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Contents

List of Figures

List of Tables

Introduction

This thesis consists of three single-authored papers on political economy topics. The first paper contributes to the growing literature analysing the determinants of politicians' performance. The second paper contributes to corruption literature analysing the effect of term limits on the corruption perpetrated by bureaucrats. Finally, the third paper quantifies the economic consequences of regional nationalism using the Catalan independence movement.

The first paper focuses on the politicians' most used and criticized benefit: the life pension. Criticism has focused on its high cost to taxpayers and for being considered an unfair and excessive benefit. However, there is no literature about the effect of life pension on politicians' performance. I use the introduction of the life pension in 1955 to analyze the effect on parliamentary effort. I find that the effect of a life pension on parliamentarian effort decreases with eligibility and seniority. The results show that the life pension reduces the parliamentary effort of the most senior and eligible parliamentarians, while the rest maintain or increase their parliamentary effort. I also find a differential effect of the life pension on parliamentary effort according to two characteristics of the parliamentarians' constituencies: distance to Parliament and price level. the effect of the life pension on parliamentary effort decreases with distance. Finally, I find that price level determines the size of the effect of life pension on parliamentary effort. For negative and positive effects, the magnitude of the effect decreases with the price level.

The second chapter focuses on the increasingly relevant issue of institutional corruption. The literature has focused on the incentives for corruption of politicians and bureaucrats separately, while linkages among them remain neglected. This paper analyses the effect of the expectation of government turnover on bureaucrats' decision to be corrupt. In other words, we analyse the effect of term limits on bureaucrats' decision to extract rents via corruption (henceforth, bureaucratic corruption). Using the introduction of term limits in Portugal's 2013 municipal elections, I find that the expectation of a government turnover has a deterrent effect on bureaucratic corruption. The results also show that the reduction of corruption is larger in municipalities with a previ-

ous presence of corruption and with higher levels of transparency. This paper provides empirical evidence indicating term limits may be adequate to reduce bureaucratic corruption, especially in conjunction with better candidate selection strategies (e.g., greater transparency).

Finally, the third chapter quantifies the economic consequences of regional nationalism. The literature has focused on the social costs of independence movements, while the literature addressing the economic cost is still scarce. Using the Catalan independence movement, we analyse the impact of regional nationalism on GDP, FDI inflows, interregional trade and the stock market. Catalonia has had one of the most active independence movements with successive popular demonstrations, the exodus of companies (change of tax headquarters) and two referendums. The results show that the independence movement has not affected any economic variables. In contrast, the stock market analysis shows that the 2014 referendum negatively affected the performance of Catalan companies.

Chapter 1

Life pension and parliamentarian effort

DAVID MEDINA RODRIGUEZ

1.1 Introduction

"Can't you abolish the life pensions of parliamentarians?", former director of the Italian National Social Security Institute Tito Boeri scolded parliamentarians.[1] Privileges for politicians are a debated but elusive topic. While some democracies limit compensation for politicians to a salary, the vast majority of democracies add a range of benefits to compensation (Achury et al., 2020). Access to an advantageous and attractive pension system has been one of the most widely used benefits in the twentieth century and is currently used in more than twenty developed democracies and some supranational entities such as the European Union.[2] The main advantages compared to the regular pension scheme are a) relaxation of eligibility requirements and b) the level of accumulation and the maximum amount. While access to the regular pension system requires 20 years of contributions, politicians are only required to run the office for a short period, varying from 1 day to an entire legislature, depending on the country. As far as the accumulation level is concerned, politicians can reach 80 per cent of their last salary in 20 years, while an average worker requires 40 years to reach 50 per cent of her last salary.[3]

In the wake of the 2008 financial crisis, media and voter pressure on life pensions have grown significantly. This pressure has led to the growth of political parties in many countries calling for its abolition, as they consider it an abusive privilege with a high cost for taxpayers. Countries such as Italy and Norway have recently abolished the life pension. The political and media debate has focused on its cost and the creation of a political elite, but little attention has been paid to the effect of the life pension on the politicians' efforts. Finding the right incentives for parliamentarians to maximize their parliamentary effort is crucial in improving the competence and quality of parliamentary work. In this case, we focus on the impact of the introduction of the life pension on parliamentarian effort.

In this paper, we show that the effect of the life pension on effort can go either way. The main features of most life pension schemes are that the pension received depends on the years served (seniority), and the eligibility given by the parliamentarians' age. Given these features, we develop a theoretical model that shows the main mechanisms that determine the sign of the effect. We find that two main forces determine the effect of the life pension on effort. On the one hand, the incentive to accumulate a higher pension increases parliamentarians' effort, although this positive effect decreases with accumulation. On the other hand, the eligibility for life pension has a

[1] See Boeri (2018).
[2] See Anderson et al. (2021).
[3] See OECD (2017).

negative effect on parliamentarians' efforts. Introducing the life pension scheme decreases the effort of eligible parliamentarians with high accumulation levels and increases or maintains the effort of the remaining parliamentarians.

The theoretical model also explains the effect of characteristics of the parliamentarian's constituency on the effort and its magnitude. We include two new characteristics for each parliamentarian i) the distance between the parliament to the constituency of origin and ii) the price level in the constituency of origin. We find that the effect of the life pension on effort is decreasing in the distance. Parliamentarians from more distant constituencies incur a higher cost of taking office and exerting parliamentary effort due to the cost of accommodation, transport and time. The introduction of the life pension makes re-election less attractive for those parliamentarians because the pension received adds to the savings in taking office and exerting effort. The price level of the constituency determines the magnitude of the positive or negative effect of the life pension on effort. In either direction, low price levels accentuate the effect and high price levels lessen the effect. Thus, the effect of the life pension on effort decreases with the price level for those parliamentarians whose effort is maintained or increased. In contrast, the life pension effect on effort increases with the price level for those parliamentarians whose effort decreases.

To empirically support our theoretical predictions, we use the introduction of the life pension scheme in Italy in 1955. The Italian case is a good context to analyze the effect of the life pension on parliamentarians' effort, as it fulfils the two main characteristics of life pension systems: the pension accumulated depends on seniority and eligibility is given by age. The introduction of the life pension scheme affected all parliamentarians, and access was conditional on being a parliamentarian for one day. By accessing the life pension scheme, parliamentarians could receive an amount equivalent to 30 per cent of their last salary once they have reached the required age. This initial amount increased linearly to 85 per cent of the last salary, which was reached in the twentieth year in office.

Our database consists of monthly data from May 1948 to February 1963. This database gives us three measures of parliamentary effort: a) the number of interventions, b) the number of bills proposed, and c) the number of bills approved. With these three measures, we create an index of parliamentary effort following Dal Bó and Rossi (2011). These authors calculate the z-score for each measure of parliamentary effort and then aggregate them. The result is the index of parliamentary effort.

In line with the theoretical results, we find that the introduction of the life pension positively impacts the parliamentary effort of those parliamentarians not eligible (i.e. parliamentarians below age 60) for the life pension. Parliamentarian effort unambiguously increases for non-eligible

parliamentarians and lower seniority. Among the measures of parliamentary effort, we find that the measure that grows the most is the number of interventions. This effect decreases when parliamentarians become eligible to receive a pension immediately. Eligible parliamentarians with higher seniority reduce their parliamentary effort, concentrating on the number of proposed bills. These results provide evidence that there are two countervailing forces. Accumulating a higher pension stimulates parliamentarians to exert more effort, especially when parliamentarians are not eligible. In contrast, eligible parliamentarians face a trade-off between accumulating or enjoying the life pension.

We also find evidence of the importance of constituency characteristics in the effect of the life pension on parliamentary effort. We find that the effect of the life pension on effort decreases with distance. This result suggests that introducing the life pension exacerbates the high opportunity cost of taking office for parliamentarians from distant constituencies. We also find evidence that the price level determines the magnitude of the effect. For parliamentarians who reduce their level of effort, we find that the effect of the life pension on effort increases with the price level. In contrast, the life pension effect on effort decreases with the level of effort for the remaining parliamentarians. This is due to the actual life pension received by each parliamentarian. The life pension amount is nominal, so the actual life pension is higher in constituencies with lower price levels. Therefore, parliamentarians in constituencies with lower price levels register a larger effect of the introduction of life pension on parliamentarian effort as their return on effort is higher. Once parliamentarians are eligible and have a high accumulated pension, the situation is reversed. The trade-off between accumulating and enjoying the life pension is less favourable in the case of parliamentarians from constituencies with lower price levels.

This paper contributes to the literature analyzing the determinants of politicians' performance. Dal Bó and Rossi (2011) find that the length of the mandate is a determinant of parliamentary effort. Shorter mandates discourage parliamentary effort, as candidates spend part of their time campaigning. In addition, they create an index of politicians' efforts following Kling et al. (2007). The legislative effort index is composed of the measures of political effort proposed by Hamm et al. (1983) and Schiller (1995). Much of the literature analyzing the determinants of politicians' performance has focused on the effect of salaries. Gagliarducci and Nannicini (2013) do a municipal analysis in Italy and find a negative relationship between wages and municipal budgets. That is, higher wages encourage fiscal conservatism. Mocan and Altindag (2013) find that higher salaries decrease floor attendance but increase politicians' commitment with an increase in the number of proposals. Another determinant of politicians' performance and behaviour has been electoral

accountability. Lopes da Fonseca (2020) analyses the effect of the introduction of term limits on fiscal policy and finds that politicians not eligible for re-election are more fiscally conservative. Although they are more fiscally conservative, Ferraz and Finan (2009) find that they have a higher level of corruption.

This paper also contributes to the literature analyzing the effect of the outside option on politicians' performance. Our results conclude that effort decreases with the level of accumulation and eligibility for life pension. This suggests that the better the outside option, the lower the level of effort. These results are in line with the existing literature. Gagliarducci et al. (2010) conduct a study with members of the Italian Parliament and use income before taking office as the outside option. They find that higher outside option leads to lower levels of effort. Arnold et al. (2014) do an analogous study in the case of the German Parliament and reach the same conclusions. Specifically, they find that an increase in the outside option negatively affects the number of interventions and interpellations.

This paper is organized as follows. Section 1.2 presents the specific details of the case study with the introduction of the Italian life pension scheme. In section 1.3, we present a theoretical model showing the main mechanisms involved in the effect of the life pension on parliamentarians' effort. In Section 1.4, we present the empirical strategy. In section 1.5, we describe the data used. In section 1.6, we present our empirical results. In Section 1.7, we conclude.

1.2 Life pension in Italy

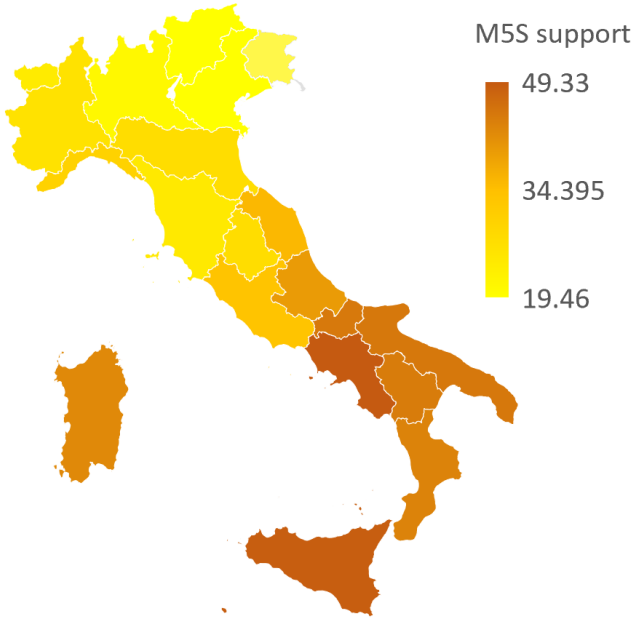
Since 1946, the Italian parliamentarian system has been composed of the Chamber of Deputies and the Senate. From 1946 to 2020, the total number of deputies was 630, and the number of senators was 315. With 945 parliamentarians, Italy has had the highest number of parliamentarians in Europe. According to a hearing of the Constitutional Affairs Committee in 2016, the number of former parliamentarians eligible for life pensions is around 2,600.[4] The endowment of the life pension for these former parliamentarians entails an annual cost of more than 200 million euros.

Privileges of parliamentarians in Italy have been a hot topic issue at the heart of the political environment in Italy. In the wake of the 2008 financial crisis, many parties led by the populist party promoted by the comedian Beppe Grillo "Movimento 5 Stelle" (M5S) bet on limiting the privileges of politicians. This commitment to limiting privileges, especially the life pension, has helped it to grow significantly in recent years. Figure 1.1 shows the party's support in each region

[4]See Boeri (2016).

during the 2018 elections. We observe that the support for this party is close to fifty per cent of voters in some regions. We also observe a disparity between north and south, but it is the first or second most voted party in all regions.

Figure 1.1: Share of votes for Movimento 5 Stelle in the 2018 elections.



Note: The information on the percentage of electoral votes has been obtained from the Italian National Institute of Statistics. The M5S obtained more than 25 per cent of the vote share in 2013 and over 15 per cent in 2022.

The life pension scheme came into force in Italy on 1 January 1955. The measure was approved on 23 December 1954. The measure provided for establishing a fund that would provide parliamentarians with an entire pension once they met the requirements. The endowment of this fund amounted to 15 per cent of the total budget of the Chamber of Deputies.[5] It was approved with the full support of the Chamber of Deputies except for one deputy, Giuseppe Veronesi.

The approval of the life pension was subject to two conditions. These two conditions were: the approval of the general state budget and the subsequent approval of the budget of the Chamber of Deputies. The approval of the general state budget is one of the most debated issues in the Chamber of Deputies and is indispensable for allocating expenditure items, including the Chamber of Deputies' expenditure. The debate on the general budget from 1 July 1954 to 30 June 1955 lasted nine months and concluded with its approval at the end of August 1954. The subsequent budget presentation to the Chamber of Deputies was on 21 December 1954, with its approval two

[5]The budget also includes salaries and committee expenses, which account for about 75 per cent of the budget. The remaining 10 per cent incorporates other expenses such as Parliament's technical staff or other minor expenses.

days later. Although parliamentarians may anticipate the adoption of the life pension scheme, the uncertainty of its adoption may affect their behaviour. If there is an anticipation of adopting the life pension scheme, the effect may be biased downwards.

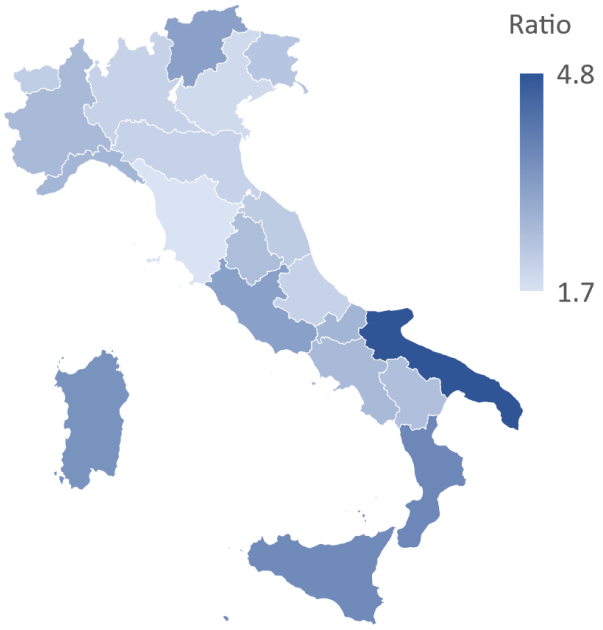
Access to the life pension scheme is a benefit that rewards the public service of parliamentarians. A life pension is a monthly payment conditional on entitlement and eligibility requirements. When the life pension scheme was introduced in 1955, the right to receive a life pension arose from anyone who has served at least one day in Parliament. On the other hand, the eligibility for immediate payment was given by fulfilling one of the following conditions i) being over 60 years of age ii) being a parliamentarian for three full terms. These entitlement and eligibility conditions were in place for 42 years, giving rise to opportunistic behaviour. Some former parliamentarians have only been parliamentarians for a few days, having access to this benefit.

The amount received depended on the number of years served and accumulated linearly. The maximum life pension was reached when one served twenty years in Parliament, equivalent to four entire legislatures. With one day in Parliament (the entitlement requirement was fulfilled), the parliamentarian was entitled to an initial amount equal to 30 per cent of her last salary. Each year served, 2.75 per cent of her last salary was added to the initial amount. For example, the accumulated pension equals 57.5 per cent of their last salary for ten years of service.

The life pension scheme has been subject to many changes in recent years. The first reform of the life pension scheme took place in 1997 when the age eligibility was increased from 60 to 65 years, and the minimum time to access the life pension system was increased from one day to one year of service in Parliament. The second reform took place in 2007, increasing the minimum time required to four years and six months. In 2011 the life pension for new parliamentarians was abolished and in 2018, a profound reorganization of the life pension scheme was carried out. This reorganization saved 20 per cent of the total cost, equivalent to 40 million euros per year. Despite various reforms, it remains a very beneficial privilege for former parliamentarians. Figure 1.2 shows the ratio between the average life pension of parliamentarians and the average pension by region in 2018. We observe that the average life pension is 1.7 times the average pension in the regions with the lowest ratio but can even be up to 4.8 times.[6] This strong disparity between North and South is mainly due to two factors i) parliamentarians in Southern Italy stay longer in office ii) average pensions in Northern Italy are higher.

[6]It should be noted that an average worker contributes for forty years, while the average parliamentarian serves for ten years.

Figure 1.2: Ratio between average life pension and average pension by region in 2018.



Note: The ratio is the average life pension/average pension for each region. Data on average pension is obtained from the national institute of social security, and data on life pension is obtained from the portal of the Chamber of Deputies.

1.3 Theoretical framework

This section presents a simple model that investigates the main mechanisms determining the effect of introducing a life pension scheme on parliamentary effort. In the baseline model, we propose a model that captures the two main features of most life pension schemes: i) age eligibility and ii) accumulated pension determined by seniority. These two individual characteristics provide the source of heterogeneity to analyze the differences in the behaviour of parliamentarians. In a further stage, we include in the baseline model the distance and price level of the constituency of origin as determinants of the effect of the life pension on parliamentary effort.

1.3.1 Baseline model

We present a simple three-period model. A parliamentarian chooses the optimal effort level to maximize her utility in the first period. Effort increases her probability of being re-elected but is costly. In the second period, elected parliamentarians receive a wage and accumulate pension benefits if a life pension scheme is introduced. Non-elected parliamentarians may or may not receive a pension depending on: i) the presence of a life-pension scheme and ii) their age eligibility. In the third period instead, all parliamentarians retire. Under a life pension scheme, all parliamentarians

receive their accumulated pension which varies depending on how long they served in parliament. Otherwise, parliamentarians do not receive any payment.

More specifically, in the first period, parliamentarians receive wage $w \geq 1$ and choose their level of parliamentarian effort, $e \geq 0$, facing an increasing cost function $c(e) > 0$, with $c'(e) > 0$ and $c''(e) > 0$. Effort increases the probability of the legislator's reelection. A parliamentarian is reelected with a probability $\rho(e)$ and not reelected with probability $1 - \rho(e)$. We assume that $0 < \rho(e) < 1$ and decreasing marginal returns to effort, that is, $\rho'(e) > 0$ and $\rho''(e) < 0$. Reelected parliamentarians receive w and accumulate pension if a life pension scheme is introduced. In the third period, all parliamentarians receive their pension if a life pension scheme is introduced.

In stage one, a parliamentarian chooses the optimal level of effort to maximize her utility equal to:

$$U = \underbrace{w - c(e)}_{\text{Period 1}} + \delta \underbrace{[\rho(e)w + (1 - \rho(e))\alpha\theta\psi]}_{\text{Period 2}} + \delta^2 \underbrace{[\rho(e)\theta + (1 - \rho(e))\alpha\theta]}_{\text{Period 3}} \tag{1.1}$$

where $\delta \in (0, 1]$ denotes the discount factor. Parameter $\theta \in \{0, 1\}$ denotes the presence or not of a life pension, with $\theta = 1$ referring to the presence of a pension scheme. Parameter $\psi \in \{0, 1\}$ denotes whether a non-elected parliamentarian in the second period can already enjoy or not a pension in this period. If $\psi = 1$, this non-elected parliamentarian receives a pension equal to $\alpha \in [0, 1]$ where α refers to the accumulated pension. All parliamentarians receive a pension under the life pension scheme in the third period. This can be either equal to the normalized value 1 for parliamentarians who served both periods in the parliament or α for parliamentarians who served in parliament only in the first period.

Rearranging the first-order condition, we obtain the following expression:

$$\frac{c'(e)}{\rho'(e)\delta} = w + \theta(\underbrace{-\alpha\psi}_{\text{Ef.1}} + \delta(\underbrace{1 - \alpha}_{\text{Ef.2}})) \tag{1.2}$$

We can observe that the left-hand side is increasing in effort level. Therefore, it is easy to see that an increase in wages or the discount factor implies higher levels of effort. Considering our empirical setting, our interest is on parameters ψ and α. Given that a life pension is in place (i.e., $\theta = 1$), those two parameters capture whether parliamentarians can enjoy their pension in period 2 if not elected (i.e., the parameter ψ) and the level of pension they have accumulated (i.e., the parameter α). We refer to the differential effect these two variables have on different parliamentarians as the "Eligibility effect" (Ef. 1) and the "Accumulation effect" (Ef. 2).

The case of Italy fits the theoretical model. After introducing the life pension scheme, we find two sources of variation among parliamentarians: the level of accumulated pension and eligibility. The level of accumulated pension (α) is determined by the seniority of the parliamentarian, i.e. by the number of years served in Parliament. It is easy to see from equation (1.2) that the effort is decreasing in accumulated pension and eligibility level. This implies that senior parliamentarians and parliamentarians over 60 registers a smaller effect on the parliamentarian effort after introducing the life pension.

Proposition 1. *If θ goes from 0 to 1 (a pension scheme is introduced), the effect on effort is:*

- *decreasing in α. Parliamentarians with high seniority register a smaller effect (less positive or more negative) in effort than those with low seniority.*
- *decreasing in ψ. Eligible parliamentarians to receive a life pension register a smaller effect (less positive or more negative) in effort than non-eligible parliamentarians.*

Such an effect is negative if $\psi = 1$ and $\alpha > \frac{\delta}{1+\delta}$ and non-negative otherwise.

Proof. See the appendix 1.8.1.

Proposition 1 tells us that the sign and magnitude of implementing the life pension are given by seniority and eligibility. Seniority determines the level of accumulated pension (α), while the age of parliamentarians determines eligibility (ψ). Eligibility and seniority similarly affect effort. Both characteristics interact positively. Higher levels of this interaction decrease the effect of the life pension's implementation on effort.

The implementation positively affects non-eligible parliamentarians if they can still accumulate a life pension. For those non-eligible parliamentarians who can no longer accumulate life pension (maximum pension has been reached), the life pension implementation does not affect their effort. The effect of the life pension for eligible parliamentarians is positive for low levels of life pension accumulation. In contrast, the effect of implementing the life pension is negative for high accumulation levels.

This indicates that non-eligible parliamentarians have incentives to be re-elected for two reasons. The first reason is to continue receiving parliamentary remuneration, as they are not eligible to receive the life pension. On the other hand, remaining in the office allows them to reach a higher level of accumulation of life pension.

The life pension's effect on eligible parliamentarians' effort can go either way. The sign of the effect of the life pension on parliamentary effort is determined by the difference in utility between accumulating and receiving the life pension. At low levels of accumulation, the difference is

positive so that parliamentarians increase their parliamentary effort to be re-elected. This difference becomes negative when accumulation levels are high, leading to a reduction in parliamentary effort.

1.3.2 An extension

In the baseline model, we assume that parliamentarians only differ in their seniority (α) and age eligibility (ψ). However, other variables may determine the effect of the introduction of life pension on parliamentarian effort. Part of the heterogeneity of parliamentarians is linked to their constituency. We include two characteristics for each parliamentarian i) the distance from the constituency of origin to Parliament ii) the price level of the constituency of origin.

Parliamentarians must be in Parliament to exert effort, i.e. to make an intervention or propose a bill. Since presence in Parliament is required, the distance from the constituency of origin to Parliament affects the cost of exerting effort. Parliamentarians from distant constituencies incur a higher cost than parliamentarians from nearby constituencies. This higher cost is due to accommodation, transport and time costs. Let the cost be equal to $k(d)c(e)$ where $k(d) \geq 1$ is the increase in the cost of effort due to distance from the constituency of origin, with $k'(d) > 0$ and $k''(d) < 0$.

On the other hand, we assume that parliamentarians return to their home constituency once they have left office. This implies that non-reelected parliamentarians return to their constituency of origin in the second term. In the third term, all parliamentarians return to their constituency of origin. Let $\pi > 0$ be the price level of the parliamentarian's constituency of origin. We normalize $\pi = 1$ as the price level of the constituency where the Parliament is located. After including the distance and the price level, the parliamentarian chooses the level of effort that maximizes his utility equal to:

$$U = \underbrace{w - k(d)c(e)}_{\text{Period 1}} + \delta \underbrace{[\rho(e)w + (1-\rho(e))\frac{\alpha\theta\psi}{\pi}]}_{\text{Period 2}} + \delta^2 \underbrace{[\frac{\rho(e)\theta + (1-\rho(e))\alpha\theta}{\pi}]}_{\text{Period 3}} \tag{1.3}$$

In equation (1.3) we observe that the price level affects only the part of the utility function when parliamentarians leave office. In the first period, parliamentarians are in the constituency of Parliament, so there is no heterogeneity in the price level since $\pi = 1$ for all parliamentarians. In the second term, those re-elected parliamentarians remain in the constituency of Parliament with $\pi = 1$. While non-reelected parliamentarians return home and the price level of the constituency of origin becomes relevant. In the third period, each parliamentarian is in her home constituency

and is subject to the price level of her home constituency. Solving for the first-order equation:

$$\frac{c'(e)k(d)}{\delta\rho'(e)} = w + \frac{\theta}{\pi}(-\alpha\psi + \delta(1-\alpha)) \tag{1.4}$$

We can observe that the left-hand side is increasing in effort level and distance. We observe that the effect of seniority (i.e., the parameter α) and eligibility (i.e., the parameter ψ) is decreasing, and the sign is not altered by the inclusion of the two new characteristics. We are interested in our empirical setting in $k(d)$ and π. Given that the life pension is in place (i.e., $\theta = 1$), $k(d)$ captures the incremental cost that parliamentarians face when moving from their home constituency to the constituency of Parliament. On the other hand, π captures the price level of the constituency of origin. Given that the life pension is in place, we observe that the effect of the price level on effort (i.e., the parameter π) can go in either way. The sign of the price level effect is determined by the values of α and ψ.

Proposition 2. *If θ goes from 0 to 1 (a pension scheme is introduced), the effect on effort is:*

- *decreasing in d. Parliamentarians from distant constituencies register a smaller effect (less positive or more negative) in effort than parliamentarians from nearby constituencies.*
- *increasing in π if $\psi = 1$ and $\alpha > \frac{\delta}{1+\delta}$ and decreasing otherwise.*

Proof. See the appendix 1.8.1.

Proposition 2 tells us that the effect of the introduction of the life pension on parliamentary effort is less positive (or more negative) for parliamentarians from more distant constituencies. The introduction of the life pension exacerbates the higher cost of being in office and exerting parliamentarian effort, borne by parliamentarians from more distant constituencies. Without the life pension, parliamentarians lack an effortless alternative income. Enjoying the life pension is more attractive for parliamentarians from distant constituencies, as these parliamentarians save the costs of accommodation, transport and time. This results in a lower incentive to be re-elected for parliamentarians from distant constituencies and thus a lower impact of the life pension on parliamentarian effort.

Proposition 2 also tells us about the effect of the price level on the impact of the life pension on parliamentarian effort could go in either way. The sign of the price level on effort is given by the seniority and eligibility of the parliamentarian. According to Proposition 1, the effect of the life pension on parliamentarian effort is negative for eligible parliamentarians with a high level of accumulation and non-negative otherwise. For those parliamentarians whose life pension

effect on parliamentarian effort is negative, the effect of the price level on parliamentary effort is increasing. In contrast, the price level has a decreasing effect on parliamentarian effort for those parliamentarians whose parliamentarian effort is positively affected by introducing the life pension. The explanation for this result derives from the value of the life pension in real terms received by each parliamentarian. The amount accumulated by each parliamentarian is given in nominal terms. Pension in real terms is given by the price level of the constituency of origin since the parliamentarians enjoy the life pension in their constituency. Those parliamentarians from low-price constituencies receive a higher real pension than those from high-price constituencies. Thus, when the incentive to accumulate is greater than the incentive to enjoy the life pension, the price level decreases the impact of the life pension on parliamentarian effort. That is, parliamentarians from low-price constituencies register a more positive effect than parliamentarians from high-price constituencies. When the incentive to accumulate is lower than the incentive to enjoy a life pension, the effect is the opposite. Parliamentarians from low-price constituencies register a more negative effect than those from high-price constituencies.

