuitively, this parameter can take value 0 - individuals do not value the public good - or positive values - not necessarily bounded to 1. There are cross-country differences in θ which may reflect cultural diversity or differences in the efficiency and quality of public good provision, related to the technology and organization of the public sector. Capital

²⁷This is because, *ex-ante* issuing debt has only intergenerational, but not intragenerational effect. Given that agents would prefer not to redistribute resources, they would vote against this policy *ex-ante*. However, *ex-post* the policy has also intragenerational effect and the young generation would prefer to transfer resources to their parents rather than to the fraction of poor people in the same cohort.

is perfectly mobile across countries and it fully depreciates after one period. The private good is produced by using both capital and labor as inputs in the production function. The domestic fiscal policy is determined through repeated elections and government debt is traded on worldwide markets. Given an inherited debt b_j , the elected government chooses the labor tax rate τ_j , public expenditure g_j and debt accumulation b'_j , subject to a standard dynamic government budget constraint. A probabilistic voting model delivers an equilibrium in which fiscal policy maximizes a weighted sum of young and old voters' utility. The weights assigned to each group represent the relative political influence of each group. The model yields a trade-off between the marginal costs of taxation, due to the reduction in private consumption c suffered by the young, and the marginal benefit of public good provision. Such a trade-off reveals a conflict of interest between young and old voters. The old want higher taxes and current spending on public goods. Thus, the more power held by the old, the greater the reduction in private consumption. The preference for public good provision affects this trade-off: a higher θ or a higher λ reduces private consumption c . Moreover, there exists a sort of "disciplining effect" exercised by the young voters. In particular, they anticipate that increasing debt will prompt a fiscal adjustment reducing their future public good consumption. A key result is that the model provides a politico-economic theory of the determination of the debt level. In particular, in spite of the complete lack of intergenerational altruism (assumed through finite lives) debt converges to a finite level, strictly below the natural borrowing constraint. This results from the combination of forward-looking repeated voting and distortionary taxation. Higher debt can be financed by increasing taxes or cutting public good provision. As debt grows larger, the convexity of tax distortions (a Laffer curve effect) implies that most of the adjustment will be in the form of less future public goods. The concern for avoiding a future situation of private affluence and public poverty makes young voters oppose debt increases. Given the prediction of a determined debt level, the model yields mean-reverting debt dynamics. Suppose that the economy is hit by a one-time fiscal shock (e.g., a surprise war) requiring an exogenous spending. The government reacts by increasing taxes and decreasing non-war

expenditure in wartime. After the war, debt, taxes, and expenditure revert slowly to the original steady state. These predictions accord well with the empirical evidence of Bohn (1998), who finds the US debt-to-output ratio to be highly persistent, but mean reverting and Müller, Storesletten and Zilibotti (2016, forthcoming) which provide similar evidence for the period 1950-2010 for a panel of OECD countries.

Müller, Storesletten and Zilibotti (2016, forthcoming) extend their model by assuming that there are two types of voters, left-wing (*l*-type) and right-wing (*r*-type), who differ in their trade-off between private consumption and public good consumption: *l*-type voters like government expenditure and public good provision more than do *r*-type voters. Voters choose sequentially a fiscal policy which includes labor taxation, government expenditure on public goods, and debt policy, subject to the government's dynamic budget constraint. The novelty of this model compared to Song, Storesletten and Zilibotti (2012) is that, here there are political shocks which can be interpreted as shocks over time to the preference for public goods. In particular, during a left-wing wave the government increases taxation and public expenditure while reducing debt. Instead, during a right-wing wave the opposite occurs. In fact the driver of fiscal discipline of the young is based on their preferences for public good when old - that is how much the young expect that they will appreciate public good provision as they become old. During left-wing governments, the demand for fiscal discipline is stronger because the young left-wing voters - who are more concerned for future public good provision than right-wing voters of the same age - detain more political influence. This is because *r*-type voters have less appeal to public good and more for private consumption. Thus, when the right-wing party is in power is less concerned to the provision of public good in the future and instead it would push up current debt today in order to use the resources as subsidies for private consumption. Left-wing voters are instead concerned with future public good provision, and would oppose such fiscal policy. The key predictions of the model are that, on the one hand, right-leaning governments are more prone to issue debt in normal times, while on the other hand left-leaning government engage in more proactive countercyclical fiscal policy - including issuing more debt during

recessions. In other words, during normal times left-leaning governments do more public savings but use the debt to smooth income shortfalls associated with recessions.²⁸ This result is reminiscent of the model by Persson and Svensson (1989) reviewed above, in a non overlapping generation framework.²⁹

It should be mentioned that all the models discussed above imply voting. Mulligan and Sala-i Martin (1999) argue that indeed spending on pensions is high in non-democracies as well as democracies, namely variables like the aging of population and the relative size of young and old matter in both regimes. In fact the relative “strength” (i.e. political influence) of the constituencies of young and old may be relevant in both democracies and non democracies even though the nature of the way in which this relative strength manifests itself is of course different. These differences in the intergenerational games in perfect and imperfect democracies and in dictatorships is an excellent topic for additional research.³⁰

2.8 Rent Seeking

Acemoglu, Golosov and Tsyvinski (2008, 2010, 2011) study the dynamic taxation in a standard neoclassical model under the assumption that taxes and public good provision are decided by a self-interested politician who cannot commit to policies. Citizens can discipline politicians by means of election as in Barro (1973) and Ferejohn (1986) in a dynamic game. The self-interested politician creates distortions, namely he wants to extract rents from

²⁸They show that these theoretical predictions are consistent with US post-war data on debt, and also with a panel of OECD countries.

²⁹However, the key difference between the two papers is that in Persson and Svensson (1989) a conservative government expecting to be replaced in the future strategically issues more debt. In contrast, the results in Müller, Storesletten and Zilibotti (2016, forthcoming) are unrelated to persistence or reelection probabilities. The robust prediction of their theory is that a left-leaning government issues less debt, irrespective of the probability of being replaced.

³⁰Azzimonti, Francisco and Quadrini (2014) make the case that the secular increase in debt to output ratios can be due to the liberalization of financial markets that took place in the mid eighties. While the political-economy comes from probabilistic voting, the paper provides an alternative theory of debt (to that of tax smoothing) and an explanation of why we could observe inefficiently higher debt to GDP ratios in the recent years. Specifically, they propose a multi-country political economy model with incomplete markets and endogenous government borrowing and show that governments choose higher levels of public debt when financial markets become internationally integrated and inequality increases.

being in office. This adds an additional constraint in the economy, the political economy constraint. This constraint implies that politicians in power compare the lifetime utility from extracting rents in each period versus the one-time shot deviation of extracting all the resources available in the economy in one period and being voted out of office. Distortions are generated by the fact that citizens have to provide incentives to politicians to stay in office. These distortions may or may not disappear in the long-run. In particular, if politicians are as patient or more patient than citizens, they value more staying in office and thus they set a tax rate equal to zero. If politicians are less patient than citizens, it may be optimal to set positive taxation. The idea is that, starting from a situation with no distortions as before, an increase in taxation has a second-order effect on the welfare of the citizens holding politician rents constant, but reduces the resources available in the economy and, thus, the rents that should be provided to politicians by a first-order amount.³¹ Thus, it is less costly to reduce the potential output in the economy, than to provide a higher rents to politicians to stay in office. These types of models therefore focus on the role of taxation as a tool to govern the interaction between citizens and self-interested politicians. There is no role for government deficit.

Yared (2010) develops a rent seeking model with implications on the accumulation of public debt using a Lucas and Stokey (1983) model. Yared considers a closed economy with no capital, with shocks to the productivity of public spending, and with complete markets. The self-interested politician has a utility function which is increasing in rents (namely tax revenues not used for productive public goods, i.e. spending with no social value). A politician cannot commit to policies once in office and citizens cannot commit to keeping the incumbent in power in the future. Thus, in an infinitely repeated game, reputation sustains equilibrium policies. The focus is on “Efficient Sustainable Equilibria” in which a politician who pursues rent seeking extractive policies is voted out of office, and a politician

³¹Specifically, the marginal cost of additional savings for the citizens is higher in equilibrium than in the undistorted allocation, because a greater level of the resources in the economy increases the politician’s temptation to deviate and thus necessitates greater rents to the politician to satisfy the political sustainability constraint.

who purses the policies expected by citizens is rewarded with future office.³² Therefore, the incumbent politician follows equilibrium policies as long as rents are sufficiently high, since this raises the value of cooperation, and as long as government debt is sufficiently high, since this limits what he can acquire through maximally extractive policies prior to removal from office. There is no default. Citizens reward a well-behaved incumbent by not replacing him as long as equilibrium taxes are sufficiently low and productive public spending is sufficiently high. Note that given the fact that citizens are all identical, there is no conflict in the political decision. Efficient sustainable policies thus solve the standard program of the benevolent government subject to incentive compatibility constraints for the politician and the representative citizen.

Consider now the rent seeking politicians. Given the lack of commitment, there are two set of incentives that have to be satisfied, the politician's and the citizens' incentives. The incumbent politician knows that citizens will remove him from office at the beginning of the following period if he misbehaves. In particular, a politician who is removed after period t receives period t rents and a punishment which is a function of χ^p , i.e. an exogenous parameter representing the strength of political institutions, namely the institutional constraints on politicians. The optimal policy for the citizens has to satisfy the constraint that the politician does not want to extract maximal rents and be removed from office. Maximal rents implies getting as much revenues as possible today, take out as much debt as possible today, delivering zero public goods, and repaying current debt. Therefore, the incumbent politician is less likely to deviate from the equilibrium policies if: (i) he is receiving a high level of equilibrium rents today and in the future because in this case the value of cooperation is high; (ii) if government debt is high because there is little space for him to expropriate resources through increasing his rents. Satisfaction of this

³²The equilibrium refinement used is the sustainable equilibrium as in Chari and Kehoe (1993). In particular, individual households are anonymous and non-strategic in their private market behavior (i.e. buying government debt), while the representative citizen is strategic in the replacement decision. The politician in office is strategic in his decision regarding the policies, which have to satisfy the government dynamic budget constraint. The set of sustainable equilibrium are those in which citizens solve their optimal decision with respect to consumption, labor supply and bonds' decision given their individual budget constraints. Within the set of sustainable equilibrium, the focus is on the efficient ones, i.e. the ones that maximize citizens' utility.

incentive compatibility constraint implies a lower bound on taxes and an upper bound on public spending which both bind whenever the incentive compatibility constraint binds. This is because there has to be a limit on the size of resources owed to the government in each period. Indeed, if the size of these resources is too large, there is a high incentive for the politician to deviate and appropriate them as rents. This implies that resources going into a given period cannot be too large, and government activity must be financed mostly with current and future taxes, instead of past taxes.

The second set of incentives to take into account are those for the citizens. In this model, citizens may have an incentive to replace an incumbent politician even if he is well behaving. In this sense, citizens cannot commit to a plan where they keep an incumbent in power no matter what. Therefore, the incumbent politician has to set fiscal policies such that they define a sufficiently low level of taxation and/or a sufficiently high level of public expenditure in order to have some chances to stay in office the subsequent period. In this framework, replacing an incumbent politician provides a benefit for the citizens which is a function of the exogenous parameter χ^c . Here, χ^c represents the lack of popularity of the incumbent.³³ These conditions provide upper bounds on revenues and lower bounds on public spending.

Summing up, satisfying the incentives of politicians requires sufficiently high revenues and sufficiently low levels of public spending. In contrast, satisfying the incentives of citizens requires sufficiently low level of taxes and sufficiently high level of public spending. The best policy is therefore found to be the one that maximizes citizens' lifetime utility subject to the two set of incentive compatible constraints. This political distortion leads to several departures from the social planner policies. In particular, taxes are not constant but *volatile*. This is because the constant revenue policy characterizing the benevolent government is associated with too much rent-seeking by politicians. Second, the increase in debt reduces the potential rents that the politician can appropriate and thus make it easier for citizens to

³³Another interpretation may be the gains for the citizens from having a new incumbent, reflected in the policies that are promoted during the electoral campaign. The author interprets it as a general "social benefit of political turnover."

provide the incentives to politicians. This approach is elegant, although contingent debt a la Lucas and Stokey (1983) is not issued by real world governments.

2.9 Budget Rules

Given that for so many reasons there are incentives for the government to run excessive deficits, is it feasible to devise rules and institutions that limit or eliminate those problems? By rules we mean numerical targets like a balanced budget rules, or a limit on the level of deficit, perhaps adjusted by the cycles, or excluding certain items such as public investment.³⁴

2.9.1 Balanced Budget Rule for National Governments

The pros and cons of national balanced budget rules, namely rules which imply zero or negative deficits (surpluses) are clear. A balanced budget rule does not allow to smooth out spending shocks (i.e. to run deficits when the need for spending are especially large) or fluctuations of tax revenues over the cycle for given tax rates. However, to the extent that political distortions are so large that governments may be far from the optimal policy, then a balanced budget rule might be a second best solution to massive political distortions.

The political debate on balanced budget rules is extensive, since the pros and cons are, in principle, straightforward but there are strong prior views about which costs or benefits are bigger and those views are not likely to be changed by the available, relatively scant, evidence.³⁵ An additional set of issues relates to the enforceability of balanced budget rules, namely whether governments restricted by these rules would engage in “creative accounting” to circumvent them or simply *de facto* ignore them.

Azzimonti, Battaglini and Coate (2015) present a quantitative evaluation of the net benefits of a balanced budget rule (BBR) for the US economy using the political economy

³⁴For a review see Fatás and Mihov (2003a).

³⁵See Sabato (2008) for a presentation of the policy debate. Fatás and Mihov (2003b) present evidence on a cross section of countries consistent with the view that the presence of budget rules limits the volatility of fiscal policy

model developed by Battaglini and Coate (2008).³⁶ As reviewed above, political economy frictions lead to inefficiently high levels of government debt in the long run. A constitutional requirement that imposes that tax revenues must be sufficient to cover spending and the interest on debt (e.g. permitting surpluses but not deficits) may improve welfare by restraining policymakers from excessive debt creation. The authors show that the BBR leads to a gradual reduction of debt in equilibrium. Intuitively, the reduction in flexibility to smooth taxes imposed by the rule increases the expected costs of taxation. Therefore, savings become more valuable as a buffer against adverse shocks. By lowering the stock of debt in good times, legislators reduce interest payments, which decreases pressure on the budget in bad times. In the long run, this results in lower taxes and higher spending in equilibrium than in the unconstrained case, “pushing” the model on the direction of optimal fiscal policy. The impact of a BBR on welfare is theoretically ambiguous: in the short run, citizens experience a loss in utility since the government has to cut spending and raise taxes to reduce debt above what might be optimal. In the long run, citizens benefit from lower debt levels but, due to the inability to borrow in bad times, suffer from higher volatility. Because the net effect depends on parameters, the authors calibrate the model to the US economy using data between 1940 and 2013, and show that it can fit the path of US fiscal policy reasonably well. One immediately wonders whether including the Second World War years in this exercise is appropriate given that during a major war probably the balanced budget rule could be easily abandoned. By including a major war period they, in a sense, may set the stage for a framework with high costs for balanced budget rules. The authors find that the short run costs are too large to compensate for the steady state benefits of a lower stock of debt. However, quite apart from the parametrization (which, as always, could be debatable) the model makes an interesting point: the balanced budget rule could be costly in the short run and beneficial in the long run. This result leads to interesting and immediate consequences on the political economy implications on voting upon a balanced budget rule in say, an overlapping generations model.

³⁶See also Stockman (2001) for calibrations of balanced budget rules in RBC models.

