Public Debt and Investment Under Political Competition: Evidence from Toxic Loans

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ABSTRACT

We examine how political considerations shape local government responses to a substantial rise in indebtedness. We use the delayed yet sharp deterioration of "toxic" loans held by French municipalities as a quasi-natural experiment to empirically investigate such phenomenon. Politically contested mayors reduce public investment significantly more in response to an increased debt burden compared to their less politically challenged counterparts. Consequently, the net increase in public debt is considerably more attenuated in politically contested municipalities. These results are consistent with a theoretical model of public investment, where electoral competition disciplines the budgetary decisions of local politicians, underscoring the political dimension of public indebtedness.

Keywords: Public debt, public investments, political competition, toxic loans.

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1 Introduction

Local governments have accumulated large amounts of debt over the past decades, which now represent around 30% of GDP, on average, for developed countries. At the same time, more than half of public investment comes from local governments.[1] The accumulation of local government debt, coupled with the sharp rise in interest rates across developed economies, raises important questions about how this indebtedness will impact their investment activities.

While an increase in the debt burden of an economic agent typically results in cuts to investments as the financial constraint becomes binding (see e.g. Gilje, 2016), surprisingly little is known about how political considerations affect this relationship in a public finance context. In contrast to our longstanding understanding that political competition affects government expenditures (Tiebout, 1956), how public indebtedness shapes policymakers' decisions remains insufficiently understood. Pinning down the central mechanism at play is crucial to both predicting local governments' response to high indebtedness depending on their political context, and assessing whether the reduction in public investment that debt may create should be primarily interpreted as the detrimental effect of a friction or as the expression of taxpayers' preferences.

Empirically estimating how increased indebtedness affects local government investments, especially how this impact varies depending on the degree of local political competition, poses significant challenges. First, the relationship between debt and investment is prone to unobserved variable bias and reverse causality. Moreover, existing evidence suggests political ideology can shape local government behavior (see for instance Beland, 2015; Pettersson-Lidbom, 2008; Folke, 2014; Ferreira and Gyourko, 2009), further complicating identification.

In this study, we overcome these challenges by exploiting a pronounced shock in indebtedness that affected a large number of French local governments and is plausibly exogenous to their level of political competition. Our analysis relies on specifications that include extensive controls for municipal characteristics and other local political factors that could influence the relationship between debt and investment. We interpret the empirical evidence through a parsimonious political agency model. Empirically, a sharp increase in local indebtedness results in significantly different magnitudes of investment reductions by local governments

[1] Source: https://stats.oecd.org/.

depending on their political context. Investment cuts are four times larger than the increase in interest expenses for politically contested governments, whereas they are of the same magnitude for governments with low political competition. In turn, the long-run net increase in debt is three quarter lower for these contested governments. We also observe no significantly heterogeneous effects on local taxes. We rationalize these findings in a model where a debt shock prompts contested incumbents to cut local investment in order to better align with the preferences of fiscally conservative local voters. Our central contribution is therefore to provide causal evidence of heterogeneous public investment responses to a public debt shock across the political competition dimension, as well as fleshing out a disciplining role of competitive elections on public investments and its associated debt when voters are fiscally conservative, as is typically the case in local elections.

Our empirical analysis exploits a large shock to local indebtedness affecting a broad set of municipalities, resulting from the ex-post outcomes of structured loans, a widespread category of loans embedding long-dated derivative instruments sold prior to the Great Financial Crisis (GFC). Our empirical setting allows us to interact this debt shock with heterogeneity in political competition across our sample to explore the role of elections in the public finance and investment nexus. The riskiest segment of structured loans was made of loans implicitly selling options on foreign-exchange rates, mostly on EUR/CHF or USD/CHF (CHF-linked loans), or on the slope of the interest-rate curve ("steepener" loans). The market conditions brought by the GFC and its aftermath led to the significant deterioration of the derivative positions of this segment of loans, which the press dubbed "toxic loans". Indeed, the Swiss Franc significantly appreciated following the GFC, and the interest rate forward curve flattened dramatically. Both these market evolutions led local governments with CHF-linked loans and steepener loans to face a surge in their interest expense, with some annual interest rates reported to be above 50%, and vastly negative mark-to-market on their loans. Overall, for the majority of toxic loan users, the episode led to a sharp rise in interest expenses, followed by a long-term increase in the level of debt as the toxic loans are restructured into vanilla loans of a larger amount to absorb the unwind costs.[2]

For identification, we use a matched triple difference design comparing cumulative investment changes between treated municipalities and a matched control group, divided into

[2]For the most affected local governments, the central government covered around half of the unwind costs ex post. Participation to this partial debt relief program was orthogonal to the political context of the local government.

high and low levels of political competition. We exploit a unique dataset that allows us to precisely identify municipalities affected by toxic loans and the extent of their exposure. We combine this data with information on local election outcomes and panel data of government financial statements covering the period 2004 to 2020, which allows us to proxy for the level of political competition in these municipalities, and control for an extensive set of municipal characteristics. We first identify from our data the local governments that held toxic loans prior to the Great Financial Crisis. We then match these municipalities with their closest neighbor based on population and debt-to population. Our main identifying assumption is a parallel trend between the treated and matched control groups in the absence of the shock. Our data confirm the absence of pre-trends and show a clear discontinuity associated with the increase in indebtedness triggered by structured loans following the Great Financial Crisis. We first show that toxic-loan exposure, both in terms of magnitude and type, is similar across treated municipalities in low- and high-political-competition groups. We then confirm that toxic loan deterioration leads to a large increase in the debt burden of the affected municipalities, with interest expense being significantly higher than in the control group for both high- and low- political competition municipalities. The magnitude of the shock is large: treated municipalities exhibit cumulative interest expenses over the 2008-2020 period that are 24% higher to the ones of the control group.

Our empirical results are as follows. A comparable increase in the debt burden leads to investment reductions of significantly different magnitudes, depending on the level of municipal political competition. Municipalities exhibiting high political competition reduce investments four times more than the ones with low political competition. This large heterogeneous effect is robust to a battery of tests regarding the proxy for the debt burden shock, the proxy for political competition, the matching methodology, and controlling for the interaction of being treated with a comprehensive set of other municipal characteristics. When examining the effect of a debt burden shock on local taxes, we observe small and statistically insignificant effects in both groups of municipalities, regardless of whether they have low or high levels of political competition. These differential responses lead to significantly lower net debt accumulation – approximately three-quarters less – for municipalities with high political competition.

We then develop a simple theoretical framework to flesh out the mechanism plausibly underlying the large and heterogeneous effect of an increase in the debt burden on local

government investments depending on how politically contested the local government is. In our setting, voters prefer to finance investment with debt rather than taxes, and trade-off the user value of public goods with the dis-utility from higher taxes or public debt. Because elected local politicians derive private benefits from local government investments, they are less fiscally conservative than voters. They prioritize using debt over taxes as they partly internalize voter preferences, but set investments to a level higher than voters' optimal one. When faced with a shock to indebtedness, and the associated reputation cost it imposes on them, incumbents reduce investments to get closer to voter preferences and improve their standing in the race. This reduction is particularly pronounced if the election is competitive, as in this case incumbents need to better align with voters to stand a chance for re-election. This framework provides a unified yet parsimonious rationalization of our empirical findings and highlights the disciplining effect of elections on local politicians' budget decisions when the incumbent is politically at risk. The model also highlights the existence of a direct political cost for the elected official in charge at the time of an exogenous debt shock, confirming the dual nature –financial and political – of such a shock.[3]

Our findings shed light on a novel political channel, which is complementary to the traditional economic channel through which higher debt increases governments' borrowing costs, and in turn depresses public investment (Laubach, 2009; Reinhart et al., 2012). This channel supports a more positive interpretation of this relationship, which results from a disciplining effect of elections in our setting. The results of our empirical setting are likely to be relevant in other contexts. First, this study should bear external validity to local governments facing large debt accumulation in countries with similar economic development and democratic institutions to France, such as the United States. To the extent that national voters are more fiscally conservative than their politicians (Peltzman, 1992; Brender and Drazen, 2008), our results should be informative for central governments as well, where it is inherently more difficult to observe cross-sectional differences in the political context and

[3]In the absence of a reputation cost from the debt shock to the incumbent in our model, there is no heterogeneity in the investment response to a debt shock along the level of political competition.

identify variations in indebtedness that are independent of government actions.[4,5]

Our results contribute to the longstanding literature on the role and effects of public debt, starting with Ricardo (1951) and Barro (1979). There is a long standing literature studying the consequences of public debt accumulation, both in developed and developing countries. While there is evidence of a positive correlation between public debt and spending cuts (Reinhart and Rogoff, 2010; Reinhart et al., 2012) in cross-country analysis, establishing causality has been more difficult, as international comparisons are plagued by problems of reverse causality and omitted variables (Panizza and Presbitero, 2014). Using quasi-experimental settings at the local level Adelino et al. (2017), Cornaggia et al. (2018), and Dagostino (2025) study the impact of relaxing municipalities' financial constraints on their bond issuance and price, government spending and local employment. Clemens and Miran (2012) and Grembi et al. (2016) estimate the size of fiscal multipliers and the effects of fiscal rules at the local level, while Huang et al. (2020) and Pinardon-Touati (2023) document the crowding-out effects of local government debt on corporate credit. Public liabilities are growing in part due to large pension liabilities, as documented by Novy-Marx and Rauh (2011), which jointly affects spending, tax, and borrowing decisions of local governments (Myers, 2020). Our setting, which uses a large and exogenous shock on local public indebtedness, allows us to disentangle the effects of debt from local economic conditions, and isolate the importance of electoral competition in the sensitivity of public investment to indebtedness. Our results thus shed light on the existence of a constraint on public investment that is not financial in nature.

Our analysis also connects with recent studies estimating the real effects of indebtedness on investment and spending for different economic agents. Agarwal et al. (2016), Di Maggio et al. (2017) and Ganong and Noel (2019) find that households who experience debt payment reductions have a lower probability of default and increase spending on durable goods. Verner and Gyongyosi (2020) exploit variation in exposure to household foreign currency debt during

[4]Peltzman (1992) documents that national voters in the U.S. are less likely to support politicians who have increased overall spending before the election. While there is evidence that targeted spending before an election can be a tool to gain votes in some contexts (see e.g. Drazen and Eslava, 2010), at the national level, Brender and Drazen (2005) show that earlier evidence of a political deficit cycle – that is, an increase in spending or deficits in election years - are driven by the first few elections in countries that have made the transition to democracy. Instead, among developed countries and established democracies, Brender and Drazen (2008) find that deficits either in the election year or over the term actually reduce an incumbent's re-election chances.

[5]At the national level, other non-mutually exclusive channels linking public debt and investment are likely at play, e.g. the ones related to monetary policy, which are outside the scope of this study.

Hungary's late-2008 currency crisis and document a rise in default and a collapse in spending. In the corporate sector, Gilje (2016) finds a reduction in investments as firms approach financial distress. We flesh out a new mechanism specific to elected bodies that creates large heterogeneity in the magnitude of this relationship for local government debt.

Our work adds to a growing body of work on the disciplining effect of electoral competition on policy choices (Besley and Case, 1995; Besley and Preston, 2007; Besley et al., 2010; Ferraz and Finan, 2011). Our contribution to this strand of literature is to characterize a new channel through which electoral competition disciplines public debt and government spending. By exploring how local government expenditures relate to local voter preferences, our work thus relates to the seminal work by Tiebout (1956), and more recent work empirically testing for such mechanism (Ferreira and Gyourko, 2009).

Last, this study also speaks to the consequences of financial innovation gone wrong, in a public finance context. When the innovation reaches sufficient scale to become systemic, it can have acute financial consequences, as documented in Mian and Sufi (2010), and lead to a broad range of real effects, including political (Gyöngyösi and Verner, 2022; Sartre and Daniele, 2022). This study looks at the consequences of a nefarious innovation on government economic policy and speaks to comparable episodes implemented at different levels of government (see e.g. Gromb and Peress, 2018).