1.4 Empirical strategy

The theoretical model in section 1.3 shows a differential effect according to the characteristics of parliamentarians. Although the life pension affected all parliamentarians, the intensity of the measure differs based on the seniority and eligibility of the parliamentarian. We adopt the approach of Finkelstein (2007), which measures the effect of Medicare on health insurance by exploiting the differences in exposure of each region depending on the share of the elderly population without health insurance. This paper analyses the differential effect of the life pension on parliamentary effort varies according to the seniority or eligibility of parliamentarians. We run the following regression:

$$Y_{it} = \alpha + \beta Lifepension \times Seniority_{it} + \gamma X_{it} + \phi_i + \mu_t + \tau_{it} + \epsilon_{it} \tag{1.5}$$

Our focus is on the interaction between the life pension ratio and seniority. The life pension variable has a value of 1 from period 78 (i.e. $t > 78$) and 0 otherwise. Seniority can have three values: 0 for a new parliamentarian, 1 for re-elected once and 2 for re-elected twice. The coefficient of this interaction shows the differential effect of introducing the life pension according to the parliamentarian's seniority. X_{it} is a matrix of covariates, ϕ_i is an individual fixed effect, μ_t is a

time fixed effect, τ_{it} is an individual specific trend and ϵ_{it} is the error term.[7]

Individual fixed effects, ϕ_i, allow us to capture the effect of specific fixed individual characteristics over time on a parliamentarian effort, such as gender, political party or constituency. In addition, using individual fixed effects captures the selection effect that may occur in our sample. Those parliamentarians who are only present before or are only present after introducing the pension for life do not affect our estimation.

Using time-fixed effects, μ_t, allows us to absorb the different patterns of parliamentarian effort unrelated to introducing the life pension. On the one hand, it allows us to control for the marked pattern in the legislature where there is a peak of activity at the beginning and then stabilizes. It also controls the possible trend of parliamentarian activity in the different legislatures. The individual trend, τ_{it}, allows us to monitor the evolution of the parliamentarian's parliamentary effort in the absence of the life pension. In some analyses, the seniority variable captures part of this evolution of parliamentarian effort.

In the next step, we calculate the net effect that the introduction of the life pension has had on the parliamentary effort of each group of parliamentarians. We linearly combine the coefficient of the life pension parameter and the coefficient of the interactions between the presence of life pension and seniority or eligibility. According to the theoretical model, the effect of life pension is negative for eligible parliamentarians with high seniority and non-negative otherwise.

1.5 Data

We build a database from the information available from the Italian Chamber of Deputies.[8] The construction of the database has been done in four stages. The first stage consists of aggregating the information on interventions. The Italian Parliament provides information on the interventions in each session. We have aggregated this information by parliamentarian daily (more than one session per day can occur) and subsequently by month. Secondly, we recorded the monthly number of bills proposed and accepted per parliamentarian. We obtain three fundamental data for each bill: date of proposal, signatories and (if any) date of approval. We assign one for each signatory on the month of the proposal date and 0 otherwise. With the approval date, we assign 1 to accepted proposals to each signatory in the month of approval and 0 otherwise. We sum the daily record of

[7] Analogous analysis is done with eligibility and distance. Eligibility is 1 if the parliamentarian is over 60 years old and 0 otherwise. Distance would be the geographical distance from the parliamentarian's constituency to the capital of Italy (Rome).

[8] See https://storia.camera.it/lavorinav and https://storia.camera.it/deputatinav.

bills proposed and approved to obtain the monthly total. The third step consists of the union of the number of interventions obtained in step 1, the number of proposed and accepted bills obtained in step 2, and the database of parliamentary characteristics provided by the Italian Parliament. This database includes the age, education, party, positions held, number of mandates, place of birth and constituencies. The last stage consists of the variables of interest: the presence of life pension, eligibility and seniority.

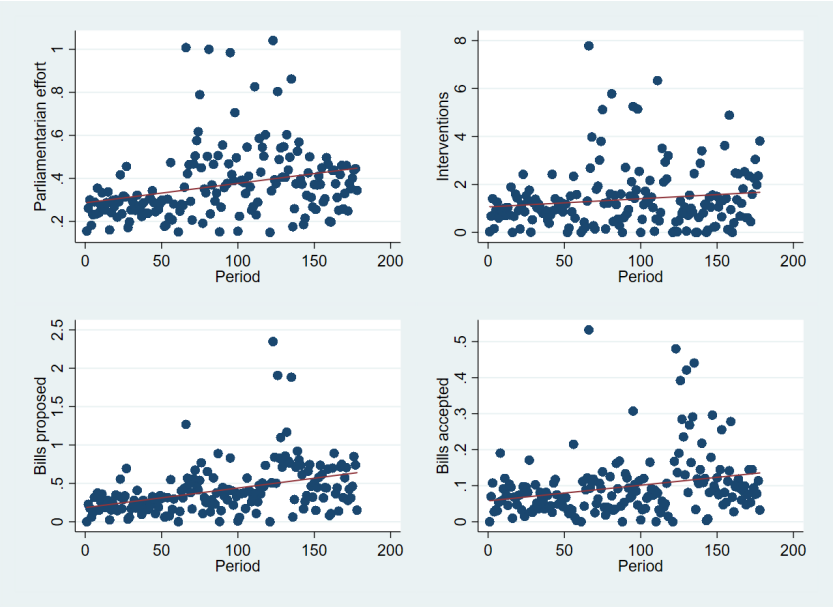
Our sample contains information on the 1098 parliamentarians who have served in one or more of the first three legislatures of the Italian Republic. This sample includes only parliamentarians who have been in the full legislature. Therefore, we exclude those parliamentarians who have left office before the end of the legislature or who have died. We describe which variables we have used in our analysis. The database covers the first three legislatures of the Italian Republic monthly, from May 1948 to February 1963. Each legislature lasts 60 months for a total of 180 months. The last two months of each legislature have been excluded, as this is an electoral period with no parliamentary activity. The reform studied was implemented in January 1955, totalling 78 months before and 96 months after the reform.

We construct a parliamentary effort index that aggregates the three measures of effort: interventions, bills proposed and bills accepted. We calculate the z-scores of each effort measure for each parliamentarian per month. The index is the equally weighted average of the monthly z-scores of its components (Kling et al., 2007). In all cases, higher-effort measures have higher z-scores.

Figure 1.3 shows the average values of parliamentarian effort and its components. The figure shows how parliamentary effort intensifies from period 50 onwards. The number of interventions is the most reactive component of parliamentarian effort from the fiftieth period onwards but stabilises after that. In the case of bills proposed and accepted, we observe a greater growth in the third legislature (i.e. from period 120 onwards). We also focus on the characteristic variables of each district: distance and price level. Distance is the geographical distance between Rome (the country's capital and where the Parliament is located) and the capital of each Italian region. On the other hand, we take the price level of each region from Daniele and Malanima (2007). We take the annual values of the price level for each region. Figure 1.4 shows each region's average price levels and points out each region's capital. The figure also shows the strong disparity in price levels between northern and southern Italy. A large heterogeneity can also be observed in the distance between the capitals of the regions and Rome.

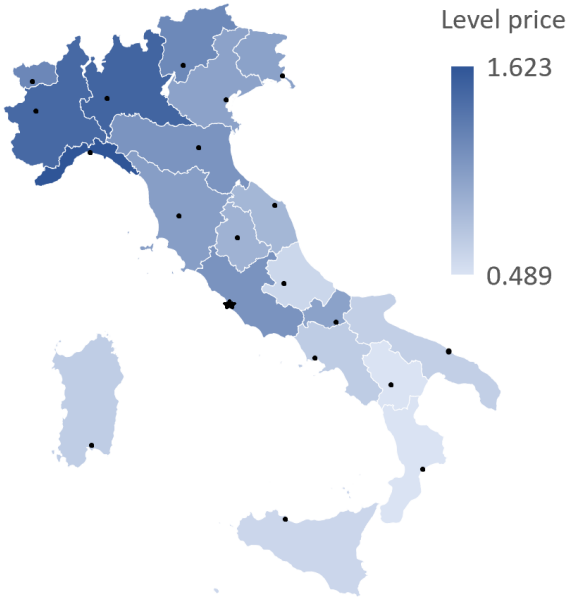
The number of parliamentarians is distributed in proportion to the population of each region. Figure 1.5 shows the distribution of parliamentarians according to price level and distance from the

Figure 1.3: Average parliamentarian effort and its components



Note: The values for each variable show the average for all parliamentarians in office in each period. The parliamentarian effort is measured as a weighted average of the z-scores, interventions as the number of interventions, bills proposed as the number of bills proposed and bills accepted as the number of bills accepted. The x-axis shows each period and comprises three legislatures.

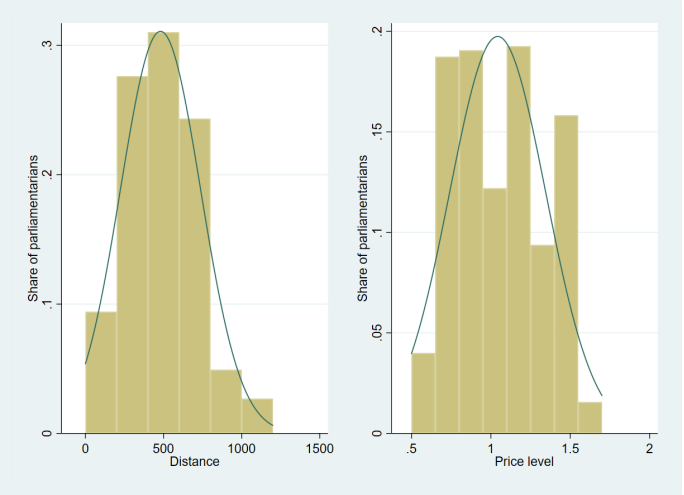
Figure 1.4: Average price level and distance in Italy. Period 1948-1963.



Note: Each region represents the average value of the price level for the period 1948-1963. The dots indicate the location of the capitals of each region, while the star shows the location of Rome. The distance is calculated as the distance (in kilometres) between each point and the star.

region. We observe that the share of parliamentarians relative to distance is normally distributed. The highest proportion of parliamentarians is concentrated in regions that are between 400 and 600 kilometres away from the capital. On the other hand, there is a concentration of parliamentarians in regions with price levels between 0.7 and 1.2.

Figure 1.5: Share of parliamentarians by price level and distance. Period 1948-1963.



Note: The y-axis represents the share of parliamentarians, while the x-axis shows the distance and price level of parliamentarians' regions. Distance is measured as kilometres between the capital of the region and Rome.

Table 1.1: Descriptive statistics

Variable	Obs	Mean	Std. dev.	Min	Max
Parliamentarian effort	106,024	0.27	0.69	0.00	14.17
Interventions	106,024	2.23	8.54	0	182
Bills proposed	106,024	0.41	1.07	0	43
Bills accepted	106,024	0.09	0.59	0	33
Seniority	106,024	0.53	0.70	0	2
Eligibility	106,024	0.20	0.40	0	1
Age	106,024	48.63	10.48	25	81
Male	106,024	0.94	0.22	0	1
University degree	106,024	0.67	0.46	0	1
Majoritarian party	106,024	0.45	0.49	0	1
Constituent assembly	106,024	0.33	0.47	0	1

Finally, Table 1.1 shows the descriptive statistics. We observe that the parliamentary effort index has a mean value of 0.27. We observe that the minimum value is 0, the value assigned for the month a given parliamentarian does not perform any parliamentary activity, i.e. 0 interventions, 0 bills proposed and 0 bills passed. Regarding the objective measures of effort, parliamentarians intervene 2.23 times a month, proposing 0.41 bills of which 20 per cent are approved (0.09 bills accepted). About the characteristics of interest, we observe that the average seniority is 0.53, i.e.

our sample has a parliamentary experience of half a legislature. Regarding eligibility, 20 per cent of our sample are eligible to receive the life pension. Regarding the general characteristics of the parliamentarians, the average age is 48 years, 94 per cent are male, 67 per cent have a university degree, and 45 per cent belong to the majoritarian party.

1.6 Results

In this section, we obtain the results of the empirical case analyzed. First, we analyze the effect of seniority, eligibility, distance from the constituency of origin to Parliament and price level on the impact of the life pension on parliamentarian effort. We also obtain the effect of the introduction of the life pension on parliamentarian effort for each group of parliamentarians. Second, we analyze the effect of the introduction of the life pension on each of the effort measures used. Third, we analyze other possible determinants of the effect of the life pension on parliamentary effort, and finally we perform a series of robustness checks.

1.6.1 Main results

The analysis estimates separately the effect of seniority and eligibility on the impact of the life pension on parliamentary effort. First, we analyze how the impact of the life pension on effort varies according to the seniority of the parliamentarian. In our sample, we differentiate three levels of seniority. It takes value zero when she is a fresh parliamentarian, one when she has been re-elected once, and two if she has been re-elected twice.

Table 1.2 shows the estimation for equation (1.5) for seniority. We find that the life pension positively affects parliamentary effort in all columns. However, when we interact the introduction of the life pension with the level of seniority, we find a differential effect according to seniority. In particular, for non-seniority parliamentarians, the effect of the life pension on parliamentary effort is unambiguously positive. The introduction of the life pension increases the effort of parliamentarians with seniority=1, and parliamentarians with higher seniority indeed reduce their level of effort. These results capture seniority's decreasing effect on the life pension's impact on the parliamentary effort.

One possible interpretation is provided by the theoretical model developed in section 1.3. In this model, introducing the life pension scheme increases parliamentary effort, as parliamentarians have the incentive to accumulate a higher pension and thus have the incentive to be re-elected. However, this effect is predicted to be smaller as seniority increases. Higher levels of seniority

bring parliamentarians closer to the maximum pension, reducing the incentive to accumulate. The intuition behind this is that parliamentarians with higher seniority have a better outside option and a greater incentive to enjoy it. On the other hand, the cost of not being re-elected decreases with the outside option, as the alternative to leaving office becomes increasingly attractive to parliamentarians.

Table 1.2: Main results by seniority

Dependent variable:	Parliamentarian effort			
	(1)	(2)	(3)	(4)
Lifepension×Seniority	-0.183***	-0.113***	-0.112***	-0.065***
	(0.017)	(0.017)	(0.017)	(0.020)
Lifepension	0.151***	0.141***	0.140***	0.124***
	(0.013)	(0.014)	(0.014)	(0.014)
Seniority	0.153***	0.172***	0.171***	0.057
	(0.016)	(0.016)	(0.016)	(0.040)
Individual FE		Y	Y	Y
Trend		Y	Y	Y
Individual trend			Y	Y
Legislature FE			Y	Y
Month of legislature FE				Y
Observations	106,023	106,023	106,023	106,023
R-squared	0.017	0.012	0.020	0.084
Number of Deputies	1,098	1,098	1,098	1,098
Effect of Life Pension	-0.032**	0.027*	0.028*	0.059***
with Seniority=1	(0.013)	(0.015)	(0.015)	(0.017)
Effect of Life Pension	-0.216	-0.085***	-0.083***	-0.005
with Seniority=2	(0.028)	(0.029)	(0.029)	(0.034)

Note: This table shows the coefficients of equation (1.5). Standard errors clustered at the legislator level are in parentheses. Trend includes a quadratic trend. Individual trend include a linear trend. Legislature FE includes First legislature and Second legislature, whose value is 1 in their respective legislature and 0 otherwise. Month of legislature FE controls for each month of the legislature respectively, with a total of 57 variables. *Significant at the 10 per cent level; **Significant at the 5 per cent level; ***Significant at the 1 per cent level.

Second, we analyze how the impact of the life pension on effort varies according to the parliamentarian's eligibility. In the case of eligibility, the variable can take two values. It takes value one if the parliamentarian is older than 60 and zero otherwise. Table 1.3 shows the estimation of equation (1.5) when we interact life pension with eligibility. In all columns, we again observe that the introduction of the life pension positively affects parliamentary effort. In contrast, when we interact eligibility with the introduction of the life pension, we find that eligibility affects the impact of the life pension on parliamentary effort. For non-eligible parliamentarians, the effect of the life pension is unambiguously positive. For parliamentarians eligible to receive the life pension, the introduction of the life pension does not affect parliamentary effort. These results show the negative effect that eligibility has on the impact of the life pension on parliamentary effort.

The theoretical model provides one possible interpretation. As with seniority, the theoretical

Table 1.3: Main results by eligibility

Dependent variable:	Parliamentarian effort			
	(1)	(2)	(3)	(4)
Lifepension×Eligibility	-0.120***	-0.104***	-0.105***	-0.097***
	(0.028)	(0.031)	(0.031)	(0.030)
Lifepension	0.110***	0.104***	0.104***	0.102***
	(0.014)	(0.013)	(0.013)	(0.013)
Eligibility	0.037	0.036	0.036	0.037
	(0.025)	(0.030)	(0.030)	(0.030)
Individual FE		Y	Y	Y
Trend		Y	Y	Y
Individual trend			Y	Y
Legislature FE			Y	Y
Month of legislature FE				Y
Observations	106,023	106,023	106,023	106,023
R-squared	0.012	0.016	0.012	0.085
Number of Deputies	1,098	1,098	1,098	1,098
Effect of Life Pension	-0.010	-0.000	-0.001	0.003
with Eligibility=1	(0.025)	(0.028)	(0.028)	(0.028)

Note: This table shows the coefficients of equation (1.5). Standard errors clustered at the legislator level are in parentheses. Trend includes a quadratic trend. Individual trend include a linear trend. Legislature FE includes First legislature and Second legislature, whose value is 1 in their respective legislature and 0 otherwise. Month of legislature FE controls for each month of the legislature respectively, with a total of 57 variables. *Significant at the 10 per cent level; **Significant at the 5 per cent level; ***Significant at the 1 per cent level.

model predicts that the positive effect of the life pension on effort is smaller for eligible parliamentarians. Parliamentary eligibility endows parliamentarians with the possibility of receiving the accumulated pension immediately. In contrast, non-eligible parliamentarians must fulfil one of the requirements and wait for a certain period. The intuition behind this result is that eligible parliamentarians face a trade-off at that point between accumulating more pension or enjoying it. In contrast, non-eligible parliamentarians cannot choose to enjoy the accumulated pension at that point, so the incentive to accumulate causes an increase in effort.

The results show that the seniority and eligibility of parliamentarians are determinants of the magnitude of the effect of the life pension on parliamentary effort. Next, we analyze the effect that the introduction of the life pension has had on the parliamentary effort of each group of parliamentarians. We include both variables in equation (1.5). This joint analysis gives us relevant information on the mechanisms behind the life pension. First, we observe whether there is an overlap between the effects of seniority and eligibility on the impact of the life pension on parliamentary effort. Second, it allows us to recognize the patterns of behaviour of different groups of parliamentarians.

Table 1.4 shows the estimate for the joint analysis. In all columns, we find that the interactions of pension with seniority and eligibility are negative coefficients, consistent with the results. More-

over, the coefficients obtained jointly are very similar to the coefficients obtained separately, which could indicate the independence of both effects. We find that unequivocally non-eligible parliamentarians with seniority of less than two terms increase their effort. We also find that unambiguously eligible parliamentarians with maximum seniority decrease their level of effort. Regarding the groups of non-eligible parliamentarians with maximum seniority or eligible parliamentarians with low seniority, we find that the sign and magnitude of the effect depend on the controls used.

Table 1.4: Results by eligibility and seniority

Dependent variable:	Parliamentarian effort			
	(1)	(2)	(3)	(4)
Lifepension×Seniority	-0.179***	-0.113***	-0.065***	-0.065***
	(0.017)	(0.017)	(0.020)	(0.020)
Lifepension×Eligibility	-0.111***	-0.104***	-0.100***	-0.099***
	(0.028)	(0.030)	(0.030)	(0.030)
Lifepension	0.167***	0.158***	0.123***	0.140***
	(0.014)	(0.015)	(0.014)	(0.015)
Seniority	0.152***	0.171***	0.057	0.067**
	(0.016)	(0.016)	(0.039)	(0.028)
Eligibility	0.031	0.041	0.035	0.040
	(0.025)	(0.030)	(0.030)	(0.030)
Individual FE		Y	Y	Y
Trend		Y	Y	Y
Individual trend			Y	Y
Legislature FE			Y	Y
Month of legislature FE				Y
Observations	106,023	106,023	106,023	106,023
R-squared	0.018	0.014	0.023	0.085
Number of Deputies	1,098	1,098	1,098	1,098
Effect of Life Pension with	-0.011	0.044***	0.057***	0.075***
Seniority=1 and Eligibility=0	(0.014)	(0.016)	(0.017)	(0.017)
Effect of Life Pension with	-0.191***	-0.069**	-0.008	0.010
Seniority=2 and Eligibility=0	(0.029)	(0.030)	(0.034)	(0.035)
Effect of Life Pension with	0.056**	0.054*	0.022	0.041
Seniority=0 and Eligibility=1	(0.027)	(0.029)	(0.029)	(0.029)
Effect of Life Pension with	-0.122***	-0.059**	-0.042	-0.024
Seniority=1 and Eligibility=1	(0.027)	(0.029)	(0.029)	(0.029)
Effect of Life Pension with	-0.302***	-0.173***	-0.108***	-0.089**
Seniority=2 and Eligibility=1	(0.036)	(0.037)	(0.041)	(0.041)

Note: This table shows the coefficients of equation (1.5). Standard errors clustered at the legislator level are in parentheses. Trend includes a quadratic trend. Individual trend include a linear trend. Legislature FE includes First legislature and Second legislature, whose value is 1 in their respective legislature and 0 otherwise. Month of legislature FE controls for each month of the legislature respectively, with a total of 57 variables. *Significant at the 10 per cent level; **Significant at the 5 per cent level; ***Significant at the 1 per cent level.

Our theoretical model offers a possible explanation for the results obtained in the conjoint analysis. The theoretical model predicts that the introduction of the life pension decreases the effort of eligible parliamentarians with a high level of seniority. In contrast, for the rest of the parliamentarians, the introduction of the life pension is non-negative. There are two predominant mechanisms when the life pension is introduced. The first mechanism is incentivized by the desire to accumulate a higher pension. This mechanism weakens as higher levels of accumulated pension

are reached. The second mechanism is determined by the time the parliamentarian must wait to receive the life pension. The shorter the period, the less incentive there is to make an effort to remain in office. Moreover, both effects can be feedback since the longer the seniority, the closer the parliamentarian is to be eligible to receive the pension.

We also analyze other possible determinants of the differences in the effect of the introduction of the life pension on parliamentary effort. We focus the analysis on two characteristics of the constituency of parliamentarians: the distance to the Parliament and the price level. First, we analyze the distance to Parliament, and this variable captures the number of kilometres from the parliamentarian constituency to Parliament. We include the interaction between the introduction of the life pension and distance.

Table 1.5: Results by distance

Dependent variable:	Parliamentarian effort			
	(1)	(2)	(3)	(4)
Lifepension× Distance	-9.71e-05**	-1.04e-04**	-1.02e-04**	-1.04e-04**
	(4.85e-05)	(5.18e-05)	(5.21e-05)	(5.18e-05)
Lifepension	0.134***	0.136***	0.117***	0.152***
	(0.024)	(0.028)	(0.029)	(0.029)
Distance	2.55e-05			
	(3.46e-05)			
Individual FE		Y	Y	Y
Trend		Y	Y	Y
Individual Trend			Y	Y
Legislature FE			Y	Y
Month of legislature FE				Y
Observations	106,023	106,023	106,023	106,023
R-squared	0.012	0.015	0.021	0.085
Number of Deputy	1,098	1,098	1,098	1,098

Note: This table shows the coefficients of equation (1.5). Standard errors clustered at the legislator level are in parentheses. Trend includes a quadratic trend. Individual trend include a linear trend. Legislature FE includes First legislature and Second legislature, whose value is 1 in their respective legislature and 0 otherwise. Month of legislature FE controls for each month of the legislature respectively, with a total of 57 variables. *Significant at the 10 per cent level; **Significant at the 5 per cent level; ***Significant at the 1 per cent level.

Table 1.5 shows the estimation of equation (1.5) when we interact life pension and distance. The interaction coefficient between life pension and distance in all columns is negative and significant. This estimation shows that the distance from the home constituency to the parliament has a negative effect on the impact of the life pension on parliamentary effort. Therefore, parliamentarians from more distant constituencies register a lower effect of the life pension on parliamentary effort than parliamentarians from closer constituencies.

The theoretical model offers a possible explanation for these results. Parliamentarians from more distant constituencies assume a higher cost of taking office due to the cost of transport, accommodation and time. The existence of an alternative income such as a life pension reduces the incentive to be re-elected. This minor incentive to re-election explains the diminishing effect

of distance on the impact of a life pension on parliamentarian effort. The parliamentarians from distant constituencies also derive an implicit benefit from enjoying the life pension, and savings on accommodation and transport.

Finally, we analyze the effect of the price level of the parliamentarian's home constituency on the impact of the life pension on parliamentary effort. The joint analysis in Table 1.4 shows that the effect of the life pension is non-negative (positive or neutral) on parliamentary effort for ineligible or low-seniority parliamentarians. In contrast, the effect is negative for eligible senior parliamentarians. The theoretical model states that the effect of the price level on effort on the impact of the life pension differs for these two groups. To analyse this differential effect, we create a variable ($Neg.affect$) with a value of 1 for parliamentarians who decrease effort (i.e. eligible parliamentarians with high seniority) and 0 otherwise. We run the following regression:

$$\begin{aligned} Y_{it} =& \alpha + Lifepension \times Lev.price \times Neg.affect_{it} + Lifepension \times Lev.price_{it} \\ &+ \gamma X_{it} + \phi_i + \mu_t + \tau_{it} + \epsilon_{it} \end{aligned} \tag{1.6}$$

This analysis is slightly different, as the price level has a different effect on the impact of the life pension on parliamentary effort for parliamentarians who decrease their effort and all other parliamentarians. Unlike previous analyses, here we include a triple interaction. The triple interaction captures the difference in effect between parliamentarians whose effort decreases and all other parliamentarians. On the other hand, the double interaction between the life pension and price level captures the effect of the price level on the impact of the life pension on effort for parliamentarians whose effort does not decrease.

Table 1.6 shows the estimation of equation (1.6). We observe that the triple interaction is positive and significant in all columns. This result suggests that among parliamentarians who reduce their level of effort, the price level positively affects the impact of the life pension on parliamentary effort. In contrast, the interaction between life pension and the price level is negative and significant. This result suggests that among parliamentarians who do not reduce their level of effort, the effect of the price level is negative on the impact of the life pension on parliamentary effort.

The theoretical model provides one possible explanation. The effect of the price level of the constituency on the impact of the life pension on effort is negative for parliamentarians whose effort is maintained or increased after the introduction of the life pension. The intuition behind

this result is that the actual pension accumulated by each parliamentarian is different. While the accumulated amount is nominal and depends on the year served, the actual amount they receive depends on the price level of their constituency of origin. Parliamentarians from low price level constituencies accumulate a higher real pension than parliamentarians from high price level constituencies. Therefore, the accumulation of a higher pension is more attractive for parliamentarians from constituencies with low price levels, and the introduction of the life pension has a larger effect on their parliamentary effort.

Table 1.6: Results by level of price

Dependent variable:	Parliamentarian effort			
	(1)	(2)	(3)	(4)
Lifepension×Lev.price×Neg.affect	0.070**	0.077***	0.075***	0.075***
	(0.028)	(0.029)	(0.029)	(0.028)
Lifepension×Lev.price	-0.042***	-0.033***	-0.025***	-0.028***
	(0.010)	(0.010)	(0.010)	(0.010)
Lifepension×Neg.affect	-0.195***	-0.149***	-0.156***	-0.150***
	(0.033)	(0.034)	(0.034)	(0.032)
Lifepension	0.143***	0.122***	0.094***	0.115***
	(0.012)	(0.013)	(0.013)	(0.013)
Lev.price	0.003			
	(0.015)			
Individual Fixed Effect		Y	Y	Y
Trend		Y	Y	Y
Individual Trend			Y	Y
Legislature FE			Y	Y
Month of legislature FE				Y
Observations	106,023	106,023	106,023	106,023
R-squared	0.012	0.010	0.014	0.086
Number of Deputy	1,098	1,098	1,098	1,098
Effect of Level of Price	0.027	0.043	0.049*	0.047*
Negative Affected	(0.028)	(0.028)	(0.028)	(0.027)

Note: This table shows the coefficients of equation (1.6). Standard errors clustered at the legislator level are in parentheses. Trend includes a quadratic trend. Individual trend include a linear trend. Legislature FE includes First legislature and Second legislature, whose value is 1 in their respective legislature and 0 otherwise. Month of legislature FE controls for each month of the legislature respectively, with a total of 57 variables. *Significant at the 10 per cent level; **Significant at the 5 per cent level; ***Significant at the 1 per cent level.

On the other hand, the price level effect is positive for parliamentarians who reduce their effort after introducing the life pension (i.e. eligible parliamentarians with high seniority). Parliamentarians from constituencies with low price levels have a greater incentive to receive pension benefits, as they receive a higher real amount. In addition, when seniority is high the incentive to accumulate higher pension decreases as taking the outside option becomes more attractive. These results suggest that low price levels exacerbate the effect of the life pension on parliamentary effort. In contrast, high price levels dampen the effect of the life pension on effort.

1.6.2 The impact of introducing life pension scheme on each measure of parliamentary effort

After analyzing the parliamentarian effort index, we analyze the effect that the introduction of the life pension has had on each effort measure separately. We perform the joint analysis of seniority and eligibility for each measure. Table 1.7 shows the results of the effect of the introduction of the life pension on each measure of parliamentarian effort. We find that the life pension has a positive effect in all measures. When we interact the introduction of the life pension with the level of seniority, we find that the effect is differential for parliamentarians of different seniority in the case of interventions and bills proposed. In the case of the number of bills accepted, the effect of the life pension is independent of the seniority level. When we interact the introduction of the life pension and the eligibility of parliamentarians, we find that the effect is differential for eligible and non-eligible parliamentarians for all measures of effort. In all measures, the effect of the introduction of the life pension is unambiguously positive on non-eligible parliamentarians with low or medium seniority (less than two terms). We also find that the negative effect of the life pension on parliamentarian effort is concentrated only on the number of bills proposed. In the number of interventions and bills accepted, the impact of introducing the life pension is always non-negative. In the case of the number of bills accepted, the introduction of the pension for life has a null effect on most groups of parliamentarians.