Halac and Yared (2015) discuss the optimal design of centralized supranational fiscal rules like those for Euro area countries, and how they compare to decentralized (national) fiscal rules in an environment in which there is a trade-off between allowing flexibility while also reducing a government's deficit bias. They consider a two-period model in which a continuum of identical governments choose deficit-financed public spending. At the beginning of the first period, each government suffers an idiosyncratic shock to the social value of spending in that period. Governments are benevolent *ex-ante*, prior to the realization of the shock, but present-biased *ex post*, when it is time to choose spending - which can be interpreted as the results of the potential political turnover (i.e. the political business cycle). The results of the paper compare optimal rules - which maximize the social welfare of all countries - when it is set by a central authority or an individual government. The results can be summarized as follows: when governments are not too impatient when choosing public spending, then the optimal centralized fiscal rule is tighter than the decentralized one, and hence interest rates are lower under centralization. The idea is that, in choosing decentralized rules, an individual country does not internalize the fact that by allowing itself more flexibility, a country pushes the global interest rate up, and thus redistributing resources away from governments that borrow more towards governments that borrow less. Instead, committing *ex-ante* to tighter rules is good as this pushes down the global interest rate and therefore allows countries with higher marginal value of spending to borrow more cheaply. If governments' present bias is large, the optimal centralized fiscal rule is slacker than the decentralized one, and hence interest rates are higher under centralization. The idea is that governments choosing rules independently do not internalize the fact that by reducing their own discretion - i.e., by choosing very tight borrowing limits - they lower interest rates, thus increasing governments' desire to borrow more and worsening fiscal discipline for all. Instead, committing *ex-ante* to more flexibility is socially beneficial: the cost of increasing discretion for over borrowing countries is mitigated by the rising interest rate, which induces everyone to borrow less. The interest rate has a disciplining effect in the sense that it reduces the incentives for over borrowing countries to borrow more.

Aguiar *et al.* (2015) investigate the conditions under which the imposition of debt ceilings is welfare-improving. Specifically, they study the interaction between fiscal and monetary policy in a monetary union with the potential for rollover crises in sovereign debt markets. Each member-country choose how much to consume and borrow by issuing nominal bonds. A common monetary authority chooses inflation for the union, taking as given the fiscal policy of its member countries. Both types of policies are implemented without commitment. The lack of commitment on fiscal policy is especially critical because it may lead to the possibility of default. They show the existence of a “fiscal externality” in this type of environment. This externality leads countries to over borrow and thus, higher inflation and lower welfare. This gives credit to the imposition of debt ceiling in a monetary union which overcome the problem of lack of commitment on fiscal policy. Aguiar *et al.* (2015) go further and investigate the impact of the composition of debt in a monetary union, that is the fraction of high-debt versus low-debt members, on the occurrence of self-fulfilling debt crisis. Specifically, they show that a high-debt country may be less vulnerable to crises and have a higher welfare when it belongs to a union with an intermediate mix of high- and low-debt members, than one where all other members are low-debt.

One could also think of balanced budget rule with escape clauses. An obvious one, mentioned above already would be a major world war. This (fortunately) rare event may be used as a relatively easy contingency to verify, but if the contingencies become too frequent then not only the stringency of the rule but even its enforceability is called into question. For instance, how does one define a “major” war? Clearly the Second World War was major, but would the Iraq war be a major one? Also one might think of cyclically adjusted balanced budget rules to overcome some of the rigidity of the latter, but then debates about how to measure the cyclical adjustment might lead to strategic manipulation of the rule itself. With specific reference to the US, Primo (2007) discusses the pitfalls of balanced budget rules with complicated escape clauses.

An additional argument against formal budget rules is that financial markets might impose increasing borrowing costs on government which move far away from the optimal

policy and accumulate large debts. Increasing borrowing costs would lead to more discipline even without rules. The recent experience of the Euro area and its fiscal crisis, casts doubts on this argument. Until 2008 the interest rate spread on, say German government bonds and even Greek ones was virtually nil. In fact, as a result of this low spreads several countries accumulated large debts in the first decade of the monetary union even when these countries were growing at respectable rates, including Greece whose economy was booming and debt skyrocketing. The reason of this is that probably investors did not believe the no bail out case of European treaties and assumed (largely correctly) that in case of a debt crisis they would be protected. In fact, probably because market discipline was not considered sufficient the funding fathers of the monetary union introduced contingent budget rules, like the stability and growth pact. These rules have been changed repeatedly and generally implied a maximum level of deficit (3 per cent of GDP) with various escape clauses in case of major recessions. The discussion about the optimality of such rules in the Euro area is immense and we do not review it here (see the excellent discussion in Wyplosz (2014)).³⁷ However, we want to make three points here. One is that the enforceability of these rules has been questionable. Even as early as 2002 Germany itself broke the rule and then many countries followed this example. The complexity and contingency of these rules did not help. The second is that probably now some European countries are feeling the bite of such rules, binding during a prolonged recession. The third is that especially at the time of the introduction of the Euro much creative accounting was widely used to satisfy “on paper” the 3 per cent rule. These procedures introduced confusion and decreased trust amongst members of the Euro area.³⁸

How can balanced budget rules for a sovereign national government can be enforced? One possibility is to have the law in the constitution so that it would take a Constitutional revision to change it. An alternative would be to require a qualified majority. Such rules need to be stable, namely they should not imply that the rule itself can be changed, as

³⁷For some empirical evidence on the Stability and growth Pact see von Hagen and Wolff (2006).

³⁸Von Hagen (2006) compare the effectiveness of budget rules in the EU versus Japan.

in Barbera and Jackson (2004). For some discussion of this issue see Primo (2007) which elaborates over the Baron and Ferejohn (1989) approach with specific reference to the US institutional setting. This is an excellent topic for future research not only within the specific American institutions.

2.9.2 Balanced Budget Rules for Local Governments

The pros and cons of balanced budget rules discussed above for national government apply also to sub national ones. However, there are reasons to believe that balanced budget rules for local governments may be more attractive than for national governments. First, as we discussed above, local governments add an additional political distortion: a common pool problem given by the fact that their local spending is at least in part financed by national transfers and therefore local governments do not fully internalize the taxation costs of their spending decisions. Second, some (or most) of the countercyclical fiscal stabilizers may be national not local. In fact balanced budget rules for local governments should be accompanied by nationally based automatic stabilizers, to avoid procyclical fiscal policy, unless, as were discussed above, a balanced budget rule is chosen also for the national government. Third, enforcement of local balanced budget rule may be easier since it may be done by the national governments. Fourth, a balanced budget rule for local governments would avoid accumulation of unsustainable debts with the related uncertainty, disruption and costs associated with bail outs of excessively indebted localities. In summary, balanced budget rules for local government may be a tool of an optimal allocation of fiscal responsibilities between national and local governments.³⁹

Indeed, work by Alt and Lowry (1994), Poterba (1995), Bayoumi and Eichengreen (1994), Bohn and Inman (1996) and Alesina and Bayoumi (1996) show that more strength budget rules in the US, namely tight fiscal controls which impose restrictions on government deficit, have been more effective at creating incentives to states more quickly responding to

³⁹See Inman (1997) and Poterba (1996) for a review of this literature.

spending or revenue shocks.⁴⁰

2.9.3 Other types of budget rules

The policy discussion over balanced budget rules has also dealt with other types of budget restrictions. One is the so-called “golden rule”, namely a rule which allows budget deficits only to finance public investments but not current expenditures. Bassetto and Sargent (2006) discuss the optimality of such rules. In principle this may be a “good” rule especially for developing countries in need of investment in infrastructures. The problem, however, is that this rule may lead to creative accounting, namely simply reporting as spending in infrastructures what is really current spending. For developed countries one may wonder whether the political incentives to spend in physical infrastructures which would be induced by this rule is really necessary. In Western Europe, in particular, the emphasis on physical infrastructures seem overplayed already, relative to other fiscal problems in this continent, and a budget rule of this type may add to this misperception and lead to overinvestment in physical infrastructures.

Another possible budget rule would impose limits on spending. The issue here is that while we have a theory of optimal deficit management, reasonable people can disagree on the optimal size of government spending because of different views about the role of the state and the size of welfare policies, for instance. Thus, while pork barrel inefficient programs (like bridges to nowhere) might be constrained by spending limits, the latter may interfere with programs desired by the majority.

⁴⁰Canova and Pappa (2006) however present result suggesting that in some cases US states managed to circumvent the rules.

2.10 Budget Institutions

2.10.1 Theory

The definition and approval of a budget in an advanced democracy is often a complex process, possibly kept strategically complex to achieve behind the scene deals or to be able to introduce them in some corner of the budget provisions in a sufficiently obscure manner to escape detection of the voters. One can identify three phases in the budget process: (1) the formulation of a budget proposal within the executive; (2) the presentation and approval of the budget in the legislature; and (3) the implementation of the budget by the bureaucracy. Two issues are crucial: the voting procedures leading to the formulation and approval of the budget, and the degree of transparency of the budget. We begin with the former.

We focus upon a key trade-off between two types of institutions. One type, which we label “hierarchical”, limits the democratic accountability of the budget process with a high degree of delegation. The second type, we label “collegial”, has the opposite features. Hierarchical institutions are those that, for instance, attribute strong prerogatives to the prime minister (or the Finance or Treasury minister) to overrule spending ministers within intergovernmental negotiations on the formulation of the budget. Hierarchical institutions also limit in a variety of ways the capacity of the legislature to amend the budget proposed by the government. Collegial institutions emphasize the democratic rule in every stage, like the prerogatives of spending ministers within the government, the prerogatives of the legislature vis-a-vis the government, and the rights of the minority opposition in the legislature. There is a trade-off between these two types of institutions: hierarchical institutions are more likely to enforce fiscal restraint, avoid large and persistent deficits, and implement fiscal adjustments more promptly. On the other hand, they are less respectful of the rights of the minority, and more likely to generate budgets heavily tilted in favor of the interests of the majority. Collegial institutions have the opposite features.

Let’s begin with the definition of the budget within the government where we have a division of responsibilities between spending ministers and the Treasury minister, The

latter has the role of aggregating the spending proposals of other ministers and produce a budget document. Spending ministers prefer a larger fraction of the budget devoted to their department: more money means more favors to constituencies. Thus, more hierarchical institutions are those which attribute stronger prerogatives to the Treasury. In the legislature, as we discussed above, different amendment rules may aggravate or reduce the common pool problem. Much of this research is based, directly or indirectly, upon a view of the budget as the result of conflicting interests of representatives with geographically based constituencies. The literature on procedures has addressed three related questions: what procedural rules mitigate or aggravate the problem of oversupply of pork barrel projects? What procedural rules make the choice of projects, given a certain total budget, more or less efficient? How do different procedural rules influence the final allocation of net benefits among districts? Two issues are particularly interesting for our purposes: (a) the sequence of voting on the budget, and (b) the type of admissible amendments on the proposed budget. Intuitively, one may argue that by voting first on the maximum size of the budget (and eventually of the deficit) one would limit the excessive multiplication of budget proposal. Ferejohn and Krehbiel (1987) study theoretically the determination of the size of the budget under the two alternative voting procedures. They assume that the budget can be allocated to two projects and different legislators have different preferences for the relative benefits of these two projects. It is not always the case that the size of the budget is smaller when the legislatures vote first on the size and then on the composition, relative to the case in which the overall budget size is determined as a residual. While the size of the budget is in general not independent on the order of votes, the relative size of the budget with different orders of votes depends on the distribution of legislatures' preferences for budget composition.⁴¹

In parliamentary democracies, the agenda setter in the budget process is the government. Thus, closed rules attribute more power to the government and less to the floor of the legislature. The result is that closed rules are more hierarchical as we discussed above. They give more influence to the government and lead to an immediate approval of the budget

⁴¹The same issue has been revisited by Hallerberg and Von Hagen (1999).

than the government poses. Open rules require more time for voting and with those rules the government gets a lower surplus relative to the non governmental minority. With a closed rule you achieve quick approval of a proposal, at the cost of implementing “unfair” budgets. Budgets are unfair in the sense that they are tilted in favor of those who make the first proposal, and always distribute benefits to the smallest possible majority. Hierarchical procedures are obviously preferable when the key problem is the control of the size of the budget and the implied deficit.

Finally, the issue of transparency. The budgets of modern economies are very complex, sometimes unnecessarily so. This complexity, partly unavoidable, partly artificially created, helps in various practices to “hide” the real balance (current and future) of costs and benefits for the taxpayers. Politicians have incentives to hide taxes, overemphasize the benefits of spending, and hide government liabilities (the equivalent of future taxes). At least two theoretical arguments support this claim. The first is the theory of “fiscal illusion” reviewed above. By taking advantage of voters’ irrational confusion, politicians can engage in strategic fiscal policy choices for reelection. The second argument does not rely on voters’ irrationality and confusion. Several papers, although in different contexts (e.g., Cukierman and Meltzer (1986); Alesina and Cukierman (1990)), highlight the benefit for policymakers of a certain amount of ambiguity even when they face a rational electorate. The idea is that, by creating confusion and, in particular, by making it less clear how policies translate into outcomes, policymakers can retain a strategic advantage versus rational, but not fully informed, voters. This advantage would disappear with “transparent” procedures; therefore, policymakers would often choose to adopt ambiguous procedures. Milesi-Ferretti (2004) shows that politicians who want to run excessive deficits would choose nontransparent procedures, and the latter would help them to achieve their (distorted) goals. As we discussed above, Rogoff and Sibert (1988) and Rogoff (1990) make a similar point in the context of political business cycle models. They show that if voters cannot easily observe the composition of the budget (on the spending or on the financing side), then policymakers can follow loose fiscal policies before elections and increase their chances of reappointment. Gavazza and Lizzeri

(2009) develop a model in which the lack of voters' information about the complexity of the budget lead to transfers to voters even when taxation is distortionary and voters are homogeneous. Transfers are financed with debt and the latter is higher the less transparent the system is, that is the less likely it is that voters can fully observe fiscal variables.⁴²

How, in reality, do policymakers obfuscate the budget? and what to do about it? In practice, a variety of tricks can serve the purpose of strategically influencing the beliefs and information of taxpayers/voters. For instance: (1) Overestimate the expected growth of the economy, so as to overestimate tax revenues, and underestimate the level of interest rates, so as to underestimate outlays. At the end of the fiscal year, the "unexpected" deficit can be attributed to unforeseen macroeconomic developments, for which the government can claim no responsibility; (2) Project overly optimistic forecasts of the effect on the budget of various policies, so that, for instance, a small new tax is forecast to have major revenue effects, thus postponing to the following budget the problem of a real adjustment; (3) Keep various items off budget; (4) Use budget projections strategically. For example, in all the discussions about future budgets, a key element is the "baseline." By inflating the baseline, politicians can claim to be fiscally conservative without having to create real costs for the constituencies. In this way, they create an illusion: they appear conservative in the eyes of the taxpayers, worried about the size of the budget, but they do not really hurt key constituencies with spending cuts. Clearly, this illusion cannot last forever, since adjustment, rigorous only relative to inflated baseline, in the end will not stop the growth of the debt. However, this procedure creates confusion and, at the very least, delays the electorate's realistic perception of the actual state of public finance; (5) Strategic use of multi-year budgeting. By announcing a, say, three-year adjustment plan in which all the hard policies occur in years two and three, politicians can look responsible and can buy time; then, they can revise the next three-year budget policies to further postpone the hard choices.⁴³

⁴²The same authors (Gavazza and Lizzeri (2011)) investigate how lack of transparency may lead to the choice of inefficient fiscal tolls for redistribution.

⁴³See Alesina, Favero and Giavazzi (2015) for a detailed study of multi-year fiscal adjustment plans.

We can think of three possibilities for increasing transparency. The first and most commonly followed is a “legalistic” approach. That is, more and more rules and regulations are imposed on how the budget should be prepared, organized, and executed. This approach is unlikely to be successful: complicated rules and regulations provide fertile ground for nontransparent budget procedures. A second alternative is to create legislative bodies in charge of evaluating the transparency, accuracy, and projections of the government budget. This approach is superior to the legalistic one, but it relies heavily on the political independence of this public body. This independence may be problematic, particularly in a parliamentary system where the government parties control a majority in the legislature. A third alternative, the most radical but the most effective, is to delegate to a respected private institution the task of verifying the accuracy and transparency of the budget process. In addition, the government budget should be based on an average of the economic forecasts of and projections derived by international organizations or private institutions.