The rest of the paper is organized as follows. Section II provides some background on the institutional setting and the toxic loan episode. Section III describes the data and the empirical strategy. Section IV presents the results. Section V provides a theoretical framework that rationalizes the empirical findings. Section VI concludes.

2 Background

This section provides details about our institutional setting. Our empirical analysis leverages a plausibly exogenous variation in the indebtedness of French local governments over the 2004-2020 period. This shock results from the combination of a large set of local governments entering into high-risk derivative transactions through structured loans, and the adverse market conditions that the Great Financial Crisis created ex post for these financial instruments.

2.1 French Municipalities' Governance, Budget and Elections

French municipalities are governed by a mayor and a municipal council that are elected together every six years. The local governments oversee a wide range of public services, including public transportation, local police, nurseries, primary schools, and road maintenance. Municipalities play a significant role in the economy, accounting for approximately 11% of total public spending in France (Broberg et al., 2022).

French municipalities are legally required to maintain a balanced operating budget, meaning they cannot finance day-to-day expenses with debt.[6] Instead, borrowing is restricted to financing capital expenditures, such as infrastructure development, school construction, public facility upgrades, and urban planning projects.

Like their counterparts in the U.S., French municipalities rely primarily on local taxes and central government transfers to finance their activities. Local taxes – representing about two-thirds of municipal revenue – consist mainly of property taxes, real estate transaction taxes, and a value-added tax on local businesses. The municipal council sets tax rates, and adjustments do not require a general vote. Government transfers are determined by objective criteria legislated from the central government. Given the legal requirement for balanced operating budgets, debt interest payments, are counted as operating expenses under public accounting rules.

Since 1983, mayoral elections are organized around candidate lists for municipalities with over 3,500 inhabitants. Our initial sample consists of all municipalities above the 3,500 population threshold for ensuring homogeneity in the electoral system.[7] A list is headed by a candidate for the mayoral position, and also includes joint candidates for the municipal council. A list is usually affiliated with a political party, or a coalition of parties. The list that obtains a majority of the vote receives automatically half the seats on the town council; the remaining seats are then distributed proportionally across all the lists (including the winning one) that received more than 5% of the votes. If no candidate receives a majority of the votes in the first round, then a second round of voting is conducted where any list with more than 10% of the votes are eligible to participate. The winner is the one that attracts

[6] In the U.S., most states also require local governments to adopt balanced budgets, but the level of enforcement and flexibility varies by state.

[7] In 2007, there was around 2,700 municipalities (out of 36,000 in total) above 3,500 inhabitants (the threshold over which electoral rules described above are the same across municipalities). These municipalities accounted for about 70% of the French population.

the larger number of votes in this runoff. The council then chooses the mayor, who is by design almost always the candidate that was leading the list that got the most votes.

2.2 Structured Loans

Structured loans, later dubbed "Toxic Loans" by the media for the high-risk ones, are a type of loans used by local governments in Europe during the 2000s, which embed sales of options with various underlying assets: interest rates, inflation, interest rate spreads, or foreign-exchange rates. The sale of options allowed local governments to borrow at a lower interest rate than with vanilla loans, as borrowers implicitly received the option premiums, as long as the options stayed out of the money.

The most widespread high-risk structured loans, which we will now refer to as toxic loans, are CHF-linked loans, and steepeners. CHF-linked loans are designed with a short exposure to CHF exchange rates: the interest rate follows a formula such as *x% + c*Max(K- Exchange Rate, 0)*. If the foreign exchange rate, typically EUR/CHF or USD/CHF, drops below the level K, the interest rate paid annually on the loan increases by *c*(Exchange Rate - K)*, where c is typically 0.5 or 1. Once in the money, an appreciation of the CHF vs the other currency of 0.01, therefore, raises the interest rate by 0.5 or 1%. Steepener loans are indexed on the slope of the interest rate curve, the most common exposure being the spread between the EUR 10-year Constant Maturity Swap rate and the EUR 2-year Constant Maturity Swap rate. The interest rate follows a formula such as *x% + L*Max(K - (CMS 10y - CMS 2y),0)*, with x being lower than the usual interest rate, L being the leverage, and K being the strike of the option on the rate spread. Such transactions create a large and long-lasting exposure to a CHF appreciation or a flattening of the interest curve, as the loan maturity can go up to 30 years.

2.3 The Impact of the Great Financial Crisis on Toxic Loans

With the Great Financial Crisis, the underlying indices for both the CHF-linked loans and steepener loans moved strongly against the loan issuers. With the Swiss Franc being a safe haven currency, the GFC led to a drop of the EUR/CHF and USD/CHF parity. To limit the appreciation of the Swiss Franc, on September 6, 2011, the Swiss National Bank (SNB) announced a floor on the EUR/CHF exchange rate of 1.20, which brought a stable

EUR/CHF exchange rate through 2014. However, at the end of 2014, foreign developments, including market participants' anticipation of a large-scale quantitative easing program in the euro area, led to a large flight to safety phenomenon into CHF-denominated securities, in turn prompting the SNB governing board to unexpectedly abandon the minimum exchange rate on January 15, 2015. This policy change led to a particularly large CHF appreciation when compared to typical short-term exchange-rate fluctuations in advanced economies (see for instance Auer et al. (2021)). In parallel, the drop in the long-term interest rate resulting from the recession expectations at the onset of the GFC led to a sharp flattening of the interest rate curve as soon as 2008. Figure 1 displays the evolution of the CHF/EUR parity and the CMS 10y - CMS 2y spread over the sample period.

INSERT FIGURE 1

The adverse market movements translated into a significant rise in interest rates on the exposed structured loans, some of them reaching annual interest rates over 50%. Relatedly, the unwind cost for exiting the derivative instrument embedded in the structured loans surged, amplified by the high duration of the loans. The amount of debt of a municipality increases as a result of the deterioration of a toxic loan when this loan is refinanced into a vanilla loan. This vanilla loan will indeed need to be larger to finance the unwind cost of the derivative component of the initial loan. Although costly to the municipalities, the unwind allows them to de-risk the position. Overall, for the majority of toxic loan users, the episode should lead to a rise in interest expenses, followed by a long-term increase in the level of debt as the toxic loans are restructured into vanilla loans of a larger amount to absorb the unwind costs. A partial debt relief program was put in place by the central government to assist local governments to unwind the derivative instruments and finance around half of the unwind cost for the most affected municipalities. This program made payments starting in 2016 and covered around 400 municipalities, including virtually all CHF-linked issuers and most of the steepener loan issuers. The cumulative transfer from the central government to local governments under this program reaches EUR 5 billion, with an even larger amount of unwind costs being borne by the affected local governments. The debt relief program was implemented without "strings attached" beyond the use of the proceeds being applied towards the unwind cost, i.e. it did not include constraints towards increased austerity or reduced investment, and eligibility was orthogonal to the political context of the

municipality.

3 Empirical Setting

3.1 Data

Our analysis draws from a number of different data sources, which we describe below. We merge these datasets using the INSEE code, a unique municipality identifier from the French statistical office.

Local Government Expenditures, Revenues, and Population. We first obtain detailed municipalities' financial statements for the period 2004 to 2020 from the French Ministry of the Interior.[8] We observe different categories of local revenue – local taxes, local debt, and transfers from the central government – and different categories of spending – local investment and local operating expenses.

Toxic Loans. We then rely on two proprietary datasets, the same as in Perignon and Vallee (2017), to identify toxic loan users, namely CHF-linked and steepener loan users. The first dataset contains details of all of the structured loans taken by municipalities between 2000 and 2009 with the bank Dexia, which has a 70% market share for such transactions in France. This dataset was leaked at the end of 2011 to the French newspaper *Liberation*. The second dataset contains detailed information on the entire debt portfolio for the 100 largest French municipalities as of the end of 2007 and stems from a survey conducted by a specialized consulting firm. Both these datasets contain information that is typically undisclosed to the public. The vast majority of these loans were issued before 2008, since a code of conduct restricting loan types was adopted by banks and local government representatives in 2009.

2008 Local Election. We also obtain the election data and incumbent outcomes for the municipal elections of 2008 used in Broberg et al. (2022).[9] We observe the vote shares, the identity of the incumbents, and whether the election has been won at the 1st round or in the runoff. We use an indicator variable that the previous election went to a runoff as our main

[8] Source: https://www.data.gouv.fr/en/datasets/comptes-individuels-des-communes-fichier-global-a-compter-de-2000/

[9] We thank the authors for sharing their data with us.

proxy for political competition being high in a given municipality. We test for robustness of our results using alternative proxies for political competition.

Local Politicians. We retrieve information on local politicians from the *Registre National des Elus* collected by the French Ministry of the Interior. These data contain the age, mandate length, political orientation, prior occupation, and office (e.g., mayor, city council member) of all local politicians. We construct the following political controls: council size, the logarithm of the number of members who serve on the municipal council, a dummy for old mayor defined as being above 60 years old, a dummy for left-wing mayor defined as mayors labeled as either "left" or "far left" when registering their list, and a dummy for high-skill mayor defined as mayor who was either a manager, engineer, physician, lawyer, or university professor.

Other Control variables from French Statistical Office. Finally, we build a series of control variables for economic and population characteristics of municipalities from INSEE, the French Statistical Institute. Economic controls include the local unemployment rate, value-added and wages, expressed in thousand euros per worker, firm debt and private investment, computed as the value-weighted ratio of debt over assets and value-weighted ratio of capital expenditures over firm capital computed across all firms located in a given municipality. These variables are computed using administrative micro data obtained from tax files covering the universe of private firms located in each municipality. Population characteristics include the share of the working-age population (ages 25–54), the share of young individuals (ages 15–24), and the distribution of workers across major sectors: retail/services/transportation, agriculture, industry, construction, and public sector/healthcare.

3.2 Empirical Strategy

Our objective is to estimate the heterogeneous effects of indebtedness shocks on municipal budget decisions, depending on the degree of local political competition. Our empirical strategy builds on a matched sample of municipalities, where each treated municipality, defined as those having CHF-linked or steepener loans on their balance sheet as of 2007, is matched to a control municipality within the same group of political competition intensity.

We implement a triple-difference methodology by comparing the difference in responses to toxic loan deterioration between treated and control municipalities within both low- and high-competition groups, and testing for a statistically significant difference in treatment effects across these groups.

Matched sample construction. Recent econometric research underscores that standard difference-in-differences estimators can be biased when the treatment and control groups differ substantially on key covariates (e.g., Abadie, 2005; Roth et al., 2023). In our context, treated municipalities (holding toxic loans in 2007) are significantly larger and have higher debt per capita than untreated ones. Matching helps ensure that treated and control municipalities are more comparable on these characteristics, mitigating concerns about confounding factors. A similar approach has been used in several recent studies to estimate treatment effects when treated and control units differ significantly on a small set of characteristics (see, for example Balsmeier et al., 2017; Jaravel et al., 2018; Azoulay et al., 2019; Fenizia and Saggio, 2024).

Our initial sample consists of all municipalities with at least 3,500 inhabitants, which share the same electoral rules. Among these, 485 municipalities hold toxic loans as of 2007 (the "treated" group). Our goal is to pair each of these treated municipalities with one "control" municipality not holding toxic loans in 2007. To do so, we implement nearest-neighbor propensity score matching separately for low-competition and high-competition municipalities, where local political competition is defined by whether the 2008 municipal election went to a runoff. Within each group, we estimate a logit model regressing a toxic-loan indicator on log population and total debt per capita in 2007. For each treated municipality in a given group, we select as the control the municipality with the closest estimated propensity score. This procedure yields 970 municipalities: 485 treated and 485 controls. Of these, 576 (288 treated and 288 control) belong to the low-competition group, and 394 (197 treated and 197 control) to the high-competition group. Overall, the matched sample covers around 56% of the population living in municipalities above the 3,500-inhabitant threshold (and 38% of the total French population). We confirm below that the matched sample achieves balance not only in debt levels and population but also on a variety of other municipal characteristics and mayoral attributes.