These results provide evidence that the introduction of the life pension affects different measures of parliamentarian effort. We find the decreasing effect of seniority and eligibility on the impact of the life pension on parliamentarian effort again. However, the life pension also creates a reallocation of parliamentarians' efforts. Parliamentarians are more likely to increase the number of speeches than the number of bills. On the other hand, those parliamentarians who decrease their effort concentrate on reducing the number of proposals. One possible interpretation of this finding is the relative cost of making an intervention and proposing a bill. Making interventions requires less skilled and less time-consuming work than proposing bills. As a result, parliamentarians focus primarily on making interventions to gain visibility and increase the probability of re-election.

Another possible interpretation of the decrease in effort concentrated on the number of bills proposed may be that the quality of the bills is improving. We observe that while the number of bills proposed decreases for senior eligible parliamentarians, the number of bills accepted is not affected. If the number of bills proposed decreases and the number of bills accepted remains the same, the percentage of bills accepted has improved. An increase in the percentage of bills accepted

may imply that the quality of bills proposed by the most senior eligible parliamentarian group has improved.

Table 1.7: Results by seniority and eligibility by measure of effort

Dependent Variable	Interventions (1)	Bills introduced (2)	Bills accepted (3)
Lifepension×Seniority	-0.604*	-0.128***	-0.009
	(0.342)	(0.034)	(0.018)
Lifepension×Eligibility	-1.328***	-0.102*	-0.056*
	(0.447)	(0.053)	(0.030)
Lifepension	2.161***	0.188***	0.060***
	(0.248)	(0.025)	(0.013)
Seniority	0.314	0.142**	0.098*
	(0.449)	(0.056)	(0.055)
Elegibility	1.029**	0.006	0.009
	(0.460)	(0.052)	(0.029)
Individual FE	Y	Y	Y
Trend	Y	Y	Y
Individual trend	Y	Y	Y
Legislature FE	Y	Y	Y
Month of legislature FE	Y	Y	Y
Observations	106,023	106,023	106,023
R-squared	0.125	0.063	0.016
Number of Deputy	1,098	1,098	1,098
Effect of Life Pension with	1.556***	0.060*	0.050**
Seniority=1 and Eligibility=0	(0.278)	(0.035)	(0.022)
Effect of Life Pension with	0.952*	-0.067	0.041
Seniority=2 and Eligibility=0	(0.572)	(0.065)	(0.039)
Effect of Life Pension with	0.833*	0.086*	0.004
Seniority=0 and Eligibility=1	(0.444)	(0.050)	(0.028)
Effect of Life Pension with	0.228	-0.041	-0.005
Seniority=1 and Eligibility=1	(0.496)	(0.046)	(0.024)
Effect of Life Pension with	-0.375	-0.168***	-0.014
Seniority=2 and Eligibility=1	(0.727)	(0.064)	(0.032)

Note: This table shows the coefficients of 1.5. Standard errors clustered at the legislator level are in parentheses. Trend includes a quadratic trend. Individual trend include a linear trend. Legislature FE includes First legislature and Second legislature, whose value is 1 in their respective legislature and 0 otherwise. Month of legislature FE controls for each month of the legislature respectively, with a total of 57 variables. *Significant at the 10 per cent level; **Significant at the 5 per cent level; ***Significant at the 1 per cent level.

1.6.3 Discussion of the results

The empirical results support the theoretical predictions of section 1.3. However, some potential cofounders may distort the effects found. In this section, we explore variables that could act as potential cofounders and explain all (or part) of the effect found.

First, we look at those variables that affect the probability of re-election. These variables may have a high correlation with the seniority of the parliamentarian. One of the main determinants of re-election is the parliamentarian's reputation (Ashworth, 2005). Reputable parliamentarians tend to hold more responsible positions. They, therefore, spend more time on administrative and organisational tasks, limiting time spent on proposing bills or making interventions. Education

and being part of the ruling party are also determinants of the probability of re-election (Prior, 2006; Carnes and Lupu, 2016). We tested some reelection determinants such as holding positions of responsibility, presence in the Constituent Assembly, having a university degree or being a ruling party member.

Table 1.8 shows the results.[9] In all columns, we find that the coefficient of the life pension is positive and significant. However, we find no differential effect of the life pension effect on the parliamentarian effort based on reputation or re-election potential determinants. These results reinforce the prediction of the theoretical model that the life pension effect on parliamentarian effort is decreasing in the seniority of the parliamentarian.

Second, we focus on potential drivers of the diminishing effect of eligibility on the impact of the life pension on effort. Similarly to distance and price level differences, constituencies also show differences in average life expectancy. Life expectancy may affect the decision to leave office, and lower life expectancy may accelerate the decision to leave office and enjoy the life pension (Van Solinge and Henkens, 2010). We test these differences in life expectancy. Table 1.9 shows the effect of life expectancy on the impact of life pension on parliamentarian effort. All columns show that the life pension positively affects parliamentarian effort. However, the interaction between life pension and life expectancy is insignificant, which shows no differential effect based on the life expectancy of parliamentarians. We also observe that life expectancy has a positive effect on parliamentarian effort. This result reinforces the prediction that parliamentarians assess whether they are eligible or ineligible but do not account for the years expected to receive the life pension.

Finally, we look at other characteristics of the constituencies that could potentially channel the differential effect found in the price level. One possible determinant of the price level may be the region's prosperity. More prosperous regions (with higher price levels) may offer better alternatives to holding office than less prosperous regions (Lazzeroni, 2010). We test two variables that may be determinants of the prosperity of each of the regions: the Human Development Index (HDI hereafter) and the average number of years of schooling (Despotis, 2005; Hanushek et al., 2013).[10] Table 1.10 shows the effect of average years of schooling and HDI on the impact of the life pension on parliamentarian effort. We observe that the coefficient of life pension is positive and significant in all columns. We find that none of the prosperity determinants affects parliamentarian effort, nor do they have a differential effect after introducing the life pension. This result reinforces the prediction that the differential effect linked to constituency characteristics is explained by the

[9] Tables 1.8, 1.9 and 1.10 are in Appendix 1.8.2.

[10] Regional data on years of schooling and the Human Development Index are provided from Felice (2007).

higher cost borne by parliamentarians from more distant constituencies and the real value of the life pension.

1.6.4 Robustness checks

Our sample covers three legislatures. In the first robustness check, we restrict our sample to parliamentarians in the legislature where the life pension is introduced. By restricting the sample only to the legislature where the life pension is introduced, we avoid any bias in politicians' incentives to be re-elected. This sample covers 599 parliamentarians. Table 1.11 shows the results for the different variables of interest. We find that the results are significant and consistent with those obtained previously. We observe that seniority, eligibility and distance have a decreasing effect on the impact of the life pension on parliamentarian effort.

The variables of interest tend to have little variation in our database. While the frequency of the database is monthly, the variables of interest tend to change at least annually or every legislature. This low variability of the explanatory variables may underestimate the errors and alter the results found. We propose two frequency changes in the database: at the annual and legislature levels. Table 1.12 shows the results for the annual frequency. We find that the results are significant and consistent with those obtained with monthly frequency. At the legislature level, we create four periods. The first period corresponds to the first legislature, the second period corresponds to the second legislature before introducing the life pension, the third period corresponds to the rest of the second legislature, and the fourth period corresponds to the third legislature. Table 1.13 shows the results for the annual frequency. We find that the results obtained are significant and consistent with those obtained previously. These results provide evidence that regardless of the frequency used, the results obtained are still consistent with the predictions of our theoretical model.

Finally, we analyze whether the effects found are exclusively due to the life pension introduction or caused by other variables. We perform a placebo test using the first legislature where there was no life pension. We introduce a placebo of the life pension in the same month of the legislature in which the life pension is introduced. Table 1.14 shows the results. All the effects disappear, providing evidence that the life pension's introduction affects parliamentarian activity.

1.7 Conclusions

We analyze the effect of the introduction of the life pension on parliamentarian effort. We find that the effect of introducing a life pension scheme on parliamentarian effort can go either way. We

create a general model that predicts that the effect of the life pension on parliamentarian effort is decreasing in seniority and eligibility. It also predicts that eligible parliamentarians with higher seniority reduce their level of effort while the effect is non-negative for all other parliamentarians. In addition, we include two characteristics for each parliamentarian i) distance from the constituency of origin to the parliament ii) price level of the constituency of origin. The theoretical model predicts a decreasing effect of distance on the impact of life pension on parliamentarian effort. In contrast, the price level affects groups of parliamentarians differently. The effect of price level on the impact of life pension on parliamentarian effort is increasing for those eligible parliamentarians with higher seniority who reduce their effort and decrease otherwise.

The empirical findings confirm the predictions of the theoretical model. To test these predictions, we use the introduction of the life pension in Italy in 1955. We find that the impact of the life pension on parliamentary effort is decreasing in seniority and eligibility. This finding evidences the existence of two mechanisms that act in opposite ways. The accumulation of a higher pension leads to increased effort, while eligibility leads to decreased effort. With the introduction of the life pension, we find that eligible parliamentarians with high seniority decrease their level of effort while the rest maintain or increase their level of effort. This decrease in the effort is only concentrated in the number of bills proposed. The empirical findings also confirm the predictions that the distance from the constituency of origin to Parliament has a decreasing effect on the impact of the life pension on parliamentarian effort. Low price levels in the constituency of origin exacerbate the effect of the life pension on parliamentarian effort. Parliamentarians from low price level constituencies register a larger rise in effort when the impact of the life pension is positive, and register a larger fall when the impact of the life pension is negative.

Our results show that the introduction of a life pension can have significant effects on parliamentarian efforts. Moreover, these results can be extrapolated to many countries granting their parliamentarians this benefit. Contrary to the populist view that such benefits are only a cost to taxpayers, we show a link between the presence of a life pension and parliamentarian effort. These results highlight the relevance of the proper design of politicians' rewards to maximize their effort.

1.8 Appendix

1.8.1 Proof of proposition 1 and 2

Proof of Proposition 1

From equation 1.2, which is $U = \frac{c'(e)}{\rho'(e)\delta} = w + \theta(-\alpha\psi + \delta(1-\alpha))$ and with $\theta = 1$:

(i) We take the partial derivative with respect to α, $\frac{\partial U}{\partial \alpha} = -\psi - \delta$. Since $\delta > 0$ and $\psi \geq 0$, then $-\psi - \delta < 0$. The effect on the effort is always decreasing in α.

(ii) We take the partial derivative with respect to ψ, $\frac{\partial U}{\partial \psi} = -\alpha$. Since $\alpha \geq 0$, then $-\alpha \leq 0$. The effect on the effort is always decreasing in ψ.

(iii) We take the partial derivative with respect to θ, $\frac{\partial U}{\partial \theta} = -\alpha\psi + \delta(1-\alpha)$. If $\psi = 0$, then $\delta(1-\alpha) \geq 0$. If $\psi = 1$, then $-\alpha + \delta(1-\alpha) < 0$ if $\alpha > \frac{\delta}{1+\delta}$ and $-\alpha + \delta(1-\alpha) \geq 0$ otherwise.

Proof of Proposition 2

From equation 1.4, which is $\frac{c'(e)k(d)}{\delta\rho'(e)} = w + \frac{\theta}{\pi}(-\alpha\psi + \delta(1-\alpha))$ and with $\theta = 1$:

(i) We take the partial derivative with respect to d, $\frac{\partial U}{\partial d} = -c'(e)k'(d)$. Since $c'(e) > 0$ and $k'(d) > 0$, then $-c'(e)k'(d) < 0$. The effect on the effort is always decreasing in d.

(ii) We take the partial derivative with respect to π, $\frac{\partial U}{\partial \pi} = \frac{1}{\pi^2}(-\alpha\psi + \delta(1-\alpha))$. Since $\pi > 0$, then $-(-\alpha\psi + \delta(1-\alpha) < 0$ according to Proposition 1 (iii). The effect of level of price is increasing in π if $\psi = 1$ and on the effort is always decreasing in ψ and $\alpha > \frac{\delta}{1+\delta}$, and decreasing otherwise.

1.8.2 Investigating mechanisms

Table 1.8: Results for reputational mechanism

Dependent variable:	Parliamentarian effort			
	(1)	(2)	(3)	(4)
Lifepension	0.107***	0.118***	0.068**	0.094***
	(0.012)	(0.013)	(0.033)	(0.014)
Lifepension × Position	-0.014			
	(0.047)			
Lifepension × Assembly		-0.043		
		(0.036)		
Lifepension × University degree			0.051	
			(0.040)	
Lifepension × Incumbent				0.019
				(0.032)
Individual FE	Y	Y	Y	Y
Trend	Y	Y	Y	Y
Individual trend	Y	Y	Y	Y
Legislature FE	Y	Y	Y	Y
Month of legislature FE	Y	Y	Y	Y
Observations	106,024	106,024	106,024	106,024
R-squared	0.11	0.11	0.12	0.013
Number of Deputy	1,098	1,098	1,098	1,098

Note: This table shows the coefficients of equation (1.5). Standard errors clustered at the legislator level are in parentheses. Trend includes a quadratic trend. Individual trend include a linear trend. Legislature FE includes First legislature and Second legislature, whose value is 1 in their respective legislature and 0 otherwise. Month of legislature FE controls for each month of the legislature respectively, with a total of 57 variables. *Significant at the 10 per cent level; **Significant at the 5 per cent level; ***Significant at the 1 per cent level.

Table 1.9: Results by life expectancy

Dependent variable:	Parliamentarian effort			
	(1)	(2)	(3)	(4)
Lifepension×Life expectancy	-0.002	-0.003	-0.003	-0.003
	(0.002)	(0.002)	(0.002)	(0.002)
Lifepension	0.119*	0.208**	0.217**	0.217**
	(0.070)	(0.109)	(0.102)	(0.103)
Life expectancy	0.002	0.004*	0.004*	0.004*
	(0.001)	(0.002)	(0.002)	(0.002)
Individual FE		Y	Y	Y
Trend		Y	Y	Y
Individual trend			Y	Y
Legislature FE			Y	Y
Month of legislature FE				Y
Observations	106,023	106,023	106,023	106,023
R-squared	0.01	0.02	0.03	0.06
Number of Deputy	1,098	1,098	1,098	1,098

Note: This table shows the coefficients of equation (1.5). Standard errors clustered at the legislator level are in parentheses. Trend includes a quadratic trend. Individual trend include a linear trend. Legislature FE includes First legislature and Second legislature, whose value is 1 in their respective legislature and 0 otherwise. Month of legislature FE controls for each month of the legislature respectively, with a total of 57 variables. *Significant at the 10 per cent level; **Significant at the 5 per cent level; ***Significant at the 1 per cent level.

Table 1.10: Results by prosperity variables

Dependent variable:	Parliamentarian effort			
	(1)	(2)	(3)	(4)
Lifepension	0.049**	0.050**	0.035**	0.036**
	(0.025)	(0.025)	(0.018)	(0.019)
Lifepension×HDI	-0.112	-0.112		
	(0.511)	(0.511)		
HDI	0.222	0.223		
	(0.499)	(0.498)		
Lifepension×Years schooling			0.006	0.006
			(0.043)	(0.043)
Years schooling			0.007	0.007
			(0.043)	(0.043)
Individual FE	Y	Y	Y	Y
Trend	Y	Y	Y	Y
Individual trend	Y	Y	Y	Y
Legislature FE	Y	Y	Y	Y
Month of legislature FE		Y		Y
Observations	106,023	106,023	106,023	106,023
R-squared	0.01	0.02	0.03	0.06
Number of Deputy	1,098	1,098	1,098	1,098

Note: This table shows the coefficients of equation (1.5). Standard errors clustered at the legislator level are in parentheses. Trend includes a quadratic trend. Individual trend include a linear trend. Legislature FE includes First legislature and Second legislature, whose value is 1 in their respective legislature and 0 otherwise. Month of legislature FE controls for each month of the legislature respectively, with a total of 57 variables. *Significant at the 10 per cent level; **Significant at the 5 per cent level; ***Significant at the 1 per cent level.

1.8.3 Robustness checks

Table 1.11: Results with the sample restricted to second legislature

Dependent variable:	Parliamentarian effort			
	(1)	(2)	(3)	(4)
Lifepension	0.157***	0.121***	0.173***	0.161***
	(0.014)	(0.014)	(0.015)	(0.010)
Lifepension×Seniority	-0.108***		-0.109***	
	(0.017)		(0.017)	
Seniority	0.163***		0.162***	
	(0.016)		(0.016)	
Lifepension×Eligibility		-0.097***	-0.098***	
		(0.030)	(0.030)	
Elegibility		0.046	0.051*	
		(0.028)	(0.028)	
Lifepension×Distance				-1.17e-04***
				(1.60e-05)
Individual FE	Y	Y	Y	Y
Trend	Y	Y	Y	Y
Individual trend	Y	Y	Y	Y
Year of Legislature FE	Y	Y	Y	Y
Observations	34,742	34,742	34,742	34,742
R-squared	0.10	0.08	0.12	0.08
Number of Deputy	599	599	599	599

Note: This table shows the coefficients of equation (1.5). Standard errors clustered at the legislator level are in parentheses. Trend includes a quadratic trend. Individual trend include a linear trend. *Significant at the 10 per cent level; **Significant at the 5 per cent level; ***Significant at the 1 per cent level.

Table 1.12: Results with annual frequency

Dependent variable:	Parliamentarian effort			
	(1)	(2)	(3)	(4)
Lifepension×Seniority	-0.020***		-0.017**	
	(0.006)		(0.007)	
Lifepension×Eligibility		-0.270***	-0.264***	
		(0.097)	(0.098)	
Lifepension	0.106**	0.043	0.134***	0.132***
	(0.046)	(0.043)	(0.047)	(0.046)
Seniority	0.020		0.012	
	(0.033)		(0.033)	
Elegibility		0.118	0.118	
		(0.093)	(0.093)	
Lifepension×Distance				-2.74e-04***
				(6.56e-05)
Individual FE	Y	Y	Y	Y
Trend	Y	Y	Y	Y
Individual trend	Y	Y	Y	Y
Legislature FE	Y	Y	Y	Y
Year of Legislature FE	Y	Y	Y	Y
Observations	9,140	9,140	9,140	9,140
R-squared	0.03	0.06	0.07	0.04
Number of Deputy	1,098	1,098	1,098	1,098

Note: This table shows the coefficients of equation (1.5). Standard errors clustered at the legislator level are in parentheses. Trend includes a quadratic trend. Individual trend include a linear trend. Legislature FE includes First legislature and Second legislature, whose value is 1 in their respective legislature and 0 otherwise. Year of legislature FE controls for each year of the legislature, respectively, with a total of 14 variables. *Significant at the 10 per cent level; **Significant at the 5 per cent level; ***Significant at the 1 per cent level.

Table 1.13: Results with frequency at legislature level

Dependent variable:	Parliamentarian effort			
	(1)	(2)	(3)	(4)
Lifepension	0.947**	0.821***	1.221***	1.022***
	(0.380)	(0.270)	(0.403)	(0.301)
Lifepension×Seniority	-0.155***		-0.166***	
	(0.0557)		(0.0560)	
Seniority	0.312**		0.300**	
	(0.144)		(0.144)	
Lifepension×Eligibility		-0.674**	-0.733**	
		(0.341)	(0.335)	
Elegibility		0.167	0.224	
		(0.397)	(0.394)	
Lifepension×Distance				-7.58e-04*
				(4.58e-04)
Individual FE	Y	Y	Y	Y
Trend	Y	Y	Y	Y
Individual trend	Y	Y	Y	Y
Observations	1,830	1,830	1,830	1,830
R-squared	0.069	0.077	0.086	0.064
Number of Deputy	1,098	1,098	1,098	1,098

Note: This table shows the coefficients of equation (1.5). Standard errors clustered at the legislator level are in parentheses. Trend includes a quadratic trend. Individual trend include a linear trend. Legislature FE includes First legislature and Second legislature, whose value is 1 in their respective legislature and 0 otherwise. *Significant at the 10 per cent level; **Significant at the 5 per cent level; ***Significant at the 1 per cent level.

Table 1.14: Results with placebo

Dependent variable:	Parliamentarian effort			
	(1)	(2)	(3)	(4)
Lifepension	0.012	0.014	0.013	0.012
	(0.011)	(0.011)	(0.012)	(0.012)
Lifepension × Seniority	-0.006		-0.006	
	(0.009)		(0.009)	
Seniority	-0.042***		-0.033***	
	(0.008)		(0.005)	
Lifepension × Eligibility		-0.028	-0.027	
		(0.034)	(0.034)	
Elegibility		0.031	0.033	
		(0.047)	(0.047)	
Lifepension × Distance				-1.31e-05
				(2.31e-05)
Individual FE	Y	Y	Y	Y
Trend	Y	Y	Y	Y
Individual trend	Y	Y	Y	Y
Year of Legislature FE	Y	Y	Y	Y
Observations	35,612	35,612	35,612	35,612
R-squared	0.03	0.01	0.03	0.01
Number of Deputy	614	614	614	614

Note: This table shows the coefficients of equation (1.5). Standard errors clustered at the legislator level are in parentheses. Trend includes a quadratic trend. Individual trend include a linear trend. *Significant at the 10 per cent level; **Significant at the 5 per cent level; ***Significant at the 1 per cent level.

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Chapter 2

The role of expectations of government turnover on bureaucratic corruption

DAVID MEDINA RODRIGUEZ

2.1 Introduction

Corruption is one of the main threats to countries' development, and a lack of transparency and accountability negatively affect different macroeconomic variables (Mauro, 1995; Aidt et al., 2008; Rock, 2009). Such adverse effects have raised awareness in developing and underdeveloped countries and have led to a growing interest in determining diverse mechanisms affecting corruption. However, the literature addressing the causes of corruption is still developing, especially the link between bureaucrats and politicians. The main goal of this paper is to analyze the effect of expectations of government turnover on bureaucrats' corruption.

Our approach parallels existing efforts analyzing how electoral accountability affects politicians' corruption showing a negative relationship between corruption and their re-election probability (Ferraz and Finan, 2011; Costas-Pérez et al., 2012). Given that incumbents choose their level of corruption based on the probability of re-election, they are maximizing the level of corruption when they cannot stand for re-election. Hence, the expectation of government turnover can lead to high levels of corruption by politicians. In our setting instead, we are asking the following questions: How does the expectation of government turnover affect the corruption of bureaucrats? And how does the corruption of bureaucrats depend on the probability of the incumbent or challenger being corrupt?

This paper highlights the effect of the expectation of government turnover on bureaucrats' decision to be corrupt. Our theoretical model shows that the expectation of government turnover can affect bureaucratic corruption either way. It also shows that the probability of being caught for corruption shapes the bureaucrats' decision to be corrupt. The probability of being caught is given by: i) the probability of government turnover, and ii) the probability of the winning candidate being corrupt. We find that bureaucratic corruption decreases with the probability of government turnover when the challenger is corrupt with a smaller probability than the incumbent. In turn, the size of the effect of the expectation of government turnover on bureaucratic corruption depends on the interaction of the probability of government turnover and the probability that the incumbent (or challenger) is corrupt. Bureaucrats prefer no government turnover when the incumbent is corrupt with a high probability, while a government turnover is preferred when the challenger is corrupt with a high probability.

To empirically test these predictions, we use the introduction of term limits in the 2013 municipal elections in Portugal approved in 2005 by the Parliament. The reform came into force on 1 January 2006 and imposed a term limit of three terms. The law allowed a grace period of one term for

candidates with three or more terms in office. In other words, all candidates could run in the 2009 elections. In the 2010-2013 term, we differentiated two types of municipalities: municipalities with a higher probability of government turnover (term-limited mayors) and municipalities with a lower probability of government turnover (non term-limited mayors). Out of the 278 municipalities in mainland Portugal, 150 had a term-limited mayor, while the remaining 128 had no term-limited mayor.

The identification strategy relies on a quasi-experimental difference-in-difference methodology. This methodology allows us to identify the effect of the expectation of a government turnover on bureaucratic corruption. We use the term limit as a proxy for the expectation of government turnover. We also analyzed the determinants of the magnitude of the effect, using prior corruption as a proxy of the probability of the incumbent being corrupt and the municipal transparency index as a proxy of the probability of the challenger being corrupt. With this methodology, we analyze the variation of bureaucratic corruption when bureaucrats expect a government turnover, leaving all other characteristics fixed. Some controls that may affect the estimation are included to control some exogenous variation.

The database covers 278 municipalities through the 2006-2009 legislature and the 2010-2013 legislature. We combined data with Lopes da Fonseca (2020) to obtain key information from the municipality and the incumbent. This data includes incumbent tenure, the ruling party, employment, population, GDP or if the incumbent has a term limit. On the other hand, the Portuguese judicial system provides municipal information on the number of crimes by type of crime and the perpetrator. We select three types of bureaucratic corruption variables: i) the number of corruption crimes committed by bureaucrats, ii) the number of bureaucrats charged for corruption crimes, and iii) the number of bureaucrats sentenced for corruption crimes. Finally, we use the municipal transparency index created by Transparency International as a proxy for the probability of the challenger being corrupt.

Note that Portugal provides an excellent setting for our model not only because it permits a good identification strategy due to the introduction of term limits (Lopes da Fonseca, 2020), but also because Portugal is one of the developed countries with the highest levels of corruption and one of the laxest anti-corruption policies. High levels of corruption are heavily present in local public administration, with more than 70 per cent of all corruption crimes registered in Portugal from 2004 to 2008 concentrated in municipal public administration (De Sousa, 2016). Bureaucrats in local administrations carried out over 65 per cent of all corruption crimes (Kickert, 2011; De Sousa et al., 2020).

Our empirical results show a reduction of bureaucratic corruption in municipalities with a higher probability of government turnover. This finding is consistent across the different measures of bureaucratic corruption used. We find a differential effect on the probability that the incumbent is corrupt when we exploit the interaction between the probability of government turnover and the probability that the incumbent is corrupt. We find a larger reduction of bureaucratic corruption in municipalities with a higher probability that the incumbent is corrupt. In the case of the interaction between the probability of government turnover and the probability that the challenger is corrupt, we find a smaller reduction of bureaucratic corruption in municipalities with a higher probability that the challenger is corrupt. This result suggests that bureaucrats internalize the probability of government turnover in the decision to be corrupt. Bureaucrats seek to minimize the probability of facing the cost of being corrupt. When bureaucrats expect a government turnover, they also consider other variables that may affect the probability of facing the cost, such as the probability of the challenger being corrupt.

This paper relates to the literature exploring the linkages between bureaucrats and politicians. Valsecchi (2016) first attempts to analyze the effect of electoral accountability on bureaucratic corruption. He finds that bureaucrats working in municipalities with mayors up for re-election register a lower number of corruption crimes, and this effect is concentrated in those bureaucrats seeking promotion. Politicians exert higher control on bureaucrats to maximize their probability of re-election. Such control focuses especially on bureaucrats eligible for promotion. These results align with articles that find that greater political control leads to better functioning of the bureaucratic structure (Lessmann and Markwardt, 2010; Dahlström et al., 2012). These articles suggest that politicians exert control over bureaucrats so that a better selection of politicians would positively affect bureaucrats' behaviour. Recently, Brierley (2020) finds evidence that politicians and bureaucrats can collaborate to extract more rents, especially when campaigning.

This paper also relates to the literature analyzing the main determinants of bureaucratic corruption. Shleifer and Vishny (1993) and Olken and Pande (2012) found that the distribution of bureaucratic corruption is not uniform but depends on certain factors. Some factors as bureaucrat autonomy increase corruption, while other factors as political control discourage the extraction of rents through corruption. It is also related to the literature that attempts to analyze bureaucrats' incentives, the main ones being job stability, salaries, and career development (Evans and Rauch, 1999; Dal Bó et al., 2013). Because the cost is high, bureaucrats' decision to be corrupt is determined by the probability of facing the cost. Finally, this work is also linked to the different incentives of politicians and bureaucrats (Alesina and Tabellini, 2007, 2008).

This paper contributes to the literature in three ways. First, we show that the expectation of government turnover shapes bureaucrats' decision to be corrupt. Bureaucrats internalize expectations in their decision-making about corruption. This result shows that any shock on expectations, such as an announcement of a future aggressive anti-corruption policy, would affect current bureaucratic corruption. On the other hand, we also contribute to empirically highlighting the differences in incentives that politicians and bureaucrats have. Politicians maximise the rents extracted when the incumbent is not eligible for re-election, while bureaucrats behave oppositely by minimizing the rents extracted. Finally, our work provides new insights into the effectiveness of term limits in reducing corruption. Previous literature argued that the imposition of term limits increased corruption (both political and bureaucratic).[1] However, this paper shows that term limits can be effective if the probability of the challenger being corrupt is lower than the probability of the incumbent being corrupt. In other words, the term limit is effective in the fight against bureaucratic corruption if the introduction of term limits goes in conjunction with policies that attract less corrupt candidates.