2.10.2 Empirical evidence

The empirical evidence on the relationship between rules and deficit is, generally speaking, supportive of the idea that hierarchical institutions are associated with lower deficits. Hallerberg, Strauch and Von Hagen (2009), in a book which also summarizes and consolidates previous works by the same authors, classify budget institutions for the EU countries in terms of delegation of prerogatives to the Treasury minister versus a contracting approach within ministers, the presence of targets, voting rules in parliament, relationship between central and local governments. They argue that institutions matter and delegations and targets (i.e. hierarchical institutions) are effective at containing deficits and debts. Alesina, Perotti and Tavares (1998) and Stein, Talvi and Grisanti (1999) consider Latin America countries and construct an index of their budget institutions based upon surveys of local officials. In doing so they can distinguish up to a point between *de iure* and *de facto* procedures. These authors correlated positively an index of hierarchical of budget institutions and of transparency to lower levels of debt. Fabrizio and Mody (2006) obtain similar results for

Center and Eastern European countries. Dabla-Norris *et al.* (2010) on a vast sample of developing countries. These results should be taken very cautiously since they are based upon a handful of countries and often the classification of procedures is open to question. For instance, *de iure* and *de facto* procedures may differ substantially. Also comparing along those lines very different countries might be challenging, for instance think of a comparison of US versus parliamentary democracies budget institutions. Debrun *et al.* (2008) compile a detailed data set for European Union countries for the period 1990 to 2005. They consider numerical fiscal rules on any fiscal aggregate, their legal status (normal law, constitutional law, supranational rules, accepted norms) and consider both national and sub national governments. Based upon this vast data set they build an index of stringency of the rules and they find that it strongly correlates with fiscal performance. More stringent rules reduce a deficit bias and improves upon the countercyclical stance of fiscal policy in EU countries. Miano (2015) has shown that national rules have the effect of reducing deficits. A recent work at IMF (Budina *et al.* (2012)) provide extensive data on budget institutions for many countries and examine how the recent financial and fiscal crisis in many countries have led to reforms in budget institutions. These data have not been used yet for extensive empirical analysis.

2.11 Questions for future research

In this final section we elaborate on some issues which in our view are left open in this literature.

2.11.1 Endogenous institutions

The literature which we have reviewed thus far uses certain political institutions (e.g. type of government, electoral rules, presidential versus parliamentary systems) as exogenous or at least predetermined in explaining economic variables. In the present paper we focus on debt and deficits but a vast literature also considers other related variables like the size of government and the level of redistribution for instance.

The assumption of exogeneity of predetermined institutions as “cause” of deficits can however be called into question. The same historical, sociological, cultural variables which may have led to the choice of certain institutions may also be correlated with fiscal policies.⁴⁴ For instance, suppose that a parliamentary proportional system (generating a multiparty system with many veto players) was adopted because it was the only way to guarantee representation to very polarized and divided societies (across income, ideological, religious or ethnic lines). Those same characteristics of society might lead to certain choices of fiscal policies (spending, deficits, debt). Thus, proportional representation and deficits would correlate but causality is called into question. Along those lines, Alesina and Glaeser (2005) review the literature showing that in many European countries proportional representation was introduced after the First or Second World War under pressure from Socialist and Communist parties. The presence of the latter clearly is not exogenous to fiscal policy decisions. Aghion, Alesina and Trebbi (2004) discuss how certain types of voting rules would be chosen optimally or not (i.e. with or without a veil of ignorance) in divided societies.⁴⁵ Empirically, they show how ethnic fractionalization is correlated with various institutional variables. Galor and Klemp (2015, unpublished) present results along similar lines using different measures of diversity. On the other hand a vast literature on ethnic fractionalization (see the survey by Alesina and La Ferrara (2005)) show how the latter variable is correlated with several economic variables which may be directly or indirectly correlated with deficits and debt. Thus, diversity of populations may “cause” both institutions and fiscal outcomes. The correlation between the latter two does not imply causality, strictly speaking. Persson and Tabellini (2000) in their work on institutional determinants of fiscal policies are aware of this limitation and make some progress in addressing causality, but this remains an open question. The literature on fiscal policy which appeals to institutional variables as causal explanation for deviations from optimality (especially when thinking of long run horizons)

⁴⁴See Alesina and Giuliano (2015, forthcoming) for a discussion of the relationship between culture and institutions.

⁴⁵See also Trebbi, Aghion and Alesina (2008) for an application to US cities.

needs to make the extra step. At this point the correlations seem clear, identification of causality is not.

These arguments apply even more strongly when focusing specifically to budget institutions. The latter may work very differently in different countries depending upon their interaction with other features of the country itself. Hallerberg, Strauch and Von Hagen (2009) argue that delegations to the Treasury minister does not work well in countries with sharp differences in the preferences of different parties for fiscal policy, a result which is consistent also with the model of political delegation by Trebbi, Aghion and Alesina (2008). With a deep political conflict delegation to one decision maker is hard, undesirable by the minority and possibly counterproductive. Budget institutions are clearly endogenous. Why do countries choose different budget institutions and therefore to what extent the latter can be used as right hand side variables in a regression with debt and deficits on the left hand side? Countries with lower polarization and more homogeneous governments may be more likely to choose more hierarchical fiscal institutions, since delegation is easier, as argued above. But then it may be that the lower political conflict leads to more restrained fiscal policies; in this case, institutions are just an “intermediate” variable. In other words, paradoxically countries which needs stringent budget rules the least, since they have a lower tendency to run deficits, may be those which adopt more stringent budget rules. As noted by Hallerberg, Strauch and Von Hagen (2009), some institutional reforms in the direction of making them more hierarchical have followed deep crisis, like the case of Sweden in the nineties. But again, causality is an issue: perhaps changes in attitudes due to the crisis might have led to a political equilibrium with more fiscal restraints regardless of the institutions. It is virtually impossible to establish causality from budget institutions to fiscal outcomes, although the correlations are interesting. Debrun *et al.* (2008) are fully aware of this problem and attempt to instrument their index of stringency of rules with some institutional variables but the exclusionary restriction is highly questionable. Miano (2015) shows how the adopting of various budget institutions are endogenous to a host of sociopolitical variables and are affected by the timing of elections. Overall, the argument

that budget institutions “cause” fiscal discipline is virtually impossible to make empirically given the endogeneity of these institutions. Countries with a culture of fiscal profligacy will not adopt them (or will not enforce them) while countries with a culture of rigor will adopt and enforce them. The evidence presented above is consistent with a weaker argument namely that countries which, for whatever reason, cultural or otherwise, prefer budget discipline will be helped in their goal by choosing certain institutions rather than others. We think that we need more research on this point: to what extent institutions “cause” fiscal policies? Perhaps more natural experiment-based research may help address this question.

A second line of argument relates to the time consistency of institutional rules. To what extent institutional choices would be time consistent and not reversed as a result of various shocks? Halac and Yared (2014) address precisely this issue in a model where a government has an incentive to overspend. The government chooses a fiscal rule to trade off its desire to commit to not overspend against its desire to have the flexibility to react to shocks. These authors show that in the case of persistent shocks the *ex ante* optimal rule is not sequentially optimal. The optimal rule in fact is time dependent with large fiscal shocks leading to an erosion of future fiscal discipline. It would be very useful to investigate the choice of budget rules under a Rawlsian veil of ignorance at the constitutional table or in a situation in which the veil of ignorance has holes, as in related work by Trebbi, Aghion and Alesina (2008) on voting rules.

2.11.2 Culture

A rapidly growing literature has recently explored how various cultural traits affect economic decisions in a variety of dimensions including, savings, investment, trade, labor markets and the private or public provisions of safety networks and, more generally, growth and development.⁴⁶ Cultural traits like trust, relationship between family members (including intergenerational generosity), individualism, respect of the rules of laws, propensity

⁴⁶Guiso, Sapienza and Zingales (2006) and Alesina and Giuliano (2015, forthcoming) provide surveys of this literature.

to save and in which form, have been widely studied and their relevance for economic behavior is well established. Many of these attitudes are relevant for a society's acceptance of government deficits, including their intergenerational redistributive effects. Also the acceptability of policies geared towards reducing excessive deficits may be different in different cultural settings. For instance Guiso, Herrera and Morelli (2015, unpublished) investigate how cultural difference among Euro area countries may have led to the aggravation of conflict over debt policies and delayed resolutions of the latter. Cultural values certainly affect decisions about tax evasion,⁴⁷ another variables which clearly determines the accumulation of debt. While a relatively vast literature studies tax evasion, we are not aware of much work linking it to the accumulation of debt.⁴⁸

The connection between institutions and culture is important (Alesina and Giuliano (2015, forthcoming), Bisin and Verdier (2015, unpublished)). The adoption of certain budget institutions may be endogenous to certain cultural traits. Countries more prone to thriftiness (say Germany) may be more likely to adopt certain budget rules and institutions, others may do the opposite. In addition, the rigorous application of certain budget rules (say a balanced budget amendments) may be endogenous to certain cultural traits having to do, for instance with the social acceptability towards "bending the rules", which may vary greatly across countries.⁴⁹ Both cross-country and within-country evidence would be useful. The latter could hold constant national institutions and examine the effect of difference cultural attitudes within the same national institutions.

The control of politicians is also a "public good" which may be under supplied in certain cultures, as shown by Nannicini *et al.* (2012) who develop an intuition by Banfield (1958). When "social capital" is low, people do not feel compelled to participate in political activities, control politicians and punish the latter when they misbehave. In fact, with low social capital individuals may expect private favors rather than public goods. Politicians then feel

⁴⁷See Richardson (2008).

⁴⁸An exception on Italy is Alesina and Maré (1996) on Italy.

⁴⁹On this point see for instance Guiso, Sapienza and Zingales (2011), Tabellini (2010), and Guiso, Herrera and Morelli (2015, unpublished).

more free to exert less effort, be self-motivated or corrupt. Less control by voters may also allow powerful lobbies to have easier access to politicians. For instance, Campante and Do (2014) show that more isolated capital cities show more levels of corruption and are associated with a greater role for money in state-level elections. In particular, firms and individuals contribute disproportionately more compared to non-isolated capital cities. Thus, lower social capital may be associated with more political distortions and rent seeking of policymakers which may aggravate the deficit bias problem.

2.11.3 Delegation

In the case of monetary policy the benefit of delegation to an independent (up to a point) agency is widely accepted. For fiscal policy this kind of delegation is virtually non-existent. The question is why and whether some delegation in fiscal policy (and how and to whom) might be useful.

The fundamental reason why delegation of an independent agency in monetary policy is more acceptable than fiscal policy goes back to where we started in this paper. Fiscal policy is perceived as much more closely linked to redistributions of various type than monetary policy. In the case of the latter, instead a policy based upon some form of Taylor rule is (at least in normal times) considered as beneficial for society as a whole and redistributions issues may eventually be corrected by fiscal policy (say unemployment benefits during a recession). Alesina and Tabellini (2007) and Alesina, Tabellini and Campante (2008) discuss issues of delegation and show results consistent with this argument: delegation is much less agreed upon when it involves redistribution while it is easier to achieve for more technical questions (say the conduct of monetary policy) with less direct distributional consequences.⁵⁰ Blinder (1997) argues that even aspects of fiscal policies may benefit from some delegation. He notes that the benefits of Central Bank independence derive from the technical nature of the task, the long term effects of certain decisions, the desire to delegate

⁵⁰Petterson-Lidbom (2012) discuss evidence on legislature and bureaucratic relationship as a determinant of the size of government using two natural experiments.

to bureaucrats through choices when needed (say creating unemployment to fight inflation and diffuse the blame away from politicians) and the tendency of policymakers to inflate too much, possibly close to elections. This author correctly notes how many of these features apply also to certain fiscal policy decisions, especially in the case of tax policy. During the financial crisis the close connections between monetary and fiscal policy (immortalized by the dramatic joint appearance of Henry Paulson and Ben Bernanke in front of Congress at the outset of the crisis) also made the sharp distinction between independent central banks and totally “political” governments even more striking and possibly artificial.

An intermediate step which does not imply delegation can be to create an independent fiscal council which examines the fiscal policy of the government and expresses an evaluation in terms of its short and long run effects and its technical problems. In the US, the Congressional Budget Office with a reputation of skills and independence has this role. In Sweden a highly respected fiscal council issues an influential document every year to review the policy of the Swedish government. In the matter of delegation, even to a Council, probably cultural variables examined above play a role. In countries with high level of trust, delegation is easier and the independence of, say, a fiscal council would be (correctly) believed. This might be precisely the case of Sweden. In countries with low levels of trust (say Italy, Spain, or France), the independence of the council would not be believed, and this skepticism might not be unreasonable. Thus, the status of the council would be compromised and it would be viewed as politically influenced and would lose its legitimacy and its potentially useful role. This is another example of the interaction between institutions and culture discussed above. What and how to delegate in the area of fiscal policy remains an excellent topic of research.

2.11.4 Lobbyist and bureaucrats

The role of the bureaucracy in the implementation of the budget is hardly studied by economists.⁵¹ Highly ranked bureaucrats may have an influence which goes well beyond the implementation of executive decisions. Thus, even without any formal delegation (discussed above) highly ranked bureaucrats when applying the fiscal provisions of the budget may have sufficient discretion to favor this or that pressure groups. Up to a point this may be a sort of “unwanted” delegation, that is a delegation which *de facto* but not *de iure* has the bureaucracy gains. This may increase the difficulty in implementing reforms because of a status quo preferences of existing bureaucratic bodies.

Finally, virtually all of the models we have considered model the polity by means of voting. A different view about the political process sees voting in legislatures simply as a result of lobbying pressure and therefore modeling lobbies’ behavior is the fundamental step. While a rich literature on lobbies exist (see Grossman and Helpman (2008)), especially with regard to trade issues, we are not aware of lobbying models related to optimal debt management. Lobbyist and bureaucrats may be connected because the former may have access to the latter and may obtain favors in the implementation of various fiscal measures. This is especially the case when budget procedures and prescriptions are sufficiently opaque so as to guarantee a *de facto* discretion of bureaucrats. In turn, this lack of transparency may be strategically preserved precisely to allow for such pressures from lobbyist, with the related gains for policymakers. Linking the lobbying literature to government debt is an excellent topic of research.

2.11.5 Empirical work

Much of the politico-economic literature reviewed above is theoretical. We think that there are high payoff in empirical research. Probably cross-country regressions have exhausted what they can teach us in most (but necessarily all) cases. Other tools are available. One is of

⁵¹See Bertrand *et al.* (2015, unpublished) and Graton *et al.* (2015, unpublished) for some recent work on the bureaucracy in India and Italy respectively.

course dynamic general equilibrium models where one could introduce political constraints or distortions and quantify their effects. A good example of this type of empirical work is the paper by Azzimonti, Battaglini and Coate (2015) on the balanced budget rule reviewed above. At the opposite extreme of methodology one can think of historical case studies which would be especially helped by “natural experiment”. For instance, imagine natural experiments which imply institutional changes (or other kind of changes) which can be considered relatively exogenous to fiscal policy. These studies may help address the question of endogeneity emphasized above. The use of historical evidence with time period spanning over institutional changes can be especially useful.

Within-country studies can also be helpful. Imagine a situation in which different localities within a country display very different policy stance regarding deficits. These studies may shed some light on determinants of deficits, holding institutions constant. Evidence on localities is useful for two reasons. One because local public finance is important and interesting per se. Second, because, holding constant national institutions, we can investigate variations in other determinants of deficits. Much of this type of research is on US localities. Thus, there is room for work on other countries.

Another dimension in which progresses could be made is in the disaggregation of fiscal variables. Most of the literature refers to government spending, taxes and debt, without distinguishing within these broad categories. This is true (with few exceptions) both for the macro literature on fiscal policy and for the political economy literature. There is much unexplored territory here.

Chapter 3

Zombie Politics:

The Effect of Electoral cycles on

Zombie Lending¹

3.1 Introduction

There is a growing interest, especially after the financial crisis, in understanding the potential factors affecting banks' lending activity. One strand of the literature has focused on the quality of banks, i.e. their level of capitalization, and the role of zombie firms. Zombie firms are firms that are almost insolvent but are kept alive by the banks. The idea is that banks are not willing to write losses in their balance sheets which would force them to raise new capital, and thus they keep rolling their loan. Thus, according to this literature zombie lending is driven by undercapitalized banks' incentive (Peek and Rosengren, 2005; Caballero *et al.*, 2008;). In this paper we study another potential reason, namely political influence by local politicians. Zombie firms are usually large and strategically important for the local economy. By keeping them alive, a local politician who is running for election can secure electoral votes. Specifically, we ask the following question: do political cycles

¹Co-authored with Giovanni Soggia.

cause zombie lending? To study this question we focus on the lending activity of banks to zombie firms around the election years. To answer this question we combine a dataset from different sources. Specifically, we hand-collect data on local elections from the Italian ministry of internal affairs. This dataset covers about 8,600 elections at the municipal level, covering about 6,549 different municipalities over the years 2010-2018. We merge this information with data on banks' balance sheets from the Supervisory Reports, the universe of loans granted to Italian firms from the Credit Register, data on banks' corporate bodies, information on firms' balance sheets and income statements, and finally with data on employment and local economic activity indicators from the National Institute for Social Security INPS and the National Institute of Statistics ISTAT. Our main empirical model is a Difference-in-Difference model comparing lending to zombie vs. non-zombie firms across municipalities and years.