Summary statistics and balance checks. Table 1 presents summary statistics for our matched sample, covering treatment variables (Panel A), cumulative budget outcomes per capita—our main dependent variables—(Panel B), and ex-ante municipal characteristics (Panel C).

INSERT TABLE 1

Panel A shows that 44% of treated municipalities held CHF-linked debt, and 80% had steepener loans. On average, toxic debt accounted for approximately $(11.3\% + 5.7\%)/2 = 34\%$ of total municipal debt in 2007. Panel B reports cumulative budget outcomes per capita. Over the sample period, cumulative municipal investments averaged 6,311 euros per capita, amounting to an aggregate 148 billion euros across all municipalities. Local debt remained relatively stable on average, increasing by only 23 euros per capita, though this masks substantial heterogeneity across municipalities. Panel C presents key municipal characteristics, measured in 2007 for economic and demographic variables and in the 2008 local election for political characteristics. The average municipality in our sample had 24,000 inhabitants, with local debt per capita at 1,278 euros, local taxes per capita at 606 euros, and central government transfers at 273 euros per capita. In terms of spending, municipal investments averaged 621 euros per capita, while operating expenses stood at approximately 1,200 euros per capita. 45% of mayors were over 60 years old, 8% were female, 40% were left-wing, and 37% had previously held a high-skill occupation. Finally, 59% of local elections in 2008 were decided in the first round, in which case we classify the municipality as having low political competition.

Figure 2 provides a geographic overview of both treated and matched control municipalities across France. This spatial distribution of toxic-debt users and their controls mitigate concerns that unobserved regional shocks might bias our results.

INSERT FIGURE 2

To assess whether treated and control municipalities differ systematically, we run univariate regressions of 2007 (or 2008 for political variables) municipal characteristics on a treatment dummy equal to one for municipalities holding CHF or steepener loans in 2007. Figure 3 displays the results separately for the entire universe of municipalities above 3,500 inhabitants (Panel A) and for the matched sample (Panel B). In the unmatched comparison

(Panel A), treated municipalities are significantly larger and more indebted, underscoring the importance of matching. By contrast, once matched (Panel B), treated and control municipalities are balanced not only on our key matching covariates (population size and debt per capita) but also on a broad set of other municipal attributes—including taxes, investments, expenses, and political characteristics such as mayors' age, gender, orientation, and skill level. This confirms that our matching procedure successfully addresses pre-existing differences between treated and control municipalities.

INSERT FIGURE 3

Baseline regression specification. To study the long-run impact of toxic loan deterioration on municipal outcomes depending on the degree of local political competition, we implement cross-sectional regressions at the municipal level in which toxic debt is the explanatory variable of interest, splitting our sample between municipalities with low political competition and the ones with high competition:

$$Y_{m,\text{2008-2020}} = \beta_1 \, \text{TOXIC}_{m,2007} \; + \; \delta_1 \, X_{\text{BUD}} + \; \delta_2 \, X_{\text{ECO}} + \; \delta_3 \, X_{\text{POP}} + \; \delta_4 \, X_{\text{POL}} + \; \gamma_{\text{AREA}} + \; \varepsilon_m,$$
$$m \in \{\text{LowComp}, \text{HighComp}\}, \tag{3.1}$$

where $Y_{m,2008-2020}$ is an outcome variable (such as cumulative municipal investments per capita) over the period 2008-2020 for municipality m. $\text{TOXIC}_{m,2007} = 1$ if municipality m holds toxic loans in 2007. $X_{\text{BUD}}, X_{\text{ECO}}, X_{\text{POP}}$, and X_{POL} include municipal budgetary, economic, demographic, and political controls measured at baseline year (2007). X_{BUD} includes the logarithm of municipal population, the amount of debt, municipal investments, operating expenses, local taxes, and central government transfers, all scaled by population; X_{ECO} includes the unemployment rate, value added per worker, wages, firm debt, and private investment aggregated across all firms located in a given municipality; X_{POP} includes the share of working age population, the share of the population with age between 25 and 54 years old, the share of workers in retail/services/transportation, in agriculture, in industry, in construction, in public sector/healthcare; X_{POL} includes council size, and dummies for old Mayor, Female Mayor, Left-wing Mayor, High-skill Mayor. γ_{AREA} are *département* fixed effects, which is the geographic division appearing in Figure 2.[10] We cluster standard errors

[10]There are ninety-six *départements* in metropolitan France, each with an average population of around 600,000 inhabitants.

at the *département* level.[11]

We then test for the statistical significance of the difference between the two coefficients of interest, β_1^{LowComp} and $\beta_1^{\text{HighComp}}$, by estimating an augmented version of Equation (3.1) in which the treatment dummy, control variables, and *d'epartement* fixed effects are interacted with the proxy for high political competition.

Matched event-study design. In order to assess the validity of the parallel trends assumption in our setting, we also estimate a matched event-study specification of the following standard form:

$$Y_{m,t} \;=\; \sum_{\substack{t=2004 \\ t\neq 2007}}^{2020} \beta_t \,\text{TOXIC}_{m,2007} \;+\; \delta_t + \alpha_m + \varepsilon_{m,t}, \quad m \in \{\text{LowComp}, \text{HighComp}\}, \tag{3.2}$$

where $Y_{m,t}$ is the outcome variable of interest, such as cumulative municipal investments of municipality m in year t, with t ranging from 2004 to 2020, δ_t are year fixed effects, α_m are municipality fixed effects, and we cluster errors by département (and by year). We omit 2007 as the reference year and estimate β_t separately for low- and high-competition municipalities. If trends were parallel prior to 2008, we expect no significant differences in the β_t estimates for $t < 2008$.

Identifying assumptions. Our design does not require random assignment of treatment, namely the debt burden shock resulting from toxic-loan deterioration, relative to municipalities level of political competition, or identical pre-treatment characteristics across municipalities. Rather, the key assumption for measuring our main object of interest, $(\beta_1^{\text{HighComp}} - \beta_1^{\text{LowComp}})$ from Equation (3.1), is that in the absence of toxic-loan deterioration, the difference in outcomes between high- and low-competition municipalities would have evolved similarly for both treated and control groups.[12] Although we cannot directly test this assumption, in our empirical setting we can examine pre-trends in the years prior to 2008, when toxic loans (both steepener and CHF-linked) began to deteriorate (see Figure 1).

[11] Our treatment is measured at the municipality level, but we cluster standard errors at the *département* level to account for potential correlations in the error term for municipalities located in the same area.

[12] Although a triple-difference estimator does not strictly require two parallel-trend assumptions to hold, as discussed in Olden and Møen (2022), we nonetheless verify the absence of pre-trends within each subgroup (low and high competition), which *a fortiori* implies parallel trends in the difference between them.

Second, while the validity of our design does not require that treated and control municipalities share similar characteristics, higher similarity makes the parallel-trends assumption more plausible. Our matching procedure ensures that treated and control municipalities exhibit comparable budgetary, economic, demographic, and political characteristics within both low- and high-competition groups. Furthermore, to mitigate concerns of selection into toxic loans based on unobserved factors, we show that our results are robust when we narrow the control group to municipalities with milder forms of toxic loans, which experienced much less pronounced deterioration than CHF-linked or steepener loans.

Finally, for our heterogeneity analysis, it is important that differences between low- and high-competition municipalities beyond political competition do not confound the observed treatment effects. Figure A.1 in the Online Appendix shows that low- and high-competition municipalities are widely dispersed geographically, making large-scale local shocks an unlikely driver of subgroup differences. Online Appendix Figure A.2 further demonstrates that these two competition groups are broadly similar in their observable characteristics, apart from a few variables (7 out of 24) that differ significantly at the 5% level. Notably, politically competitive municipalities tend to be larger, yet do not appear less financially constrained. We include these remaining variables as controls, interacted with the high competition dummy, to help isolate the role of political competition from other potential confounding factors.

3.3 Shock Comparability Across Competition Groups

Our goal is to isolate how political competition shapes municipal responses to a local indebtedness shock. In the next section, we will show that treated municipalities in high-competition settings reduce investments more sharply in response to toxic-loan deterioration, which we will interpret through a model of strategic political behavior. However, this interpretation hinges on establishing that the shock itself is comparable across municipalities, regardless of their level of political competition.

Exposure to toxic debt. We first show that toxic-loan exposure is similar for treated municipalities in both low- and high-political competition groups. Specifically, we estimate Equation (3.1) with the share of steepener and CHF-linked debt as the dependent variables, separately for municipalities in low and high political competition groups. Table 2 reports the results. Columns (1) and (2) indicate that, relative to their matched controls, treated

municipalities in both groups hold similar quantities of steepener debt (Panel A) and CHF-linked debt (Panel B) at the beginning of the sample period. Column (3) confirms that these two groups do not differ significantly in their degree of toxic-loan exposure, reinforcing the case that the debt burden shock is comparable across political competition contexts.

INSERT TABLE 2

Impact on interest expenses. Next, we examine whether toxic-loan deterioration translates into comparable increases in interest expenses across both groups of political competition. Table 3 reports cross-sectional regressions, following Equation (3.1), in which the dependent variable is cumulative interest payments per capita over 2008–2020. Consistent with a substantial shock, in Panel A, we find that municipalities holding toxic loans incurred approximately 0.13/0.54=24% higher interest expenses than those without such loans, regardless of political competition status (columns 1–2). Column (3) shows no statistically significant difference in this effect between low- and high-competition municipalities, further confirming that the two groups do not differ significantly in their exposure to toxic loan deterioration.

INSERT TABLE 3

A concern might be that high-competition municipalities, if they strategically reduce investment to limit debt accumulation, should experience a smaller increase in cumulative interest payments. While this is theoretically true, the differential strategic response across low- and high- political competition municipalities has only a modest effect on cumulative interest payments, as the impact on debt accumulation materializes only in the latter part of the sample period.[13] To address this issue directly, we run the same regressions while including cumulative new debt per capita over the sample period 2008–2020 as an additional control and present the results in Panel B. As expected, the coefficient on cumulative new debt is positive and statistically significant. More importantly, consistent with the point above that lower debt accumulation affects the differential response, we find that controlling for cumulative new debt slightly increases the treatment effect of toxic debt on the

[13]See Online Appendix Table A.2 for a sample spit into two sub-periods of the effects of toxic loan deterioration on the main outcome variables, including interest payments in Panel A, and debt accumulation in Panel D.

high-political-competition group relative to the low-political-competition group. However, the effect remains modest, and the difference between the groups is small and statistically insignificant.

Finally, Figure 4 displays event-study estimates, separately for municipalities with low and high competition. Reassuringly, both panels show parallel trends in interest expenses prior to 2008, implying that treated and control groups evolved similarly before the toxic loans deteriorated. After 2008, interest payments for treated municipalities increase steadily and to a similar extent in both competition groups. Hence, the burden of toxic loans rises in a comparable fashion, further validating our claim that the shock is orthogonal to local political competition.

INSERT FIGURE 4

Overall, these findings confirm that toxic-loan deterioration imposes a similarly large, exogenous shock on both low- and high- political competition municipalities, allowing us to interpret the subsequent differences in public investments we document in the next section as reflecting strategic political considerations rather than variation in the shock's intensity.

4 Effects on Local Government Budget Decisions

4.1 Local Investment

The previous section demonstrated that toxic loan deterioration was acute and of similar severity across low- and high- political competition municipalities. The objective of this section is to provide evidence that the level of local political competition affects mayors' decision to cut investment when facing a debt burden shock.

Baseline results. We first implement the long-run cross-sectional regression in Equation (3.1), using cumulative investment per capita from 2008 to 2020 as the dependent variable. The results, shown in Panel A of Table 4, indicate that while toxic loan deterioration leads to a similar increase in interest payments across municipalities with low and high political competition, the impact on investment differs significantly. For low-political-competition municipalities (column 1), the reduction in investment is small and statistically insignificant. In contrast, for high-political-competition municipalities (column 2), the decline is both large

and statistically significant. The difference in coefficients between columns 1 and 2 is both economically and statistically meaningful.