This paper is organized as follows. Section 2.2 presents a simple model explaining the main mechanisms behind the effect of expectations of government turnover on bureaucrats' decisions to be corrupt. Section 2.3 describes the main characteristics of corruption in Portugal and introduces term limits in the 2013 municipal elections. In section 2.4, we explain the empirical strategy used. In section 2.5, we show the data used and their descriptive statistics. In section 2.6, we obtain the main results and section 2.7 concludes.

2.2 Model

We present a simple two period model. In the first period, a bureaucrat chooses the rent she extracts from activities linked to corruption and receives a salary. In the second period, the probability of the bureaucrat being caught for corruption depends on two factors i) the probability of a government turnover ii) the probability that the elected candidate is not corrupt. The bureaucrat faces the cost of being caught for corruption. Irrespective of the probability of government turnover, the bureaucrat receives a salary. With government turnover, the probability of being caught is determined by the probability of the challenger not being corrupt. With no government turnover, the probability of being caught depends on the probability of the incumbent not being corrupt.

More specifically, in the first period, a bureaucrat chooses the rent extracted by corruption-

[1] See Ferraz and Finan (2011) and Valsecchi (2016).

linked activities $r \geq 0$ and receives a salary $w \geq 0$. In the second period, a government turnover occurs with probability π and the incumbent is reelected with probability $1-\pi$ with $0 \leq \pi \leq 1$. The cost of being caught is given by the cost function $c(r)$ with $c'(r) > 0$ and $c''(r) > 0$. Independent of the probability of government turnover, the bureaucrat receives a salary (w). With a government turnover (i.e. $\pi = 1$), the probability of facing the cost is given by the probability that the challenger is not being corrupt $1-\theta_c$. If there is no government turnover (i.e. $\pi = 0$), the probability of being caught depends on the probability of the incumbent politician not being corrupt $1-\theta_i$.

A bureaucrat chooses r to maximize her utility equal to:

$$U = \underbrace{w + r}_{\text{Period 1}} + \underbrace{w - \pi(1-\theta_c)c(r) - (1-\pi)(1-\theta_i)c(r)}_{\text{Period 2}} \tag{2.1}$$

where $\theta_c = [0, 1]$ is the probability of the challenger being corrupt, with $\theta_c = 1$ representing that the challenger is corrupt and $\theta_c = 0$ representing that the challenger is not corrupt. The probability of the incumbent being corrupt is given by $\theta_i \in [0, 1]$. If $\theta_i = 1$ denotes that the incumbent is corrupt and $\theta_i = 0$ denotes that the incumbent is not corrupt. The model aims to analyze the effect of the parameters π, θ_c and θ_i on the rents extracted via corruption by bureaucrats, r. Rearranging the first-order condition, we obtain the following expression:

$$c'(r) = \frac{1}{1 + \pi(\theta_i - \theta_c) - \theta_i} \tag{2.2}$$

We observe how the left-hand side of the equation is increasing in the rents extracted. On the right side of equation (2.2), it is easy to see that the rents extracted increase with the probability of the incumbent being corrupt (θ_i) and the probability of the challenger being corrupt (θ_c). Finally, we see that the effect of the probability of government turnover (π) on the rents extracted depends on the difference between the probability of the incumbent being corrupt and the probability of the challenger being corrupt.

Proposition 1.

i) *If the probability of the incumbent being corrupt is smaller than the probability of the challenger being corrupt (i.e. $\theta_i < \theta_c$), then the rents extracted by corruption (r) increases with the probability of a government turnover (π). r is:*

- *decreasing in $\pi\theta_i$. The increasing effect of the probability of government turnover on extracted rents is smaller (i.e. less positive) when the probability of the incumbent being corrupt is high.*
- *increasing in $\pi\theta_c$. The increasing effect of the probability of government turnover on extracted*

rents is larger (i.e. more positive) when the probability of the challenger being corrupt is high.

ii) *If the probability of the incumbent being corrupt is larger than the probability of the challenger being corrupt (i.e. $\theta_i > \theta_c$), then the rents extracted by corruption (r) decreases with the probability of a government turnover (π). r is:*

- *decreasing in $\pi\theta_i$. The decreasing effect of the probability of government turnover on extracted rents is larger (i.e. more negative) when the probability of the incumbent being corrupt is high.*
- *increasing in $\pi\theta_c$. The decreasing effect of the probability of government turnover on extracted rents is smaller (i.e. less negative) when the probability of the challenger being corrupt is high.*

Proof. See the appendix 2.8.1.

Proposition 1 shows that expectations of a government turnover may affect bureaucratic corruption either way. The difference in the probability of the challenger and the incumbent being corrupt determines the direction of the effect. If the challenger is expected to be less corrupt than the incumbent, the bureaucrat reduces the rent extracted. In this case, bureaucrats expect the challenger exerts higher control on corruption, discouraging bureaucrats from extracting rents. The imposition of term limits (i.e. probability of government turnover equal to 1) would reduce corruption. Conversely, if the challenger is more likely to be corrupt than the incumbent, term limits would increase overall corruption. These predictions align with the literature that argues that greater political control has a deterrent effect on bureaucrats' malfeasance (Shleifer and Vishny, 1993; Olken and Pande, 2012).

Proposition 1 also shows that the interaction between the probability of government turnover and the probability of the incumbent or the challenger being corrupt marks the magnitude of the effect. The interaction between the probability of government turnover and the probability of the incumbent being corrupt makes the effect less positive (or more negative). This prediction shows that the bureaucrat prefers the incumbent's re-election when the probability of the incumbent being corrupt is high. The intuition is that the bureaucrat prefers the status quo when the incumbent is corrupt. One possible explanation stems from the probability of finding a challenger more corrupt than the incumbent decreases with the probability of the incumbent being corrupt. It is unlikely to find a challenger more corrupt than the incumbent when it is corrupt. Analogously, it is unlikely to find a challenger more honest than the incumbent when the incumbent is honest.

The size of the difference in the probability of the incumbent or challenger being corrupt determines the magnitude of the reduction (or increase). For instance, given a highly corrupt incumbent

and an expected challenger with low corruption, the model predicts a sharp reduction in corruption with an expected government turnover. Such situations may occur when countries plan to attract better candidates through transparency, better salaries or conditions. Moreover, the model also considers when both the incumbent and challenger's probability of being corrupt is high. The result is positive in equation (2.2), and the denominator tends to 0, resulting in explosive corruption growth. Conversely, if both the incumbent's and the challenger's probability of being corrupt is low, the level of corruption would be low since the denominator would tend to 1. This result can explain the systematically high corruption of some countries or the systematically low corruption of others.

2.3 The case study

In this section, we provide an overview of corruption in Portugal. The explosion of political scandals during the 2008 financial crisis has attracted much attention from researchers and generated extensive literature. Secondly, we introduce the reform that imposed term limits for mayors in the 2013 municipal elections.

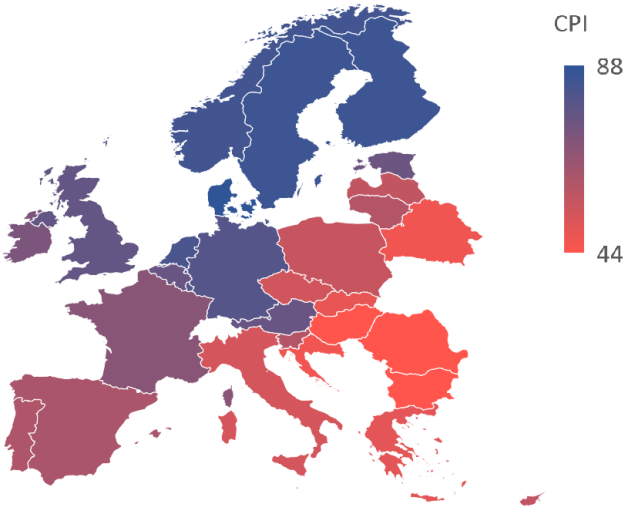
2.3.1 Corruption in Portugal

According to Transparency International, Portugal is one of the developed countries with the highest levels of corruption (TI, 2020). The last few years have seen many corruption scandals involving big businessmen and Members of Parliament.[2] These scandals have attracted the attention of researchers seeking to analyze the root causes of widespread corruption in the country.

Figure 2.1 shows the perception of corruption in European countries. We note that among developed European countries, Portugal has the second highest level of perception of corruption after Italy. Portugal is placed between low corruption perception countries (Northern European countries) and high corruption perception countries (Eastern European countries). However, Portugal is still far behind the countries where the perception of corruption is low. These high levels of perceived corruption affect the quality of government. Figure 2.2 shows the quality of government in European countries. In this case, government quality in Portugal is closer to low-quality government countries than high-quality government countries.

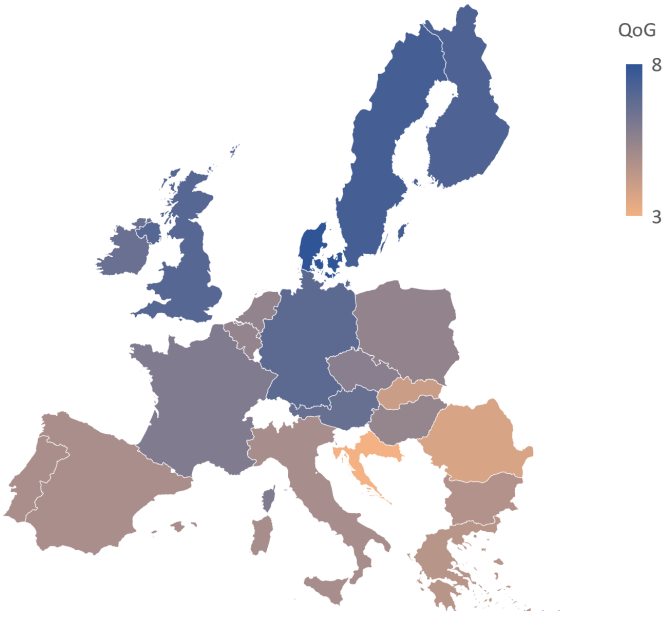
[2]Some of the most notable cases of corruption scandals have involved former prime minister José Socrates in money laundering, former president Cavaco Silva in the Banco Espirito Santo case or the EDP case that affected several politicians (Cruz et al., 2015).

Figure 2.1: Average corruption perception index (CPI). Period 2005-2015.



Note: The Corruption Perceptions Index calculates the level of corruption perceived by the citizens of a country. The index ranges from 0 to 100, with 0 representing a high corruption country and 100 a low corruption country.

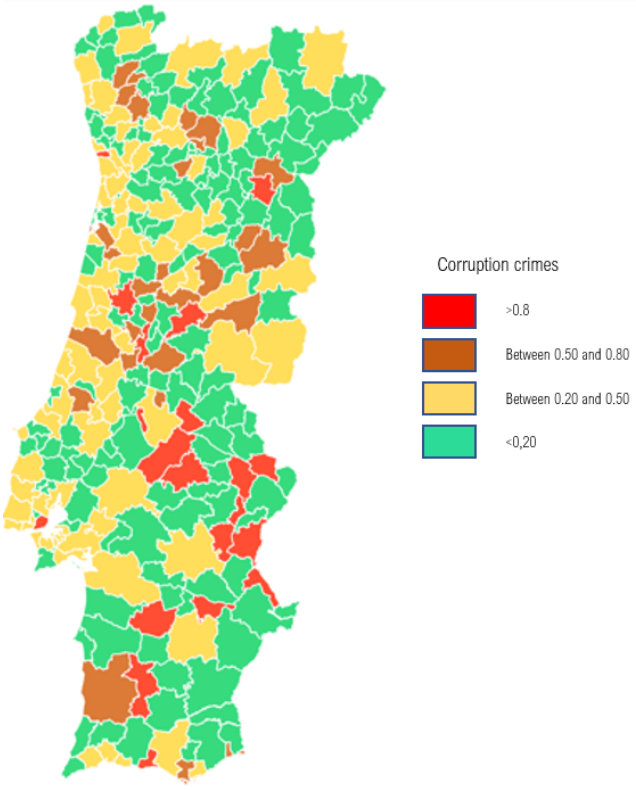
Figure 2.2: Quality of government.



Note: The quality of government is an index established by Charron et al. (2019). This index ranges between 0 and 10, with 0 as low-quality government and ten as high-quality government. This index is the average quality of the judiciary, healthcare, and educational systems.

The literature has highlighted two main factors determining high levels of corruption in Portugal: a high tolerance for corruption and clientelism (Lopes, 1997; De Sousa, 2001; Stockemer and Calca, 2013). Citizens' high tolerance for corruption promoted a sense of impunity for politicians and bureaucrats. Citizens do not punish corruption as strongly, so the electoral cost is low. However, these patterns changed significantly with the 2008 financial crisis, and greater emphasis shifted to corruption cases, and the electoral punishment for politicians was higher (Bosco and Verney, 2012). On the other hand, De Sousa (2008) shows that clientelism in Portugal is widespread in Portuguese institutions at the municipal, regional and national levels. He finds that it is one of the European countries with the highest levels of clientelism, which is one of the reasons the quality of institutions is lower than the European average.

Figure 2.3: Average bureaucratic corruption crimes (per 10000 inhabitants). Period 2000-2020.



Note: The measure shown in the figure is calculated by municipality as a $\sum_{2000}^{2020} Crimes / \sum_{2000}^{2020} Population$. The population has 10000 inhabitants as the basic unit. Only five municipalities out of 278 register zero corruption cases in the period.

De Sousa (2016) analyses the main corruption patterns in Portugal and find that much of the corruption is carried out by bureaucrats in local administrations. In Portugal, bureaucrats in local administrations committed 65 per cent of all registered corruption crimes. On the other hand,

politicians accounted for 12 per cent of all registered corruption crimes. The remaining corruption crimes registered involved bureaucrats in national administrations, managers of public enterprises or private individuals. Figure 2.3 shows the bureaucratic corruption of Portuguese municipalities in the period 2000 to 2020.[3] We observe a substantial variability of bureaucratic corruption across municipalities. We also observe that corruption strength is highest in inner Portugal, while most coastal municipalities have moderate strength of bureaucratic corruption.

Despite being the developed country that fights least against corruption, Portugal has made efforts to fight corruption over the last 20 years (Kickert, 2011). Portugal has carried out several initiatives to reduce corruption and improve the transparency of municipal governments. Among them is the creation of the municipal transparency portal that has been set up in all Portuguese municipalities (Mateus et al., 2010). This initiative promotes and facilitates access to municipal accounts for citizens. There has also been an improvement in corruption indicators in Portugal and its municipalities following the uncovering of political scandals involving the Portuguese political elite. This has led to a greater commitment on the part of the parties to institutional regeneration by combating corruption. For example, the main opposition party in the city of Lisbon or Porto introduced in its electoral program in 2009 and 2013 the restructuring of public procurement or greater control over municipal finances. Another example is a manifesto published by the Left Bloc party (which represents 10 per cent of the Portuguese parliamentarians) in which they indicate the common points of their party at the municipal level. Among these points, we find more control over corruption to improve the transparency of municipalities.

The high tolerance of citizens for corruption attracts more corrupt candidates, so the probability of the incumbent being corrupt is high. This tolerance may be reduced in the case of increased media coverage of political scandals or adverse economic situations, such as the 2008 financial crisis. This reduced tolerance led to growing concern about corruption and the illicit enrichment of individuals exploiting their position to extract rent. Creating municipal portals to increase transparency, better management of public contracts and greater control over public resources discourages the most corrupt candidates from entering politics. This context shows our empirical analysis because corruption scandals increased markedly during the financial crisis, and Portugal's economy was hit hard. Relating this context to our theoretical predictions, we can argue that in the case of Portugal, the probability of the incumbent being corrupt is higher than the probability of the challenger being corrupt. The theoretical model predicts that when the incumbent's probability

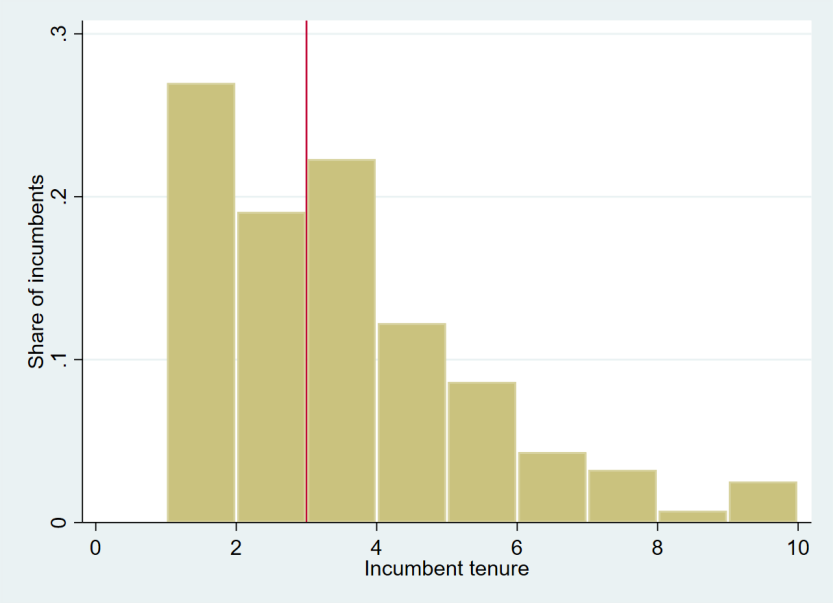
[3]We take the average number of bureaucratic corruption crimes per 10000 inhabitants to correct for the population effect and obtain a standard measure of the strength of bureaucratic corruption in each municipality.

is corrupt is higher than the probability that the challenger is corrupt, bureaucratic corruption decreases with the probability of government turnover.

2.3.2 Introduction of term limit in municipal elections in Portugal

The application of Law 46/2005, of 29 August 2005, establishes limits on the successive renewal of mandates of mayors and came into force on 1 January 2006. The first elections where the law was enforced were the elections of 2013, where 160 mayors were barred from standing for re-election. The introduction of the term limit had a remarkable impact on municipal policy in Portugal. Figure 2.4 shows the tenure of incumbents in Portuguese municipalities. We observe an intense concentration of municipalities with newly elected mayors or mayors reelected once or twice. However, some mayors have also been reelected several times (up to nine). The term limit affects a majority of mayors (approximately 53 per cent of the total) being forced to leave office at the end of the 2010-2013 legislature.

Figure 2.4: Share of incumbents by tenure.



Note: Incumbent tenure measures the number of legislatures the incumbent has served. The red vertical line separates the non-term limited incumbent group and the term limited incumbent group in the 2013 elections.

The first restriction imposed by the law is that mayors can only be elected up to three consecutive times. A grace period is granted to those mayors who have served three or more terms at the time of the entry into force of this law, i.e. the law takes effect in the 2013 elections. The law also states that mayors who have served their third term in office are not allowed to hold institutional

or political office for the next four years. The third restriction prevents mayors from retiring before the end of the term in the last mandate and standing for re-election. The mayor is also considered to have completed all three mandates and faces the same restrictions that apply to a full term of office. We should stress that there is no restriction on the incumbent's term-limited party to continue governing with another candidate. However, the literature indicates that in municipal elections the acceptability of the candidate is decisive for the outcome (Lieske, 1989; Hajnal and Trounstine, 2010; Trounstine, 2011). This implies that a change of incumbent mayor entails a significant change in municipal institutions regardless of the same party remaining in office.[4]

This reform provides a framework to analyze the effect of the probability of government turnover on bureaucratic corruption. In the 2006-2009 term, all mayors are eligible for re-election. In contrast, in the 2010-2013 term, we have two types of mayors: term-limited and non term-limited. The striking difference is that the implementation of this law not only forces the mayor to leave the office but also any institutional position. The outgoing incumbent cannot remain in a position close to the mayoralty, allowing the incumbent to maintain control.

2.4 Empirical strategy

We analyze the effect of the expectation of government turnover on bureaucratic corruption. To conduct this study, we use the implementation of term limits in the municipal elections in Portugal in 2013. The introduction of term limits in the Portuguese municipal elections is an excellent setting to evaluate the effect of expectations of a government turnover on bureaucratic corruption. This quasi-experimental study compares municipalities with a higher probability of government turnover (term-limited mayors) with municipalities with a lower probability of government turnover (non term-limited mayors). Using a difference-in-difference approach, we run the following regression:

$$Y_{ist} = \alpha + \beta_1 Government\_turnover_{it} + Z'_{it}\gamma + \phi_t + \phi_s + \phi_{st} + \epsilon_{it} \tag{2.3}$$

where Y_{ist} is the corruption measure for the municipality i in district s in legislature t. The sample covers two legislatures, $2006-2009$ ($t=1$) and $2009-2013$ ($t=2$). We use the term limit as a proxy for the expectation of a government turnover. Then *Government_turnover* equals 1 if $t=2$ and the municipality has a mayor with three or more terms in office. β_1 is the average effect of the expectation of government turnover on bureaucratic corruption. Z'_{it} is a series of socioeconomic

[4] Among the municipalities where mayors were term-limited, there is a decline in support for the ruling party. In the case of municipalities ruled by right-wing party mayors, support declined by 18 per cent on average. For municipalities ruled by left-wing parties, support declined by 13 per cent.

characteristics that allow us to control the substantial heterogeneity between municipalities.[5] ϕ_t is time fixed effect, ϕ_s is a district trend, ϕ_{st} is a district specific trend by time and ϵ_{it} is the error term.

The model shows that the interaction of the expectation of government turnover and the probability of the incumbent being corrupt and the challenger being corrupt are key determinants of bureaucrats' decisions to extract rents. Specifically, the interaction between the probability of government turnover and the probability of the incumbent being corrupt decreases bureaucratic corruption. Conversely, the interaction between the probability of a government turnover and the probability of the challenger being corrupt has an increasing effect on bureaucratic corruption.

To capture the probability of the incumbent being corrupt, we create the variable $Corr\_Inc$, whose value is 1 for those municipalities that have registered any bureaucratic corruption crime in the legislature 2002-2005 and 0 otherwise. We also proxy the probability of the challenger being corrupt with the level of transparency of each municipality (MTI) creating the variable $Corr\_Cha = -MTI$. The variable $Corr\_Cha$ takes higher values for those municipalities with lower transparency, hence the higher probability of the challenger being corrupt. MTI may be correlated with measures of corruption through several channels. Those municipalities with higher levels of transparency have more effective corruption detection mechanisms and therefore register more corruption cases. Less transparent municipalities have weaker institutions, attracting more corrupt candidates and rent-seeking bureaucrats. The inclusion of municipal fixed effects absorbs some of these channels, especially a direct link. However, some potential sources of endogeneity are not being controlled for in our specification. We also analyze the interaction between government turnover and the probability of the incumbent being corrupt.[6] This interaction captures the differential effect of the expectation of government turnover on bureaucratic corruption between municipalities with higher and lower probability of incumbent (or challenger) being corrupt. We run the following regression:

$$Y_{ist} = \alpha + \beta_1(Government\_turnover_t \times Corr\_Inc)_i + Z'_{it}\gamma + \phi_t + \phi_s + \phi_{st} + \epsilon_{it} \qquad (2.4)$$

The theoretical model also predicts the effect of the probability of the incumbent being corrupt and the probability of the challenger being corrupt on extracted rents. We cannot empirically test

[5] Socioeconomic controls include factors that are potential drivers of corruption. On the one hand, we find GDP per capita, average education of citizens and competition in elections (measured by the number of parties in elections) as possible deterrents of corruption. On the other hand, we include variables that may foster corruption, such as incumbent tenure, party affiliation or party alignment.

[6] Analogously, we analyze the interaction between the probability of a government turnover and the probability that the challenger is corrupt.

for this effect as both variables remain constant throughout the periods analyzed, and the use of municipal fixed effects absorbs this effect.

2.5 Data

Lopes da Fonseca (2020) provides a rich database that includes a wide variety of characteristics of Portuguese municipalities annually for the period 2002-2013. The database includes all 278 municipalities in mainland Portugal.[7] We take two legislatures: the legislature before the imposition of the term limit and the legislature where the term limit takes place. We obtain the average values of each characteristic during the years covered by the legislature. In our sample, legislature 1 (i.e. $t = 1$) covers from 2006 to 2009, then to obtain each characteristic's value, we do the average between the 2006, 2007, 2008 and 2009 values. The same procedure is done for legislature 2 (i.e. $t = 2$), which covers 2010 to 2013. In the 2010-2013 legislature, there were 150 municipalities with a term-limited mayor, while 128 municipalities had a non term-limited mayor. Municipalities with term-limited mayors have associated a higher probability of government turnover than municipalities with non-term-limited mayors.

The database of Lopes da Fonseca (2020) is complemented with information from the Portuguese National Institute of Statistics. The characteristics of municipalities included are population, percentage of the population with secondary education, electricity consumption, GDP per capita, abstention rate, ruling political party, number of parties, unemployment and party alignment with the government. The characteristics of mayors are the number of terms in office and gender.

The database also includes measures of corruption. We have included three objective measures of corruption by municipality: the number of cases of bureaucratic corruption crimes, the number of bureaucrats charged with corruption crimes and the number of bureaucrats sentenced for corruption crimes. The Portuguese judicial system provides information on the different types of corruption crimes and their perpetrator. The Portuguese Penal Code lists 16 types of corruption that can affect different agents in the public sector. Among these 16 types, local administration bureaucrats can commit three offences: influence peddling, bribery and undue receipt of advantage. Influence peddling would be the improper use or exploitation of knowledge or information obtained in the performance of a public office. An example of influence peddling could be expediting a bureaucratic process, such as granting an opening license. A bureaucrat grants bribery a favour in exchange for monetary compensation by using her position. An example of bribery would be overlooking an

[7] Island municipalities are excluded since they are subject to different legislation and voting systems.

audit's negative results in exchange for money. Undue receipt of advantage is when a bureaucrat assigns an advantageous position to a third party. An example of undue receipt of advantage would be when a contractor receives an advantage over the rest to award the contract.

Figure 2.5: Mean crimes, sentences and charged bureaucrats by treatment and legislature.

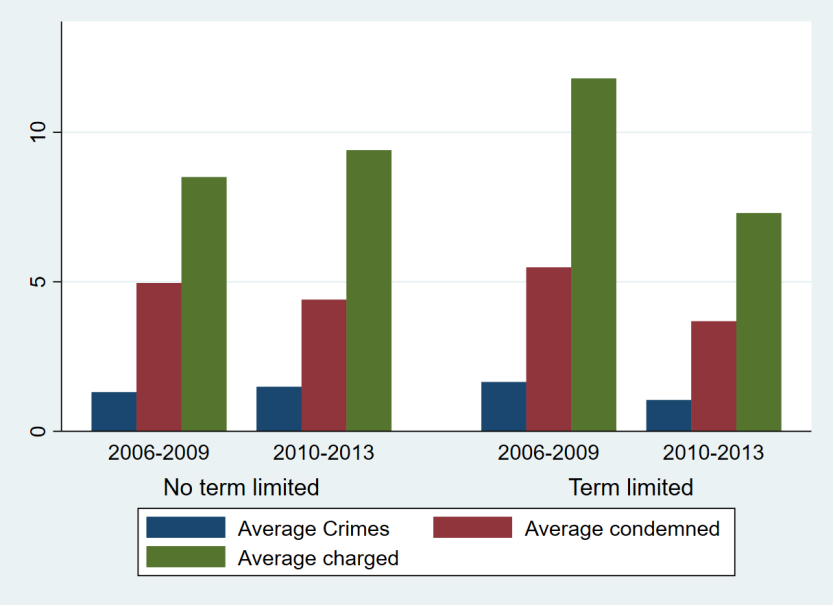


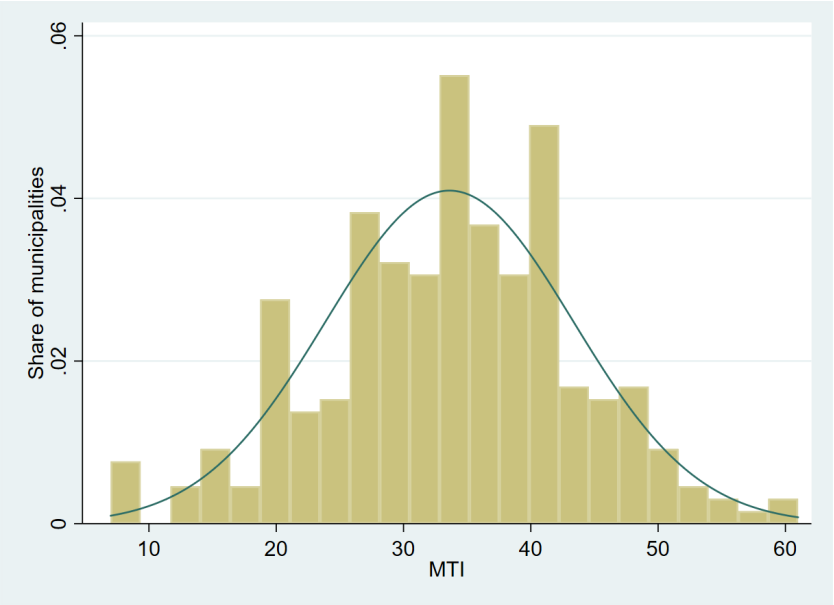
Figure 2.5 shows the average number of corruption crimes, bureaucrats charged and bureaucrats sentenced by legislature and treatment. Among municipalities where the incumbent is not term-limited, there is little variability in all variables over time. We observe an increase in the number of crimes and bureaucrats charged over time, while there is a slight decrease in the number of bureaucrats sentenced. In the case of municipalities where the incumbent is term-limited, we find a significant decrease in all variables. We observe a larger decrease in the number of bureaucrats charged and sentenced, while the decrease is smaller for the number of crimes variable.