We find three main results. First, we confirm the evidence of a positive relation between electoral cycle and lending activity at the municipality level. Specifically, a municipality experiencing an election year has an increase in the growth rate of credit by 1.7%.

Second, by looking at the firm-level we shed light on the positive relation of zombie lending and electoral cycles. To identify firms as zombie we follow the literature Schivardi *et al.*, 2019 considering the degree of financial leverage of a firm (which affects its default risk) as well as its profitability. We find that zombie firms benefit from election years. We confirm the results by looking at close race elections, i.e. those in which the margin of victory is very small. These are the type of elections in which the marginal benefit would be the highest. We also find that the results are driven by local banks and less so by national banks.

Third, we do not find evidence on observable rewards for the local politicians. Specifically, we find no effect during election years on employment at zombie firms. However, it may be the case that politicians are obtaining private rewards not visible to the econometrician.

This paper contributes to three strands of the literature. First, the effect of the electoral cycle on lending activity. Previous works either perform cross-country analysis (e.g. Kern

and Amri, 2019) or they focus on the role of government-owned banks (e.g. Cole, 2009; Carvalho, 2014; Englmaier and Stowasser, 2017) or both (e.g. Dinç, 2005). We provide evidence that there is a positive relation also within a country that does not have any government-owned banks. Second, the literature on zombie lending. Previous works show that zombie lending is driven by undercapitalized banks (Peek and Rosengren, 2005; Caballero *et al.*, 2008;) and have negative implications for the real economy (Giannetti and Simonov, 2013; Acharya *et al.*, 2019b; Blattner *et al.*, 2017; Banerjee and Hofmann, 2018; Passalacqua *et al.*, 2020). We show that the electoral cycle can also predict zombie lending dynamics and the effect is driven by local banks. Third, the literature on politically connected firms (Akcigit *et al.*, 2018; Faccio, 2006)

3.2 Data

For our analysis we leverage a high quality dataset from multiple sources. We combine data on credit, banks, firms, municipality and elections. The datasets are described below and further details can be found in Appendix. The final sample consists of a panel data from 2012 to 2018. The level of observation can be either at the municipality level or at the firm level.

3.2.1 Data on Elections

The data on elections come from the website of the *Ministero per gli Affari Interni e Territoriali*.² It includes all the elections, divided by type, that took place in the last year. There are different types of elections: 1. for the Senate; 2. for the chamber of representatives; 3. for the regional board members; 4. for the municipality board members (including the elections of the mayor). For the purpose of our analysis we focus only on local elections, i.e. elections at the municipality level for the election of the mayor. The reason behind this decision is given by the fact that local elections are most likely to play an important role in affecting decisions

²It is publicly available and can be downloaded from the following link: <https://elezionistorico.interno.gov.it/>.

of local firms. In other words, it is easier to map political influence in the form of increased lending to zombie firms at the local level. For our analysis we collect data on elections from 2010-2018. In our sample we cover 8,600 elections at the municipal level, covering about 6,549 different municipalities. In our sample we follow 29% of the municipalities for at least two elections. Local elections are in general held every 5 years except in special circumstances (i.e. for instance the local government is disbanded prematurely).

3.2.2 Information on Firms

We collect detailed information on balance sheets, income statements, and registry variables from the Cerved dataset. This dataset is collected by the CERVED group SpA and contains information on the universe of only incorporated businesses (i.e. limited liability companies), but not sole proprietorship and other-non incorporated firms. Information is collected yearly and thus the unit of observation is firm-year. As highlighted by Lenzu and Manaresi (2017) compared to other popular publicly available datasets (such as Orbis and Amadeus by Bureau van Dijk) CERVED has the advantage of having no selection bias, no issues with merging different vintages, and a substantially richer set of balance sheet, income statement, and registry variables. The drawback is that it does not include very small firms. Each firm has its unique identifier (i.e. tax identifier) which allows us to link the balance sheet data to the credit data.

3.2.3 Information on Credit

We use granular data at the loan level obtained from the Italian Credit Registry. This dataset is collected by the Bank of Italy and contains detailed information on credit exposure for all non-financial borrowers and for all the loans granted above €30,000 euros. Loans are divided into different technical forms. Specifically there are three main loan facilities: revocable credit lines, term loans and loans backed by account receivables (LBR). Following the literature on credit supply shocks (Khwaja and Mian, 2008; Schivardi, Sette, and Tabellini, 2017; Bottero, Lenzu, and Mezzanotti, 2018) we consider granted loans instead of

outstanding loans. Additionally we have information on whether the loan is becoming non performing and its amount. Contrary to performing loans, we do observe the universe of loans that become non performing (NPL). We also have information on whether the loan is backed by collateral.

3.2.4 Information on municipalities

We augment the dataset with information on the municipality such as median income, population, GDP growth, level of education, level of social capital. This dataset is obtained from ISTAT (*Italian National Institute of Statistics*).

3.2.5 Definition of Zombie firms

We follow the literature and identify as zombies those firms that match two critical conditions. First, their profitability is very low and in particular so low that they are unable to cover the interest payments on loans. Second, zombies firms receive favorable interest rates on their loans from their banks (Caballero *et al.* (2008)). Our definition of zombie firms follow Schivardi *et al.* (2019). From a lender's perspective to identify the optimal interest rate, both the debtor's expected profits conditional on surviving and default risk matter, since both determine the expected return on the loan. We define profitability as return on assets, defined as Earnings Before Interest and Taxes - EBIT - over total assets. To control for fluctuations over time as well as to identify the long-term trend of profitability, we consider the average of EBIT over total assets in the last three years. To identify those firms that get favorable interest rates on loan, we compare our measure of profitability to the cost of capital for the safest borrowers in the sample. We obtain the latter by considering the average interest rate in the previous three years that is charged on new term loans granted to the safest company. We call this interest rate the PRIME interest rate. We identify the safest firms as those that are rated 1 or 2 by the Italian credit agency.³ We take into account default risk by considering the degree of leverage of each firm. The idea is that highly

³The credit score ranges from 1-2, which means safest, to 9, which riskiest.

leveraged firms are more at risk of default and therefore a bank is less likely to extend to them a new loan. We define leverage as total financial debt over total assets.⁴ We divide the sample of firms into high and low leveraged if their average leverage during 2008-2010 is above or below the median. We define a firm as zombie if its profitability is below the PRIME rate *and* it is high leveraged. Note we identify the set of zombie firms based on the years 2008-2010 and follow them over the years 2011-2018. That is, we keep the group fixed over time. According to this definition we identify about 13% of firms that are zombies. The total sample include about 560,000 firms.

Table 3.1 provides some descriptive statistics of the two set of firms.

Table 3.1: *Descriptive statistics*

	Zombie firm=0				
	mean	sd	p50	p25	p75
Total assets	5430.882	216387.858	697.000	280.333	1981.333
leverage	0.611	1.037	0.550	0.367	0.745
Liquidity ratio	0.109	0.139	0.055	0.017	0.146
Return on Assets	-0.026	358.521	3.243	-1.900	8.123
Wage bills	686.453	9453.445	141.000	53.333	368.000
Revenues	5164.357	120013.374	753.000	307.667	2060.333
Fixed assets/Total Assets	0.202	0.221	0.114	0.040	0.292
	Zombie firm=1				
	mean	sd	p50	p25	p75
Total assets	5089.222	38667.317	1041.000	410.333	2938.333
Leverage	0.621	0.325	0.627	0.462	0.768
Liquidity ratio	0.059	0.090	0.026	0.008	0.071
Return on assets	-0.456	691.306	4.645	2.737	7.320
Wage bills	522.069	3129.074	140.500	52.333	366.000
Revenues	4401.510	34845.457	878.000	358.000	2426.500
Fixed assets/Total Assets	0.249	0.250	0.155	0.046	0.390

Notes: Table 3.1 shows descriptive statistics for firms in our sample. All variables are measured considering the average between 2008 and 2010. Liquidity ratio is the ratio between liquidity over total assets. Leverage is the ratio between total financial debts over total assets

⁴Financial debt does not include debt towards shareholders.

3.3 Empirical Evidence

3.3.1 Elections and lending activity

We start our analysis by looking at whether political cycles affect lending activity. While there are several papers that uncover this positive relationship between electoral cycles and lending activity across countries (Dinç, 2005; Kern and Amri, 2019), there is little evidence within-country. To uncover this relationship, we employ a municipality-level analysis using the following empirical model:

$$\Delta \log(\text{total credit}) = \alpha_i + \gamma_b + \eta_{mt} + \phi X_{mt} \text{Municipality controls} + \beta \text{Electoral year}_{mt} + \epsilon_{mt} \quad (3.1)$$

where m , p , and t refer to municipality, province and year. y_{mt} is the growth rate of credit, and $\text{Election year}_{mt}$ is a dummy variable that takes value 1 if municipality m has an election in year t . We include municipality fixed effects α_m , province-year fixed effects δ_{pt} as well as time-variant controls X_{mt} at the municipality levels. These are population, median income, unemployment rate. Standard errors are clustered at the municipality-year level. β is our coefficient of interest which consider the effect of experiencing an election year on the credit growth at the municipal level.

Table 3.2 shows the results of the analysis. We find a positive correlation between change in the growth rate of credit and election years. This is true even when controlling for specific time trend at the municipality level (i.e. including municipality-year fixed effects). In our preferred specification we find that municipalities that experience an election year have a positive change in the growth rate of new credit commitments by 1.7%. This result is statistically significant at the 95%.

While this result gives us a first evidence of this credit cycle during electoral times, our results does not give us any evidence on the role of zombie lending. To tackle this question and see whether zombie lending is more prominent during election years we move to a loan level analysis.

Table 3.2: *Municipality-level analysis*

VARIABLES	$\Delta \log(\text{credit})$		
	(1)	(2)	(3)
Election year	0.010* (0.006)	0.011* (0.006)	0.017** (0.007)
Observations	40,471	40,471	40,471
R-squared	0.209	0.218	0.349
Municipality FE	Y	Y	Y
Year FE	Y	N	Y
Province-Year FE	N	Y	N
Municipality controls	N	N	Y
Cluster	M-Y	M-Y	M-Y

Notes: Table 3.2 shows the results of the following regression: $\Delta \log(\text{credit}) = \alpha_i + \gamma_b + \eta_{mt} + \phi X_{mt} + \beta \text{Electoral year}_{mt} + \epsilon_{mt}$. Standard errors are clustered at the municipality-year level.

3.3.2 Zombie lending during electoral cycles

This subsection provides evidence on the effect of zombie lending during electoral cycles. To uncover the effect of the electoral cycle on zombie lending we move to a firm-level analysis. We find that electoral cycles positively affect lending to zombie firms.

We construct a new dataset at the firm level where we collapse all the loans obtained by firm i in a particular year t from any bank. To study the effect of election year on zombie lending we include also our variable identifying whether a firm is zombie. Specifically, we consider the following empirical model:

$$\begin{aligned} \Delta \log(\text{total credit}) = & \alpha_i + \delta_m + \phi_t + \eta X_{mt} + \beta_1 \text{Election Year}_{mt} + \\ & + \beta_2 \text{Election Year}_{mt} \times \text{Zombie Firm}_{im} + \epsilon_{imt} \end{aligned} \quad (3.2)$$

where i, m and t define respectively firm, municipality and year. Our outcome variable is $\Delta \log(\text{total credit})$ which defines the growth rate of credit. $\text{Election year}_{mt}$ is a dummy variable that takes value 1 if municipality m has an election in year t . We include municipality fixed effects α_m , province-year fixed effects δ_{pt} as well as time-variant controls X_{mt} at the

municipality levels. These are population, median income, unemployment rate. Standard errors are clustered at the municipality-year (M-Y) level.

Table 3.3: Firm Level

VARIABLES	$\Delta \log(\text{credit})$				
	(1)	(2)	(3)	(4)	(5)
Election year	0.053** (0.025)	0.053** (0.025)	0.035 (0.028)	0.035 (0.028)	0.035 (0.027)
Election year \times Zombie firm			0.072** (0.035)	0.072** (0.035)	0.070** (0.036)
$\beta_1 + \beta_2 = 0$			p=0.001	p=0.001	p=0.001
Observations	1,423,641	1,423,641	1,423,641	1,423,641	1,423,641
R-squared	0.145	0.215	0.225	0.245	0.255
Firm	Y	Y	Y	Y	Y
Year	Y	Y	Y	Y	Y
Municipality	Y	Y	Y	Y	Y
Industry	N	Y	N	N	Y
Cluster	M-Y	M-Y	M-Y	M-Y	M-Y

Notes: Table 3.3 shows the results of the following regression: $\Delta \log(\text{total credit}) = \alpha_i + \delta_m + \phi_t + \eta X_{mt} + \beta_1 \text{Election Year}_{mt} + \beta_2 \text{Election Year}_{mt} \times \text{Zombie Firm}_{im} + \epsilon_{imt}$. Standard errors are clustered at the municipality-year (M-Y) level.

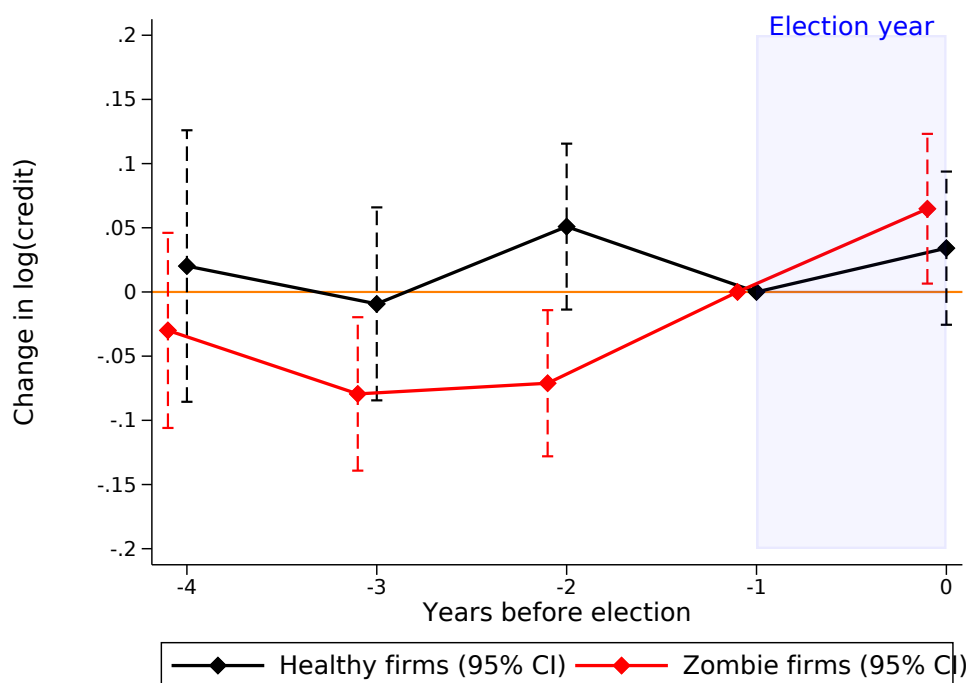
Table 3.3 shows the results of equation 3.6. In column (1) and (2) we confirm that results found in table 3.2, namely a positive relationship between election year and credit growth rate. This result is robust to the inclusion of firm, year, municipality and industry fixed effects. In column (3)-(5) we add the interaction with the dummy variable zombie firm. We shed light on a very interesting result: by adding this interaction term to the equation we find that only the coefficient on the interaction is positive and statistically significant.

Dynamic over the electoral cycle

To study the evolution of the lending activity to zombie vs non-zombie firms over the electoral cycle we run the following model for each of the two groups:

$$y_{mt} = \alpha_i + \delta_m + \delta_{pt} + \eta X_{mt} + \beta_{-4} S_{mt}^{-4} + \beta_{-3} S_{mt}^{-3} + \beta_{-2} S_{mt}^{-2} + \beta_{-1} S_{mt}^{-1} + \eta X_{mt} + \epsilon_{mt} \quad (3.3)$$

Figure 3.1: Electoral cycle



Notes: This figure shows the results of the following regression: $\Delta \log(\text{credit line}) = \alpha_i + \delta_m + \delta_{pt} + \eta X_{mt} + \beta_{-4} S_{mt}^{-4} + \beta_{-3} S_{mt}^{-3} + \beta_{-2} S_{mt}^{-2} + \beta_{-1} S_{mt}^{-1} + \eta X_{mt} + \epsilon_{mt}$. The outcome variable is $\Delta \log(\text{credit line})$ and represents the credit growth rate. We cluster the standard errors at the municipality-year level.

where S_{mt}^{-j} with $j = -4, -3, -2, -1, 0$ are time dummy variables indicating the year in the electoral cycle.⁵

Figure 3.1 show the dynamics over the electoral cycle. We find that lending to zombie firms is negative before the election year and becomes positive the year of the election.