INSERT TABLE 4

The additional decline in cumulative investment due to toxic loan deterioration for high-political-competition municipalities amounts to $(0.586/6.311) = 9\%$ of the sample average. In Panel B, we further confirm these results in a 2-SLS specification where we instrument cumulative interest per capita with the indicator for having toxic debt as of 2007. The coefficient in column 3 underscores the particularly strong responsiveness of investment cuts to rising debt burdens in municipalities with high political competition.

Pre-trends. A potential concern is that the observed heterogeneity in investment reductions may stem from pre-existing trends rather than the impact of toxic debt. To address this, we present event-study estimates of Equation (3.2), where the dependent variable is cumulative municipal investment from 2004 to year t, scaled by the 2007 municipal population. Figure 5 presents results separately for low- and high- political competition municipalities. Reassuringly, treated and control municipalities exhibit parallel investment trends before 2008 in both low- and high- political competition groups, indicating that treated and control municipalities followed similar trajectories before toxic loans deteriorated. After 2008, investment declines slightly for low-political competition municipalities but drops significantly for high-political competition ones. By 2020, the cumulative investment reductions are consistent with the cross-sectional regression findings.

INSERT FIGURE 5

Robustness. We then conduct a battery of robustness tests of our main finding using alternative measures of municipal spending, of treatment exposure, of proxies for political competition, and alternative matching methodologies. We present the results in Table 5.

INSERT TABLE 5

In column 1, we use the sum of cumulative investments and expenses over the period 2008-2020, scaled by municipal population in 2007 as an alternative dependent variable representing total municipality spending. The difference between the groups increases relative

to our baseline specification of Table 4, suggesting that toxic debt deterioration also leads to a more pronounced response in terms of operating expenses for high political competition municipalities.

In columns 2 to 5, we use alternative treatment variables. We replace the dummy for toxic debt with the amount of toxic debt (in thousand euros) scaled by municipal population in 2007 in column 2, by the share of toxic debt over total municipal debt in column 3, by a dummy for CHF-linked debt in column 4, and by a dummy for steepener debt only in column 5. The difference in the treatment effect across low- and high- political competition municipalities remains statistically significant across all specifications.

In columns 6 and 7, we use alternative measures of political competition. In column 6, we split the sample of municipalities based on the vote margin between the winner and the runner-up in the 2008 local elections (above versus below the median vote margin). In column 7, we split the sample of municipalities based on whether the incumbent mayor (rather than any candidate) won in the first round of the municipal elections in 2008, as a proxy for a particularly low level of political competition. The results using these alternative proxies are consistent in both direction and magnitude.

In columns 8 and 9, we test the specification on alternative samples. In column 8, we use the full sample of municipalities with more than 3,500 inhabitants in 2007. In column 9, we form a matched sample based of control municipalities with milder types of structured loans. The difference remains of similar magnitude and statistically significant, alleviating concerns that selection effects into toxic loans based on unobservable characteristics could drive our results.

Although our regressions already control for a broad set of municipal characteristics, one concern is that differences in treatment effects might reflect heterogeneous response to the debt shock along other municipal characteristics rather than political competition. To ensure that the larger reduction in investments we observe is indeed driven by political competition, we augment our specification by interacting municipal characteristics with the treatment dummy. Formally, we run the following cross-sectional specification:

$$Y_{m,\text{2008-2020}} = \beta_1 \, \text{TOXIC}_{m,2007} \; + \; \beta_2 \, \text{TOXIC}_{m,2007} \; \times \; I_m^{\text{HighComp}} + \sum_{i \in \{\text{BUD, ECO, POP, POL}\}} \delta_i \, X_i$$
$$+ \sum_{i \in \{\text{BUD, ECO, POP, POL}\}} \gamma_i \, X_i \times \text{TOXIC}_{m,2007} + \gamma_{\text{AREA}} + \; \varepsilon_m, \tag{4.1}$$

where $Y_{m,2008-2020}$ is cumulative municipal investments per capita over the sample period 2008-2020 for municipality m. $\text{TOXIC}_{m,2007} = 1$ if municipality m holds toxic loans in 2007, and $I_m^{\text{HighComp}} = 1$ if the 2008 local election in m went to a runoff. $X_{\text{BUD}}, X_{\text{ECO}}, X_{\text{POP}}$, and X_{POL} include municipal budgetary, economic, population, and political controls measured at baseline (2007), which are further interacted with the treatment dummy.[14] As previously, we cluster standard errors at the *département* level.

We present the results in Table 6. Column 1 reports the baseline coefficient, which corresponds to column 3 of Panel A in Table 4. In column 2, we include the interaction between the toxic debt dummy and controls for municipal size and budget characteristics. These controls include the logarithm of municipal population, as well as municipal debt, investments, operating expenses, local taxes, and central government transfers, all scaled by the municipal population in 2007. In column 3, we include the interaction of the toxic debt dummy with controls for the economic characteristics of municipalities. These controls consist of the unemployment rate, value added per worker, wages, firm debt, and private investment. Column 4 incorporates the interaction of the toxic debt dummy with controls for population characteristics of municipalities. This includes the share of the population aged 15 to 24, the share of workers employed in agriculture, industry, construction, retail/services/transportation, and the public sector, as well as their interaction with the share of toxic debt. In column 5, we introduce the interaction of the toxic debt dummy with controls for political characteristics of municipalities. These controls include the logarithm of the number of council members, dummies for older mayors, the mayor's gender, political ideology, and educational attainment (high-skill mayors). Finally, column 6 includes the interaction of the toxic debt dummy with all the municipal characteristics described above.

INSERT TABLE 6

[14] In Equation (4.1), the municipal controls and the *département* fixed effects are also interacted with the dummy for high-competition municipalities, as we do in Equation (3.1) when testing for the statistical significance of the difference between the treatment effect in the high and low competition groups.

The heterogeneity along political competition we previously stress is robust to the inclusion of the interaction of any of these characteristics with our treatment variable. When introducing the interacted characteristics, the coefficient on the interaction between the treatment for toxic debt and the proxy for political competition remains significantly negative and exhibits a stable magnitude, strengthening the findings of Table 4, and mitigating concerns over other characteristics, e.g. different economic conditions or governance contexts, driving the heterogenous effects we document.

4.2 Local Taxes

We also analyze the impact of toxic debt deterioration on local taxes, which municipalities largely control, as described in Section 2, and which serve as their primary revenue source. One possible response to an increased debt burden would be for municipalities to offset the additional expense by raising tax revenues, rather than cutting municipal investments.

To test whether municipalities respond by adjusting taxes, we use the cumulative amount of local taxes per inhabitant over the period 2008 to 2020 as the dependent variable in Equation (3.1). Regression coefficients are reported in Table 7. Our findings indicate no significant impact of toxic debt deterioration on local taxes, suggesting that elected officials are reluctant to impose tax hikes when facing an increase in the debt burden. If anything, we observe a modest reduction in local taxes following toxic debt deterioration in treated municipalities with high political competition relative to the ones with low political competition, though this difference is not statistically significant. This pattern is consistent with prior work suggesting that heightened electoral pressure constrains politicians' fiscal choices, making tax hikes politically costly (e.g., Besley et al., 2010).

INSERT TABLE 7

4.3 Debt Accumulation

To conclude our empirical analysis, we examine the impact of toxic loan deterioration on long-term total debt accumulation. Given that municipalities respond endogenously to this shock in a manner that varies with the degree of political competition, we expect net debt accumulation to differ accordingly. Specifically, we anticipate that the more substantial

decline in municipal investment observed in areas with high political competition will result in a lower increase in total debt over the sample period.

To test this hypothesis, we estimate our baseline specification from Equation (3.1), using the change in total debt per inhabitant over the period 2008–2020 as the dependent variable. We conduct separate analyses for municipalities with low and high political competition, with the results reported in Panel A of Table 8. Consistent with the observed sharper reduction in investment in politically competitive municipalities, we find that these municipalities experience significantly lower net debt accumulation over the period. The absolute magnitude of this difference is comparable to the observed decline in investment. Overall, the pronounced endogenous response of mayors facing high political competition translates into an increase in debt that is three-quarters lower in these municipalities.[15]

In Panel B, we confirm our findings by analyzing cumulative new debt over the sample period, excluding increases in debt resulting from renegotiation or restructuring of toxic loans. While we find no significant effect in municipalities with low political competition, those with high political competition exhibit a statistically significant absolute decline in new loans. Our results highlight the endogenous relationship between political competition, local government spending, and public debt.

INSERT TABLE 8

5 Theoretical Framework

To help interpret our empirical results and pin-down the channel through which – and the context in which – shocks to public indebtedness affect politician budget decisions, we propose a model of public investment under electoral competition that generates the key empirical facts previously documented. For simplicity, we rely on a static model where politicians first announce their policies and can commit to them, and then the election occurs. While this model does not capture the dynamic nature of our data, it provides a

[15] In Online Appendix Table A.1, Table 1, we show that the debt relief program introduced by the central government at the end of 2015 – intended to absorb part of the losses from toxic loan deterioration – was taken up at similar rates by treated municipalities, regardless of political competition. In Panel B, we confirm that toxic loan deterioration led to a larger increase in debt accumulation, net of the losses absorbed by the relief program, in municipalities with low political competition compared to those with high political competition.

unified framework to interpret the cumulative effects of toxic shocks on local investment presented above, and allows comparative statics in the cross section of political competition.

In the model, two candidates running for local elections announce and commit to a level of local public investment and whether to finance it through tax or debt. Because elected politicians derive private benefits from public investment, their preferred level of investment is higher than the one of voters, who trade off the user value of local public goods with their dis-utility of higher taxes or public debt. Voters are therefore structurally more fiscally conservative than politicians, consistent with empirical evidence (Peltzman, 1992; Brender, 2003; Brender and Drazen, 2008; Arvate et al., 2009). This assumption is also consistent with survey evidence during the French 2020 municipal elections, presented in Table A.3 in the Online Appendix, where a majority of voters agreed with the statements that "Financial and debt management", and "local taxes" are crucial elements in their vote.

We model the shock resulting from toxic loans as both a sudden increase in local public indebtedness and a decrease in the perceived quality of the incumbent mayor prior to the upcoming campaign. We view this specification as externally valid to other exogenous increases in indebtedness, consistent with voters struggling to distinguish skill from luck. This dual nature of the shock generates the two main empirical regularities we observe in the data: a general reduction in investment, and a heterogeneous effect according to how contested the next election is.[16] Electoral competition therefore acts as a disciplinary device on candidates: they internalize the fact that they will lose the election if they choose their own preferred level of local investments. As a result, following an identical toxic debt shock, local investment is significantly lower – and closer to voters' preferences – in politically contested municipalities, defined as those in which the incumbent mayor has only a small electoral advantage.

5.1 Setup

Formally, we consider a local election (e.g. a mayoral election) with two candidates in a given location: the incumbent and their main challenger (denoted respectively M and C below).

[16] We do not take a stand on the exact channel through which a toxic debt shock is associated with a decrease in the reputation of the incumbent mayor. For instance, there is a staining effect for being in charge when an exogenous negative shock is realized, as documented for instance in Bagues and Esteve-Volart (2016); Cunha et al. (2022). In our empirical setting, only a small fraction of the mayors that put in place the toxic loans are still in office when the shock is realized.

The two candidates occupy fixed positions in the ideology profile: $X_M = 1$ and $X_C = -1$.[17] Each candidate j ($j = M$ or $j = C$) has a personal quality, θ_j, that captures a combination of their reputation, skills, and political ability.