Finally, the municipal transparency index (MTI) is obtained by Transparency International.[8] This index takes 76 indicators grouped into seven dimensions: Information on the municipality's organization, reports, taxation, public procurement, economic transparency and transparency in urban planning. This index can take values from 0-100, with 0 being no transparency and 100 being total transparency. Figure 2.6 shows the distribution of municipalities according to the MTI. We observe that the distribution follows a normal distribution with an intense concentration between 25 and 40. We also find a strong dispersion reaching values below ten and above sixty.

Table 2.1 shows the descriptive statistics. We observe that more than 53 per cent of the municipalities have a term-limited mayor. We observe that per legislature in each municipality,

[8]See da Cruz et al. (2016).

Figure 2.6: Share of municipalities by municipal transparency index (MTI).



Note: This figure shows the distribution of municipalities according to the municipal transparency index (MTI). This index ranges from 0 to 100 with 0 for zero transparency and 100 for full transparency.

Table 2.1: Descriptive statistics

Variable	Observations	Average	Std. Device
Government turnover	556	0.53	0.44
No. of bureaucratic corruption crimes	556	1.37	2.79
No. of bureaucrats charged	556	9.19	16.81
No. of bureaucrats sentenced	556	4.16	8.27
Corruption	556	0.33	0.41
MTI	556	33.61	9.73
Tenure (No. of terms served)	556	3.02	1.96
Abstention rate	556	0.33	0.08
Number of parties	556	4.28	1.09
Unemployment	556	4.71	1.83
Population	556	36.24	57.66
Right party	556	0.39	0.48
Left party	556	0.51	0.50
Independent party	556	0.10	0.30

on average, 1.37 bureaucratic corruption crimes are registered, 9.19 bureaucrats are charged with corruption crimes and 4.05 are sentenced for corruption crimes. We also observe that 33 per cent of our sample have registered corruption before the introduction of the term limit. The average MTI is 33. The average tenure of mayors is slightly more than three terms. There is an abstention rate of 33 per cent and, on average, 4.28 parties per municipality run for election. Unemployment is below 5 per cent, and the average population per municipality is over 36,000. The right-wing party governs 39 per cent of the municipalities, the left-wing party governs 51 per cent of the municipalities, and the remaining municipalities are governed by an independent party.

2.6 Results

This section shows the empirical results. We find that the expectation of a government turnover reduces bureaucratic corruption. Moreover, we find that the reduction of corruption by the expectation of government turnover is larger in municipalities with a higher probability of the incumbent being corrupt. However, this reduction is smaller in municipalities with a higher probability of the challenger being corrupt. The second part of the section checks the robustness of the results and investigates potential drivers of the effect.

2.6.1 Main results

Table 2.2 shows the coefficients for equation (2.3). In all columns, the dependent variable is the number of cases of bureaucratic corruption crimes. The first column includes only time-fixed effects, the second includes both time-fixed effects and district trends, and the third includes the interaction between time and district-fixed effects. Columns 4, 5 and 6 add municipality-level controls to the regressions in the first three columns. In all regressions, standard errors are clustered at the municipal level.

We find that the existence of term limits (and the associated greater probability of government turnover) reduces the number of cases of bureaucratic corruption crimes. In all columns, the estimated reduction exceeds 37 per cent of the number of cases at the mean. Moreover, the estimated reduction is very similar across specifications.

One possible explanation is provided by the theoretical model developed in section 2.2. In this model, the effect of the probability of government turnover on bureaucratic corruption can go either way. Bureaucrats minimize the probability of facing the cost of being corrupt, taking into account the probability of incumbent re-election. The expectation of a government turnover has a

deterrent effect on corruption if the expected honesty of the challenger is larger than the honesty of the incumbent politician, while it encourages corruption otherwise. The intuition behind this result is that at least part of the cost of being corrupt is paid in the future, and is thus shaped by the honesty of the future mayor. A greater probability of government turnover means greater expected punishment if the expected honesty of the challenger is larger than the honesty of the incumbent politician, and lower expected punishment otherwise.

Table 2.2: Main results with number of cases of bureaucratic corruption crimes

Dependent Variable	Number of cases of bureaucratic corruption crimes					
	(1)	(2)	(3)	(4)	(5)	(6)
Government_turnover	-0.518*	-0.518*	-0.529*	-0.522*	-0.522*	-0.526*
	(0.273)	(0.273)	(0.297)	(0.275)	(0.275)	(0.295)
Change	-37%	-37%	-37%	-38%	-38%	-38%
Time FE	Y	Y		Y	Y	
District trends		Y			Y	
District × Time			Y			Y
Controls				Y	Y	Y
Observations	556	556	556	556	556	556
R-squared	0.01	0.01	0.07	0.17	0.18	0.19
Number of Municipalities	278	278	278	278	278	278

Note: Diff-in-diff regression results from the estimation of equation (2.3). Each cell provides the average treatment effect from a different regression. Change is calculated as 100× Estimate/Mean. Controls include alignment, population, party affiliation, number of parties, tenure and education. All estimates include municipality fixed effects. Standard errors are robust to heteroscedasticity and clustered at the municipality level. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Another possible interpretation may be related to limited opportunities due to incumbent incentives. According to Brierley (2020), politicians and bureaucrats collaborate when campaign funds are needed. When term limits bind, politicians do not require campaign funds and do not need the collaboration of bureaucrats. This fact leads to a reduction in the number of opportunities for bureaucrats to be corrupt. On the other hand, Ferraz and Finan (2011) finds that politicians with no electoral accountability maximize the rents extracted by corruption. These results can suggest a substitution effect between political corruption and bureaucratic corruption. When the politician is term-limited, political corruption increases and bureaucratic corruption decreases. A possible explanation may come from the costs of being corrupt for politicians and bureaucrats. While the cost for a politician is limited to legal costs, the bureaucrat also faces job loss and job stability. Therefore, the maximization of rents by politicians may force bureaucrats to decrease corruption.

Tables 2.3 and 2.4 show the coefficients for the other corruption measures: number of bureaucrats charged with corruption and number of bureaucrats sentenced for corruption. We find that the existence of term limits reduces the number of bureaucrats charged and the number of bureaucrats sentenced. Table 2.3 shows that term limits reduce the number of bureaucrats charged with

corruption crimes by more than 30 per cent. In Table 2.4, we find that term limits reduce the number of sentenced bureaucrats by more than 34 per cent. This result shows a considerable drop in bureaucratic corruption after introducing term limits. These results are in line with previous findings. Because each corruption crime can involve more than one bureaucrat, it could happen either with a decrease in corruption crimes but an increase in the number of bureaucrats charged or sentenced. The results show a similar effect of term limits across different bureaucratic corruption variables. This effect homogeneity indicates that the expectation of government turnover does not affect the average number of bureaucrats involved in corruption crimes.

Table 2.3: Main results with number of bureaucrats charged

Dependent Variable:	Number of bureaucrats charged of corruption-related offences					
	(1)	(2)	(3)	(4)	(5)	(6)
Government_turnover	-3.114***	-3.114***	-2.887***	-3.191***	-3.191***	-3.033***
	(1.031)	(1.031)	(1.092)	(1.055)	(1.055)	(1.119)
Change	-34%	-34%	-30%	-34%	-34%	-33%
Time FE	Y	Y		Y	Y	
District trends		Y			Y	
District × Time			Y			Y
Controls				Y	Y	Y
Observations	556	556	556	556	556	556
R-squared	0.04	0.04	0.17	0.34	0.34	0.35
Number of Municipalities	278	278	278	278	278	278

Note: Diff-in-diff regression results from the estimation of equation (2.3). Each cell provides the average treatment effect from a different regression. Change is calculated as 100× Estimate/Mean. Controls include alignment, population, party affiliation, number of parties, tenure and education. All estimates include municipality fixed effects. Standard errors are robust to heteroscedasticity and clustered at the municipality level. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 2.4: Main results with number of bureaucrats sentenced

Dependent Variable:	Number of bureaucrats sentenced of corruption-related offences					
	(1)	(2)	(3)	(4)	(5)	(6)
Government_turnover	-1.530***	-1.530***	-1.409***	-1.564***	-1.564***	-1.474***
	(0.544)	(0.544)	(0.563)	(0.553)	(0.553)	(0.574)
Change	-36%	-36%	-33%	-36%	-36%	-34%
Time FE	Y	Y		Y	Y	
District trends		Y			Y	
District × Time			Y			Y
Controls				Y	Y	Y
Observations	556	556	556	556	556	556
R-squared	0.03	0.03	0.08	0.32	0.32	0.34
Number of Municipalities	278	278	278	278	278	278

Note: Diff-in-diff regression results from the estimation of equation (2.3). Each cell provides the average treatment effect from a different regression. Change is calculated as 100× Estimate/Mean. Controls include alignment, population, party affiliation, number of parties, tenure and education. All estimates include municipality fixed effects. Standard errors are robust to heteroscedasticity and clustered at the municipality level. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

A second analysis focuses on the interaction between term limits and the probability of the incumbent being corrupt. Table 2.5 shows the estimation for equation (2.4). In all columns, we observe that the coefficient of the interaction between term limit and corruption is negative and significant in all measures of corruption used. We observe that the coefficients are much higher

than previously estimated. In addition, we observe that the coefficient on term limit has become no longer significant, although it is still negative in all cases. We find that the reduction due to a greater probability of government turnover is concentrated in municipalities with a higher probability of the incumbent being corrupt, and these reductions exceed 59 per cent in all cases. The last part of the table shows the effect of the expectation of a government turnover on each measure of bureaucratic corruption, which is obtained by linearly combining the coefficients of the interaction and the coefficient of the term limit.

Table 2.5: Results for the interaction of expectation of government turnover and incumbent corruption

Dependent variable:	Number of crime cases		Number of bureaucrats charged		Number of bureaucrats sentenced	
	(1)	(2)	(3)	(4)	(5)	(6)
Government_turnover×Corr_Inc	-1.101**	-1.124***	-6.861***	-6.909***	-3.532***	-3.623***
	(0.649)	(0.622)	(2.513)	(2.414)	(1.273)	(1.228)
Government_turnover	-0.024	-0.033	-1.060**	-0.938	-0.467	-0.376
	(0.234)	(0.247)	(0.518)	(0.624)	(0.302)	(0.354)
Time FE	Y		Y		Y	
District trends	Y		Y		Y	
District × Time		Y		Y		Y
Controls	Y	Y	Y	Y	Y	Y
Observations	556	556	556	556	556	556
R-squared	0.17	0.18	0.35	0.36	0.33	0.33
Number of municipalities	278	278	278	278	278	278
Effect of Expectation of Government Turnover on Corruption with Corr_Inc=1	-1.625**	-1.657***	-7.921***	-7.847***	-3.999***	-3.998***
	(0.533)	(0.534)	(2.667)	(2.661)	(1.350)	(1.340)
Change	-79%	-79%	-60%	-59%	-67%	-67%

Note: Diff-in-diff regression results from the estimation of equation (2.4). Each cell provides the average treatment effect from a different regression. Change is calculated as 100× Estimate/Mean. Controls include alignment, population, party affiliation, number of parties, tenure and education. All estimates include municipality fixed effects. Standard errors are robust to heteroscedasticity and clustered at the municipality level. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

The theoretical model provides one interpretation. If bureaucratic corruption decreases with the probability of a government turnover, the decrease is larger in municipalities with a higher probability of the incumbent being corrupt. The intuition behind this is that the probability that a government turnover reduces the expected punishment decreases with the probability of the incumbent being corrupt. There are two potential reasons for this effect. The first is that the probability of finding a challenger more corrupt than the incumbent decreases with the probability of the incumbent being corrupt. We are comparing municipalities with incumbents with different probabilities of being corrupt. The results show that municipalities with incumbents with a higher probability of being corrupt register a larger decrease in bureaucratic corruption. The second reason focuses on the effect of bureaucratic corruption on the probability of government turnover. For example, a corruption scandal could increase the probability of government turnover by negatively affecting the probability of incumbent re-election. Since the bureaucrat knows that re-election is the main incentive for politicians, the bureaucrat also knows that the cost of reporting a corruption

case is higher for the incumbent. Conversely, the challenger may benefit from reporting a corruption case from the previous legislature by increasing her probability of election. So even if the probability of the incumbent and the challenger being corrupt is similar, the incumbent's propensity to pursue corruption may be lower.

Table 2.6 shows the results of equation (2.4) for the interaction between term limits and the probability that the challenger is corrupt. The interaction is negative in all columns, although it is only significant for the number of corruption crimes and bureaucrats charged with corruption. We also find that the coefficient of term limit is negative in all columns and significant for the number of bureaucrats charged and sentenced.

Table 2.6: Results by the interaction of expectation of government turnover and challenger corruption

Dependent variable:	Number of crime cases		Number of bureaucrats charged		Number of bureaucrats sentenced	
	(1)	(2)	(3)	(4)	(5)	(6)
Government_turnover×Corr_Cha	3.169*	3.419*	6.888*	4.716*	4.873	4.201
	(1.688)	(1.789)	(3.605)	(2.467)	(3.289)	(3.537)
Government_turnover	-1.531	-1.685	-7.653*	-6.082	-4.721**	-4.191*
	(1.130)	(1.193)	(4.174)	(4.476)	(2.201)	(2.359)
Time FE	Y		Y		Y	
District trends	Y		Y		Y	
District × Time		Y		Y		Y
Controls	Y	Y	Y	Y	Y	Y
Observations	556	556	556	556	556	556
R-squared	0.16	0.17	0.34	0.35	0.32	0.32
Number of municipalities	278	278	278	278	278	278

Note: Diff-in-diff regression results from the estimation of equation (2.4). Each cell provides the average treatment effect from a different regression. Controls include alignment, population, party affiliation, number of parties, tenure and education. All estimates include municipality fixed effects. Standard errors are robust to heteroscedasticity and clustered at the municipality level. $*p < 0.1$, $**p < 0.05$, $***p < 0.01$.

The theoretical model provides one interpretation of these results, which argues a positive link between the probability of the challenger being corrupt and bureaucratic corruption. The model predicts that when the probability of government turnover reduces bureaucratic corruption, the reduction is less negative in municipalities with a higher probability of the challenger being corrupt. The intuition behind this is that the probability of a government turnover lowering the expected punishment increases with the probability that the challenger is corrupt. In other words, bureaucrats increase actual corruption with the probability of government turnover when they expect the challenger to be corrupt. In the analysis, we compare the effect of the probability of government turnover in municipalities with challengers with different probabilities of being corrupt. We find that the effect of the probability of government turnover on bureaucratic corruption is less negative the higher the probability that the challenger is corrupt.

2.6.2 Robustness checks

This section analyses potential sources that may undermine the results' validity. First, each type of corruption crime is analyzed separately. This analysis allows us to see whether all corruption crimes behave in the same direction as the main results. A heterogeneous effect might indicate that the results obtained result from a higher weighting of one crime over another. Table 2.9 shows the result for the three crime types considered: undue receipt of advantage, bribery and influence peddling. We find that the effect found is negative in all cases, and significant in the crimes of undue receipt of advantage and bribery. Results show that the direction of the effect is the same across all types of crime, while the magnitude differs. It provides consistency to the previous results since the findings are still consistent at different levels of aggregation.

The dependent variables are count data. Then it would be appropriate to test the results using specific methodologies for counting data such as the negative binomial. Table 2.10 shows the results obtained using a negative binomial regression. In all columns, the coefficients are negative and significant. As in the results obtained above, the expectation of government turnover has a deterrent effect on bureaucratic corruption. This result shows that alternative specifications do not affect the consistency of the results.

The robustness of the results depends on the correct choice of controls. To rule out the possibility of inadequate controls, we include only the initial conditions by taking the values of the socio-economic characteristics of the 2006-2009 legislature and leaving them constant. Hence, we rule out that the evolution of these variables may drive the effect found. Table 2.11 shows the results to test the possibility of inadequate controls. The results are consistent with the main results, indicating the robustness of the results and the correct choice of controls.

Finally, we analyze the existence of a selection bias or an anticipation effect. It is important to note that the law's approval took place during the 2006-2009 legislature, so there could have been an anticipation effect. The possibility also exists that mayors re-elected more than three times are different from mayors re-elected less than three times. A placebo test rules out selection bias and the anticipation effect. The placebo test allows us to analyze whether there are any determinant characteristics beyond the presence of term limits that may affect the outcome. We include the 2002-2005 legislature in the database to construct the placebo and drop the 2010-2013 legislature. In this database, we leave the 2002-2005 legislature as the period before entering the term limit and the 2006-2009 legislature as the period where the term limit takes place. We run the regression in equation (2.3) with the placebo. Table 2.12 shows the results. In all columns, the coefficients

are not significant. This indicates no anticipation effect and selection bias between the two groups of municipalities.

2.6.3 Discussion of the results

Besides the different analyses conducted, other variables may be potential drivers of the effect of the expectation of government turnover on bureaucratic corruption. We include a triple interaction between the three variables analyzed: government turnover, incumbent and challenger corruption. We estimate whether the probability of the challenger being corrupt has a differential effect on those municipalities with a higher probability of government turnover and a higher probability of the incumbent being corrupt. Among municipalities with a higher probability of government turnover and a higher probability of the incumbent being corrupt, those with a higher probability of the challenger being corrupt register a less negative reduction. We run the following regression.

$$Y_{ist} = \alpha + \beta_1(Government\_turnover_t \times Corr\_Inc \times Corr\_Cha)_i + Z'_{it}\gamma + \phi_t + \phi_s + \phi_{st} + \epsilon_{it} \quad (2.5)$$

Table 2.7 shows the estimation for equation (2.5). In all columns, we observe that the triple interaction between term limits, the probability of the incumbent being corrupt and the probability of the challenger being corrupt is positive and significant. We also find that the double interaction between term limits and the probability of the incumbent being corrupt is negative and significant. This implies a differential effect based on the probability of the challenger being corrupt in municipalities with a higher probability of government turnover and a higher probability of the incumbent being corrupt.

In municipalities with a high probability of government turnover and a high probability of the incumbent being corrupt, the expected punishment decreases with the probability of the challenger being corrupt. Fixing the probability of government turnover and the probability that the incumbent is corrupt, bureaucrats in municipalities with a higher probability of the challenger being corrupt register a less negative reduction than bureaucrats in municipalities with a lower probability of the challenger being corrupt.

Other possible determinants may be the driver behind the effect found. The 2010-2013 legislature is amidst a severe economic recession so unemployment could affect bureaucrats' decisions. municipalities with higher unemployment rates, bureaucrats may be more reluctant to extract rents. Part of the cost of bureaucrats may be the loss of work, so the cost is higher in municipalities with

Table 2.7: Results for the triple interaction

Dependent variable:	Number of crime cases (1)	Number of bureaucrats charged (2)	Number of bureaucrats sentenced (3)
Government_turnover×Corr_Inc×Corr_Cha	0.067**	0.450***	0.275***
	(0.032)	(0.160)	(0.110)
Government_turnover×Corr_Inc	-0.408**	-2.999***	-2.601***
	(0.188)	(1.184)	(1.233)
Government_turnover×Corr_Cha	0.049*	0.150	0.597
	(0.028)	(0.115)	(0.529)
Government_turnover	-0.189***	-1.902	-2.273
	(0.065)	(4.431)	(2.200)
District × Time	Y	Y	Y
Controls	Y	Y	Y
Observations	556	556	556
R-squared	0.18	0.38	0.33
Number of municipalities	278	278	278

Note: Diff-in-diff regression results from the estimation of equation (2.5). Each cell provides the average treatment effect from a different regression. Controls include alignment, population, party affiliation, number of parties, tenure and education. All estimates include municipality fixed effects. Standard errors are robust to heteroscedasticity and clustered at the municipality level. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

fewer job opportunities. We tested this hypothesis and found no differential effect on unemployment. Column 1 of Table 2.8 shows the estimated coefficients, and we find that the coefficient for the interaction between term limit and unemployment is insignificant.

Table 2.8: Investigating mechanisms

Dependent variable	Number of cases of bureaucratic corruption crimes				
	(1)	(2)	(3)	(4)	(5)
Government_turnover	-0.388	-0.300**	-0.522***	-0.520*	-0.588**
	(0.300)	(0.132)	(0.174)	(0.300)	(0.280)
Government_turnover×Unemployment	0.195				
	(0.279)				
Government_turnover×Tenure		-0.026			
		(0.062)			
Government_turnover×Alignment			-0.014		
			(0.064)		
Government_turnover×Population				-6.72e-05	
				(0.001)	
Government_turnover×Abstention					-0.016
					(0.060)
District × Time	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y
Observations	556	556	556	556	556
R-squared	0.17	0.19	0.19	0.21	0.20
Number of municipalities	278	278	278	278	278

Note: Diff-in-diff regression results from the estimation of equation (2.4). In equation (2.4), we interact government turnover with unemployment, tenure, alignment, population and abstention. Unemployment is the average unemployment rate during the legislature. Tenure is the number of mandates the mayor has served. The alignment shows whether the mayor's party is the same as the party of the autonomous government, the population is the number of inhabitants (in thousands of people) of each municipality, and abstention is the abstention rate in municipal elections. All estimates include municipality fixed effects. Standard errors are robust to heteroscedasticity and clustered at the municipality level. *$p < 0.1$, **$p < 0.05$, ***$p < 0.01$.

We also test for a differential effect of the probability of government turnover on incumbent tenure. More tenured incumbents may have better connections, better corruption procedures and different characteristics from less tenured incumbents. Column 2 of Table 2.8 shows no differential

effect based on incumbent tenure, while the coefficient of term limit remains negative and significant. We also explore other potential differential effects based on party alignment, population or abstention ratio. Columns 3, 4 and 5 of Table 2.8 show the results. We find that the effect of the probability of government turnover has no differential effect on these characteristics. On the other hand, the coefficient of the term limit remains negative and significant. Tables 2.13 and 2.14 show the results for the other corruption variables, and we find that the results are consistent with those obtained previously.

2.7 Conclusions

We analyze the effect of the expectation of government turnover on bureaucratic corruption. We formalize the main mechanisms that determine the effect's direction and magnitude. We find that the difference between the probability of the incumbent being corrupt and the probability of the challenger being corrupt determines the direction of the effect. The effect of the probability of government turnover on bureaucratic corruption increases when the probability of the incumbent being corrupt is smaller than the probability of the challenger being corrupt and decreases otherwise. Furthermore, the size of the effect of the expectation of government turnover on bureaucratic corruption is determined by the interaction between the probability of government turnover and the probability that the incumbent or challenger is corrupt. While the interaction between the probability of government turnover and the probability that the incumbent is corrupt makes the effect more negative (or less positive), the interaction between the probability of government turnover and the probability that the challenger is corrupt makes the effect less negative (or more positive).

The empirical results corroborate the theoretical predictions. To test these predictions, we use term limits in the 2013 municipal elections in Portugal. We compare municipalities with a higher probability of government turnover (term-limited mayors) with municipalities with a lower probability of government turnover (non term-limited mayors). We find that bureaucratic corruption decreases by more than 30 per cent in municipalities with a higher probability of government turnover. We find differential effects in the interactions between the probability of government turnover and the probability of the incumbent or challenger being corrupt. Consistent with theoretical predictions, the interaction of the probability of government turnover and the probability of the incumbent being corrupt makes the effect more negative. On the other hand, the interaction between the probability of government turnover and the probability of the challenger being corrupt makes the effect less negative.

The performance of bureaucrats is a key determinant of the quality of institutions, so there is growing interest in analyzing the incentives that determine the behaviour of bureaucrats (Tabellini, 2008; Charron et al., 2017). The results highlight the importance of analyzing and understanding the links between politicians and bureaucrats (Valsecchi, 2016; Gulzar and Pasquale, 2017; Bertrand et al., 2020). On the one hand, it contributes to the literature showing the importance of politicians' supervision of bureaucrats in improving performance quality. It also shows that the behaviour of bureaucrats is affected by the expectation of government turnover. This paper also contributes to the literature that shows that the performance of bureaucrats is affected by electoral processes (Iaryczower et al., 2013; Valsecchi, 2016). These authors show that bureaucrats with aspirations for promotion improve their performance when the probability of government turnover is low. This prediction shows that the expectation of government turnover positively decreases bureaucratic corruption and negatively affects bureaucrats' performance.

This paper also provides another view on the effectiveness of term limits as a deterrent to corruption. While the literature finds that term limits increase corruption (both political and bureaucratic), we find a positive effect in reducing bureaucratic corruption. This paper shows that term limits reduce bureaucratic corruption when bureaucrats expect that a government turnover increases the probability of being caught. Hence, this paper may have policy implications by promoting different tools that increase the probability of being caught. First, the implementation of term limits together with anti-corruption programs can considerably reduce bureaucratic corruption like in Portugal. Attracting better candidates to politics increases the probability of being caught and thus further reduces bureaucratic corruption. Finally, the statute of limitations can potentially contribute to the reduction of corruption. As the paper shows, expectations play an important role in bureaucrats' decisions to be corrupt. Then, a longer time horizon (i.e. the longer statute of limitations) increases the uncertainty of the bureaucrats' decision to be corrupt, which could discourage bureaucratic corruption.

2.8 Appendix

2.8.1 Proof of proposition 1

From equation (2.2), which is $c'(r) = \frac{1}{1+\pi(\theta_i-\theta_c)-\theta_i}$, then:

i) If we take the partial derivative with respect to π, we get that $-c'(r)(\theta_i - \theta_c) = 0$. With $(\theta_i - \theta_c) < 0$, then $-c'(r)(\theta_i - \theta_c) > 0$. Then r is increasing in π.

If we take the partial derivative with respect to $\pi\theta_i$, we get that $-c'(r) = 0$. With $c'(r) > 0$, then r is decreasing in $\pi\theta_i$.

If we take the partial derivative with respect to $\pi\theta_c$, we get that $c'(r) = 0$. With $c'(r) > 0$, then $c'(r) > 0$.

ii) If we take the partial derivative with respect to π, we get that $c'(r)(\theta_i - \theta_c) = 0$. With $(\theta_i - \theta_c) < 0$, then $c'(r)(\theta_i - \theta_c) > 0$. Then r is decreasing in π.

If we take the partial derivative with respect to $\pi\theta_i$, we get that $-c'(r) = 0$. With $c'(r) > 0$, then r is decreasing in $\pi\theta_i$.

If we take the partial derivative with respect to $\pi\theta_c$, we get that $c'(r) = 0$. With $c'(r) > 0$, then r is increasing in $\pi\theta_c$.

2.8.2 Robustness checks

Table 2.9: Results by type of corruption

Type of corruption:	Undue receipt of advantage			Bribery		
Dependent variable:	No. crime	No. charged	No. sentenced	No. crime	No. charged	No. sentenced
	(1)	(2)	(3)	(4)	(5)	(6)
Government_turnover	-0.308*	-1.040**	-0.760	-0.804***	-0.856**	-0.584**
	(0.180)	(0.484)	(0.584)	(0.268)	(0.340)	(0.240)
District × Time	Y	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y	Y
Observations	556	556	556	556	556	556
R-squared	0.23	0.198	0.184	0.214	0.242	0.187
Number of municipalities	278	278	278	278	278	278

Type of corruption:	Influence peddling		
Dependent variable:	No. crime	No. charged	No. sentenced
	(7)	(8)	(9)
Government_turnover	-0.196	-0.104	-0.024
	(0.184)	(0.068)	(0.028)
District × Time	Y	Y	Y
Controls	Y	Y	Y
Observations	556	556	556
R-squared	0.102	0.097	0.071
Number of municipalities	278	278	278

Note: Diff-in-diff regression results from the estimation of equation (2.3). Each cell provides the average treatment effect from a different regression. This table shows the results for equation (2.3) for each bureaucratic corruption crime. Controls include alignment, population, party affiliation, number of parties, tenure and education. All estimates include municipality fixed effects. Standard errors are robust to heteroscedasticity and clustered at the municipality level. $*p < 0.1$, $**p < 0.05$, $***p < 0.01$.

Table 2.10: Results with alternative specification

Dependent Variable:	No. crimes		No. charged		No. sentenced	
	(1)	(2)	(3)	(4)	(5)	(6)
Government_turnover	-0.797***	-0.672*	-1.567***	-1.328***	-1.727***	-1.256*
	(0.361)	(0.403)	(0.394)	(0.508)	(0.518)	(0.750)
Time FE	Y		Y		Y	
District trends	Y		Y		Y	
District × Time		Y		Y		Y
Controls	Y	Y	Y	Y	Y	Y
Observations	556	556	556	556	556	556
R-squared	0.13	0.09	0.11	0.10	0.10	0.12
Number of municipalities	278	278	278	278	278	278

Note: Diff-in-diff regression results from the estimation of equation (2.3). This table shows the results with a negative binomial approach rather than an OLS as in previous analyses. Each cell provides the average treatment effect from a different regression. Controls include alignment, population, party affiliation, number of parties, tenure and education. All estimates include municipality fixed effects. Standard errors are robust to heteroscedasticity and clustered at the municipality level. $*p < 0.1$, $**p < 0.05$, $***p < 0.01$.