Heterogeneous effect across industries

Table B.1 in the Appendix shed lights on which industries are mostly affected by the electoral cycle. We find evidence that zombie lending during the electoral year is mostly driven by the construction, and wholesale and retail trade industry.

⁵In general elections are hold every 5 years.

3.3.3 Mechanism: evidence from close race elections

To give more credit to the story that the boom in lending during electoral years is driven by the local politicians' incentives to increase their electoral support we look at the set of close race elections. Close race elections are those in which the margin of victory is small. If politicians use this mean to increase support we should find a strong result on the credit growth to firms in this subsample.

We consider the following empirical model:

$$\begin{aligned} \Delta \log(\text{credit}) = & \alpha_i + \phi_t + \delta_m + \eta X_{mt} + \beta_1 \text{Election Year}_{mt} + \beta_2 \text{Election Year}_{mt} \times \text{Zombie Firm}_{im} \\ & + \beta_3 MV_j + \beta_4 \text{Election Year}_{mt} \times MV_j + \beta_5 \text{Zombie Firm}_{im} \times MV_j \\ & + \beta_6 \text{Election Year}_{mt} \times \text{Zombie Firm}_{im} \times MV_j + \epsilon_{imt} \end{aligned} \quad (3.4)$$

where compared to previous models we include also the dummy variable MV_j which identifies whether an election is a close race or not. We consider different thresholds of margin of victory, i.e. 1%, 5%, 10%, 15%, 20%.

Table 3.4 reports the results of the regressions. Two results are worth mentioning. First, we confirm that there is an overall positive effect on zombie lending during election years. Across all the specifications, the coefficient on the interaction $\text{Election Year}_{mt} \times \text{Zombie Firm}_{im}$ is positive and statistically significant. Second, the triple interaction $\text{Election Year}_{mt} \times \text{Zombie Firm}_{im} \times MV_j$ is positive and statistically significant considering some threshold, i.e. $MV = 5\%$ and $MV = 10\%$.⁶

3.3.4 Political influence through banks: National vs. Local Banks

This section provides evidence that the credit boom to zombie firms during electoral years is driven by local banks.

To study which banks are involved in the zombie lending, we consider a dataset at the

⁶There are very few data points regarding close elections for which the margin of victory is 1%.

Table 3.4: Firm Level: Close race

VARIABLES	$\Delta \log(\text{credit})$				
	Close Race Elections			(4) MV=15%	(5) MV=20%
	(1) MV=1%	(2) MV=5%	(3) MV=10%		
Election year \times Zombie firm	0.067* (0.036)	0.103** (0.041)	0.114*** (0.043)	0.090** (0.039)	0.090** (0.039)
Election year \times Zombie firm \times MV _j	0.034 (0.177)	0.111* (0.059)	0.138** (0.061)	0.044 (0.073)	0.044 (0.073)
Observations	1,572	1,572	1,572	1,572	1,572
R-squared	0.250	0.251	0.251	0.250	0.250
Firm	Y	Y	Y	Y	Y
Year	Y	Y	Y	Y	Y
Municipality	Y	Y	Y	Y	Y
Cluster	M-Y	M-Y	M-Y	M-Y	M-Y

Notes: Table 3.4 reports the results of the following regression: $\Delta \log(\text{credit}) = \alpha_i + \delta_m + \eta X_t + \beta_1 \text{Election Year}_{mt} + \beta_2 \text{Election Year}_{mt} \times \text{Zombie Firm}_{im} + \beta_3 \text{MV}_j + \beta_4 \text{Election Year}_{mt} \times \text{MV}_j + \beta_5 \text{Zombie Firm}_{im} \times \text{MV}_j + \beta_6 \text{Election Year}_{mt} \times \text{Firm}_{im} \times \text{MV}_j \epsilon_{imt}$. We follow the literature and consider an election to be a close race if $\text{MV} < 15\%$. Standard errors are clustered at the Municipality-Year (M-Y) level.

loan level tracking the type of firms as well as banks. We construct a dummy variable *Local Bank* that identifies those banks that are involved in the lending activity only in a specific geographical area. We identify in this group Mutual banks that by law have to operate only in a specific area. Passalacqua *et al.* (2020) show that these banks are small but extremely risky, the share of NPL is relatively high compared to the other type of banks. The fact that these banks are lending locally makes them the perfect target to use political influence at the municipality level.

To test this potential hypothesis we employ the following empirical model:

$$\begin{aligned}
\Delta \log(\text{credit})_{ibmt} = & \alpha_i + \delta_m + \phi_t + \gamma_b + \eta X_t + \beta_1 \text{Election Year}_{mt} + \\
& \beta_2 \text{Election Year}_{mt} \times \text{Zombie Firm}_{im} + \beta_3 \text{Local Bank}_b + \\
& \beta_4 \text{Election Year}_{mt} \times \text{Local Bank}_b + \beta_5 \text{Zombie Firm}_{im} \times \text{Local Bank}_b \\
& + \beta_6 \text{Election Year}_{mt} \times \text{Zombie Firm}_{im} \times \text{Local Bank}_b + \epsilon_{ibmt} \quad (3.5)
\end{aligned}$$

Table 3.5: National and Local banks

VARIABLES	$\Delta \log(\text{credit})$			
	(1)	(2)	(3)	(4)
Election year	-0.002 (0.004)	0.002 (0.004)	-0.018 (0.122)	-0.019 (0.122)
Election year \times Local bank	0.051*** (0.006)	0.048*** (0.006)	0.047*** (0.006)	0.047*** (0.006)
Zombie Firm \times Election year		0.009*** (0.003)	0.011*** (0.003)	0.011*** (0.003)
Zombie Firm \times Local bank		0.006** (0.002)	0.005** (0.002)	0.005** (0.002)
Election year \times Local bank \times Zombie Firm		0.013** (0.006)	0.012* (0.006)	0.012* (0.006)
Observations	4,648,676	4,648,676	4,646,403	4,646,403
R-squared	0.168	0.168	0.179	0.210
Firm	Y	Y	Y	Y
Bank	Y	Y	Y	Y
Year	Y	Y	N	Y
Municipality	Y	Y	N	Y
Municipality-Year	N	N	Y	N
Industry	Y	N	N	Y
Cluster	M-Y	M-Y	M-Y	M-Y

Notes: Table 3.5 reports the results of the following regression: $\Delta \log(\text{credit})_{ibmt} = \alpha_i + \delta_m + \phi_t + \gamma_b + \eta X_{mt} + \beta_1 \text{Election Year}_{mt} + \beta_2 \text{Election Year}_{mt} \times \text{Zombie Firm}_{im} + \beta_3 \text{Local Bank}_b + \beta_4 \text{Election Year}_{mt} \times \text{Local Bank}_b + \beta_5 \text{Zombie Firm}_{im} \times \text{Local Bank}_b + \beta_6 \text{Election Year}_{mt} \times \text{Zombie Firm}_{im} \times \text{Local Bank}_b + \epsilon_{ibmt}$. Standard errors are clustered at the Municipality-Year (M-Y) level.

Table 3.5 show the results of equation 3.5. In column (1) we show that local banks are the institutions driving the credit expansion during election years. By including also interaction terms with the dummy Zombie firm we find that the coefficient on the triple interaction $\text{Election Year}_{mt} \times \text{Zombie Firm}_{im} \times \text{Local Bank}_b$ is positive and statistically significant. This result is robust by adding a set of fixed effects. In column (2) we include firm, bank, year, and municipality fixed effects. In column (3) we include municipality-year fixed effects, while in column (4) we add industry fixed effects.

Overall, we find evidence on a positive relationship between zombie lending and electoral years. The result is most prominent in close race elections where the marginal benefit of doing so is higher in terms of electoral support. We also find that the results are driven by local banks.

3.3.5 What are the rewards for politicians?

In this section we try to identify what are the potential rewards for politicians in boosting zombie lending.⁷

We test the hypothesis that credit expansion to zombie firms is aimed at increasing employment. By influencing banks, and ultimately positively affecting employment in the local economy, politicians can secure more votes during the election year (or as a reward to those votes).

To test this idea we consider the same model as in equation 3.6, but now we use as dependent variable $\log(\text{Employment})$. Specifically, we employ the following model:

$$y_{imt} = \alpha_i + \delta_m + \phi_t + \eta X_{mt} + \beta_1 \text{Election period}_{mt} + \beta_2 \text{Election period}_{mt} \times \text{Zombie Firm}_{im} + \epsilon_{imt} \quad (3.6)$$

where the outcome variable is either $\Delta \log(\text{employment})$ or $\log(\text{employment})$. $\text{Election period}_{mt}$ is a dummy variable taking value 1 if the year is the election year, or the year after. i, m and t define respectively firm, municipality and year. We include municipality fixed effects α_m , province-year fixed effects δ_{pt} as well as time-variant controls X_{mt} at the municipality levels. These are population, median income, unemployment rate. Standard errors are clustered at the municipality-year level.

Table 3.6 show the results. We find a positive effect on employment at zombie firms. However, the results are not statistically significant.

⁷3.3.3 gives already a first evidence that in those elections in which the margin of victory is small zombie lending is more important.

Table 3.6: Firm-level Employment

VARIABLES	$\log(\text{Employment})$		$\Delta\log(\text{Employment})$	
	(1)	(2)	(3)	(4)
Election period	-0.008 (0.027)	-0.009 (0.027)	0.012 (0.024)	0.011 (0.024)
Election period \times Zombie firm	0.023 (0.037)	0.024 (0.037)	0.077 (0.056)	0.078 (0.056)
Observations	2,292,432	2,292,432	1,837,833	1,837,833
R-squared	0.892	0.892	0.215	0.215
Firm	Y	Y	Y	Y
Year	Y	Y	Y	Y
Municipality	Y	Y	Y	Y
Industry	N	Y	N	Y
Cluster	M-Y	M-Y	M-Y	M-Y

Notes: Table 3.6 reports the results of the following regression: $y_{imt} = \alpha_i + \delta_m + \phi_t + \eta X_{mt} + \beta_1 \text{Election period}_{mt} + \beta_2 \text{Election period}_{mt} \times \text{Zombie Firm}_{im} + \epsilon_{imt}$. Standard errors are clustered at the municipality-year (M-Y) level.

3.4 Conclusion

This paper shed light on the relation of zombie lending and electoral cycle. While most of previous works focus on the role of undercapitalized banks in lending to unviable firms, we consider another potential reason: political influence. Local politicians use their political power to keep these firms alive. These firms are important for the local economy and thus politicians hope to increase the electoral consensus as a reward. We find evidence of this relationship especially in municipalities in which there is a close race election, i.e. the margin of victory is small. Especially in these circumstances the marginal benefit of supporting zombie lending may outweigh the potential costs. We find that local banks are those more likely to undertake zombie lending during electoral years. This is in line with the idea that local politicians have more traction among these banks compared to national banks.

We study potential reward for politicians. We find no evidence of an increase of employment in zombie firms among the election years. However, we cannot rule out that politicians may obtain private benefits that are not observable by the econometrician. In the

future we will try to shed more light on this last point.

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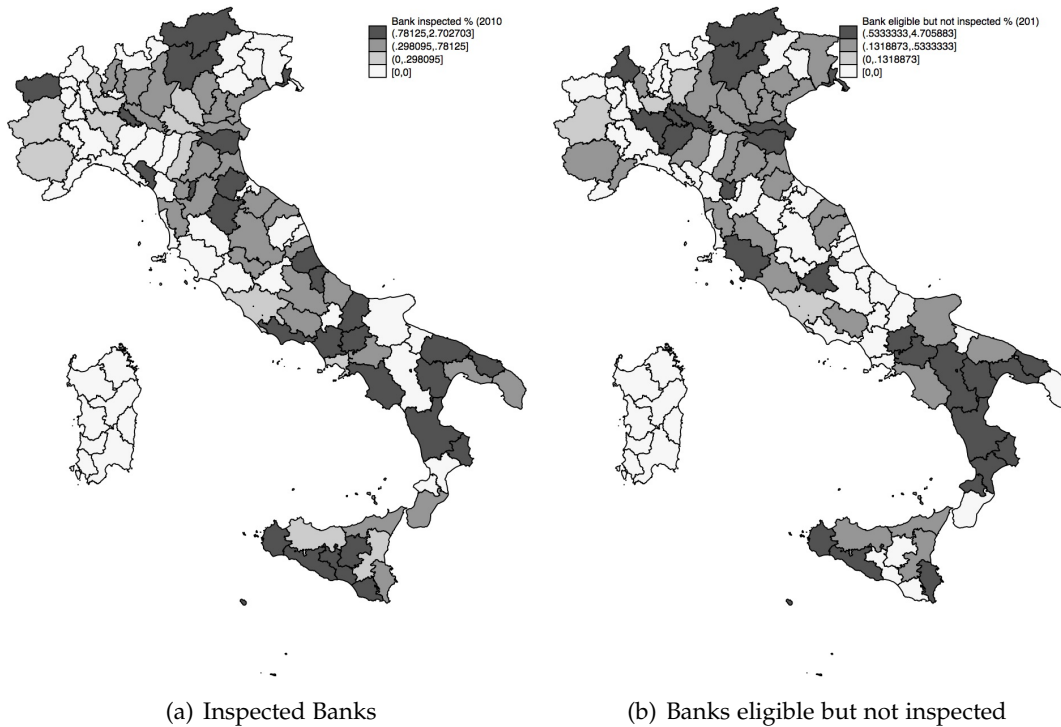
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Appendix A

Appendix to Chapter 1

A.1 Supplementary Tables and Figures

Figure A.1: 2010 Inspection Plan



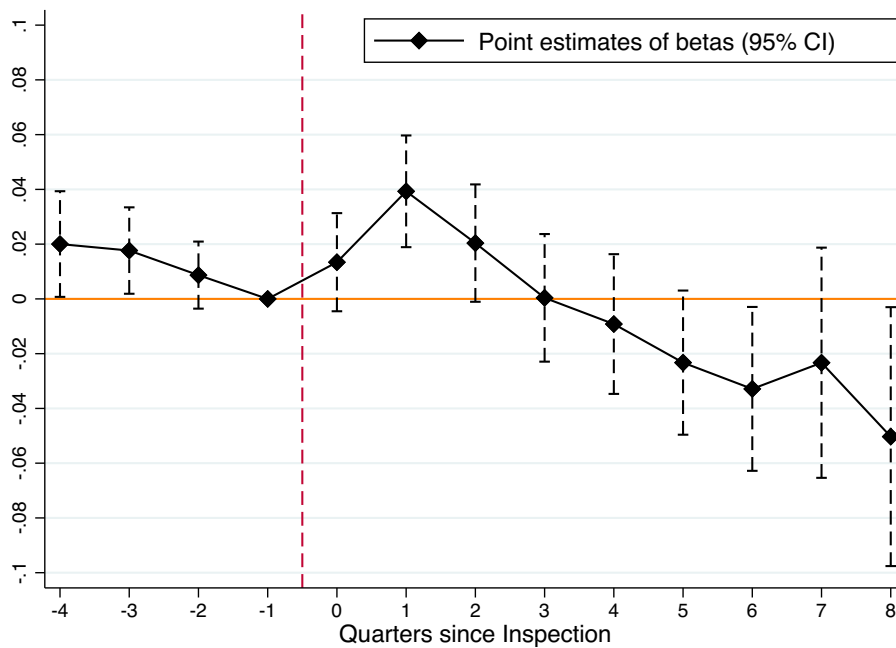
Notes: This figure shows the spatial distribution of Inspected (Treated group) and Eligible but not inspected banks (Control group) relative to the 2010 inspection plan. Panel **A**. shows the distribution of Inspected banks. Panel **B**. shows the distribution of Eligible but not inspected banks. Borders define provinces. A province has roughly the same size of a US county. For each province we compute the relative shares of branches belonging to either the treated or control group. The denominator is the total number of branches in that province on December 31 of the year before the inspection plan. Note the total includes also branches of banks that are not in any of the two groups (i.e. ineligible banks). The share is multiplied by 100.