Voters and electoral competition. In each location, there is a continuum of voters that care about the ideology, the quality, and the budget choices of the candidates M and C. Specifically, voter i - with personal ideology X_i - gets the following utility from voting for candidate j, who has announced (s)he will implement the level of local public investment I_j over the next mandate, and finance it with new debt D_j and taxes T_j:

$$U_{i,j} = -|X_i - X_j| + \theta_j + \lambda.I_j - (D_O + D_j + \mu.T_j)^\gamma \tag{5.1}$$

under the budget constraint:

$$I_j = T_j + D_j$$

where D_O denotes the initial stock of debt, $\lambda > 0$ is a parameter capturing the value of local investment for voters, $\mu > 1$ is a parameter capturing voters' preference to finance investment with debt rather than taxes,[18] and $\gamma > 1$ models an increasing marginal private cost for contributing to the financing of local investment.[19,20]

The ideology of voters – observed by parties – is assumed to be uniformly distributed around the ideology of the median voter m: $X_i \sim \mathcal{U}[-1 + X_m, 1 + X_m]$. It follows that the mayor M wins the election if the median voter gets a higher utility when voting for M than for C, that is $U_{m,M} > U_{m,C}$.

Candidates. Both candidates, M and C, derive a fixed private benefit $\underline{\beta} \geq 0$ for being elected and a variable private benefit $\beta > 0$ proportional to the level of investment they implement when elected,[21] which add up to the utility they get as a voter as per Equation

[17] This ideology should be interpreted as orthogonal to budget choices.

[18] Voters might be impatient or present-biased, or prefer debt over taxes because they can avoid repaying the debt when moving to other municipalities.

[19] Such convex cost naturally arises in case of private consumption commitment, for instance.

[20] In what follows, we assume D_O is not too large to ensure interior equilibrium levels of local investment. This boils down to assuming formally that $D_O < \left(\frac{\lambda}{\gamma}\right)^{\frac{1}{\gamma-1}}$.

[21] This is consistent with prior empirical work documenting large private returns to holding public office in both developing and developed countries (see e.g. Fisman et al., 2014; Cingano and Pinotti, 2013), and showing that higher investment levels increase rent-seeking opportunities to politicians (Keefer and Knack, 2007; Lehne et al., 2018; Bandiera et al., 2009).

(5.1). The utility of being elected for the candidate j can therefore be written as:

$$U_j^{\text{Elected}} = \underline{\beta} + \beta.I + U_{i=j,j} \tag{5.2}$$

If candidate j loses the election, their utility simply equals $U_{i=j,-j}$.

Toxic Debt Shock. We model structured debt gone wrong, i.e. becoming toxic as described in section 2, as both an increase in local indebtedness (by D_{Tox}), and a decrease in the perceived quality of the incumbent mayor (by θ_{Tox}), consistent with the "staining effect" of negative shocks on people in charge at the time of their occurrence. Formally, if a toxic debt shock occurs, voter i gets the following utility when voting for the mayor:

$$U_{i,M}^{\text{Tox}} = -|X_i - X_M| + \theta_M - \theta_{\text{Tox}} + \lambda.I_M - (D_O + D_{\text{Tox}} + D_M + \mu.T_M)^\gamma \tag{5.3}$$

whereas (s)he gets the following utility when voting instead for the challenger:

$$U_{i,C}^{\text{Tox}} = -|X_i - X_C| + \theta_C + \lambda.I_C - (D_O + D_{\text{Tox}} + D_C + \mu.T_C)^\gamma \tag{5.4}$$

Equilibrium. We solve for a Nash equilibrium, which consists of choices of investment I, new debt D, and taxes T for both the Mayor M and Challenger C. We assume that the ideology of the median voter and the quality θ_M and θ_C of both candidates are public knowledge, as well as the occurrence of a toxic debt shock, if any. The timing of the game is then as follows: the Mayor M and Challenger C announce and commit simultaneously to their level of investment I, new debt D, and taxes T; Voters observe the policy choices of both candidates, vote, and one candidate is elected. The formal proof of the Proposition presented below is provided in Online Appendix B.

5.2 Effects of the Toxic Loan Shock on Local Public Investment

The first intuition of our framework is that voters' preferences will push candidates to campaign for financing public investment with debt rather than taxes. To see this formally, let us solve for the preferred policy levels, I^V, D^V, and T^V for voters, which maximizes expression (5.1). Given that taxes are perceived as more costly than debt ($\mu > 1$), voters have a preference for debt-financed investment, that is $T^V = 0$ and $D^V = I^V$. It follows that I^V

equals $\left(\frac{\lambda}{\gamma}\right)^{\frac{1}{\gamma-1}} - D_O$.[22] The second intuition is that the preferred level of local investment for politicians, denoted I^P, is higher than the one of voters, because politicians derive private benefits from higher level of investment.[23]

We derive below two key results on how local investment changes when a toxic shock occurs, summarized in the following Proposition. Proof is provided in the Online Appendix.

Proposition 5.1. *After the occurrence of a toxic debt shock:*

(i) local investment decreases, while taxes stay unchanged;

(ii) The decline in investment is larger in politically contested municipalities.

Following a toxic debt shock, incumbent mayors adjust their choices of investment downwards for two reasons: first, because more indebtedness shifts the preferences of both voters and politicians towards less investment; and second, because the negative reputation shock on the perceived quality of the mayor reduces her political advantage, and leads her to strategically reduce the level of investment towards the preferences of voters in order to preserve her chances of reelection. Importantly, this second force binds only in politically contested municipalities. In non-contested municipalities, the initial political advantage of the mayor is so large that even after experiencing a negative reputation shock, the incumbent mayor is still certain to win the election even if she sticks to her preferred level of high investment – in this case, $I^P - D_{\text{Tox}}$. Instead, in contested municipalities, the reputation shock leads the incumbent mayor to strategically reduce the level of investment by more than the increase in indebtedness D_{Tox}. Figure 6 provides a graphical illustration of the equilibrium investment level after a toxic debt shock in both politically non-contested municipalities (upper panel) and politically contested municipalities (lower panel). Indeed, in order to compensate for the electoral cost associated to the loss in reputation, the incumbent mayor needs to decrease further local investment, closer to the preferences of voters, in order to maintain her chances of reelection.

INSERT FIGURE 6

[22] I^V maximizes expression (5.1) with $T^V = 0$ and $D^V = I^V$, that is $\lambda.I - (D_O + I)^\gamma$, and thus equals $\left(\frac{\lambda}{\gamma}\right)^{\frac{1}{\gamma-1}} - D_O$. Note that I^V is strictly positive as we assume $D_O < \left(\frac{\lambda}{\gamma}\right)^{\frac{1}{\gamma-1}}$.

[23] Formally, I^P maximizes expression (5.2) with $T^P = 0$ and $D^P = I^P$, that is $(\lambda + \beta).I - (D_O + I)^\gamma$, and thus equals $\left(\frac{\beta+\lambda}{\gamma}\right)^{\frac{1}{\gamma-1}} - D_O$.

6 Conclusion

In this study, we exploit the deterioration of notorious financial instruments, dubbed "toxic loans" by the press, to provide causal evidence that an increase in local government indebtedness results in reduction in local government investments that is shaped by the political context. Incumbent mayors facing competitive re-election cut municipal investments significantly more than those encountering less electoral competition. In turn, the debt accumulation resulting from both the shock and the endogenous response by the incumbent is significantly attenuated when political competition is high. In contrast, local taxes remain largely unaffected by the increased debt burden in both groups.

These empirical findings are consistent with a model where public investment choices are disciplined by electoral competition, which highlights the disciplining role of competitive elections on public indebtedness when voters are fiscally conservative, and the dual nature, both financial and political, of debt shocks.

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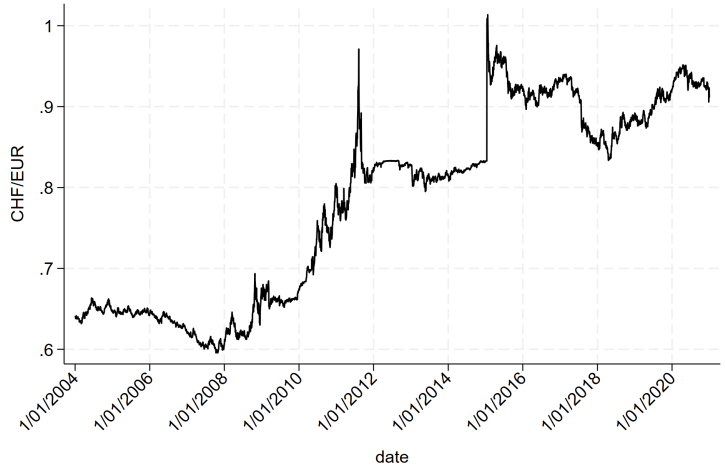
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7 Figures & Tables

Panel A: Swiss Franc-Euro (CHF/EUR) exchange rate



Panel B: Spread between Euro CMS 10 Year Swap Rate and 2 Year Swap Rate

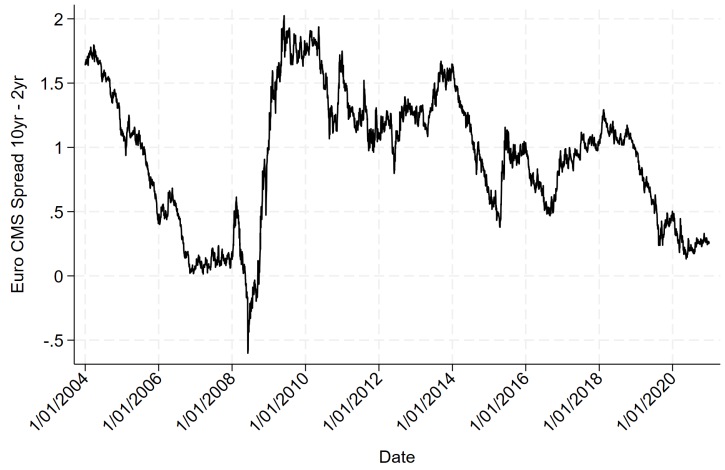


Figure 1
Structured Loan Underlying Indices

Note: This figure presents the evolution of the CHF/EUR exchange rate (Panel A) and the spread between the EUR CMS 10 year rate and the EUR CMS 2 year rate (Panel B).