Table 2.11: Results to check for potential bad controls

Dependent Variable:	No. crimes		No. charged		No. sentenced	
	(1)	(2)	(3)	(4)	(5)	(6)
Government_turnover	-0.543*	-0.554*	-2.991***	-2.776***	-1.453***	-1.326***
	(0.288)	(0.316)	(0.866)	(0.888)	(0.447)	(0.444)
Time FE	Y		Y		Y	
Initial conditions	Y		Y		Y	
Initial conditions × Time		Y		Y		Y
Observations	556	556	556	556	556	556
R-squared	0.29	0.30	0.41	0.42	0.39	0.40
Number of municipalities	278	278	278	278	278	278

Note: Diff-in-diff regression results from the estimation of equation (2.3). This table alters the general specification by taking the initial values of the socio-economic characteristics as controls. We take the 2006-2009 legislature values for alignment, population, party affiliation, number of parties, tenure and education. Standard errors are robust to heteroscedasticity and clustered at the municipality level. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 2.12: Results for placebo test

Dependent variable:	Number of crime cases		Number of bureaucrats charged		Number of bureaucrats sentenced	
	(1)	(2)	(3)	(4)	(5)	(6)
Placebo_Turnover	0.164	0.164	0.645	0.571	0.341	0.312
	(0.214)	(0.225)	(0.470)	(0.550)	(0.235)	(0.203)
Time FE	Y		Y		Y	
District trends	Y		Y		Y	
District × Time		Y		Y		Y
Controls	Y	Y	Y	Y	Y	Y
Observations	556	556	556	556	556	556
R-squared	0.10	0.11	0.38	0.37	0.36	0.34
Number of municipalities	278	278	278	278	278	278

Note: Diff-in-diff regression results from the estimation of equation (2.3). This table shows the results for the placebo tests. We exclude the 2010-2013 legislature from the sample. We move our time one legislature earlier. The 2002-2005 legislature would be the legislature before the term limit comes into force and the 2006-2009 legislature would be the legislature where the term limit comes into force. Each cell provides the average treatment effect from a different regression. Change is calculated as 100× Estimate/Mean. Controls include alignment, population, party affiliation, number of parties, tenure and education. Standard errors are robust to heteroscedasticity and clustered at the municipality level. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

2.8.3 Investigating mechanisms

Table 2.13: Investigating mechanisms

Dependent variable	Number of bureaucrats charged of corruption-related offences				
	(1)	(2)	(3)	(4)	(5)
Government_turnover	0.0337	-0.236***	-0.749***	-0.303*	-4.957**
	(0.368)	(0.067)	(0.652)	(0.180)	(2.166)
Government_turnover × Unemployment	-0.213				
	(0.143)				
Government_turnover × Tenure		-0.349			
		(0.247)			
Government_turnover × Alignment			-0.161		
			(0.177)		
Government_turnover × Population				-0.016	
				(0.013)	
Government_turnover × Abstention					-0.146
					(0.153)
District × Time	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y
Observations	556	556	556	556	556
R-squared	0.35	0.32	0.37	0.41	0.37
Number of municipalities	278	278	278	278	278

Note: Diff-in-diff regression results from the estimation of equation (2.4). We include in equation (2.4) the interaction between government turnover and unemployment, tenure, alignment, population and abstention. Unemployment is the average unemployment rate during the legislature. Tenure is the number of mandates the mayor has served. The alignment shows whether the mayor's party is the same as the party of the autonomous government, the population is the number of inhabitants (in thousands of people) of each municipality, and abstention is the abstention rate in municipal elections. All estimates include municipality fixed effects. Standard errors are robust to heteroscedasticity and clustered at the municipality level. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 2.14: Investigating mechanisms

Dependent variable	Number of bureaucrats sentenced of corruption-related offences				
	(1)	(2)	(3)	(4)	(5)
Government_turnover	-0.111	-0.128***	-0.910***	-0.137**	-2.619**
	(0.087)	(0.039)	(0.328)	(0.065)	(1.056)
Government_turnover × Unemployment	0.042				
	(0.286)				
Government_turnover × Tenure		-0.152			
		(0.124)			
Government_turnover × Alignment			-0.062		
			(0.096)		
Government_turnover × Population				-0.137	
				(0.096)	
Government_turnover × Abstention					-0.047
					(0.153)
District × Time	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y
Observations	556	556	556	556	556
R-squared	0.31	0.29	0.34	0.38	0.34
Number of municipalities	278	278	278	278	278

Note: Diff-in-diff regression results from the estimation of equation (2.4). We include in equation (2.4) the interaction between government turnover and unemployment, tenure, alignment, population and abstention. Unemployment is the average unemployment rate during the legislature. Tenure is the number of mandates the mayor has served. The alignment shows whether the mayor's party is the same as the party of the autonomous government, the population is the number of inhabitants (in thousands of people) of each municipality, and abstention is the abstention rate in municipal elections. All estimates include municipality fixed effects. Standard errors are robust to heteroscedasticity and clustered at the municipality level. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$.

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Chapter 3

What are the economic consequences of regional nationalism? The case of Catalonia

DAVID MEDINA RODRIGUEZ

3.1 Introduction

"Nationalism is the real war" said former EU commission president Jean Claude Juncker. Regional nationalisms have been present since the creation of the European Union. After decades since the cease of the violent Basque or Northern Irish nationalisms, Europe is experiencing a resurgence of new types of nationalism, such as Catalonia or Scotland (Jeram et al., 2016; Berdiyev and Can, 2022). Such regional nationalisms feature a lack of violence and a legal seeking of self-determination referendums. Although peaceful, they are also characterised by some xenophobic and populist components (Passarelli and Tuorto, 2012; Adam and Deschouwer, 2016).

A growing literature has focused mainly on the roots and the social effects of regional nationalism on society (May, 2013; Pattie and Johnston, 2017; Rodríguez-Teruel, 2020; Siroky et al., 2021). However, the literature on the economic consequences of regional nationalism remains scarce. Early research has focused on the regional nationalisms of the second half of the 20th century, analysing the economic effects of Basque terrorism or the violence of Northern Irish nationalism (Abadie and Gardeazabal, 2003; Dorsett, 2013). This paper focuses on one of the most active regional nationalisms of the 21st century, Catalonia.[1] It is peaceful, but it generated considerable political uncertainty with two illegal referendums, the imprisonment of most political leaders of the nationalist parties and restrictions on the Catalan government's autonomy. Beyond the social implications, what are the economic consequences of regional nationalism?

This paper investigates the economic consequences of regional nationalism using the case of Catalonia. Therefore, the analysis covers the domestic economy, the impact on foreign investment attractiveness and the effect on exports to other Spanish regions. The analysis of GDP provides information on the aggregate effect of regional nationalism on the economy. FDI analysis provides evidence about the effect of regional nationalism on the investment attractiveness of the region. Finally, the analysis of exports to Spanish regions addresses the possibility that discontent in other Spanish regions may be channelled through boycotts or lower consumption of Catalan products.

To address this question, we construct a counterfactual that allows us to observe the evolution of Catalonia in the absence of nationalism. We use the synthetic control methodology to create a synthetic region as a weighted average of the rest of the regions (Abadie and Gardeazabal, 2003).[2]

[1] There is extensive literature analysing the political and social aspects of the case of Catalonia. See Serrano (2013), Aramburu (2020), Perales-García et al. (2022) or Sanjaume-Calvet and Riera-Gil (2022).

[2] The economy of Spain is concentrated in Catalonia and Madrid. Despite their similarities in population size and GDP, there are strong differences between them (e.g. average education or sectoral distribution of the economy). Therefore, the counterfactual construction requires weighting across all regions and not simply comparing Madrid and Catalonia.

This methodology is widely used in comparative case studies with a treated unit. The results show that political uncertainty generated by regional nationalism does not affect GDP, FDI and export to Spanish regions. Robustness checks control for the possibility of spillover effects or lagged effects. The results suggest that regional nationalism has no economic effects on the regional economy. They may also indicate that the absence of unexpected events makes the risk of independence a non-credible threat, which would not encourage changes in behaviour.

We also analyze the effect of political uncertainty on the stock prices of both Catalan and Spanish firms. This analysis aims to analyse whether some political uncertainty is channelled through the stock market. In this case, we find a poorer performance of Catalan companies triggered by the 2014 referendum. This result aligns with Galasso (2022), who finds a poorer performance of Catalan firms associated with major nationalist events.

We use a database with regional information covering 1980 to 2018. The database uses different sources which provide annual data for each region on GDP, education, sectoral distribution, population density, and gross value added. We use DataInvex (Spanish Ministry of Trade and Industry) for FDI. This database provides annual information by region on FDI inflows. We use Llano et al. (2010) database, which provides information on interregional trade taking as dependent variable exports of each region to the rest of Spain. The union of all sources creates a rich database with detailed information for each region.

This paper links with the literature analyzing the economic costs of nationalism. Recently, Born et al. (2019) analyze the effect of Brexit on the UK economy and found that the economy has stopped growing by 3.2 per cent in less than three years.[3] Abadie and Gardeazabal (2003) also analyses the economic cost of terrorism linked to Basque nationalism and finds that the Basque economy grew by less than 12 per cent of its potential growth in the absence of terrorism. Dorsett (2013) performs a similar analysis for Northern Irish nationalism and finds a 10 per cent drop in the Northern Irish economy due to the violence associated with nationalism.

This work also relates to the literature that analyses the effect of political uncertainty on economic growth and foreign direct investment flows. The literature finds a negative relationship between political uncertainty and GDP (Barro, 1991; Levine and Renelt, 1992; Alesina and Perotti, 1996). Recently, Baker et al. (2016) find that political uncertainty and GDP do not correlate. The determinants of foreign direct investment flows have been extensively studied, and there is some

[3]The case of Brexit differs significantly from the case of Catalonia. Brexit involves a country's exit from a supranational institution such as the European Union. However, Catalan nationalism seeks the split of a region from a country, which would be much more complex because of the essential economic, social and cultural ties. Born et al. (2019) focuses on the effect of unexpected voting results on political uncertainty and, thus, on the economy.

consensus that political uncertainty reduces foreign direct investment flows (Asiedu, 2006; Williams, 2017; Witte et al., 2020). Investment flows reductions may be due to less protection of property rights or less attractive regulation for investors (Glass and Saggi, 2002; Chung, 2014). Finally, the paper relates to the literature analyzing the effect of political tensions on the generation of boycotts for specific products. Recently, some studies have analyzed political tensions as a determinant of demand for certain regional products. The media exploitation of political tensions discourages trade between regions and penalizes the economy of the other region (Edwards, 1990; Heilmann, 2016; Ali, 2021).

This paper contributes to the literature that attempts to evaluate the economic consequences of regional nationalism. Contrary to previous literature, the case of Catalonia has no terrorism like that of Basque nationalism or an unexpected outcome like Brexit. We also provide evidence that regional nationalism does not affect the attractiveness of the region to receive FDI or exports to other regions. Finally, we contribute to the literature showing that stock markets react negatively to regional nationalism, especially at key moments.

This paper is organized as follows. Section 3.2 outlines the main characteristics of Catalan nationalism and regional economic distinctiveness. Section 3.3 presents the main features of the synthetic control methodology. Section 3.4 presents the main sources of information to construct the database. Section 3.5 presents the main results and robustness checks for analyzing GDP, FDI and export to Spanish regions. Section 3.6 presents the results of the effect of regional nationalism on the stock market. Finally, section 3.7 concludes.

3.2 Catalonian economic and political context

This section describes the political and economic situation in Catalonia. First, we focus on the evolution of nationalism in Catalonia. Secondly, we describe the economic situation of Catalonia as one of the most notable regions in Spain. Apart from Madrid, it is the region with the highest GDP, the primary recipient of FDI and the largest presence in interregional trade.

3.2.1 Nationalism in Catalonia

Nationalism has been present in Catalonia since the late 19th century. Despite its long trajectory, it was from 1980 onwards that it took on a higher presence in the national context. The successive electoral victories of the CiU (Convergence and Union) party led by Jordi Pujol allowed the estab-

lishment and spread of nationalism (Harty, 2002).[4] The Catalan government focused on controlling and implementing the Catalan language in the educational context and media for indoctrination (Molina and Quiroga, 2019).

These policies polarised Catalan society between supporters of increasing independence for Catalonia and supporters of maintaining equal relations with other regions. Up to the 1999 elections, the support for nationalist parties (i.e. CiU and ERC) was similar to that of state parties (i.e. PP and PSOE). However, the presence of state parties decreased considerably after 1995. Figure 3.1 shows the evolution of the number of deputies in the Catalan government in both groups. We observe that while the number of deputies of the nationalist group remains constant or even grows slightly, there is a sharp fall in the number of deputies of the state parties. This shows that Catalan society was beginning to become disenchanted with the state parties and was increasing support for other parties.[5] It can also be seen in Figure 3.1 that the drop in support for state parties is more accentuated from 2010. This decline in support coincides with the national government's decision to reject further independence for the region of Catalonia. This greater independence consisted of managing more resources and a lower contribution to the Spanish state budget.[6]

The ineffectiveness of the Spanish government also marked this decline in support of state parties in responding to the 2008 financial crisis. The nationalist parties used both arguments to boost nationalism seeking electoral gain to hold a self-determination referendum. This strongly impacted public opinion, which responded favourably to the potential independence of Catalonia. Figure 3.2 shows the support for potential independence from 2005 to 2018. We note that before the economic recession and the central government's refusal to accept further economic independence for Catalonia, support for potential independence was in the minority (below 20 per cent). However, support for independence tripled during the economic recession, especially from 2010 onwards.

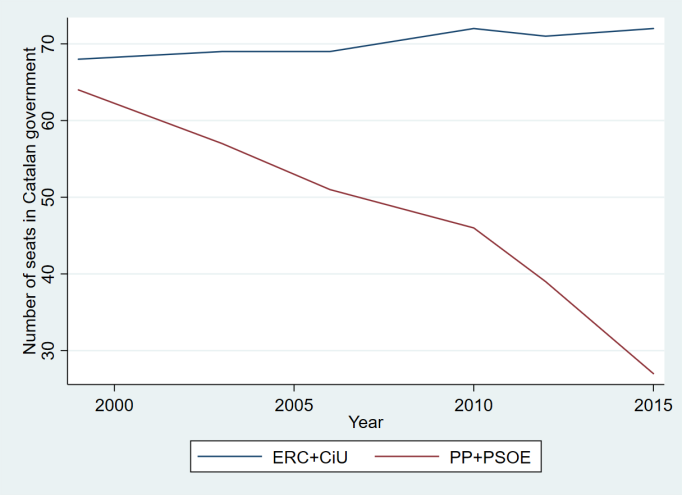
Since 2010, successive popular demonstrations have favoured independence, including two referendums. In November 2014, a first referendum was held, supported by other referendums, such as the Scottish and Crimean referendums. The non-binding result was that forty per cent of the Catalan electorate went to the vote, and 80 per cent favoured Catalan independence. The consequence of this result was that the nationalist parties united to present a common platform with

[4] Jordi Pujol was the president of the Catalan government from 1980 to 2003. The period during which he presided is known as Pujolism.

[5] Ciudadanos, CUP or en Comum Podem stand out among the new parties that channelled the vote. Ciudadanos has a similar position (with more radical aspects) to the state parties. CUP adopted a more radicalized position compared with the nationalist parties. Finally, Comum Podem was ambiguous on the nationalist issue.

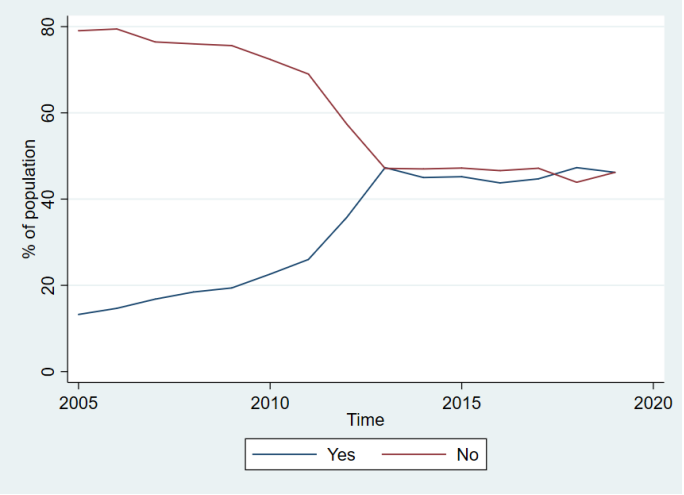
[6] The Spanish budget consists of all regions giving a certain amount and then redistributing it to benefit the poorer regions. Catalonia has always been a net contributor of funds to the Spanish budget since it is one of the richest regions.

Figure 3.1: Number of seats in Catalan government of nationalist and state parties. Period 1999-2015.



Note: This figure shows the number of seats in the Catalan Parliament of the two main state parties (PP and PSOE) and the two main nationalist parties (CiU and ERC). The total number of seats in the Catalan Parliament is 135.

Figure 3.2: Percentage of the Catalan population supporting independence. Period 2005-2018.



Note: This figure shows the percentage of the Catalan population that would vote yes in a potential independence referendum. This information is obtained from the questionnaire conducted quarterly by the Government of Catalonia. The values in the figure show the percentage of respondents who answer "Yes" or "No" to the question "Do you want Catalonia to be an independent state?".

the sole objective of obtaining a binding referendum on self-determination. This platform took power in 2015, and after successive events, another non-binding referendum took place on October 1, 2017. In this case, the non-binding result was a 44 per cent turnout and a 90 per cent victory for Catalan independence. The consequences were that the Spanish government stripped the Catalan government of its autonomy and many political leaders of nationalist parties ended up being imprisoned in 2019.

3.2.2 Political uncertainty in Catalonia

Nationalism in Catalonia has been one of the significant issues of the 21st century in Spanish politics. Nationalism has been an issue of concern in Spain for two main reasons. The first reason is the size of the Catalan economy and population since it is a region that accounts for about 20 per cent of the population and GDP. It is also one of the most industrialized regions and one of the most open to international trade. Therefore, any effect on the Catalan economy would have a noticeable effect on the economy.[7] The second reason is political, as it could destabilize Catalan and national politics.[8] This political instability has very adverse effects in different areas. First, the nationalist parties tended to radicalize to capture the nationalist vote. Secondly, the state parties cannot form solid governments and must gradually cede more autonomy to the nationalist parties in exchange for support (Ştefuriuc, 2009; Slater and Simmons, 2013).

Figure 3.3 shows the economic policy uncertainty index for Spain and Europe.[9] We observe a large concentration of political uncertainty in both indices in 2012 and 2013, coinciding with the bank bailout of many European countries. Since then, political uncertainty in Spain has generally been higher than in Europe. The two referendums are the moments where the differential becomes larger. Spain's highest peak of political uncertainty coincides with the 2017 referendum, although it decreases rapidly. However, the period following the 2014 referendum is when political uncertainty rises.

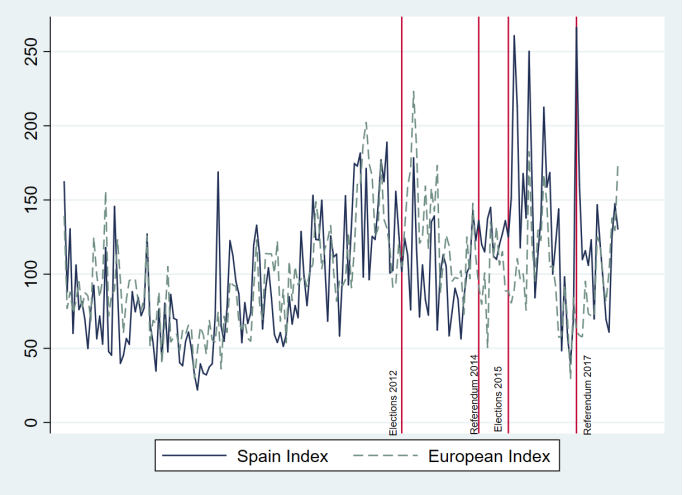
The economic policy uncertainty generated by nationalism has affected the decision of where to locate. Historically, Catalonia has been the region with Madrid that attracted the most companies, having the largest number (around 18 per cent of the total). However, in recent years there has been

[7] For example, Basque nationalism, although characterized by ETA terrorism, affected a percentage of the population of about 6 per cent

[8] In Spain, the winning party in the elections has formed a coalition with the nationalist parties CiU or PNV (Catalonia and the Basque Country respectively) to form a government when they have not obtained an absolute majority. This happened in 1993, 1996, 2004, 2011 and 2015 elections.

[9] This index was proposed by Baker et al. (2016) and measures the relative frequency with which a series of concepts such as economy, uncertainty or politics appear in the main newspapers. Ghirelli et al. (2019) calculated the index for Spain.

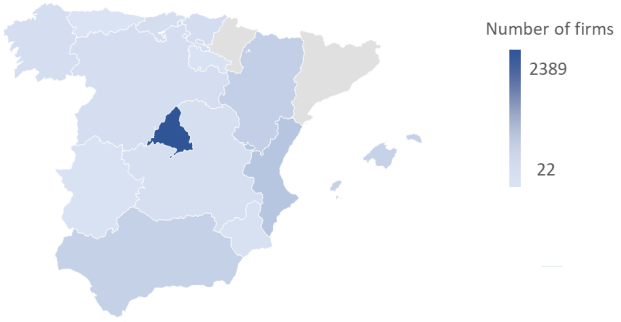
Figure 3.3: Economic policy uncertainty (EPU) index in Spain and Europe. Period 2003:06-2018:12.



Note: This figure shows the monthly frequency with which certain keywords appear in the main newspapers. The average value is 100, and a value of 300 would mean that in that month the frequency of those words is three times the average.

an exodus of companies from Catalonia to other regions. Figure 3.4 shows the difference between the number of firms that have moved from Catalonia to each region minus the number of firms that have moved from the region to Catalonia from 2016 to 2019. No region has a negative balance with Catalonia, indicating the widespread exodus of firms to other regions. Within the different regions, the region of Madrid stands out, whose balance is 2389 companies. Aragon, Valencia and the Balearic Islands have also benefited greatly from this exodus.[10]

Figure 3.4: Exodus of companies from Catalonia caused by nationalism. Period 2016-2019.



Note: This figure shows the balance between companies coming from Catalonia and companies leaving Catalonia by region. The data for the Basque Country (a grey region) is unavailable.

[10]These regions have been particularly benefited for three main reasons. The first reason is that these are the regions adjacent to Catalonia, which represent a minor change. On the other hand, Aragon and Valencia have similar economic structures to Catalonia. Finally, Valencia and the Balearic Islands share many identity aspects such as the Catalan language.

3.2.3 The dependence of Catalonia on the external sector

A key factor of Catalan nationalism has been media exposure at national and international levels. This increased media coverage can positively affect media resonance and generate political uncertainty or backlash. Therefore, we analyze two variables strongly affected by this political uncertainty or the backlash: FDI and export to Spanish regions. Foreign investors could be discouraged in a scenario of high political uncertainty. On the other hand, the rest of the Spanish regions may reduce their purchases of Catalan products due to political tensions or as a form of punishment. This subsection shows Catalonia's position in the external sector both nationally and internationally.

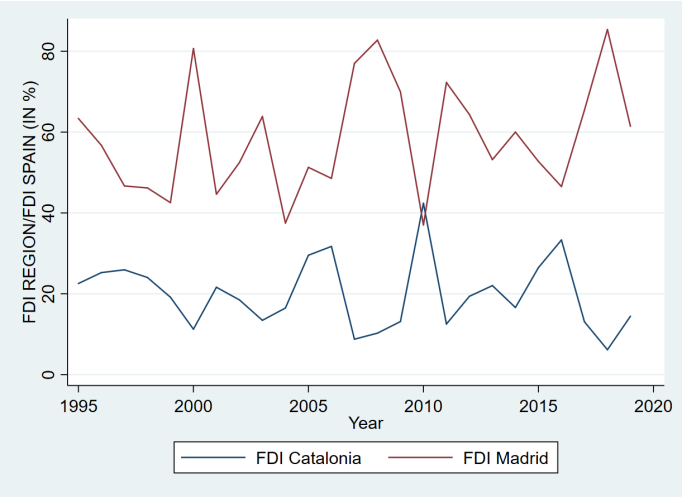
Catalonia's economy is characterized by being one of the most industrialized of the Spanish regions, and also by being one of the most open to the external sector. It is also one of the regions most exposed to the external sector and the perception of political uncertainty can negatively affect the Catalan economy. Catalonia region is the largest recipient of Foreign Direct Investment (FDI) after Madrid. Figure 3.5 shows the evolution of FDI percentage in the Madrid region and Catalonia.[11] In the last 25 years, we can see that 60 per cent of FDI has gone to the Madrid region and 20 per cent to the Catalonia region. The remaining amount of FDI is divided among the other regions. Therefore, there is a possibility that nationalism makes Catalonia a less attractive option for foreign investors and thus reduces the amount of foreign investment in the region.

One of the essential pillars of the Catalan economy is the positive trade balance with the rest of Spain's regions. Catalonia's exports to other Spanish regions account for over 20 per cent of Catalonia's total GDP. It is the largest exporter to other Spanish regions and has a positive trade balance with the rest of Spain. Figure 3.6 shows the weight in exports to other Spanish regions of the five regions with the highest weight.[12] We can see that Catalonia's share of exports to other Spanish regions has decreased over the last few years, but it is still around 25 per cent and twice as large as the next largest region, Andalusia. Political tension between the different regions may affect exports to Spanish regions, as citizens' discontent in the other regions may discourage

[11] This figure also provides information on the possible composition for forming the synthetic control for the FDI. The intense concentration of FDI in Catalonia and Madrid to the rest of the regions means that the weight of Madrid in the synthetic region is much higher. Subsection 3.5.2 shows that the weight assigned to Madrid in the synthetic region is 0.65. The 0.35 is distributed among Aragon, the Basque Country and Andalusia regions, which receive the largest FDI flows (after Madrid and Barcelona).

[12] This figure also provides information on the possible composition for forming the synthetic control for the variable exports to the rest of the Spanish regions. In this case, we expect Andalusia, the second largest exporter, to have a substantial weight in the synthetic region. Due to population size and GDP similarities, Madrid is also expected to have a substantial weight. Subsection 3.5.3 shows the synthetic region without nationalism, simulating exports to the rest of the regions of Catalonia, consisting of 0.53 of Madrid and 0.47 of Andalusia.

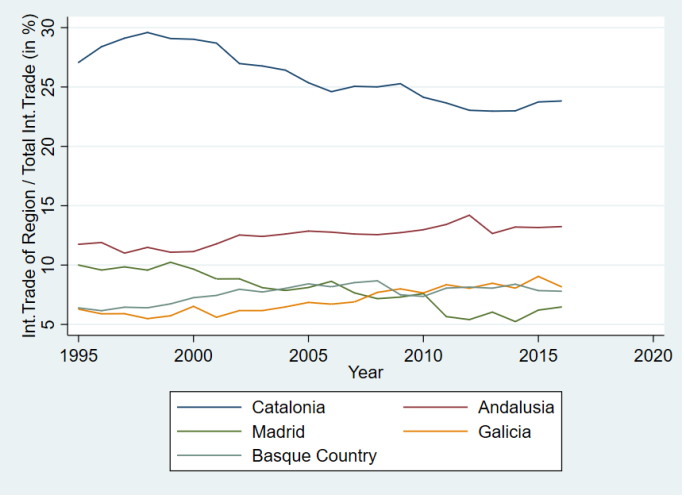
Figure 3.5: Percentage of FDI in the region of Catalonia and Madrid. Period: 1995-2019.



Note: This figure shows the percentage of foreign direct investment flows in Madrid and Barcelona. It is calculated as the ratio of FDI flows in the region to total FDI flows in Spain. The rest of the FDI flows are distributed among the other regions, especially Andalusia and the Basque Country.

consumption or promote boycotts of products from Catalonia.

Figure 3.6: Share of the most exporting regions to other Spanish regions.



Note: The contribution of each region is calculated as the export of each region to other regions of Spain divided by the total exports of all regions.

3.3 Synthetic control methodology

The synthetic control methodology (SCM) estimates the effects of an intervention or event (henceforth, the treatment) in comparative case studies when there is only one unit treated (Abadie and

Gardeazabal, 2003; Abadie et al., 2010). The main idea of the SCM is the use of the pre-treatment periods to create a synthetic region, whose characteristics are similar to the unit treated. The synthetic region is a weighted average of the untreated regions.

Consider $i = 1, ..., N+1$ observed units for $t = 1, \ldots, T_0, \ldots, T$ periods where $T_0 = 2014$ is the period of implantation of the treatment (referendum). $i = 1$ is the unit exposed to the treatment and $i = 2, ..., N+1$ are the potentials controls to construct the synthetic region. Further, let Y_{it}^U be the potential outcome observed in the region i in period t when there is no intervention. On the other hand, Y_{it}^I is the potential outcome observed for region i in period t when there is intervention.

Let $\alpha_{it} = Y_{it}^I - Y_{it}^U$ be the effect of the treatment of region i in period t, and D_{it} be the indicator that a unit i is treated at t. The indicator D_{it} has the following distribution:

$$D_{it} = \begin{cases} 1 \quad if \quad i = 1 \quad and \quad t > T_0, \\ 0 \quad otherwise. \end{cases}$$

Further, let Y_{it} be the observed outcome for unit i in period t. Y_{it} is given by:

$$Y_{it} = \alpha_{it} D_{it} + Y_{it}^U \tag{3.1}$$

$$Y_{it}^U = \delta_t + \theta_t Z_i + \lambda_t \mu_i + \epsilon_{it} \tag{3.2}$$

where δ_t is a time-fixed effect, Z_i is a vector of time-invariant measured predictors with time-varying coefficient vector θ_t, μ_t is a vector of time-invariant unobserved predictor variables with time-varying coefficients λ_t and ϵ_t are unobserved transitory shocks with zero mean. The vector Z_i contains pre- and post-treatment values of time-varying values, as long as they are not affected by the intervention. Unlike difference-in-difference or fixed-effects specification, SCM allows unobservable heterogeneity (μ_t) to vary over time with the introduction of λ_t.