Figure A.2: *Distribution of Banks according to their Legal Form - Type of Credit*



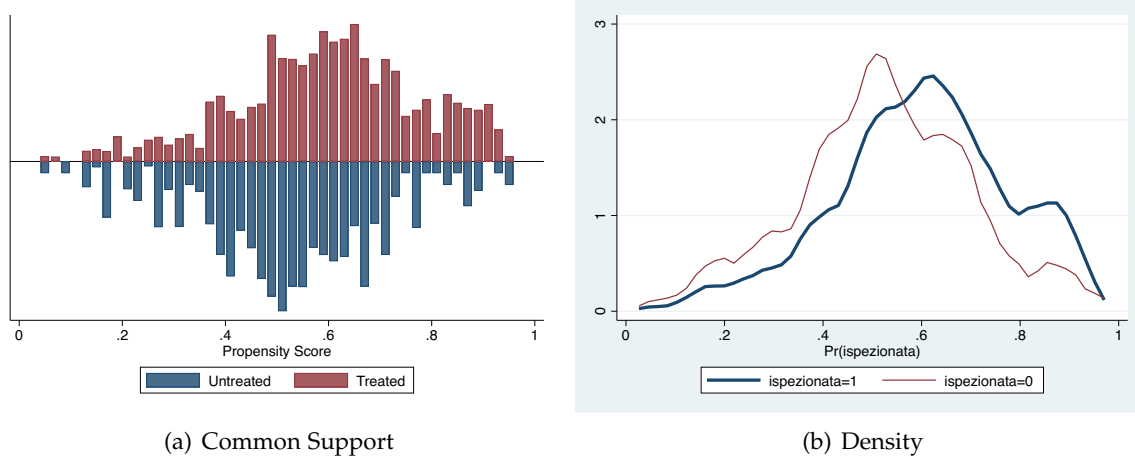
Notes: This figure shows the distribution of banks according to their types of ownership. There are four different type of banks in the Italian banking system. Public (orange) includes banks that are traded in the public market. Mutual (green) refers to mutual banks. Cooperative (yellow) stands for cooperative banks. Panel A shows the distribution of granted loans backed by account receivables by type of bank. To compute this, we first take the mean of total assets for each bank for the year 2010. We then sum up the total assets according to the different legal form. The share of Loans backed by account receivables of cooperative banks account for the 7.6%. For Public banks account for the 91.5%; for Mutual banks, for the 0.8%; and government-owned banks, for the 0%. Panel B shows the distribution of granted Credit Lines by type of bank. To compute this, we first take the mean of total assets for each bank for the year 2010. The share of credit lines of cooperative banks account for the 11.3%; For Public banks account for the 87.7%; for Mutual banks, for the 0.9%; and government-owned banks, for the 0%. We then sum up the total assets according to the different legal form. Panel C show the distribution of Total Amount of Term Loans by type of banks. To compute it we first take the mean of total assets for each bank for the year 2010. We then sum up the total assets according to the different legal form. The total share of term loans of cooperative banks account for the 2.6%; For Public banks accounts for the 86.3%, for Mutual banks for the 11.1% and government-owned banks for the 0%. Panel D shows the distribution of total credit by type of banks. Total credits consist of revocable credit lines, term loans and loans backed by account receivables (LBR). The total amount of credit of cooperative banks account for the 3.6%; for Public banks account for the 83.9%; for Mutual banks, for the 12.4%; and government-owned banks, for the 0%.
Source: Credit Registry. Reference Year: 2010

Figure A.3: Eligible vs. Not Eligible Banks



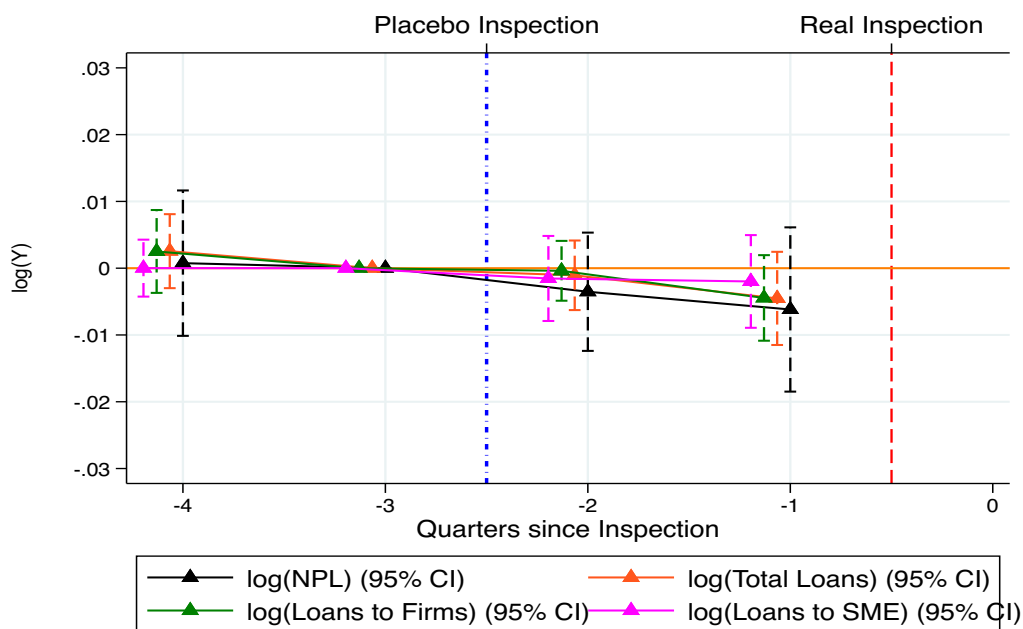
Notes: The sample includes both eligible and not eligible banks. This graph plots the result of the following regression: $y_{bptm} = \alpha_t + \alpha_b + \alpha_{pm} + \sum_{\tau=-4}^{+8} \beta_{\tau} Inspected_{bptm} \times \{1_{\tau=t}\} + \sum_{\tau=-4}^{+8} \gamma_{\tau} X_{PRE,b,p,m} \times \{1_{\tau=t}\} + \varepsilon_{bptm}$. The outcome variable is the log of loan loss provision for other types of NPL, i.e. unlikely-to-pay exposure and overdrawn/past-due exposure. We include bank, quarter, and inspection plan-macro area fixed effects. Standard errors are two-way clustered at the bank and inspection plan level. We also include pre-defined bank-level controls: size (natural logarithm of lagged total assets), ROA, liquidity ratio, deposit ratio, capital ratio and NPL ratio. Note that we normalize $\beta_{-1} = 0$ so that all coefficients represent the differences in outcomes relative to the quarter before the inspection. For a full description of the empirical equation refer to equation 1.1. Data comes from bank's balance sheet (Supervisory Reports).

Figure A.4: Propensity Score Matching

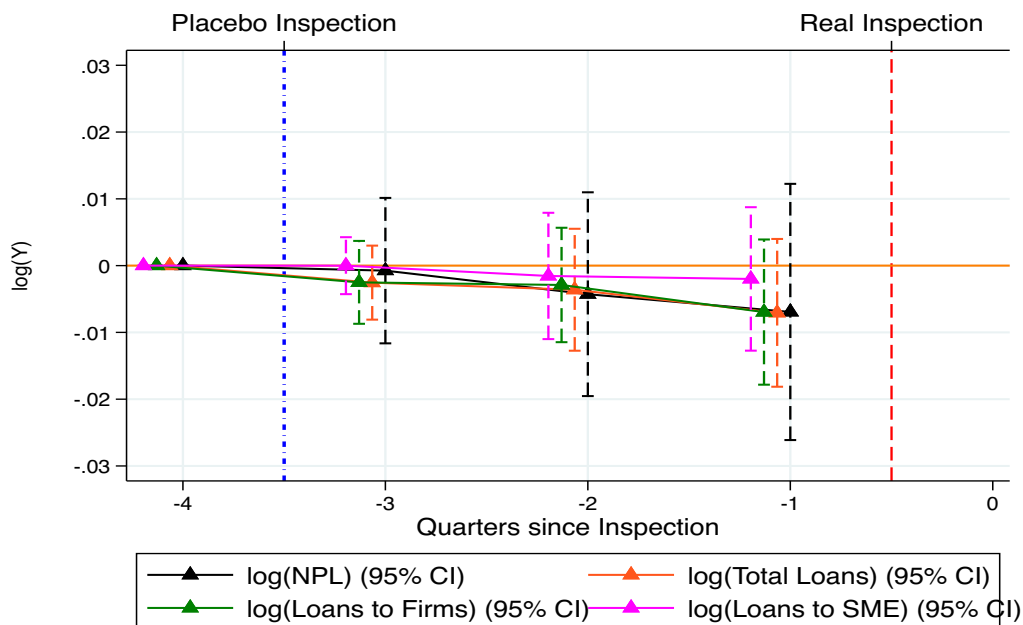


Notes: This Figure shows the common support and the density between treated and untreated banks. Panel A shows the common support between treated and untreated but eligible banks. Panel B shows the density function of the two groups.

Figure A.5: Placebo Test



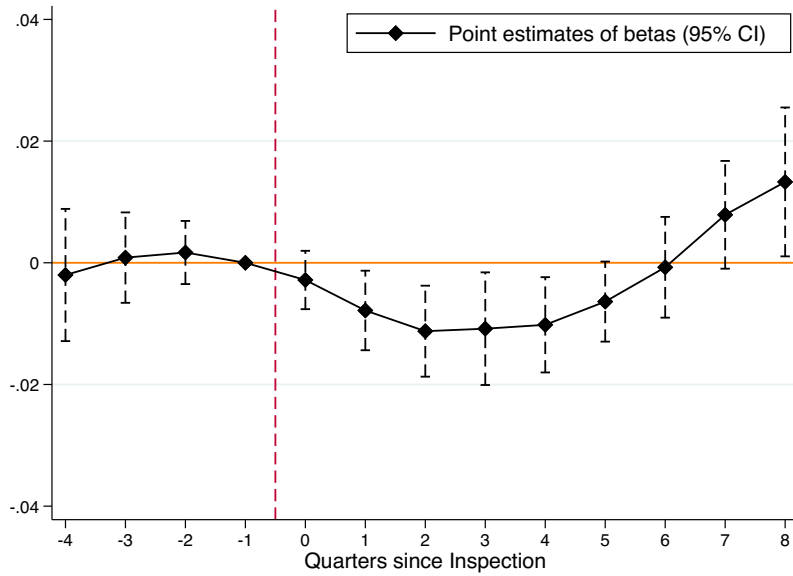
(a) Placebo Inspection at $\tau = (-2; -1)$



(b) Placebo Inspection at $\tau = (-3; -2)$

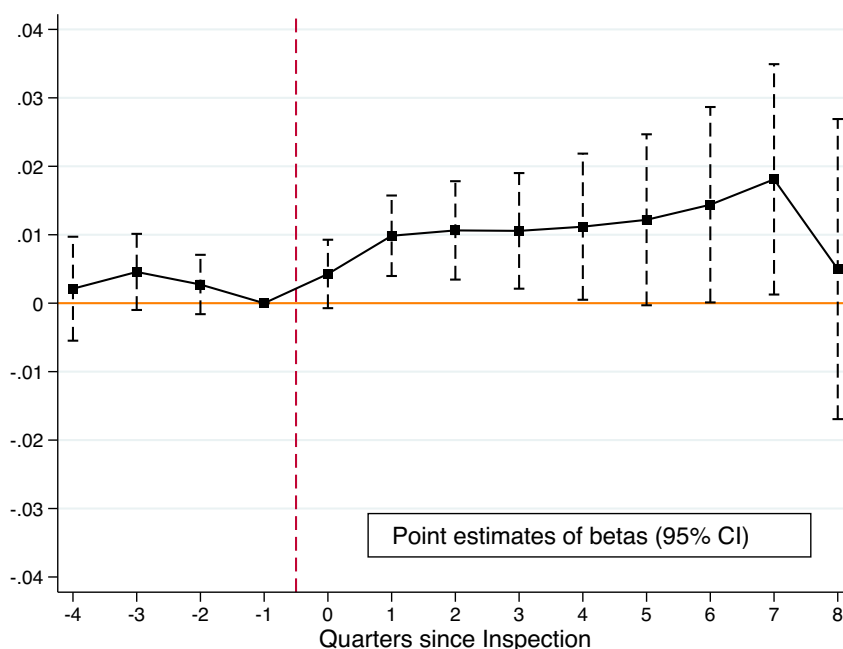
Notes: This Figure shows a placebo test. In Panel A we assign bank inspections in period $t = (-2; -1)$ and normalize $\beta_\tau = 0$ at $\tau = -3$. In Panel B we assign bank inspections in period $t = (-4; -3)$ and normalize $\beta_\tau = 0$ at $\tau = -4$. The banking inspection in period $t = -3$. We set $\beta_\tau = 0$ at $\tau = -3$. We compute the effect of the artificial inspections on the $\log(NPL)$, $\log(Total Loans)$, $\log(Loans to Firms)$ and $\log(Loans to SME)$. The blue vertical line defines the starting of the artificial bank inspection while the red line shows the true timing of the bank inspection.

Figure A.6: *Dynamic DiD:log(deposits)*



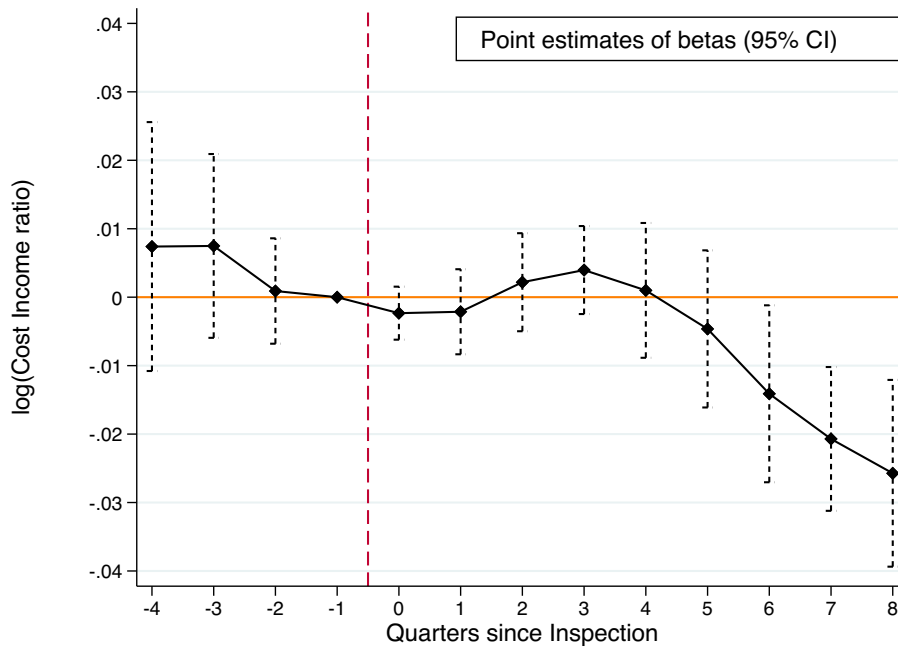
Notes: This graph plots the result of the following regression: $y_{bptm} = \alpha_t + \alpha_b + \alpha_{pm} + \sum_{\tau=-4}^{+8} \beta_{\tau} Inspected_{bptm} \times \{1_{\tau=t}\} + \sum_{\tau=-4}^{+8} \gamma_{\tau} X_{PRE,b,p,m} \times \{1_{\tau=t}\} + \varepsilon_{bptm}$. The outcome variable is the log of deposits. We include bank, quarter and inspection plan-macro area fixed effects. Standard errors are two-way clustered at the bank and inspection plan level. We also include pre-defined bank-level controls: size (natural logarithm of lagged total assets), ROA, liquidity ratio, deposit ratio, capital ratio, and NPL ratio. Note that we normalize $\beta_{-1} = 0$ so that all coefficients represent the differences in outcomes relative to the quarter before the inspection. For a full description of the empirical equation, refer to equation 1.1. Data comes from bank's balance sheet (Supervisory Reports).