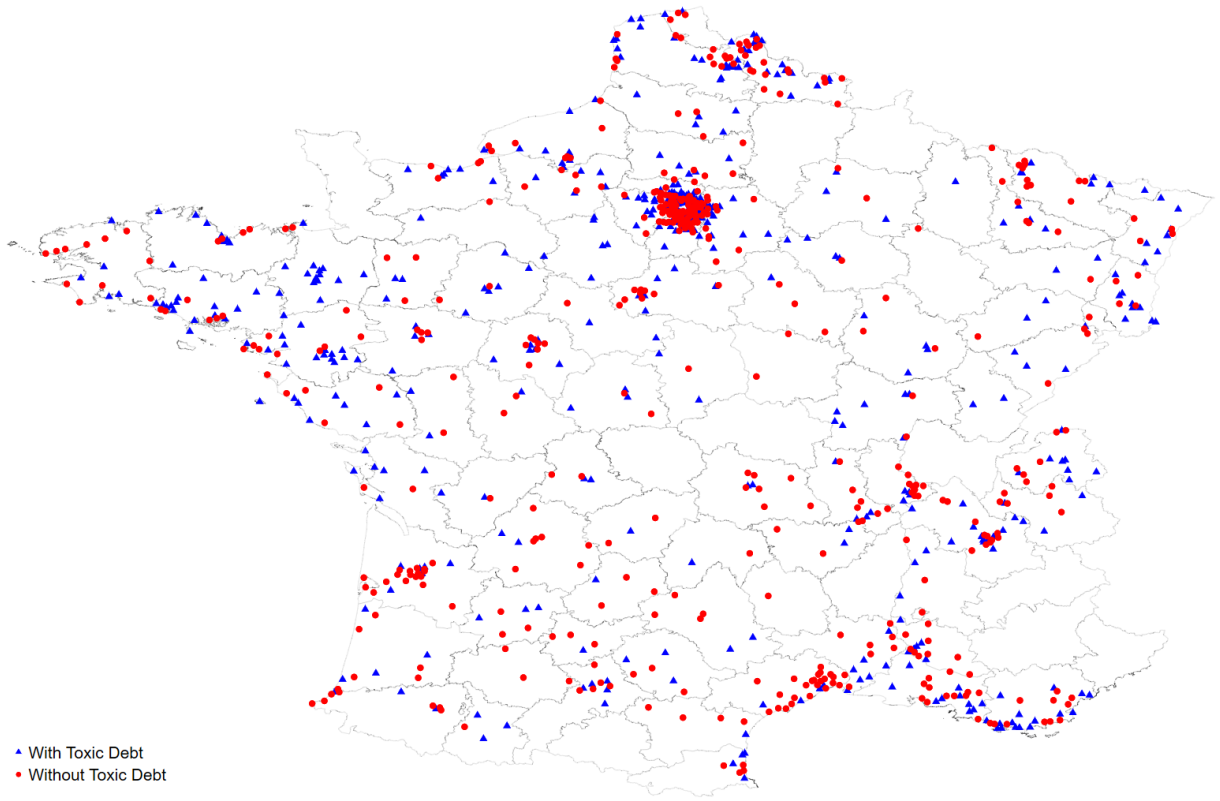
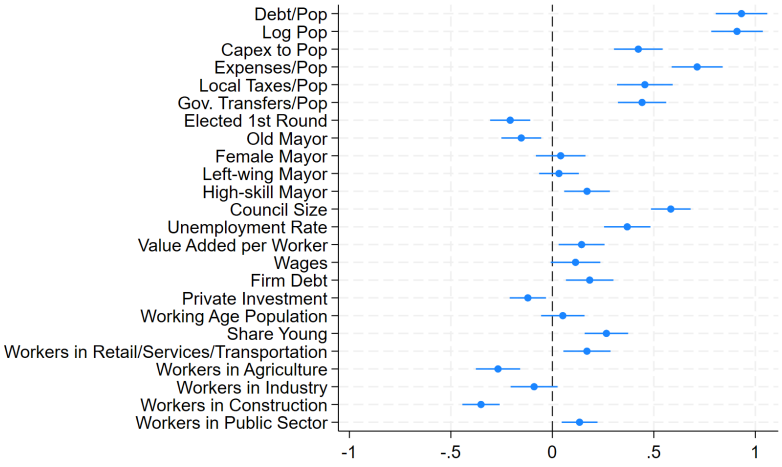


Figure 2
Geographic Location of Treated and Control Municipalities - Matched Sample

Note: This map displays the location of municipalities with toxic debt (either CHF or steepener debt), on their balance sheet as of 2007, the treated group in our analysis, as well as the municipalities included in the matched control group. The control group consists of closest neighbor based on population and debt-to-population.

Panel A: All Municipalities



Panel B: Treatment Group + Matched Control Group

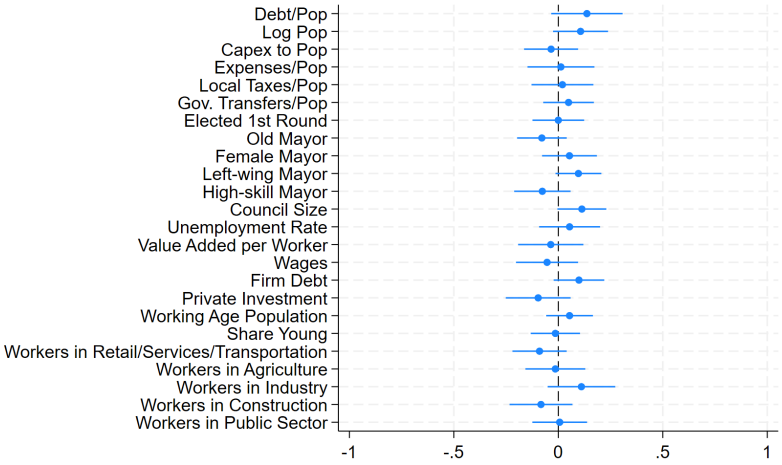


Figure 3
Regression Coefficients between Municipal Characteristics and Toxic Debt Dummy in 2007

Note: This figure displays the OLS coefficients for the univariate regressions of a set of municipal characteristics on a dummy variable equal to one if the municipality has toxic debt (that is, either CHF or steepener loans) on its balance-sheet in 2007. The exercise is performed for the universe of French municipalities with more than 3,500 inhabitants in Panel A, and for our baseline matched sample (treated group + matched control group) in Panel B. The control group consists of closest neighbor based on population and debt-to-population. For the sake of comparison, all municipal characteristics have been standardized to obtain empirical distributions with a mean of zero and a standard deviation of one. Standard errors are clustered at the department level.

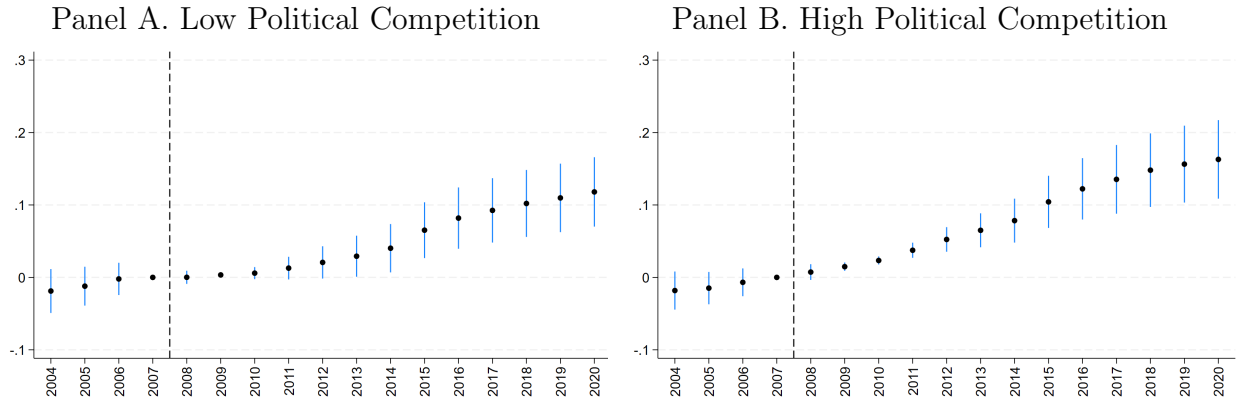


Figure 4
Toxic Debt and Interest Expenses - Dynamic Specifications

Note: This figure presents estimates for dynamic specifications of cumulative interest expenses per capita regressed on a full set of year dummies (using 2007 as the reference year) interacted with a dummy for the presence of toxic debt in 2007 on the balance-sheet of municipalities. The regressions include municipality and year fixed effects and standard errors are clustered at the department and year levels. The sample period is 2004-2020. The figures also display 95% confidence intervals.

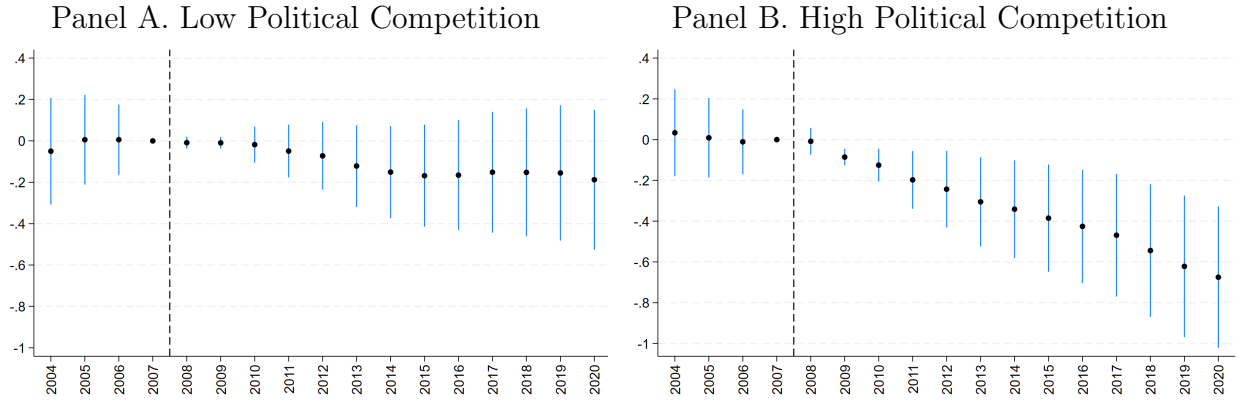


Figure 5
Toxic Debt and Municipal Investments - Dynamic Specifications

Note: This figure presents estimates for dynamic specifications of cumulative investments per capita regressed on a full set of year dummies (using 2007 as the reference year) interacted with a dummy for the presence of toxic debt in 2007 on the balance-sheet of municipalities. The regressions include municipality and year fixed effects and standard errors are clustered at the department and year levels. The sample period is 2004-2020. The figures also display 95% confidence intervals.

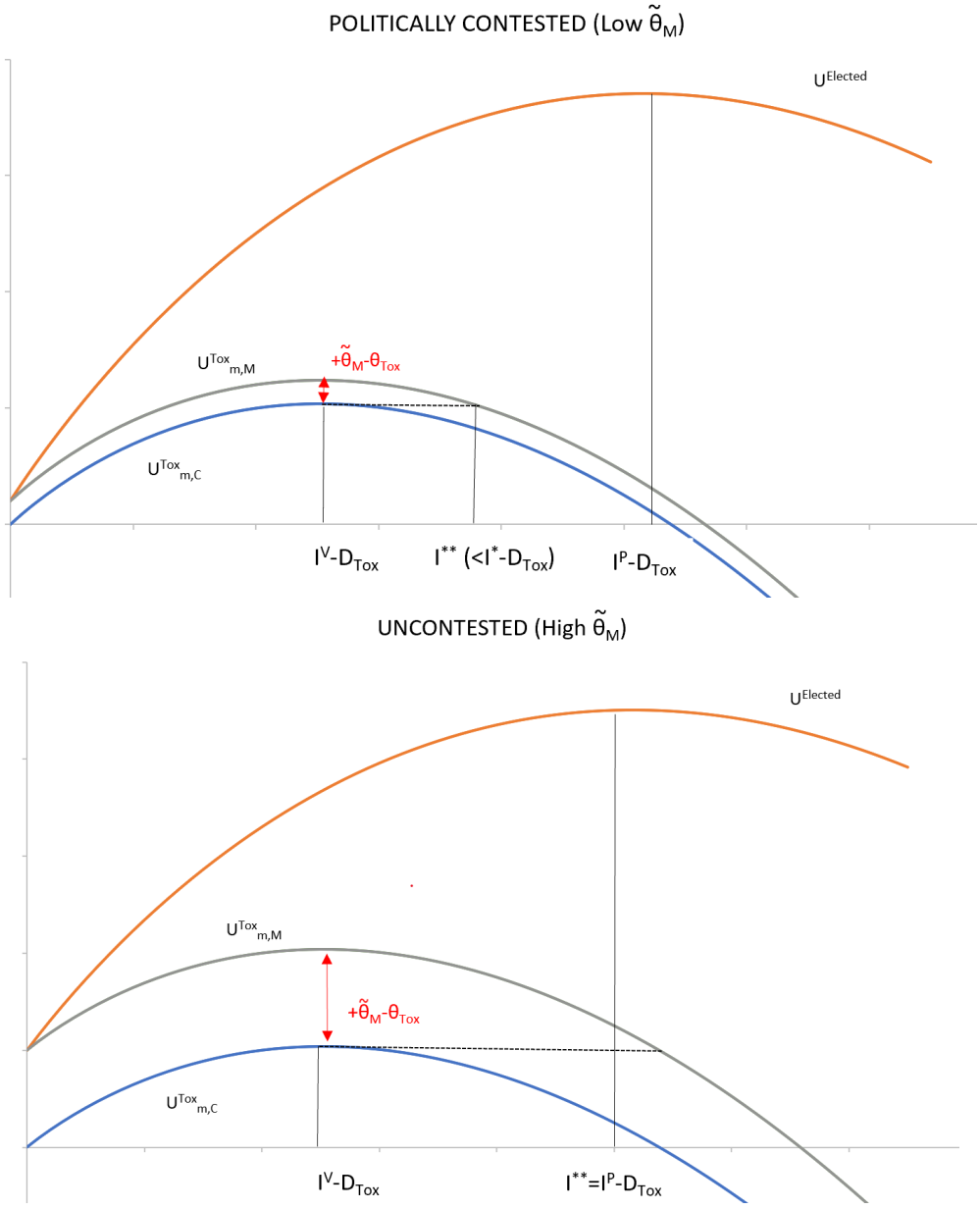


Figure 6
Investment Choice in Politically Contested Versus Non-politically Contested Municipalities After a Toxic Shock

Note: This figure provides a graphical illustration of the equilibrium level of investment after a toxic shock in both politically contested (upper panel) and non-contested municipalities (lower panel). The blue, grey and orange lines plot respectively $U^{\text{Tox}}_{m,C}(I, D = I, T = 0)$, $U^{\text{Tox}}_{m,M}(I, D = I, T = 0)$, and $U^{\text{Elected}}_{M}(I, D = I, T = 0)$ as a function of I.