In this setup, we aim to estimate $(\alpha_{1T_0+1}, ..., \alpha_{1T})$ and the effect of the treatment for $i = 1$ for $t > T_0$. In $\alpha_{it} = Y_{it}^I - Y_{it}^U$, for $t > T_0$ we can observe Y_{it}^I but instead Y_{it}^U is unobservable, so we use SCM to construct it. In the SCM the objective is to find a vector of weights $W = [w_2.....w_{N+1}]^T$ such that it minimizes the distance of the pre-treatment period:

$$\|X_1 - X_0 * W\|_V = \sqrt{(X_1 - X_0 * W)' V (X_1 - X_0 * W)} \tag{3.3}$$

subject to $w_i \geq 0$ for $i = (2, ..., N+1)$ and $\sum_{i=2}^{N+1} w_i = 1$. X_1 is a $(Kx1)$ vector containing the values of the pre-treatment predictors of the treated units that we aim to match as closely as possible,

and let X_0 be a (KxN) matrix collecting the values of the same variables for $i \in \{2, ..., N+1\}$. V is a (KxK) diagonal positive semi-definite matrix that measures the relative importance of each predictor. Minimization of equation (3.3) obtains the solution $W^*(V)$, which depends on the matrix V, so we comment on how to find the optimal weights of the predictors. Although there are several methods to calculate it, we use the data-driven approach proposed by Abadie and Gardeazabal (2003) and Abadie et al. (2010). In particular, let Y_1 be the (T_0x1) vector collecting the pre-treatment values of the outcome for $i = 1$ and Y_0 is (T_0xN) matrix containing the pre-treatment values for $i \in \{2, ..., N+1\}$. To calculate V, we minimize Mean Square Prediction Error (MSPE), whose formula is given by $(Y_1 - Y_0 * W^*(V))'(Y_1 - Y_0 * W^*(V))$.

As previously defined, Y_{it} is the outcome of unit i at time t. Since what we want is to construct a synthetic region of the treated region (i.e., Catalonia), the estimation of Y_{1t}^U is given by $\hat{Y}_{1t}^U = \sum_{i=2}^{N+1} w_i Y_{it}$. Once we have obtained $\hat{Y}_{1t}^U$, we can estimate the treatment's effect on the unit treated. The estimation of the effect of treatment is given by $\hat{\alpha_{it}} = Y_{it}^I - \hat{Y}_{1t}^U$

Abadie et al. (2010) argues that large sample inferential techniques are not applicable when the number of units is small. A placebo test is therefore used to address this. The placebo test is based on permutation methods, where the objective is to find the effect of treatment on the control units separately. The permutations' distribution can be obtained iteratively by reallocating the treatment to the units in the control group by estimating the "placebo effects" in each iteration. The treatment's effect on the unit treated is significant when its magnitude is abnormally different from the distribution generated. Abadie et al. (2010) proposes a statistic test which measures the ratio between the pre- and post-treatment adjustment in each unit. Equations (3.4) and (3.5) show the pre-treatment and post-treatment adjustment formulas, respectively.

$$t_i^{pre} = \sqrt{\frac{1}{T_0} * \sum_{t=1}^{T_0} [Y_{it} - \hat{Y}_{1t}^U]^2} \tag{3.4}$$

$$t_i^{post} = \sqrt{\frac{1}{T - T_0} * \sum_{t=T_0+1}^{T} [Y_{it} - \hat{Y}_{1t}^U]^2} \tag{3.5}$$

$t_i^{ratio} = t_i^{post}/t_i^{pre}$ measures the deviation between each unit and their synthetic control in post-treatment periods to pre-treatment periods. If $t_i^{ratio} = 1$, then the deviation has not changed

after applying the treatment. Abadie et al. (2015) propose as p-value the following expression $p = \sum_{i=1}^{N+1} 1[t_i^{ratio} \geq t_1^{ratio}]/(N+1)$, which measures the probability that the units of the control group have a higher deviation than the treated unit. As a rule of thumb, to reject the null hypothesis that the treatment does not affect, the p-value is less than 0.1.

3.4 Data

We use annual GDP data for each region from 1980 to 2018. GDP values are deflated by Spain's Producer price index obtained from the St. Louis Federal Bank database, FRED. The explanatory variables' population, population density, sectoral distribution, productivity, gross value added and highway density are obtained from the Urban Platform Plus of the European Commission. On the other hand, information on the population's education is obtained from the Valencian Institute of Economic Research. This information allows us to analyze the effect of regional nationalism on GDP.

We use the FDI flows provided by DATAINVEX (Spanish Ministry of Industry, Trade and Tourism) to analyze the effect of national regionalism on foreign direct investment. The FDI flows data cover 1995 to 2018. We deflate the amounts by Spain's Producer Price Index. Our analysis focuses on the effect of regional nationalism on the region's investment attractiveness. Therefore, the sample includes only FDI inflows to each region. To test whether the series is stationary, we check whether it has a unit root. We perform the Dickey-Fuller and Phillips-Perron tests and found no evidence of unit root.

We also use a novel database that collects data on trade between the different regions of Spain. Llano et al. (2010) provides detailed information on trade in Spain from 1995 to 2016. This database provides information on trade between two regions and differentiates by type of good. The analysis focuses on determining if the discontent of other regions is channelled through boycotts or some penalty. Therefore, our variable of interest is the exports of each region to the other regions of Spain. A possible boycott of products from Catalonia would primarily affect exports from Catalonia to other regions. The stationarity of the series is also checked by repeating the unit root tests. In none of these tests is there any evidence of a unit root.

Finally, we use the information provided by the Madrid Stock Exchange. This database provides daily information on the value of stocks, companies' size, and their book to market. The database also collects information of companies with suspended listings or changes in the number of shares (reduction or increase of capital).

3.5 Results

This section shows the results of using the SCM in GDP per capita, FDI and exports to other Spanish regions. To create a synthetic region similar to a potential Catalonia without nationalism, we select the main predictors of each variable and allocate weights across the remaining 16 Spanish regions.[13] The selection of different determinants may lead to different assignments of weights to each region. The marked economic disparity in Spain, presented in section 3.2, leads to relevant compositional changes of the synthetic region by variable analyzed. As a result, in GDP per capita or FDI, Catalonia resembles other regions such as Balearic Islands, Basque Country or Aragon. However, regarding exports to other regions, Catalonia resembles Andalusia. Despite differences in weight allocation, results reveal a common pattern with Madrid as the most contributing region in the synthetic regions for each variable.

Our results show that nationalism has not affected the variables analyzed. We have performed a series of robustness checks to corroborate these conclusions to investigate potential anticipation or spillover effects. The robustness checks show that Catalan nationalism has had no impact on GDP per capita, FDI or exports to the rest of the Spanish regions.

3.5.1 Result of GDP per capita

The regions with a positive weight in the synthetic control to simulate a Catalonia without nationalism are Madrid (0.38), Balearic Islands (0.19), Basque Country (0.17), Aragon (0.13) and Valencia (0.13). We expect the composition as the regions selected include only those with GDP per capita closest to Catalonia. Moreover, such regions have the most similar characteristics to those of Catalonia. The region that contributes the most is Madrid, a region very similar to Catalonia in GDP and population. On the other hand, the Balearic Islands have a similar education distribution to Catalonia, with a high concentration of their human capital in primary or secondary education. Basque Country, Aragon and Valencia regions have a sectoral distribution with a higher weight of industry and a lower weight of agriculture than the national average, as in the case of Catalonia.

Table 3.1 shows the mean GDP per capita determinants from 1980 to 2013 for Catalonia and the synthetic region. The similarity between Catalonia and synthetic control is high. The most notable differences are a higher presence of the service sector and a more educated population in synthetic control. The weight of Madrid, a region focused on the service sector and with one of

[13]The assignment of weights of the synthetic region, as shown in the equation (3.3), is done by choosing the combination that minimizes the deviation from the original region (i.e., Catalonia).

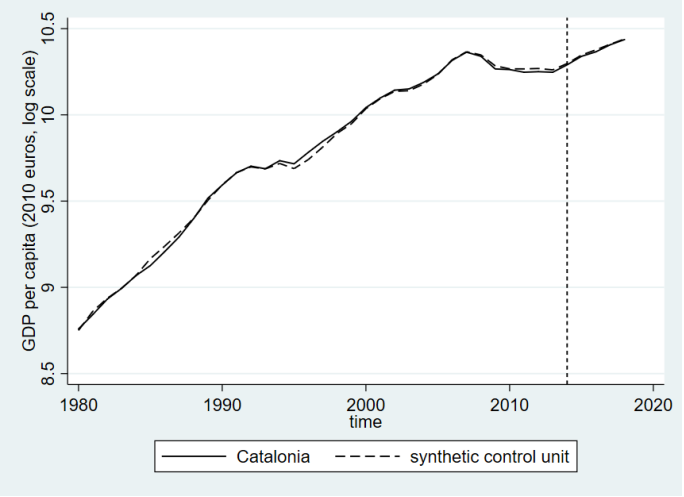
Table 3.1: GDP per capita. Pre-referendum characteristics 2013.

	Catalonia	Synthetic
GDP per capita	19.3	19.0
Population density	5.3	5.3
Investment ratio *	27.6	27.6
Agriculture *	3.4	4
Industry *	24.9	21.2
Construction *	9.3	9.3
Services *	62.3	69.1
Illiterates *	2.7	2.6
Up to primary studies *	44.7	42.3
Up to secondary studies *	41.6	41.6
Tertiary studies *	10.9	13.5
RMSPE		0.02

Note: GDP per capita is measured in thousands of euros. Population density shows the logarithm of the population density. * These variables are measured in percentages. RMSPE calculates the deviation of the synthetic control series from the Catalan GDP series before the 2014 referendum (see equation (3.4)). These variables have been selected because they are the main determinants of GDP per capita.

the most educated populations, may explain these differences. The last row shows the RMSPE indicating that Catalonia and the synthetic region fit well. Figure 3.7 shows the evolution of the logarithm of GDP per capita in Catalonia and the synthetic region. We observe the good fit of both series. It can also be seen that from 2014 onwards, there is no divergence in the series. This suggests that regional nationalism has not affected Catalonia's economy.

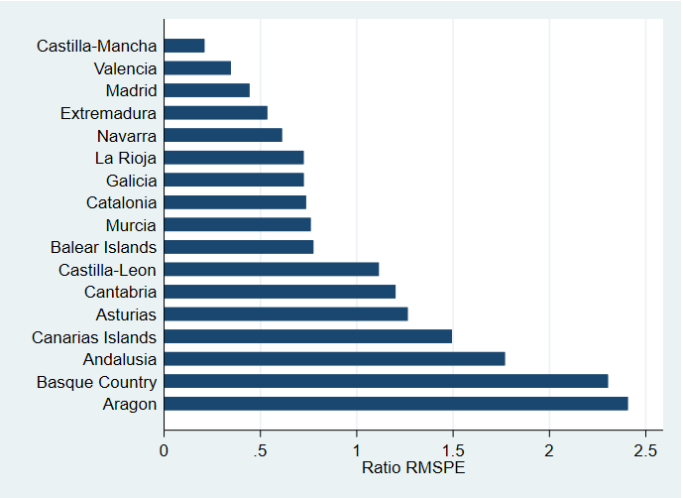
Figure 3.7: Log GDP per capita, Catalonia versus synthetic control. Period 1980-2018.



Note: The solid line shows the GDP per capita logarithm of Catalonia from 1980-2018. The dashed line shows the GDP per capita logarithm in the synthetic region as the weighted average of the GDP per capita logarithm of Madrid, Basque Country, Balearic Islands and Aragon regions.

The graphical analysis provides a preview of the result that regional nationalism does not affect the region's GDP per capita. Figure 3.8 shows the ratio of the post-treatment deviation to the

Figure 3.8: Ratio of post and pre-referendum 2014 deviations: Catalonia and 16 control regions.



Note: The ratio shows each region's GDP per capita deviation from the synthetic control after the 2014 referendum divided by the deviation before the 2014 referendum. Equations (3.4) and (3.5) show the formula for calculating the deviation before and after the referendum, respectively.

pre-treatment deviation for all regions. We observe that the ratio of the Catalonia region is not abnormally different from the rest of the regions. Specifically, the p-value value would be 0.56. These values corroborate the result predicted in the graphical analysis.

The results show that the political uncertainty generated by nationalism in Catalonia has not impacted the regional economy. This result aligns with the literature that argues that GDP per capita is not correlated with political uncertainty. It can also be argued that the lack of effect is because political uncertainty has not been sufficiently high. Two factors may explain the lack of effect of Catalan nationalism on GDP: the absence of violence and predictable outcomes. Most of the literature arguing that political uncertainty negatively affects GDP per capita relates political uncertainty to violent events such as terrorism or coups (Abadie and Gardeazabal, 2003; Dorsett, 2013). Born et al. (2019) claims that the outcome of Brexit explains a large part of the negative effect on GDP per capita. The unexpected outcome of the vote (the Remain option winning expected) explains much of the negative economic effect of Brexit. However, Catalan nationalism lacks both components, as it has been a regional nationalism absent of violence and with predictable outcomes.

Robustness checks show consistent results after analyzing other potential drivers of the effect. The first potential driver is the economic disparity within Catalonia. Much of the region's economy is generated in Barcelona and its metropolitan area. To determine if any effect exists in any province, we performed the synthetic control analysis for each province of Catalonia: Barcelona,

Gerona, Lleida and Tarragona. Table 3.5 shows the values of the GDP determinants for each province and its synthetic control. Figure 3.16 shows the evolution of GDP per capita of each province and its synthetic region. We find that there is no significant deviation after 2014. This graphical analysis is corroborated by Figure 3.17, which shows that the ratios of the Catalan provinces are not abnormally large. This first robustness check shows the consistency of the results obtained previously.

A second robustness check focuses on the possibility of lagged effects. There is a possibility that the 2014 referendum is not the key event for Catalan nationalism, and in that case, the potential effect might be anticipated or delayed. To control this possibility, we replicate the synthetic control analysis shifting the starting year of the treatment. Figure 3.18 shows the evolution of GDP per capita for Catalonia and its synthetic control changing the year of treatment. We again find a good fit and no deviation in the years after the treatment. Figure 3.19 shows the ratios for each analysis, and we obtain the same previous result.

Finally, we check the possibility of a spillover effect. Nationalism may affect not only the economy of Catalonia but also the economy of other Spanish regions. We perform the synthetic control analysis using Spain as the treated unit and the OECD countries as the control units to rule out potential spillover effect. Figure 3.20 shows the evolution of Spain's GDP and the synthetic region. We observe that it fits poorly than the previous cases but still has a similar trend. Moreover, no deviation is observed after 2014 either. The ratios shown in Figure 3.21 corroborate the absence of an effect of nationalism in Spain. With this robustness check, it can be concluded that nationalism has not affected Catalonia's GDP.

3.5.2 Result of FDI

A key feature of foreign direct investment is not evenly distributed over time, and companies tend to invest heavily initially and then reduce their investments. This feature makes foreign investment a volatile variable, as a sizeable isolated investment by one firm can distort the data. We use Chen (2004) cumulative FDI per capita to rule out the possibility of an isolated investment driving the effect. This variable is less exposed to remote operations and controls for the size of each region. The formula for the cumulative FDI per capita is:

$$CumulativeFDIpc_{it} = \frac{\sum_{1995}^{t} FDIflows_{it}}{Population_{it}} \tag{3.6}$$

where i corresponds to each region and t to each period. The sum of FDI flows is a proxy for FDI stock in region i and period t. On the other hand, *Population* is the region's population i in period t. The variable $CumulativeFDIpc_{it}$ increases if the increase in FDI stock is larger than the increase in population and decreases otherwise.

The regions contributing positive weights in the synthetic control are Madrid (0.65), Aragon (0.20), Andalusia (0.12) and Basque Country (0.03). Madrid has a higher weight in the synthetic control because they are the two regions that receive more FDI. Aragon and the Basque Country contribute positively to the synthetic control since their sectoral structure is similar. Finally, Andalusia contributes a positive weight because it is the third-largest recipient of FDI in Spain. Table 3.5.2 shows the average values from 1995 to 2013 of FDI determinants in Catalonia and the synthetic control.[14] We observe a high similarity between Catalonia and the synthetic region. The main differences are that Catalonia is more open to the external sector, with an economic structure more heavily weighted in the industrial sector and less weighted in the agricultural sector. In the rest of the determinants of FDI, we find very close values and the RMSPE is 0.04 showing a fit between them.

Table 3.2: Cumulative FDI per capita. Pre-referendum characteristics 2013.

	Catalonia	Synthetic
GDP *	10.1	10.1
GDP per Capita *	18.9	18.5
Productivity *	10.9	10.9
Density Highways *	3.5	3.7
Wages *	10.1	10.1
Illiterates **	1.9	1.9
Tertiary education **	13.5	13.0
Openness **	51.4	33.9
Employment Industry **	20.9	13.2
Employment Agriculture **	2.3	2.9
RMSPE		0.04

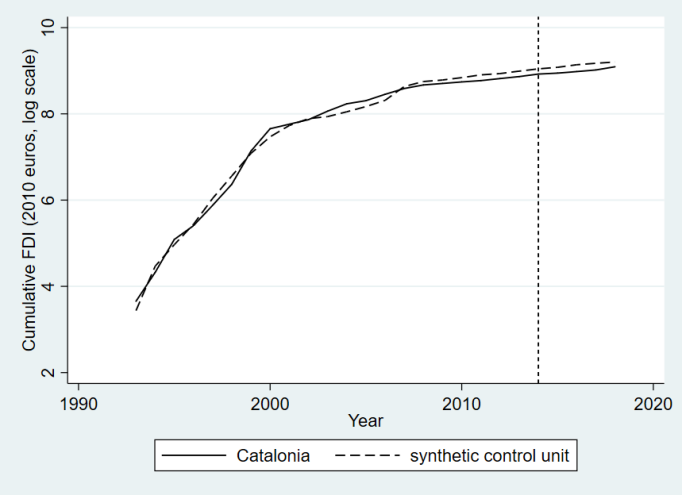
Note: Openess is the ratio of (Imports + Exports)/GDP. Highway density shows the number of kilometres of highway per 1000 square kilometres. * The values of these variables are measured in logarithms. ** The values of these variables are measured in percentage. RMSPE calculates the deviation of the synthetic control series from the Catalan cumulative FDI series before the 2014 referendum (see equation (3.4)). These variables have been selected because they are the main determinants of cumulative FDI.

Figure 3.9 shows the cumulative FDI per capita in Catalonia and the synthetic region from 1995 to 2018. We observe a good fit between both series and that there is no deviation after the referendum. This graphical analysis suggests that nationalism in Catalonia has not affected FDI. Figure 3.10 shows the ratios for all regions. We observe that Catalonia is the region with the smallest deviation, which would result in a p-value of 0.94. This value confirms that regional nationalism

[14] See Noorbakhsh et al. (2001) and Villaverde and Maza (2012).

has not affected FDI. This is evidence that the political uncertainty linked to regional nationalism does not detract from the region's international attractiveness. This is especially notable in a region like Catalonia open to the foreign sector. Another possible interpretation of this result is that investors perceive that a particular peak of uncertainty does not affect long-term returns. This perception makes investors continue to invest regardless of regional nationalism. Moreover, Catalan nationalism supports the entrepreneurial system avoiding uncertainty about fiscal changes that might undermine the return or performance of the firm.

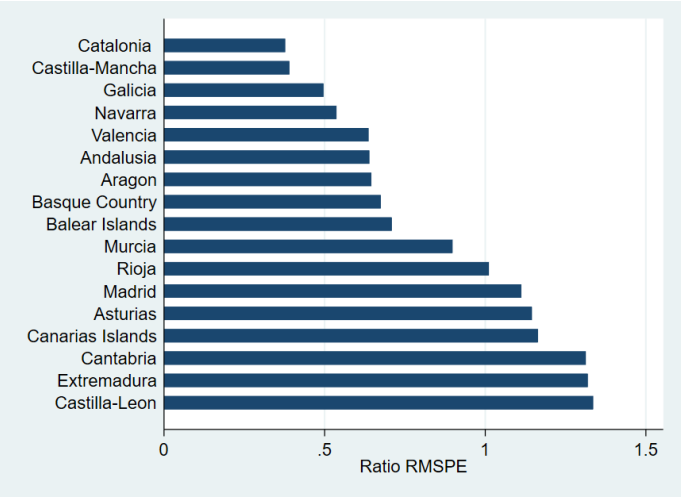
Figure 3.9: Log cumulative FDI per capita, Catalonia versus synthetic control. Period 1995-2018.



Note: The solid line shows the cumulative FDI per capita logarithm of Catalonia from 1995-2018. The dashed line shows the cumulative FDI per capita logarithm in the synthetic region as the weighted average of the cumulative FDI per capita logarithm of Madrid, Basque Country, Andalusia and Aragon regions.

There is also the possibility of the effect being anticipated or delayed. Investors can anticipate uncertainty stemming from regional nationalism, and they adjust their investment strategy before the significant events. On the other hand, the investor can maintain the initial investment strategy until a significant event changes the investment strategy. We control this possibility by conducting the synthetic control analysis by shifting the treatment start year. Figure 3.22 shows the fit of both series by taking different years as starting points. We observe a good fit between both series and no deviation. Figure 3.23 shows the ratio value of each series, confirming the absence of an effect. This corroborates the previous finding that regional nationalism has did not affect foreign direct investment.

Figure 3.10: Ratio of post and pre-referendum 2014 deviations: Catalonia and 16 control regions.



Note: The ratio shows each region's cumulative FDI per capita deviation from the synthetic control after the 2014 referendum divided by the deviation before the 2014 referendum. Equations (3.4) and (3.5) show the formula for calculating the deviation before and after the referendum, respectively.

3.5.3 Results for exports to other Spanish regions

Section 3.2 shows that Catalonia is the largest exporter to other Spanish regions. We cannot make a weighted average across the other regions to match the value of exports from Catalonia to the other regions. As our interest is to know the variation of the variable, we transform the variable that allows us to simulate the exports from Catalonia to the other regions without losing information. The following formula shows the transformation:

$$NormalizedExports_{it} = \frac{Exports_{it}}{\frac{1}{N}\sum_{1995}^{t=2016} Exports_{it}} \tag{3.7}$$

where i corresponds to each of the regions, t to each period and N is the total number of periods. This transformation takes the average regional exports from 1995 to 2016 as value 1. For each period (t), the value of exports is divided by this average value. If exports are above the average value, the variable has values above one and below one otherwise.

The regions that contribute a positive weight to inter-regional trade are Madrid (0.53) and Andalusia (0.47). Madrid is the largest contributor to synthetic control due to its similarities in GDP, productivity and wages. On the other hand, Andalusia is the other contributor to the synthetic control due to being the second largest export to other Spanish regions. Table 3.3 shows the average values of the determinants from 1995 to 2013. We find some differences between the

Catalonia region and the synthetic control.[15]Catalonia has a higher GDP and GDP per capita than synthetic control and has a higher gross value added in the agriculture and industry sectors. In addition, private investment in research and development is higher in Catalonia than in synthetic control. We note that the RMSPE is 0.05, indicating a good fit.

Table 3.3: Exports to other Spanish regions: Pre-referendum characteristics 2013.

	Catalonia	Synthetic
GDP per capita *	10.1	10.0
GDP *	19.0	18.8
Average Wages *	10.2	10.1
Average Expenditure *	9.1	9.1
GVA agriculture *	12.3	11.6
GVA industry *	15.0	14.2
Productivity	55.9	54.6
Tertiary education **	13.3	13.5
Private R&D **	0.8	0.6
RMSPE		0.05

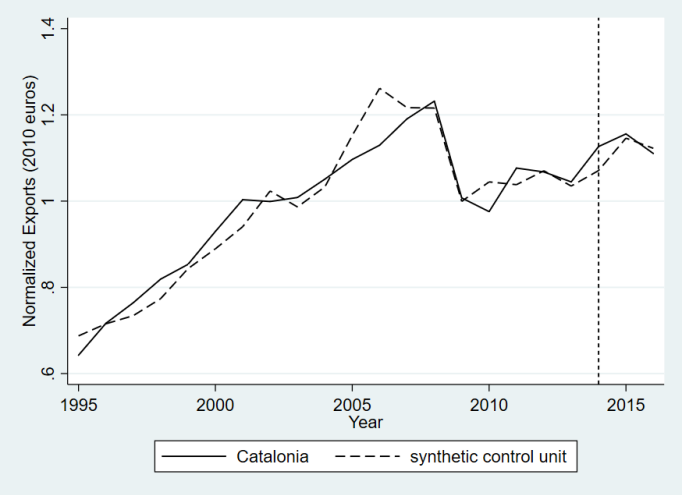
Note: GVA is the gross value added of the sector. Expenditure indicates the amount spent per capita in the region. Productivity is calculated as GDP divided by the total number of hours worked. Private R&D indicates the percentage of GDP invested by the private sector in research and development. * These variables are shown in logarithms. ** These variables are shown in percentages. RMSPE calculates the deviation of the synthetic control series from the Catalan exports to other regions series before the 2014 referendum (see equation (3.4)). These variables have been selected because they are the main determinants of exports to other regions.

Figure 3.11 shows the variation of exports to other regions in Catalonia and the synthetic region from 1995 to 2016. The adjustment is considerably poorer than the previously analyzed variables, but they maintain a similar trend. The figure highlights the sharp retraction of exports to the other regions in the 2008 financial crisis. After the 2014 referendum, there is no discernible deviation between the region of Catalonia from the synthetic region. Figure 3.12 corroborates that no deviation has occurred. The p-value is 0.24, which confirms that there is no effect. These results show that regional nationalism has also not affected exports to other Spanish regions. This result suggests that other regions do not channel discontent through boycotts or penalize the regional economy.

There is extensive literature arguing that political tensions affect relations between different regions, and this paper shows that political tensions created by regional nationalism do not affect bilateral trade with the country's other regions.[16] On the one hand, there is the possibility that the discontent of citizens in other regions is not channelled through boycotts. Another potential

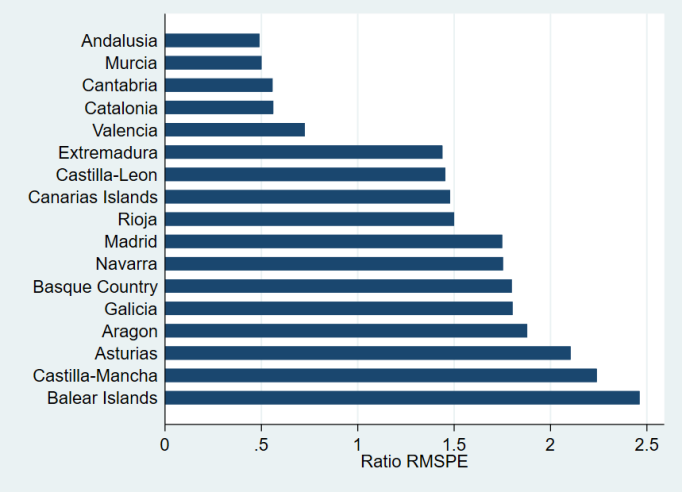
[15]See Nicolini (2003) and Llano et al. (2010).
[16]See Ashenfelter et al. (2007) or Cuadras-Morató and Raya (2016).

Figure 3.11: Exports to other Spanish regions, Catalonia versus synthetic control. Period 1995-2016.



Note: The solid line shows the normalized exports to other Spanish regions of Catalonia from 1980-2018. The dashed line shows the normalized exports to other Spanish regions in the synthetic region as the weighted average of the dependent variable of Madrid and Andalusia.

Figure 3.12: Ratio of post and pre-referendum 2014 deviations: Catalonia and 16 control regions.



Note: The ratio shows each region's normalized export to other regions deviation from the synthetic control after the 2014 referendum divided by the deviation before the 2014 referendum. Equations (3.4) and (3.5) show the formula for calculating the deviation before and after the referendum, respectively.

explanation is that polarization or dissatisfaction of citizens could occur within the region but not in other regions. Alternatively, it may be that there has been a boycott of products that are very characteristic of the region (such as Cava) but which have a meagre weight in total exports. However, Cuadras-Morató and Raya (2016) shows that regional nationalism has not affected the sale of products characteristic of the region of Catalonia to other Spanish regions.

3.6 Analysis of the stock market

In this section, we analyze the impact of the referendum 2014 on the stock market. In subsection 3.6.1, we describe the sample used, the differentiation between Spanish and Catalan stocks and the construction of the cumulative abnormal return. In subsection 3.6.2, we explain the timeline used for the event study and obtain the results.

3.6.1 Sample and cumulative abnormal return

This analysis aims to explore the impact of regional nationalism in Catalonia on the stock market. We find a negative effect of the independence movement on the return of Catalan stocks in the referendum of 9 November 2014. These results align with Galasso (2022) and Abadie and Gardeazabal (2003), who find a lower performance of Catalan and Basque stocks due to the uncertainty associated with nationalism.

We split our sample of stocks into Catalan and Spanish stocks. The stock selection process is shown as follows. The first step eliminates stocks of most international companies or those with less than 30 per cent of their sales in Spain. After this process, 78 stocks remain available. A second step is eliminating those stocks suspended in any session, and 57 companies remain. The classification of these stocks is carried out directly by financial analysts. We collected the daily returns from April 2014 to January 2015, totalling 171 sessions. We have 19 Catalan stocks and 38 Spanish stocks.