Figure A.7: Dynamic DiD: Effect on Capital



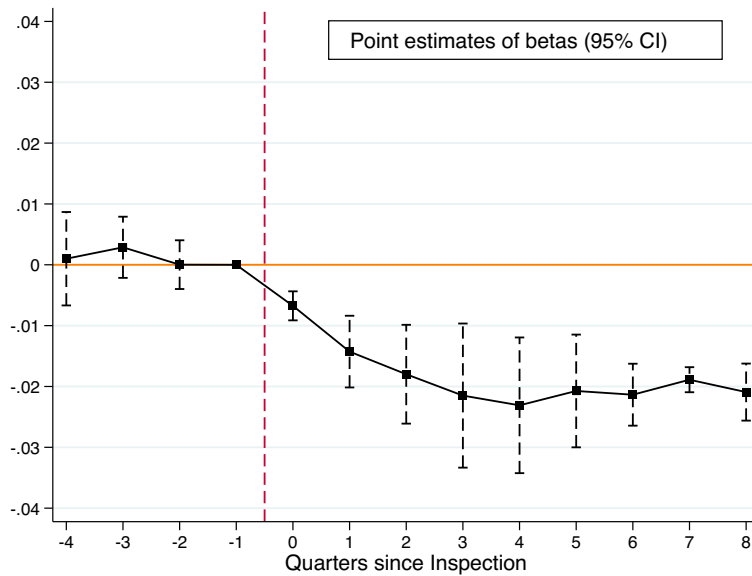
Notes: This graph plots the result of the following regression: $y_{bptm} = \alpha_t + \alpha_b + \alpha_{pm} + \sum_{\tau=-4}^{+8} \beta_{\tau} Inspected_{bptm} \times \{1_{\tau=t}\} + \sum_{\tau=-4}^{+8} \gamma_{\tau} X_{PRE,b,p,m} \times \{1_{\tau=t}\} + \varepsilon_{bptm}$. The outcome variable is the log of capital. We include bank, quarter and inspection plan-macro area fixed effects. Standard errors are two-way clustered at the bank and inspection plan level. We also include pre-defined bank-level controls: size (natural logarithm of lagged total assets), ROA, liquidity ratio, deposit ratio, capital ratio and NPL ratio. Note that we normalize $\beta_{-1} = 0$ so that all coefficients represent the differences in outcomes relative to the quarter before the inspection. For a full description of the empirical equation, refer to equation 1.1. Data comes from bank's balance sheet (Supervisory Reports).

Figure A.8: *Dynamic DiD: Effect on Bank's Efficiency - log(cost to Income)*



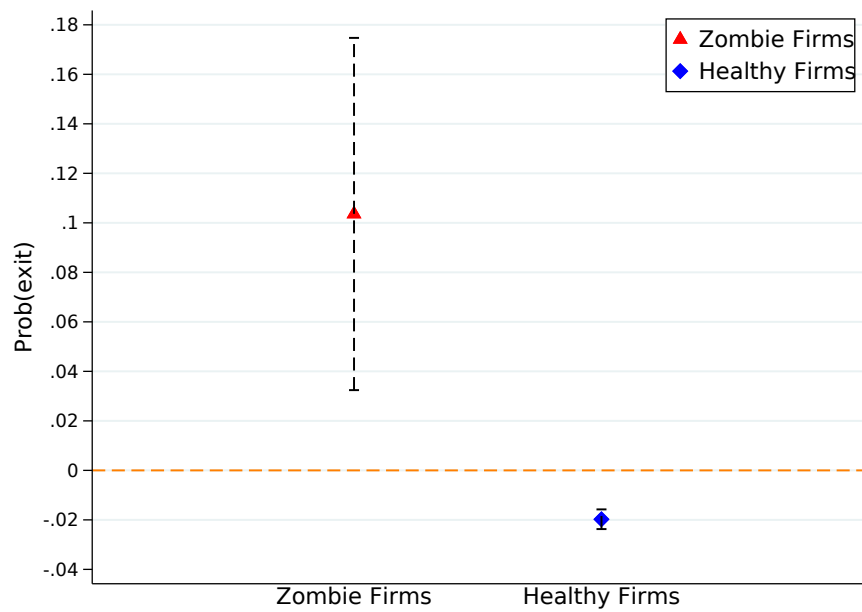
Notes: This graph plots the result of the following regression: $y_{bptm} = \alpha_t + \alpha_b + \alpha_{pm} + \sum_{\tau=-4}^{+8} \beta_{\tau} Inspected_{bptm} \times \{1_{\tau=t}\} + \sum_{\tau=-4}^{+8} \gamma_{\tau} X_{PRE,b,p,m} \times \{1_{\tau=t}\} + \varepsilon_{bptm}$. The outcome variable is the log of cost to income. We include bank, quarter and inspection plan-macro area fixed effects. Standard errors are two-way clustered at the bank and inspection plan level. We also include pre-defined bank-level controls: size (natural logarithm of lagged total assets), ROA, liquidity ratio, deposit ratio, capital ratio and NPL ratio. Note that we normalize $\beta_{-1} = 0$ so that all coefficients represent the differences in outcomes relative to the quarter before the inspection. For a full description of the empirical equation refer to equation 1.1. Data comes from bank's balance sheet (Supervisory Reports).

Figure A.9: *Dynamic Diff-in-Diff: log(loans to household)*



Notes: This graph plots the result of the following regression: $y_{bptm} = \alpha_t + \alpha_b + \alpha_{pm} + \sum_{\tau=-4}^{+8} \beta_{\tau} Inspected_{bptm} \times \{1_{\tau=t}\} + \sum_{\tau=-4}^{+8} \gamma_{\tau} X_{PRE,b,p,m} \times \{1_{\tau=t}\} + \varepsilon_{bptm}$. The outcome variable is the log of loans to households. We include bank, quarter, and inspection plan-macro area fixed effects. Standard errors are two-way clustered at the bank and inspection plan level. We also include pre-defined bank-level controls: size (natural logarithm of lagged total assets), ROA, liquidity ratio, deposit ratio, capital ratio and NPL ratio. Note that we normalize $\beta_{-1} = 0$ so that all coefficients represent the differences in outcomes relative to the quarter before the inspection. For a full description of the empirical equation, refer to equation 1.1. Data comes from bank's balance sheet (Supervisory Reports).

Figure A.10: Effect on Probability of Exit



Notes: This figure shows the results of the following regression: $Prob(exit_i) = \beta Exposure_{ip} + \eta_l + \eta_c + \eta_t + \gamma S_{i,PRE} + \epsilon_{itp}$. The outcome variable is $Prob(exit_i)$ and represents the probability that the firm exists the market within two years from the inspection. $S_{i,PRE}$ is a set of predetermined firm-level characteristics computed one to three quarters before the shock. These variables are the natural logarithm of assets, sales growth, capital/assets, interest paid/ebitda, and the current ratio. $Exposure_{i,PRE}$ is our treatment, which is the share of credit coming from inspected banks computed in the pre-period. We include province, and industry fixed effects. We cluster the standard errors at the industry level. Coefficients are standardized.

Table A.1: Bank-level Regression: Non Parametric model

VARIABLES	(1) log(<i>NPL</i>)	(2) log(<i>tot loans</i>)	(3) log(<i>Loans to Firms</i>)	(4) log(<i>Loans to SME</i>)
-4	0.002 (0.012)	0.003 (0.005)	0.002 (0.005)	-0.001 (0.005)
-3	0.007 (0.008)	0.002 (0.003)	0.001 (0.003)	0.000 (0.003)
-2	0.004 (0.004)	0.002 (0.003)	0.002 (0.003)	-0.000 (0.002)
0	0.024* (0.011)	-0.011*** (0.002)	-0.012*** (0.002)	-0.007** (0.002)
1	0.055*** (0.011)	-0.021*** (0.004)	-0.023*** (0.004)	-0.013** (0.005)
2	0.046*** (0.009)	-0.025*** (0.006)	-0.026*** (0.006)	-0.015** (0.005)
3	0.034*** (0.009)	-0.028*** (0.007)	-0.029*** (0.007)	-0.016** (0.007)
4	0.025** (0.008)	-0.025** (0.008)	-0.025** (0.008)	-0.012 (0.007)
5	0.021 (0.012)	-0.017** (0.006)	-0.016* (0.007)	-0.004 (0.006)
6	0.026 (0.021)	-0.013** (0.005)	-0.012* (0.006)	0.002 (0.005)
7	0.023 (0.018)	-0.003 (0.005)	-0.003 (0.006)	0.011** (0.004)
8	0.020 (0.023)	0.001 (0.004)	0.002 (0.007)	0.015* (0.007)
Observations	29,855	30,054	30,054	30,054
R-squared	0.974	0.991	0.990	0.990
bank FE	Y	Y	Y	Y
IP×Macro Area FE	Y	Y	Y	Y
Quarter FE	Y	Y	Y	Y
Bank controls Cluster	bank-IP	bank-IP	bank-IP	bank-IP

Notes: This table shows the results of the following equation: $y_{bp} = \beta \sum_{\tau=-4}^{+8} Inspected_{bp} + \gamma X_b + \delta W_{b,PRE} + \epsilon_{bp}$. We include bank FE, Inspection plan FE, and quarter FE. The time dummy variables refer to quarters relative to the the banking inspection. We omit event time 1. Note that we normalize $\beta_{\tau=-1} = 0$ so that all coefficients represent the differences in outcomes relative to the quarter before the inspection. Column (1) considers the log(NPL). Column (2) the log(Total Loans). Column (3) the log(loans to firms) and column (4) the log(Small and Medium Enterprise). * p < 0.10. ** p < 0.05, *** p < 0.01.

Table A.2: Bank-level Regression: Parametric model - Long term effect

VARIABLES	(1) log(NPL)	(2) log(<i>tot loans</i>)	(3) log(<i>Loans to Firms</i>)	(4) log(<i>Loans to SME</i>)
post × inspection	0.025** (0.008)	-0.014* (0.006)	-0.016* (0.008)	-0.004 (0.006)
Observations	29,855	30,054	30,054	30,054
R-squared	0.974	0.991	0.990	0.990
bank FE	Y	Y	Y	Y
Inspection Plan Year FE	Y	Y	Y	Y
Quarter FE	Y	Y	Y	Y
Cluster	bank-IP	bank-IP	bank-IP	bank-IP

Notes: This table shows the results of the following equation: $y_{bp} = \beta Post_{pt} \times Inspected_{bp} + \alpha_{ip} + \gamma X_{ib} + \delta W_{b,PRE} + \epsilon_{ibp}$. Column (1) considers the log(NPL) where NPL stands for Non-Performing Loans. Column (2) the log(Total Loans) where Total loans includes loans to both households and firms (i.e. *famiglie consumatrici* and *famiglie produttrici*). Column (3) considers the log(loans to firms) and column (4) the log(Small and Medium Enterprise), i.e. a subgroup of firms. Each bank included in the inspection plan p is observed 4 quarters before and 8 quarters after the inspection. This is the parametric version of Table A.1. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.3: Ranking Prediction

(1) COVARIATES	(2) β	(3) p-value
log(NPL)	0.004	0.142
log(lending)	0.000	0.836
Cost to income ratio	0.001	0.349
Liquidity ratio	-0.003	0.148
Capital ratio	0.001	0.256
log(deposits)	0.002	0.325
Profits/Total Assets	0.000	0.146
Total Assets	1.162	0.439

Notes: Table A.3 reports the results from the following regression: $Covariate_{b,p,PRE} = \beta ranking_{b,p} + \eta_p + \epsilon_{b,p}$, where $ranking_{b,p}$ is the ranking position assigned to the subsample of eligible and inspected banks. We include inspection plan fixed effects η_p and we double cluster the standard errors at the bank-inspection plan level. * $p < 0.10$. ** $p < 0.05$, *** $p < 0.01$.

Table A.4: Balance Test: Eligible vs. Not Eligible

(1)	(2)	(3)	(4)	(5)	(6)
Covariates	Coefficient	p-value	Observations	Mean Cont. Group	Number of Banks
Total Assets	-27.829	0.532	3,174	527.823	438
NPL	8.105***	0.000	3,174	21.356	438
Total Lending	-19.318	0.533	3,174	366.012	438
Net Interbank Lending	3.419	0.418	3,174	25.484	438
Total Deposits	-16.825	0.448	3,174	253.488	438
Cash	-0.163	0.390	3,174	2.187	438
Capital	-2.314	0.624	3,174	62.868	438
Capital Ratio	-0.005**	0.030	3,174	0.130	438
Liquidity Ratio	-0.014*	0.095	3,174	0.233	438
Revenues	-0.606	0.574	3,174	12.636	438
Cost to Income Ratio	16.660	0.177	3,174	61.249	438
Debt Securities	-12.155	0.366	3,174	150.240	438
Net Interest Margin	-0.460	0.443	3,174	7.594	438
Brokerage Income	-0.334	0.723	3,174	11.465	438
Profits/Total Assets	-0.003***	0.000	3,174	0.003	438

Notes: This table shows balance test for Eligible vs. not Eligible banks' covariates. The coefficient and p-value in columns (2) and (3) are from regressions of the covariate in column (1) on an indicator for the status Eligible (i.e. whether the score system keep or discard the bank), controlling for fixed effects (quarter, inspection plan). Regressions consider time $t = -4$ - which is roughly the time in which the banking supervisor defines the Inspection Plan for the subsequent year. Column (4) reports number of observation. Column (5) reports the mean of the covariate in the control group, namely banks that are discarded by the scoring system. Column (6) reports overall number of unique banks in the sample of inspection plans. Some banks are considered in multiple inspection plans. P-values are based on standard errors clustered at the inspection plan year. * $p < 0.10$. ** $p < 0.05$, *** $p < 0.01$.

Table A.5: *Balanced Test: Inspected (Treated Group) vs. Eligible but Not Inspected (Control Group)*

(1) Covariates	(2) Coefficient	(3) p-value	(4) N	(5) Mean Control Group
Total Assets	-0.374	0.974	1,009	464.517
NPL	-3.096	0.211	1,009	38.28
Total Lending	-6.015	0.349	1,009	384.198
Net Interbank Lending	5.600	0.402	1,009	24.704
Total Deposits	-2.802	0.695	1,009	220.470
Cash	0.000	1.000	1,009	1.960
Capital	1.952	0.420	1,009	55.849
Capital Ratio	-0.003	0.128	1,009	0.124
Liquidity Ratio	-0.002	0.605	1,009	0.223
Revenues	-0.190	0.301	1,009	11.469
Cost to Income	0.558	0.692	1,009	82.524
Debt Securities	-1.667	0.722	1,009	130.481
Net Interest Margin	-0.093	0.253	1,009	6.801
Brokerage Income	0.214	0.535	1,009	10.331
Profits/Total Assets	0.001**	0.025	1,009	-0.001

Notes: This table shows balanced test for inspected vs. eligible but not inspected banks' covariates. The coefficient and p-value in columns (2) and (3) are from regressions of the covariate in column (1) on an indicator for the treatment status (i.e. whether the bank is inspected or not), controlling for fixed effects (quarter, inspection plan). Regressions consider time $t = -4$ - which is roughly the time in which the banking supervisor defines the Inspection Plan for the subsequent year.. Column (4) reports number of observation. Column (5) reports the mean of the covariate in the control group, namely banks that are eligible but not inspected. Column (6) reports overall number of unique banks in the sample of inspection plans. Some banks are considered in multiple inspection plans. P-values are based on standard errors clustered at the inspection plan year. * $p < 0.10$. ** $p < 0.05$, *** $p < 0.01$.

Table A.6: Placebo Test:

Panel A:				
VARIABLES	(1) log(<i>NPL</i>)	(2) log(<i>tot loans</i>)	(3) log(<i>Loans to Firms</i>)	(4) log(<i>Loans to SME</i>)
post × inspection	0.000701 (0.002)	-0.000947 (0.001)	0.000389 (0.002)	-0.000845 (0.003)
Observations	9,833	9,954	9,954	9,954
R-squared	0.984	0.996	0.995	0.996
bank FE	Y	Y	Y	Y
Inspection Plan FE	Y	Y	Y	Y
Quarter FE	Y	Y	Y	Y
Cluster	bank-IP	bank-IP	bank-IP	bank-IP
Panel B:				
VARIABLES	(1) log(<i>NPL</i>)	(2) log(<i>tot loans</i>)	(3) log(<i>Loans to Firms</i>)	(4) log(<i>Loans to SME</i>)
post × inspection	0.005868 (0.004)	0.000917 (0.002)	0.000846 (0.006)	0.001198 (0.002)
Observations	9,833	9,954	9,954	9,954
R-squared	0.984	0.996	0.995	0.996
bank FE	Y	Y	Y	Y
Inspection Plan FE	Y	Y	Y	Y
Quarter FE	Y	Y	Y	Y
Cluster	bank-IP	bank-IP	bank-IP	bank-IP

Notes: This table shows the result of a placebo test considering equation 1.2. We construct a fictitious banking inspection and test its effect on bank's performance. Specifically Panel A considers an inspection that happens in event time = -1.5. Panel B considers a fictitious banking inspection in event time = -2.5. Note we allow for one period as a pre-period to have a pre- and post-period. The real inspection is at event time = -0.5.