Table 1
Summary Statistics: Matched Sample of 970 Municipalities

	(1) Mean	(2) St. Dev.	(3) p1	(4) p50	(5) p99
Panel A: Treatment Variables (in 2007)					
Toxic Debt (0/1)	0.500	0.500	0.000	0.500	1.000
CHF Debt (0/1)	0.219	0.413	0.000	0.000	1.000
Steepener Debt (0/1)	0.399	0.490	0.000	0.000	1.000
Toxic Debt / Pop (07)	0.218	0.320	0.000	0.003	1.401
CHF Debt Share (07)	0.057	0.138	0.000	0.000	0.593
Steepener Debt Share (07)	0.113	0.182	0.000	0.000	0.782
Panel B: Municipal Outcome Variables					
Σ_{08-20} Interest Expenses / Pop (07)	0.607	0.342	0.056	0.529	1.680
Σ_{08-20} Municipal Investments / Pop (07)	6.311	2.589	2.505	5.779	15.888
Σ_{08-20} Municipal Expenses / Pop (07)	16.761	5.029	8.700	15.894	34.652
Σ_{08-20} Local Taxes / Pop (07)	7.950	2.725	3.609	7.548	17.530
Σ_{08-20} New Debt / Pop (07)	1.303	0.780	0.010	1.201	3.800
Δ_{08-20} Local Debt / Pop (07)	0.023	0.640	-1.091	-0.059	2.115
Debt Relief Program Participation	0.282	0.450	0.000	0.000	1.000
Δ_{08-20} Net Local Debt / Pop (07)	0.023	0.640	-1.091	-0.059	2.115
Panel C: Municipal Characteristics					
Municipal Size and Budget (in 2007)					
Population	24182	33584	3720	13579	166537
Debt / Pop	1.278	0.607	0.161	1.182	3.138
Interests / Pop	0.054	0.027	0.007	0.049	0.137
Municipal Investments / Pop	0.621	0.332	0.161	0.534	1.648
Local Taxes / Pop	0.606	0.367	0.228	0.525	2.019
Op. Expenses / Pop	1.196	0.370	0.540	1.153	2.431
Central Gov. Transfer / Pop	0.273	0.121	0.092	0.256	0.698
Economic Characteristics (in 2007)					
Unemployment Rate	0.123	0.045	0.048	0.116	0.238
Value Added per Worker	53.587	15.910	33.149	49.941	137.200
Wages	27.233	4.254	20.533	26.404	43.576
Firm Debt	0.271	0.158	0.045	0.230	0.814
Private Investment	0.135	0.068	0.034	0.124	0.406
Population Characteristics (in 2007)					
Working Age Population	0.643	0.043	0.522	0.649	0.726
Share Young	0.327	0.071	0.214	0.319	0.568
Workers in Retail/Services/Transportation	0.441	0.101	0.225	0.432	0.723
Workers in Agriculture	0.007	0.013	0.000	0.002	0.061
Workers in Industry	0.154	0.106	0.030	0.125	0.550
Workers in Construction	0.071	0.036	0.021	0.061	0.183
Workers in Public Sector/Healthcare	0.320	0.101	0.092	0.323	0.571
Political Characteristics (Local Election 2008)					
Council Size	3.524	0.260	3.219	3.497	4.094
Older Mayor	0.453	0.498	0.000	0.000	1.000
Female Mayor	0.079	0.270	0.000	0.000	1.000
Left-wing Mayor	0.413	0.493	0.000	0.000	1.000
High-skill Mayor	0.377	0.485	0.000	0.000	1.000
Wins First Round	0.594	0.491	0.000	1.000	1.000
Large Vote Margin (More than 20%)	0.438	0.496	0.000	0.000	1.000
Incumbent Wins First Round	0.437	0.496	0.000	0.000	1.000

Note: This table provides summary statistics for the municipalities in our matched sample. Variables scaled by population in 2007 are expressed in thousand euros per inhabitant. Value Added and Wages are expressed in thousand euros per worker, and computed using the universe of private firms located in each municipality. Firm Debt (respectively Private Investment) is the value-weighted ratio of debt over assets (respectively ratio of capital expenditures over firm capital) computed across all firms located in a given municipality. Working Age Population (respectively Share Young) is the share of the population with age between 25 and 54 years old (respectively with age between 15 and 24 years old). Political variables are based on the local elections held in 2008. Council Size is the logarithm of the number of members who serve on the municipal council. Old Mayor is defined as being above 60 years old. The dummy for left-wing mayor is 1 when mayors are labeled as either "left" or "far left". High-skill Mayor is a dummy indicating whether the mayor was either a manager, engineer, physician, lawyer, or university professor. Vote Margin is the the gap in vote percentages between the winner and the runner-up.

Table 2
Toxic Debt

Panel A:	(1)	(2)	(3)
	Steepener Debt Share (07)		
	Low Political Competition	High Political Competition	High-Low
Toxic Debt (0/1)	0.241***	0.219***	-0.023
	(0.014)	(0.015)	(0.019)
Municipal Controls	Y	Y	Y
Area FE	Y	Y	Y
Observations	576	394	970
R^2	0.546	0.551	0.548

Panel B:	(1)	(2)	(3)
	CHF Debt Share (07)		
	Low Political Competition	High Political Competition	High-Low
Toxic Debt (0/1)	0.123***	0.107***	-0.016
	(0.013)	(0.017)	(0.018)
Municipal Controls	Y	Y	Y
Area FE	Y	Y	Y
Observations	576	394	970
R^2	0.322	0.430	0.359

Note: This table presents the OLS coefficients from regressing the change in municipal debt over the period 2008-2020 on a dummy for the presence of toxic debt on the balance-sheet of municipalities in the matched sample in 2007. The dependent variable is scaled by municipal population in 2007. The regressions include controls for the logarithm of municipal population, and the amount of debt, municipal investments, operating expenses, local taxes, and central government transfers as per 2007 (all scaled by population), the unemployment rate, value added per worker, wages, firm debt, private investment, the share of working age population, the share of the population with age between 25 and 54 years old, the share of workers in retail/services/transportation, in agriculture, in industry, in construction, in public sector/healthcare, council size, and dummies for old Mayor, Female Mayor, Left-wing Mayor, High-skill Mayor, as well department fixed effects. Standard errors are clustered at the department level, and are reported into parenthesis under the regression coefficients. ***, ** and * indicate statistical significance at the 1%, 5% and 10% level, respectively.

Table 3
Toxic Debt and Interest Payments

	(1)	(2)	(3)
Panel A:	Σ_{08-20} Interests per capita		
	Low Political Competition	High Political Competition	High-Low
Toxic Debt (0/1)	0.139***	0.131***	-0.008
	(0.015)	(0.024)	(0.028)
Municipal Controls	Y	Y	Y
Area FE	Y	Y	Y
Observations	576	394	970
R^2	0.764	0.804	0.779
	(1)	(2)	(3)
Panel B:	Σ_{08-20} Interests per capita		
	Low Political Competition	High Political Competition	High-Low
Toxic Debt (0/1)	0.138***	0.146***	0.008
	(0.015)	(0.022)	(0.028)
Σ_{08-20} New Debt per capita	0.079***	0.072***	
	(0.015)	(0.022)	
Municipal Controls	Y	Y	Y
Area FE	Y	Y	Y
Observations	576	394	970
R^2	0.781	0.819	0.795

Note: This table presents the OLS coefficients from regressing the cumulative amount over the period 2008-2020 of interest expenses on a dummy for the presence of toxic debt on the balance-sheet of municipalities in the matched sample in 2007. The dependent variable is scaled by municipal population in 2007. The regressions include controls for the logarithm of municipal population, the amount of debt, municipal investments, operating expenses, local taxes, and central government transfers as per 2007 (all scaled by population), the unemployment rate, value added per worker, wages, firm debt, private investment, the share of working age population, the share of the population with age between 25 and 54 years old, the share of workers in retail/services/transportation, in agriculture, in industry, in construction, in public sector/healthcare, council size, and dummies for old Mayor, Female Mayor, Left-wing Mayor, High-skill Mayor, as well department fixed effects. In Panel B, we further control for the cumulative amount of new debt over the period 2008-2020, scaled by municipal population in 2007. Cumulative new debt excludes changes in debt resulting from the renegotiation or restructuring of existing debt (including toxic debt) into new loans. Standard errors are clustered at the department level, and are reported into parenthesis under the regression coefficients. ***, ** and * indicate statistical significance at the 1%, 5% and 10% level, respectively.

Table 4
Toxic Debt and Municipal Investments

	(1)	(2)	(3)
Panel A: Reduced-form	Σ_{08-20} Municipal Investments per capita		
	Low Political Competition	High Political Competition	High-Low
Toxic Debt (0/1)	-0.216	-0.802***	-0.586**
	(0.133)	(0.205)	(0.249)
Municipal Controls	Y	Y	Y
Area FE	Y	Y	Y
Observations	576	394	970
R^2	0.715	0.633	0.686

	(1)	(2)
Panel B: IV	Σ_{08-20} Municipal Investments per capita	
	Low Political Competition	High Political Competition
Σ_{08-20} $\widehat{\text{Interests per capita}}$	-1.553	-6.133***
	(0.947)	(1.860)
Municipal Controls	Y	Y
Area FE	Y	Y
Observations	576	394
First-stage F statistic	90.9	30.1

Note: Panel A of this table presents the OLS coefficients from regressing the cumulative amount over the period 2008-2020 of municipal investments on a dummy for the presence of toxic debt on the balance-sheet of municipalities in the matched sample in 2007. Panel B presents 2SLS cross-sectional regressions of cumulative amount over the period 2008-2020 of municipal investments on the cumulative amount of interest expenses over the same period instrumented using the dummy for the presence of toxic debt on the balance-sheet of municipalities in the matched sample in 2007. The dependent variable, and cumulative interest expenses, are both scaled by municipal population in 2007. The regressions include controls for the logarithm of municipal population, and the amount of debt, municipal investments, operating expenses, local taxes, and central government transfers as per 2007 (all scaled by population), the unemployment rate, value added per worker, wages, firm debt, private investment, the share of working age population, the share of the population with age between 25 and 54 years old, the share of workers in retail/services/transportation, in agriculture, in industry, in construction, in public sector/healthcare, council size, and dummies for old Mayor, Female Mayor, Left-wing Mayor, High-skill Mayor, as well department fixed effects. Standard errors are clustered at the department level, and are reported into parenthesis under the regression coefficients. ***, ** and * indicate statistical significance at the 1%, 5% and 10% level, respectively.