Table 3.4 shows the main characteristics of the stocks.[17] Catalan stocks have smaller size (i.e. smaller market capitalization) and smaller book to market.[18] Fifty per cent of the Catalan stocks are companies whose headquarters are located in Catalonia. On the other hand, only 13 per cent of the Spanish stocks are companies whose headquarters are located in Catalonia.

[17]The list of Catalan and Spanish stocks used for the analysis is provided in Subsection 3.8.3, Table 3.6.

[18]Size is the market capitalization of a publicly traded company, calculated by multiplying the number of its outstanding shares by the current share price. The book-to-market is the ratio of the book value of a stock to its market value.

Table 3.4: Characteristics of Catalan and Spanish stocks.

		Catalan	Spanish	All
No. Stocks		19	38	57
Registered in Catalonia	Fraction	0.50	0.13	0.23
Size (in millions of Euros)	Mean	5,43	17,90	13,72
	S.D	7,01	65,39	50,01
	Min	37,80	2,87	2,87
	Max	33,13	275,89	275,89
Book to market	Mean	2.23	2.82	2.62
	S.D	1.23	2.95	2.51
	Min	0.53	0.01	0.01
	Max	7.05	19.1	19.1

Following the standard approach of Kothari and Warner (2007), we use a single-factor market model. This model assumes a linear relation exists between the stock returns and the market returns. For each period t and each firm, we calculate the following equation:

$$R_{j,t} = \gamma_j + \mu_j R_{M,t} + \epsilon_{j,t} \tag{3.8}$$

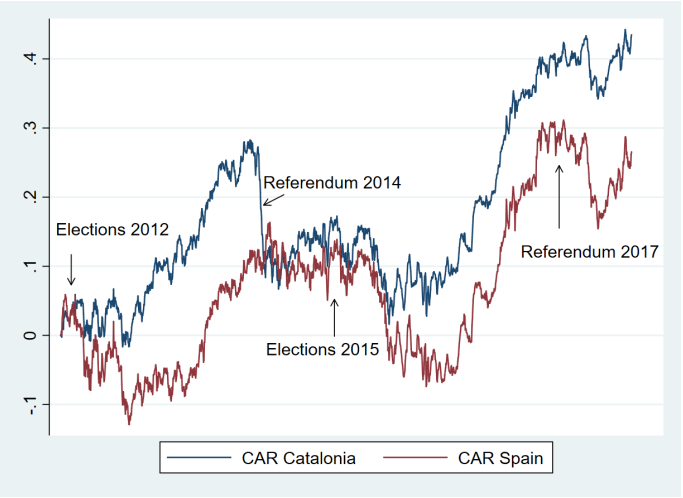
where $R_{j,t}$ is the difference between the stock price in period t and period $t-1$. The market return ($R_{M,t}$) is given by the difference in the price of the IBEX-35 index between period t and period $t-1$.[19] Once the $\hat{\gamma}$ and $\hat{\mu}$ parameters are estimated, we calculate the abnormal return calculated for each period and each stock as follows:

$$AR_{j,t} = R_{j,t} - \hat{\gamma}_j - \hat{\mu}_j R_{M,t} \tag{3.9}$$

where AR_{jt} is the deviation of the price of stock j in period t taking into account the evolution of the market and the constant. Once we obtain the abnormal return, we calculate the cumulative abnormal return given by $CAR_{j,t} = \left(\prod_{s=1}^{t} \{1 + AR_{j,t}\} \right) - 1$. Figure 3.13 shows the average cumulative abnormal return in the Catalan and Spanish stocks. We observe a sharp drop of cumulative abnormal return in the Catalan stocks in the 2014 referendum, which is indicative that this referendum (and the uncertainty associated with this event) had a substantial impact on the cumulative abnormal return of the Catalan stocks. In contrast, we observe no major changes in the other major Catalan independence events.

[19] The IBEX-35 is the index of the 35 main Spanish companies. The weighting of the companies is based on stock market value, with the main stocks being banks, energy and industry firms.

Figure 3.13: Cumulative abnormal return of Catalan and Spanish stocks. Period 2012-2018.

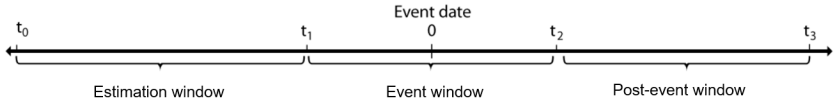


Note: This figure shows the result of equation (3.9) for the Catalan and Spanish stocks. Both lines represent the cumulative average abnormal return of Spanish and Catalan stocks. The time period includes all the main events of Catalan nationalism, which are marked on the graph.

3.6.2 Timeline and results

Figure 3.14 shows the timeline of the event study analyzing the November 2014 referendum effect on the stock market. We take the standard approach of event study with the stock market using 20 sessions before and 20 sessions after the event (De Jong et al., 1992; Oberndorfer et al., 2013; Mollet and Ziegler, 2014). The estimated window refers to the sessions we use as a basis for calculating the cumulative abnormal ratio of the stock market. We take 100 sessions to avoid biases or anticipation effects of the effect.[20] Finally, the post-event window concentrates on the last 31 sessions of our sample and analyses possible long-term effects.

Figure 3.14: Event study timeline

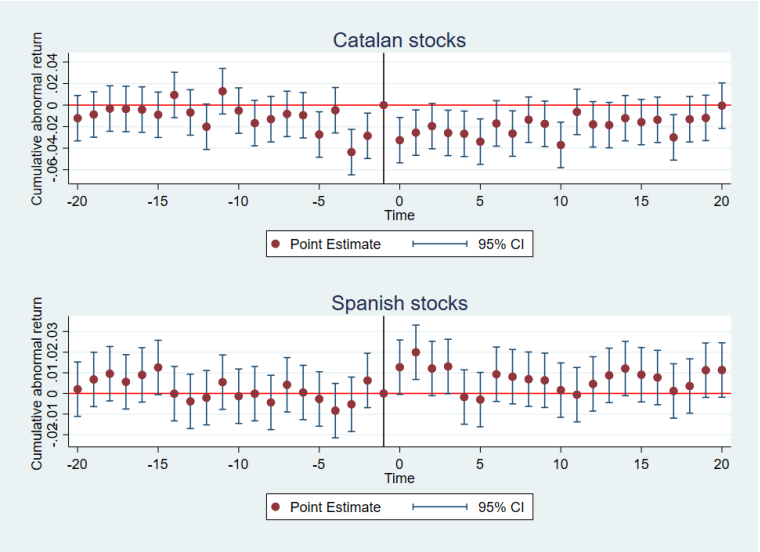


Note: This figure represents the timeline of the event study. The 0 corresponds to the holding of the referendum on 9 November 2014. The space between t_1 and 0 corresponds to the 20 stock market sessions before the referendum. The space between 0 and t_2 corresponds to the 20 sessions after the referendum. The estimation window collects the first 100 sessions and calculate the average cumulative abnormal ratio. The post-event study includes the last 31 sessions to control for possible long-term effects.

[20]The referendum proclamation occurred at the end of September 2014, so if there were an anticipation effect, we would observe it in the sessions prior to the referendum.

Figure 3.15 shows the effect of 2014 referendum on cumulative abnormal return for Catalan and Spanish stocks. Catalan stocks show a poorer performance after the November 2014 referendum. This poorer performance remains for several sessions, and the negative effect disappears from the tenth session after the referendum. It is also worth noting that in the sessions before the referendum, Catalan stocks also have poorer performance. This shows some anticipation on the part of investors. In the case of Spanish stocks, we do not observe significant results. However, it is noteworthy that the coefficients are positive after the referendum. This could indicate a substitution effect between Catalan and Spanish stocks. The results suggest that the November 2014 referendum has negatively affected the performance of Catalan stocks. In line with Galasso (2022) and Abadie and Gardeazabal (2003), we find that the stock market reacts to moments of political uncertainty, especially in sessions close to key moments.

Figure 3.15: Estimate of the effect of the 2014 referendum on Catalan and Spanish stocks.



Note: This figure shows the effect of the 2014 referendum on the stock market for Spanish and Catalan stocks. The figure shows when we take as an event window 20 sessions before and after the event. However, we have estimated other windows ranging from 30 sessions before and 20 sessions after the event. The results obtained are the same as those shown in this figure.

3.7 Conclusion

After decades since the cessation of violent regional nationalism in the Basque country or the north of Ireland, Europe is experiencing a rise of a new type of regional nationalism, as in the case of Catalonia or Scotland. This paper analyzes the economic consequences of this new nationalism

which, although peaceful, generates a great deal of political uncertainty linked to the holding of illegal referendums, a confrontation between regional and national governments or the imprisonment of the foremost nationalist leaders. We study the case of Catalonia as one of the most active regional nationalisms of the last decade. Using the synthetic control methodology proposed by Abadie and Gardeazabal (2003), we perform a multidimensional analysis estimating the effect of the 2014 referendum on GDP, FDI and exports to the other Spanish regions. The 2014 referendum and subsequent events have not affected the regional economy despite the exodus of firms and the intense conflict with the Spanish government.

This paper also analyzes the effect of regional nationalism on the stock market. Using an event study methodology, we analyze the effect of the 2014 referendum on the stock prices of Catalan and Spanish companies. Catalan companies show poorer performance in the pre-referendum and post-referendum sessions. In contrast, Spanish companies have not been affected by the 2014 referendum. These results indicate that political uncertainty linked to nationalism steered investors away from companies heavily dependent on the Catalan economy.

Contrary to previously analyzed cases such as the Basque Country or Northern Ireland, Catalan nationalism has not significantly impacted the economy. Several factors can explain the absence of results. One of the most notable factors is the absence of violence or terrorism characteristic of regional nationalism in the second half of the 20th century. Violence creates a rejection in society inside and outside the region. This causes the confluence of two factors that depress the economy: the decrease in internal demand and external demand. The presence of violence affects the decisions of individuals, reducing their consumption Smith and Keeney (2005). On the other hand, companies are reluctant to invest in regions where there is insecurity (Witte et al., 2017).

Political factors may also partially explain the absence of results. The nationalist parties have channelled the discontent of the Catalan population with the Spanish government, which has allowed the Catalan government to be governed by nationalist parties. Despite the substantial disparities, the nationalist parties consistently join together, giving the government stability. Government stability positively impacts the economy, which may offset the negative impacts of political uncertainty (Quinn and Woolley, 2001; Doucouliagos and Ulubaşoğlu, 2008).

Finally, the threat of independence may be another factor behind the absence of results. The credibility of a potential independent Catalonia is low from several sides. The Primary is the lack of legal mechanisms allowing the self-determination of a European region. For instance, Brexit is an independent country opting to leave a supranational entity. However, Catalonia is a dependent region seeking independence. That dependency raises several potential social and economic prob-

lems that are extremely complex to solve. For example, finding a solution for Catalans unwilling to integrate into the new nation is challenging. On the economic side, there may be difficulty in properly allocating public debt or using shared public assets.

3.8 Appendix

3.8.1 Robustness checks for GDP per capita

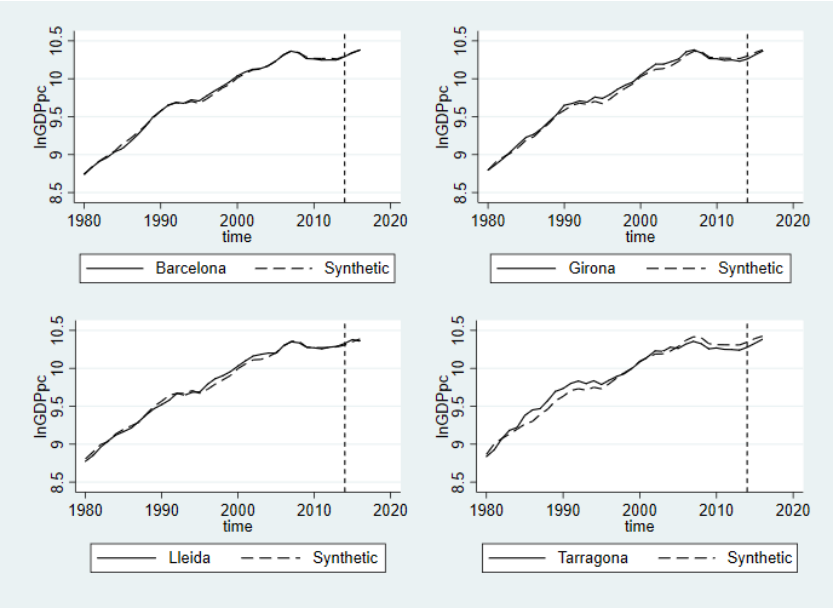
Table 3.5: GDP per capita. Provincial pre-Referendum characteristics 2013

Province	Barcelona	Synthetic	Girona	Synthetic
GDP per capita	19.1	19.4	19.6	19.4
Population density	6.4	5.9	4.5	4.5
Investment ratio *	25.0	27.1	35.9	34.1
Agriculture *	1.01	2.7	5.18	7.4
Construction *	8.0	8.6	12.0	8.6
Industry *	26.7	15.9	23.3	23.5
Services *	64.0	72.7	59.4	60.5
Illiterates *	3.6	5.6	1.9	3.9
Up to primary studies *	41.5	43.1	52.0	50.8
Up to secondary studies *	45	40.8	36.5	35.7
Tertiary education *	9.4	10.1	9.4	9.4
RMSPE		0.02		0.03

Province	Lleida	Synthetic	Tarragona	Synthetic
GDP per capita	19.2	19.2	20.5	20.5
Population density	3.4	4.1	4.5	4.5
Investment ratio *	31.2	23.8	37.0	30.9
Agriculture *	17.3	10.6	10.0	5.17
Construction *	11.1	9.6	14.5	8.3
Industry *	16.8	17.0	19.8	25.3
Services *	54.5	60.0	55.5	61.1
Illiterates *	4.4	4.4	5.1	5.1
Up to primary studies *	46.7	46.7	44.9	51.1
Up to secondary studies *	40.2	39.1	41.2	35.1
Tertiary studies *	8.5	9.6	8.7	8.7
RMSPE		0.04		0.07

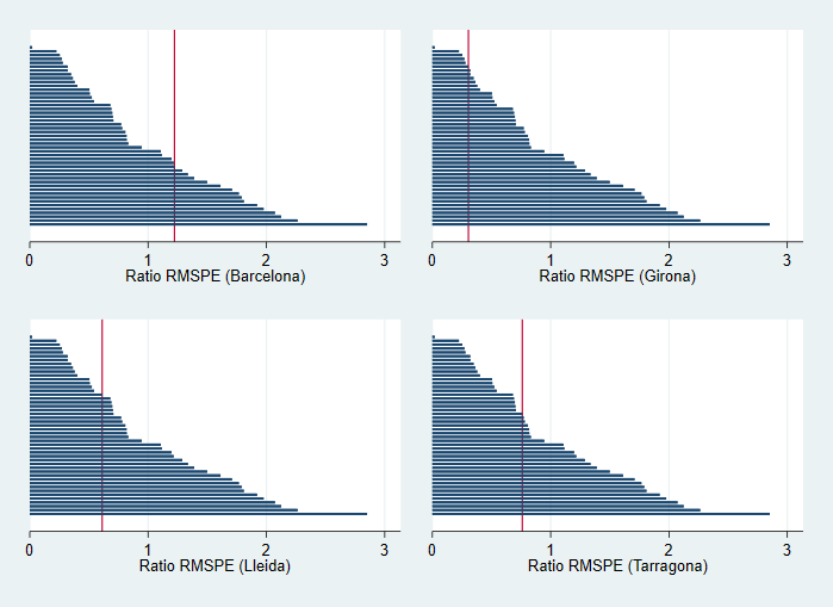
Note: GDP per capita is measured in thousands of euros. Population density shows the logarithm of the population density. * These variables are measured in percentages. RMSPE calculates the deviation of the synthetic control series from the Catalan GDP series before the 2014 referendum (see equation (3.4)). These variables have been selected because they are the main determinants of GDP per capita.

Figure 3.16: Log GDP per capita. Catalan provinces versus synthetic control. Period 1980-2016.



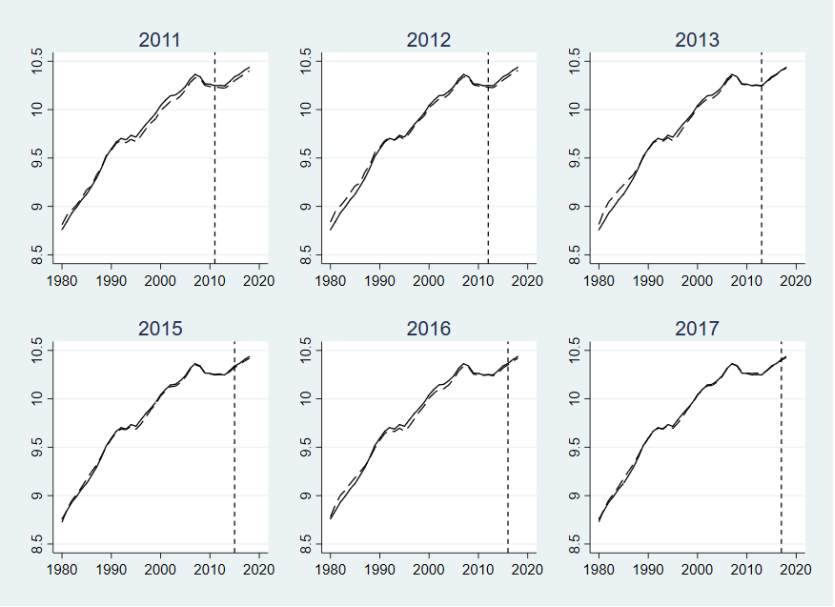
Note: The solid line shows the GDP per capita logarithm of Catalonia provinces from 1980-2016. The dashed line shows the GDP per capita logarithm in the synthetic region as the weighted average of the GDP per capita logarithm of other Spanish provinces.

Figure 3.17: Ratio of post and pre-referendum 2014 deviations. Catalan provinces and 46 provinces.



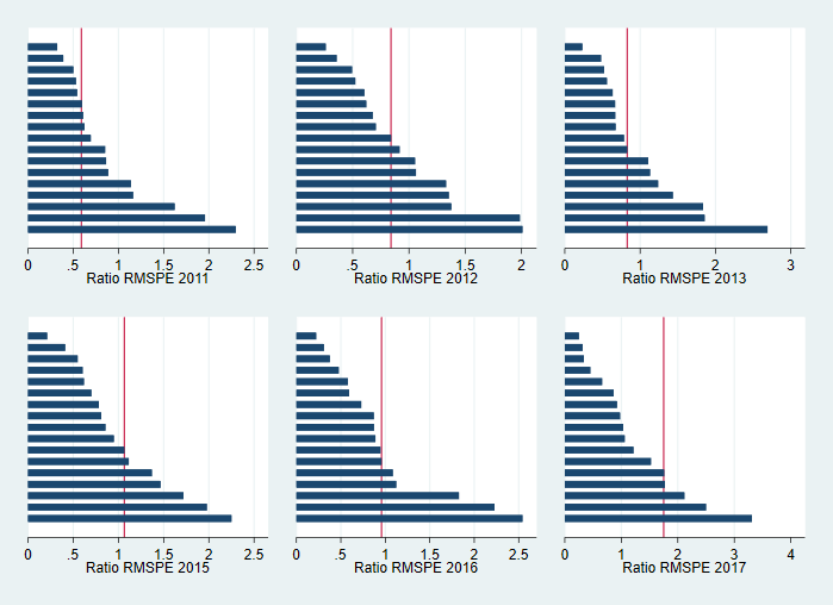
Note: The ratio shows each province's GDP per capita deviation from the synthetic control after the 2014 referendum divided by the deviation before the 2014 referendum. Equations (3.4) and (3.5) show the formula for calculating the deviation before and after the referendum, respectively.

Figure 3.18: Log GDP per capita. Catalonia versus synthetic control by year of treatment. Period 1980-2018.



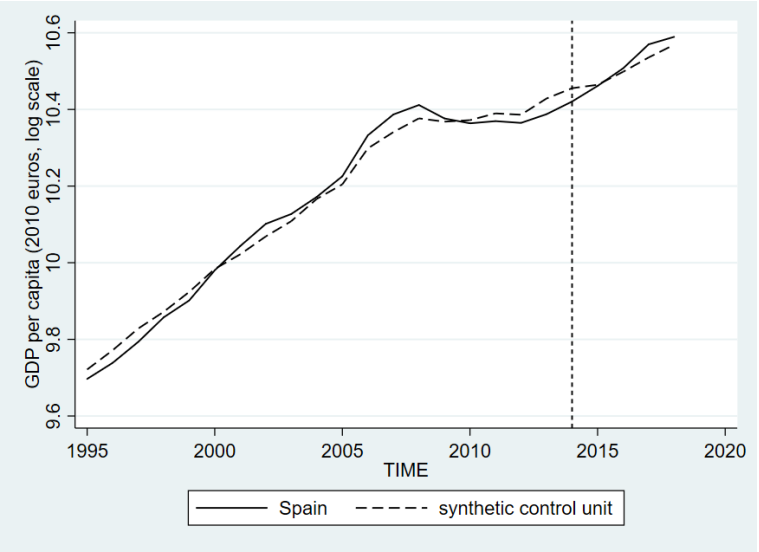
Note: The solid line shows the GDP per capita logarithm of Catalonia from 1980-2018. The dashed line shows the GDP per capita logarithm in the synthetic region as the weighted average of the GDP per capita logarithm of Madrid, Basque Country, Balearic Islands and Aragon regions.

Figure 3.19: Ratio of post and pre-treatment by year of treatment. Catalonia and 16 regions.



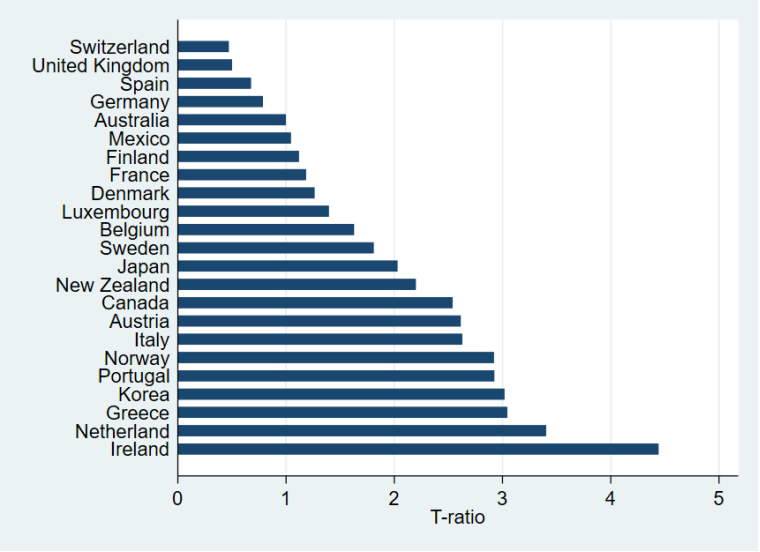
Note: The ratio shows each region's GDP per capita deviation from the synthetic control after the 2014 referendum divided by the deviation before the 2014 referendum. Equations (3.4) and (3.5) show the formula for calculating the deviation before and after the referendum, respectively.

Figure 3.20: Log GDP per capita. Spain versus synthetic control. Period 1980-2018.



Note: The solid line shows the GDP per capita logarithm of Spain from 1995-2018. The dashed line shows the GDP per capita logarithm in the synthetic region as the weighted average of OECD countries' GDP per capita logarithm.

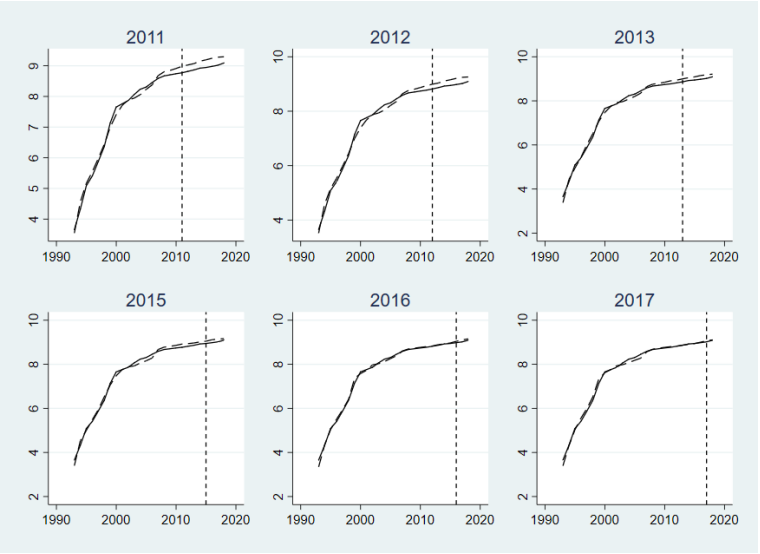
Figure 3.21: Ratio of post and pre-referendum 2014 deviations: Spain and countries of OECD.



Note: The ratio shows each region's GDP deviation from the synthetic control after the 2014 referendum divided by the deviation before the 2014 referendum. Equations (3.4) and (3.5) show the formula for calculating the deviation before and after the referendum, respectively.

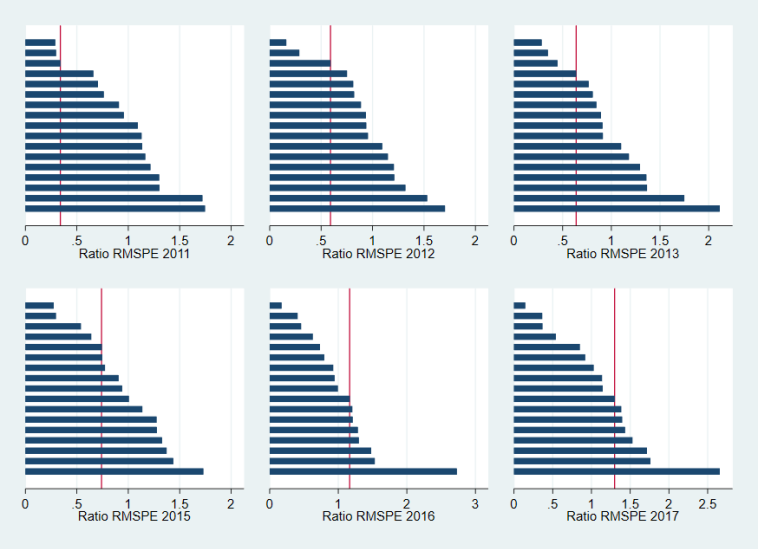
3.8.2 Robustness checks for FDI

Figure 3.22: Log of cumulative FDI per capita, Catalonia versus synthetic control by year of treatment. Period 1995-2018.



Note: The solid line shows the cumulative FDI per capita logarithm of Catalonia from 1995-2018. The dashed line shows the cumulative FDI per capita logarithm in the synthetic region as the weighted average of the cumulative FDI per capita logarithm of Madrid, Basque Country, Andalusia and Aragon regions.

Figure 3.23: Ratio of post and pre-treatment RMSPE by year of treatment: Catalonia and 16 regions.



Note: The ratio shows each region's cumulative FDI per capita deviation from the synthetic control after the 2014 referendum divided by the deviation before the 2014 referendum. Equations (3.4) and (3.5) show the formula for calculating the deviation before and after the referendum, respectively.

3.8.3 List of stocks

Catalan Stocks	
ABE Abertis Infraestructuras S.A	IDR Indra Sistemas S.A
ADX Audax Renovables S.A	MCM Miquel y Costas S.A
BKT Bankinter S.A	REE Red Electrica de España S.A
CABK CaixaBank S.A	REN Renta Corporacion S.A
COL Inmobiliaria Colonial S.A	RJF Laboratorios Reig Jofre S.A
ELE Endesa S.A	RLIA Realia S.A
ENG Enagas S.A	ROVI Laboratorios Rovi S.A
FAE Faes Farma S.A	SAB Banco Sabadell S.A
FCC Fomento de Construcciones y Contratas S.A	SLR Solaria Energia y Media Ambiente S.A
GCO Catalana Occidente S.A	

Non-Catalan Stocks	
A3M Atresmedia S.A	IBG Iberpapel S.A
ABG Abengoa S.A	MAP Mapfre S.A
ADZ Adolfo Dominguez S.A	OHL Obrascon Huarte Lain S.A
ALM Almirall S.A	PHM Pharma Mar S.A
AMP Amper S.A	PRM Prim S.A
ANA Acciona S.A	PRS Grupo Prisa S.A
BBVA Banco Bilbao Vizcaya Argentaria S.A	PSG Prosegur S.A
BDL Baron de Ley S.A	QBT Quabit S.A
BIO Biosearch Life S.A	REN Renta4 Banco S.A
BME Bolsa y Mercados Españoles	SAN Banco Santander S.A
BKIA Bankia S.A	SCYR Sacyr S.A
CBAV Clinica Baviera S.A	SGRE Siemens Gamesa S.A
CPL Cementos Portland S.A	SNC Sniace S.A
DIA Distribuidora Internacional de Alimentacion S.A	TEF Telefonica S.A
ENO Elecnor S.A	TL5 Mediaset S.A
EZE Ezentis S.A	TRE Tecnicas Reunidas S.A
GALQ General Alquiler de Maquinaria S.A	UBS Urbas Grupo Financiero S.A
GSJ Grupo Empresarial San Jose S.A	VID Vidrala S.A
IBE Iberdrola S.A	VOC Vocento S.A

Table 3.6: List of Stocks

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