Table A.7: Bank-level Regression: Parametric model - arbitrary picked banks atc- Short term effect

VARIABLES	(1) log(NPL)	(2) log(Total Loans)	(3) log(Loans to Firms)	(4) log(Loans to SME)
post × inspected	-0.043 (0.069)	-0.068** (0.024)	-0.070** (0.028)	-0.034 (0.026)
Observations	16,935	17,085	17,085	17,085
R-squared	0.979	0.992	0.992	0.993
bank FE	N	N	Y	Y
Quarter FE	Y	Y	Y	Y
IP × Macro-Area FE	Y	Y	Y	Y
bank controls	Y	Y	Y	Y
Cluster	bank-IP	bank-IP	bank-IP	bank-IP

Notes: This table shows the results of the following equation: $y_{btpm} = \alpha_t + \alpha_b + \alpha_{pm} + \beta^{ATE} Post_{tb} \times Inspection_{bp} + \gamma X_{b,PRE} + \varepsilon_{btpm}$. We include bank FE, Inspection plan-macro area FE and quarter FE. We include pre-defined bank-level controls: size (natural logarithm of lagged total assets), ROA, liquidity ratio, deposit ratio, capital ratio, and NPL ratio. The treated group (inspected) consists only of banks that are arbitrarily picked by the bank supervisor without the use of the computer algorithm. Column (1) considers the log(NPL), column (2) the log(total loans), column (3) the log(loans to firms) and column (4) the log(loans to Small and Medium Enterprises). IP stands for Inspection Plan. We consider only the four quarters before and the four quarters after the inspection. * $p < 0.10$. ** $p < 0.05$, *** $p < 0.01$.

Table A.8: Propensity Score Matching Model

	(1) log(NPL)	(2) log(Total Loans)	(3) log(Loans to Firms)	(4) log(Loans to SME)
post × inspection	0.033*** (0.007)	-0.028*** (0.007)	-0.034*** (0.007)	-0.025*** (0.007)
Observations	10,488	10,510	10,510	10,510
Bank FE	Y	Y	Y	Y
Inspection Plan FE	Y	Y	Y	Y
Quarter FE	Y	Y	Y	Y
Cluster	bank-IP	bank-IP	bank-IP	bank-IP

Notes: This table reports the result of a regression based on a propensity score matching. The matching is defined in the following way. For each inspection plan we compute a logit model of the following type:

$$\text{logit}(e_{ij}) = \alpha_0 + X_{ij}\beta \quad (\text{A.1})$$

and matching algorithm

$$A_{rj} = \left\{ kj' \in I_0 : \hat{e}_{kj'} = \min_{k' \in I_0} |\hat{e}_{rj} - \hat{e}_{k'j}| < 0.25\hat{\sigma}_e \right\} \quad (\text{A.2})$$

We use one-to-one nearest neighbor matching within a caliper of 0.25 standard deviations of the estimated PS (with replacement).

Table A.9: Effect of Banking inspections on credit growth according to TFP

VARIABLES	(1) gr(tot Loans)	(2) gr(tot Loans)	(3) gr(tot Loans)	(4) $\Delta \log(\text{tot Loans})$	(5) $\Delta \log(\text{tot Loans})$
inspected	0.019 (0.016)	-0.005 (0.014)	-0.006 (0.014)	-0.005 (0.016)	-0.006 (0.016)
inspected \times TFP _{pre}		0.010*** (0.003)	0.009*** (0.003)	0.011*** (0.003)	0.010*** (0.003)
Observations	627,823	627,823	627,823	627,823	627,823
R-squared	0.411	0.394	0.414	0.376	0.396
firm FE	Y	Y	Y	Y	Y
bank FE	N	N	Y	N	Y
Inspection Plan FE	Y	Y	Y	Y	Y
bank controls	Y	Y	Y	Y	Y
bank-firm relat	Y	Y	Y	Y	Y
Cluster	bank	bank	bank	bank	bank

Notes: This table shows the results of the following equation: $credit\ growth_{ib,t} = \beta Post_{bpt} \times Inspected_{bp} + \eta (Post_{bpt} \times Inspected_{bp} \times TFP_{i,PRE}) + \alpha_{it} + \gamma X_{b,PRE} + \delta W_{ib,PRE} + \epsilon_{ibp}$. In columns (1)-(3) the outcome variable is $growth(credit_{ib,t}) = \frac{credit_{ib,t} - credit_{ib,t-1}}{0.5(credit_{ib,t} + credit_{ib,t-1})}$. In column (4) and (5), the outcome variable is the following: $\Delta \log(credit_{ib,t}) = \log(credit_{ib,t}) - \log(credit_{ib,t-1})$. $Post_{bpt}$ is a dummy variable equal to 1 for the quarters after bank b , included in inspection plan p is inspected. $Inspected_{bp}$ is a dummy equal to 1 if bank b included in inspection plan p is inspected, 0 if it is eligible but not inspected. $TFP_{i,PRE}$ is a dummy that is equal to 1 if a loan belonged to firm i is reclassified as NPL within a quarter from the inspection. $X_{b,PRE}$ is a set of pre-determined bank-level controls. These are: size (natural logarithm of lagged total assets), ROA, liquidity ratio, deposit ratio, equity ratio and NPL ratio. We include bank FE, Inspection plan-macro area FE and quarter FE. We include pre-defined bank-level controls: size (natural logarithm of lagged total assets), ROA, liquidity ratio, deposit ratio, capital ratio, and NPL ratio. $W_{ib,PRE}$ is a set of pre-determined bank-firm relationship controls. These are: relationship length (number of quarters in which we observe a lending relationship between the firm and the bank; firm's credit share (i.e. share of the firm's loan balance in the bank's loan portfolio); main lender is a dummy equal to 1 if the bank is the firm's largest lender; bank share refers to the share of the bank in the firm's loan portfolio. We include the following fixed effects: bank, firm \times quarter, Inspection plan, quarter. The sample includes only firms that have no NPL before the inspections and it is conditional only on firms that we observe at least one period before the inspection and one period after the inspection. * $p < 0.10$. ** $p < 0.05$, *** $p < 0.01$.

Table A.10: Balance Test: Healthy vs. Reclassified

(1) Variables	(2) Healthy Firms	(3) Reclassified Firms	(4) Number of Firms	(5) Difference
Total Assets	3926.628	5320.108	334340	-1393.480*** (232.147)
Leverage	1.279	1.857	334340	-0.579*** (0.013)
ROA	3.380	-12.346	332072	15.726*** (0.277)
Cash Flow	152.641	-236.979	331443	389.620*** (12.288)
Cash\Total Assets	0.074	0.037	309429	0.036*** (0.003)
EBIT\Revenues	-0.030	-0.607	321597	0.577*** (0.009)
Total Debt\EBITDA	13.261	-7.571	332293	20.831*** (2.075)
Intangible Assets\Total Assets	0.059	0.068	250241	-0.009* (0.004)
Tangible Assets\Total Assets	0.240	0.245	317887	-0.005 (0.007)
Total Credit\Total Assets	0.398	0.387	331828	0.011 (0.006)

Notes: Table A.10 shows averages for firms that are subject to loss underreporting in a given year. The second column of the right panel shows differences in means relative to firms that have their loans reclassified. Column (2) shows mean for healthy firms. Column (3) reports the mean for reclassified firms. Column (5) reports the difference in means. Standard Errors are in parenthesis. * p < 0.10, ** p < 0.05, *** p < 0.01.

Table A.11: Bank-level Regression: Parametric model - Treatment Group: Banks arbitrarily picked

VARIABLES	(1) log(NPL)	(2) log(Total Loans)	(3) log(Loans to Firms)	(4) log(Loans to SME)
post × inspected	-0.056 (0.064)	-0.071*** (0.017)	-0.077** (0.022)	-0.038 (0.023)
Observations	16,935	17,085	17,085	17,085
R-squared	0.978	0.992	0.991	0.992
bank FE	N	N	Y	Y
Inspection Plan FE	Y	Y	Y	Y
Quarter FE	Y	Y	Y	Y
Cluster	bank-IP	bank-IP	bank-IP	bank-IP

Notes: This table shows the results of the following equation: $y_{btpm} = \alpha_t + \alpha_b + \alpha_{pm} + \beta^{ATE} Post_{tb} \times Inspection_{bp} + \gamma X_{b,PRE} + \varepsilon_{btpm}$. We include bank FE, Inspection plan-macro area FE and quarter FE. We include pre-defined bank-level controls: size (natural logarithm of lagged total assets), ROA, liquidity ratio, deposit ratio, capital ratio, and NPL ratio. The treated group (inspected) consists only of banks that are arbitrarily picked by the bank supervisor without the use of the computer algorithm. Column (1) considers the log(NPL), column (2) the log(total loans), column (3) the log(loans to firms) and column (4) the log(loans to Small and Medium Enterprises). IP stands for Inspection Plan. We consider only the four quarters before and the four quarters after the inspection. * p < 0.10, ** p < 0.05, *** p < 0.01.

Table A.12: Probability of exiting the market

VARIABLES	exit			
	Zombie Firms		Healthy Firms	
	(1)	(2)	(3)	(4)
	Pr(exit)	Pr(exit)	Pr(exit)	Pr(exit)
Exposure	0.104*** (0.032)	0.104*** (0.036)	-0.024*** (0.002)	-0.020*** (0.002)
Observations	35,143	25,854	324,295	309,554
R-squared	0.139	0.144	0.473	0.496
Province FE	Y	Y	Y	Y
Industry FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
Firm controls	N	Y	N	Y
Cluster	industry	industry	industry	industry

Notes: This table shows the results of the following regression: $Prob(exit_i) = \beta Exposure_{ip} + \eta_l + \eta_c + \eta_t + \gamma S_{i,PRE} + \epsilon_{itp}$. The outcome variable $Prob(exit_i)$ is the probability that the firm exists the market within two years from the inspection. $S_{i,PRE}$ is a set of predetermined firm-level characteristics computed one to three quarters before the shock. These variables are the natural logarithm of assets, sales growth, capital/assets, interest paid/ebitda, and the current ratio. $Exposure_{i,PRE}$ is our treatment, which is the share of credit coming from inspected banks computed in the pre-period. We include province, industry, and year fixed effects. We cluster the standard errors at the industry level. Coefficients are standardized.

Table A.13: Correlation

VARIABLES	(1)	(2)	(3)	(4)
	Exposure _{t-1}	Exposure _{t-1}	Exposure _{t-1}	Exposure _{t-1}
$\Delta \log(GDP)_{t-2,t-1}$	0.878 (0.838)	0.935 (0.933)	-0.652 (1.160)	-1.088 (1.136)
Share Deposits BCC_{t-1}	0.231 (0.163)	0.068 (0.224)	0.027 (1.851)	0.254 (1.981)
Average Income _{t-1}		-0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Observations	346	274	262	262
R-squared	0.007	0.011	0.314	0.333
province FE	N	N	Y	Y
Inspection Plan FE	N	N	N	Y
Cluster	province	province	province	province

Notes: This table shows the regression of our treatment variable $Exposure_{i,PRE}$ on several variables that potentially can affect the local economy. These are: the change in the GDP between $t - 2$ and $t - 1$, the share of deposit by Mutual banks (which is a proxy for the importance of these banks in the province, and the average income. Standard errors are clustered at the province level.

A.2 On-site Inspections

There are two main phases of the banking inspection process: (1) pre-inspection activity; (2) inspection activity. Both phases use a procedure called MARC (Monitoraggio Andamento Rischiosita' Creditizia - Credit Risk Trend Monitoring). The pre-inspection activity is performed during the period in which the Bank of Italy defines the inspection plan for the next year. This is generally around the spring of the year before the inspection is performed and it is used as a first screening to select banks that are eligible to be inspected. This is an evaluation of the credit positions held by the bank. The evaluation considers all problematic credits and a portion of performing credits – about 20% of performing credits in the bank's portfolio. The evaluation usually considers the largest share of credits to avoid the evaluation of too many positions. If the bank is actually selected to be inspected, there is an additional inspection phase which is performed locally at the supervised bank's office. The audit consists of an intense few weeks of field work - depending on the size of the bank and the complexity of its activity - where inspectors evaluate the vast majority of credit positions not limiting themselves to only non-performing loans (NPL).¹ After this process, the inspectors follow the MARC procedure to write a report of the audit. In their audits, inspectors combine information from the Credit Registry, the banks' balance sheet as well as information from Cerved regarding firms' balance sheet and income statement. Moreover, inspectors can have access to all private information regarding a loan available in the bank's office such as private mail between the firm and the bank, and all sort of internal information about a particular loan such as the loan application. The audits have the goal of validating a bank's quality of its assets and of its reporting activity. The audits may have several consequences. The most common consequence is an adjustment of the bank's balance sheet. The inspector can force the reclassification of a credit from performing into non performing. In some cases, it can suggest the readjustment of the expected value of the loan

¹The number of days per inspection are on average 66 as reported by figure 1.3(d).

by writing-off some of its amount.² During on-site inspections, the Bank of Italy may also discover potential or actual violations of administrative laws and of secondary regulations, or of criminal state laws. In the first case, a process is initiated and the potential violations may give rise to sanctions against the bank or its administrators, statutory auditors, and directors. Sanctions are generally of pecuniary nature, but can also cause representatives administrators to temporarily or permanently lose their fit-and-proper status. The sanctions are proposed by the Banking Supervision and regulation directorate and are administered by the Board of the Bank of Italy. The sanctioned subjects have a right to be heard during the procedure. They may appeal to a court against the final decision made by the Bank of Italy. The sanctioning measures are published on the Bank of Italy's website.³ In case of actual or potential violations of criminal state laws, the Bank of Italy alerts the competent prosecutors, who have judiciary powers and may autonomously decide to start an investigation. These cases are a subset of the sanctioning cases. The relevant data are not published, but they are available to the Bank of Italy, so we can use them in the analysis. Unfortunately, we do not have information on the final outcome of these procedures, i.e. whether these referrals do or do not end up in actual convictions.

²Technically this is only a "suggestion" since this is a business decision. The Bank of Italy cannot impose decisions unless it breaks the law.

³<https://www.bancaditalia.it/compiti/vigilanza/provvedimenti-sanzionatori/index.html?com.dotmarketing.htmlpage.language=102>.

Appendix B

Appendix to Chapter 3

B.1 Supplementary Tables and Figures

Table B.1: Firm Level: Industry regressions

VARIABLES	$\Delta \log(\text{credit})$				
	(1) Agriculture	(2) Manufacturing	(3) Construction	(4) Wholesale and retail trade	(5) Real estate
Election year	0.164* (0.099)	0.117** (0.047)	0.026 (0.075)	-0.034 (0.045)	0.125*** (0.044)
Election year \times Zombie Firms	0.099 (0.101)	0.081 (0.222)	0.196* (0.119)	0.133** (0.065)	0.092 (0.212)
Observations	78,552	106,316	198,415	497,999	59,140
R-squared	0.233	0.293	0.267	0.248	0.292
Firm	Y	Y	Y	Y	Y
Year	Y	Y	Y	Y	Y
Municipality	Y	Y	Y	Y	Y
Cluster	M-Y	M-Y	M-Y	M-Y	M-Y

Notes: Table B.1 shows the results of the following regression. $\Delta \log(\text{credit})_{ibmt} + \alpha_i + \delta_m + \phi_t + \eta X_t + \beta_1 \text{Election Year}_{mt} + \beta_2 \text{Election Year}_{mt} \times \text{Zombie Firm}_{im} + \beta_3 \text{Local Bank}_b + \beta_4 \text{Election Year}_{mt} \times \text{Local Bank}_b + \beta_5 \text{Zombie Firm}_{im} \times \text{Local Bank}_b + \beta_6 \text{Election Year}_{mt} \times \text{Zombie Firm}_{im} \times \text{Local Bank}_b + \epsilon_{ibmt}$. We cluster the standard errors at the municipality-year level.