Table 5
Toxic Debt and Municipal Investments
Robustness

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Other Dep Variable	Other Treatment				Other Def of Political Competition		Other Samples	
	Investments+ Expenses	Toxic Debt per Capita (07)	Toxic Debt Share (07)	CHF Debt (0/1)	Steepener Debt (0/1)	Large Vote Margin	Incumbent Wins First Round	Unmatched Sample	Matched with Structured Debt Only
Treatment Effect on Investments									
Low Political Competition	-0.214	-0.512**	-0.469	-0.404**	-0.226	-0.198	-0.267	-0.247**	-0.230
	(0.231)	(0.239)	(0.294)	(0.199)	(0.139)	(0.162)	(0.169)	(0.121)	(0.150)
High Political Competition	-1.166***	-1.604***	-2.264***	-1.169***	-0.752***	-0.694***	-0.688***	-0.615***	-0.659***
	(0.338)	(0.400)	(0.484)	(0.291)	(0.240)	(0.161)	(0.145)	(0.173)	(0.208)
High-Low	-0.952**	-1.092**	-1.795***	-0.764**	-0.526*	-0.487*	-0.423*	-0.367**	-0.429*
	(0.398)	(0.436)	(0.497)	(0.370)	(0.287)	(0.247)	(0.231)	(0.177)	(0.220)

Note: This table presents variants of the specifications presented in Panel A of Table 4. In column 1, we use the sum of cumulative investments and expenses over the period 2008-2020, scaled by municipal population in 2007 as alternative dependent variable. In columns (2-5), we use alternative treatment variables. We replace the dummy for toxic debt by the amount of toxic debt in thousand euros scaled by municipal population in 2007 in column 2, by the share of toxic debt in total debt on the balance-sheet of municipalities in column 3, by a dummy for CHF debt only in column 4, and by a dummy for steepener debt only in column 5. In columns (6-7), we use alternative measures for the degree of political competition in each municipality. In column 6, we split the sample of municipalities based on the vote margins between the winner and the runner-up in the local elections of 2008 being below or above the median. In column 7, we split the sample of municipalities based on whether the incumbent mayor won in the first round of the local elections in 2008. In columns (8-9), we run the same specification as in Panel A of Table 4 for alternative samples of municipalities. In column 8, we use the full sample of municipalities with more than 3,500 inhabitants in 2007. In column 9, we form a matched sample based of control municipalities with milder types of structured loans. The control group consists of closest neighbor based on population and debt-to-population. Standard errors are clustered at the department level and are reported into parenthesis under the regression coefficients.

Table 6
Toxic Debt and Municipal Investments
Controlling for Interaction of Toxic Debt with Other Municipal Characteristics

	(1)	(2)	(3)	(4)	(5)	(6)
	Σ_{08-20}Investments					
		Adding Interaction Terms for Toxic Debt (0/1) With...				
	Baseline	Municipal Size and Budget	Political Charac.	Economic Charac.	Workforce Charac.	All Charac.
Toxic Debt (0/1) × High Political Competition	-0.586**	-0.648***	-0.591**	-0.629**	-0.646**	-0.704***
	(0.249)	(0.244)	(0.253)	(0.262)	(0.253)	(0.255)
Toxic Debt (0/1) × Municipal Controls	Y	Y	Y	Y	Y	Y
Political Competition × Municipal Controls	Y	Y	Y	Y	Y	Y
Area × Political Competition FE	Y	Y	Y	Y	Y	Y
Observations	970	970	970	970	970	970
R^2	0.686	0.692	0.688	0.687	0.688	0.697

Note: This table presents the OLS coefficients of regressing cumulative municipal investments from 2008-2020, scaled by population in 2007, on a dummy for toxic debt, its interaction with a dummy indicating whether the mayor was elected in the runoff of the election in 2008, as well as interactions between the dummy for toxic debt and municipal characteristics. Column 1 reports the baseline coefficient (the same as in column 3 of Panel A in Table 3). We further include in column 2 the interaction of the dummy for toxic debt with controls for municipal size and budget characteristics (the logarithm of municipal population, and municipal debt, municipal investments, operating expenses, local taxes, central government transfers, all scaled by municipal population in 2007), in column 3 the interaction of the dummy for toxic debt with controls for economic characteristics of municipalities (the unemployment rate, value added per worker, wages, firm debt, and private investment), in column 4 the interaction of the dummy for toxic debt with controls for population characteristics of municipalities (the share of the population with age between 15 and 24 years old, the share of workers employed in agriculture, in industry, in construction, in retail/Services/transportation, in the public sector, and their interaction with the share of toxic debt), in column 5 the interaction of the dummy for toxic debt with controls for political characteristics of municipalities (the logarithm of the number of members serving on the council, dummies for old mayors, for the gender of the mayor, for the political ideology of the mayor, for high-skill mayors), in column 6 the interaction of the dummy for toxic debt with all the municipal characteristics mentioned above. Standard errors are clustered at the department level, and are reported into parenthesis under the regression coefficients. ***, ** and * indicate statistical significance at the 1%, 5% and 10% level, respectively.

Table 7
Toxic Debt and Local Taxes

	(1)	(2)	(3)
	Σ_{08-20} Local taxes per capita		
	Low Political Competition	High Political Competition	High-Low
Toxic Debt (0/1)	0.078	-0.056	-0.133
	(0.117)	(0.113)	(0.146)
Municipal Controls	Y	Y	Y
Area FE	Y	Y	Y
Observations	576	394	970
R^2	0.766	0.813	0.784

Note: This table presents the OLS coefficients from regressing the cumulative amount over the period 2008-2020 of local taxes on a dummy for the presence of toxic debt on the balance-sheet of municipalities in the matched sample in 2007. The dependent variable is scaled by municipal population in 2007. The regressions include controls for the logarithm of municipal population, and the amount of debt, municipal investments, operating expenses, local taxes, and central government transfers as per 2007 (all scaled by population), the unemployment rate, value added per worker, wages, firm debt, private investment, the share of working age population, the share of the population with age between 25 and 54 years old, the share of workers in retail/services/transportation, in agriculture, in industry, in construction, in public sector/healthcare, council size, and dummies for old Mayor, Female Mayor, Left-wing Mayor, High-skill Mayor, as well department fixed effects. Standard errors are clustered at the department level, and are reported into parenthesis under the regression coefficients. ***, ** and * indicate statistical significance at the 1%, 5% and 10% level, respectively.

Table 8
Toxic Debt and Debt Accumulation

	(1)	(2)	(3)
Panel A:	Δ_{08-20} Debt per capita		
	Low Political Competition	High Political Competition	High-Low
Toxic Debt (0/1)	0.458***	0.109	-0.348***
	(0.053)	(0.086)	(0.094)
Municipal Controls	Y	Y	Y
Area FE	Y	Y	Y
Observations	576	394	970
R^2	0.300	0.305	0.306
	(1)	(2)	(3)
Panel B:	$\sum_{08-20}$ New Debt per capita (Exc. restructuring)		
	Low Political Competition	High Political Competition	High-Low
Toxic Debt (0/1)	0.011	-0.212**	-0.224**
	(0.058)	(0.086)	(0.108)
Municipal Controls	Y	Y	Y
Area FE	Y	Y	Y
Observations	576	394	970
R^2	0.467	0.471	0.472

Note: This table presents the OLS coefficients from regressing the change in municipal debt over the period 2008-2020 (Panel A) and the cumulative new debt over the period 2008-2020 (Panel B) on a dummy for the presence of toxic debt on the balance-sheet of municipalities in the matched sample in 2007. Cumulative new debt excludes changes in debt resulting from the renegotiation or restructuring of existing debt (including toxic debt) into new loans. The dependent variable is scaled by municipal population in 2007. The regressions include controls for the logarithm of municipal population, and the amount of debt, municipal investments, operating expenses, local taxes, and central government transfers as per 2007 (all scaled by population), the unemployment rate, value added per worker, wages, firm debt, private investment, the share of working age population, the share of the population with age between 25 and 54 years old, the share of workers in retail/services/transportation, in agriculture, in industry, in construction, in public sector/healthcare, council size, and dummies for old Mayor, Female Mayor, Left-wing Mayor, High-skill Mayor, as well department fixed effects. Standard errors are clustered at the department level, and are reported into parenthesis under the regression coefficients. ***, ** and * indicate statistical significance at the 1%, 5% and 10% level, respectively.

ONLINE APPENDIX

Public Debt and Investment Under Political Competition: Evidence from Toxic Loans

Julien Sauvagnat and Boris Vallée

A Appendix Tables

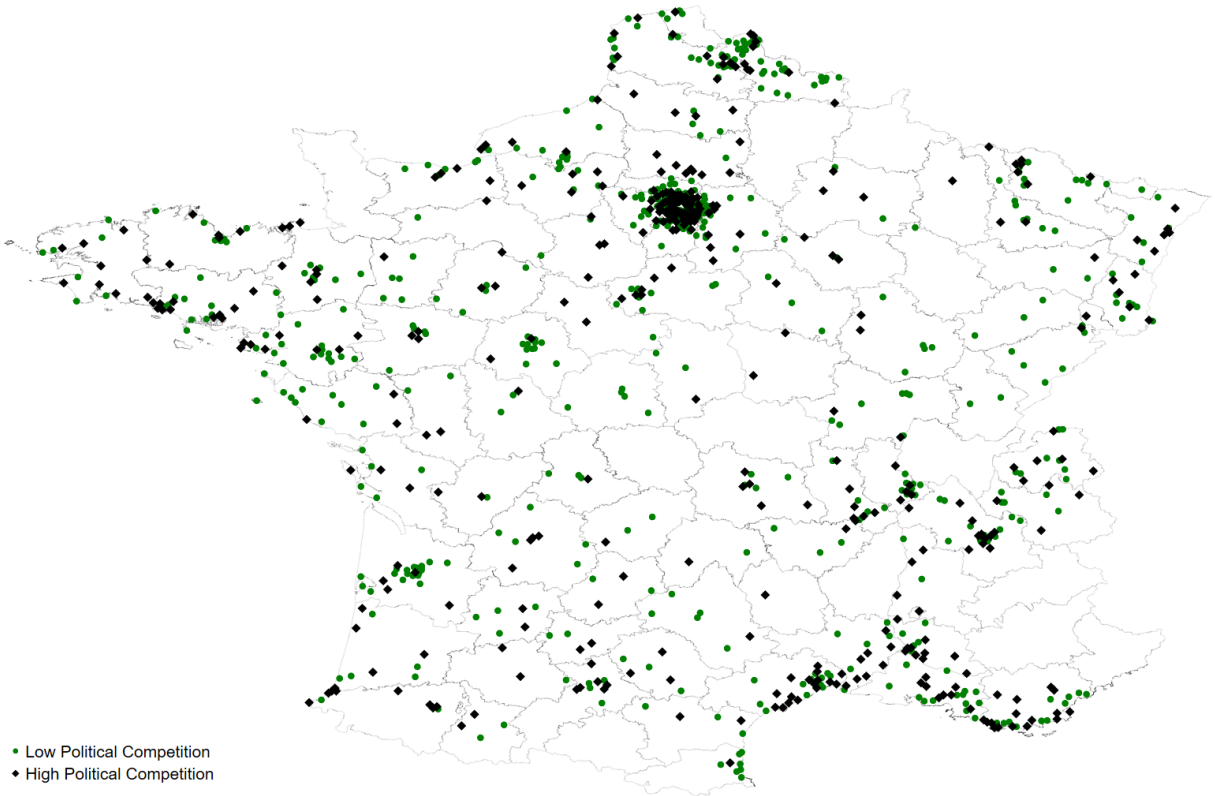


Figure A.1
Geographic Location of Low and High Political Competition Municipalities - Matched Sample

Note: This map displays the location of municipalities for which the mayor was elected in first round in the 2008 elections ("Low Political Competition"), or in the run-off ("High Political Competition") in our matched sample.

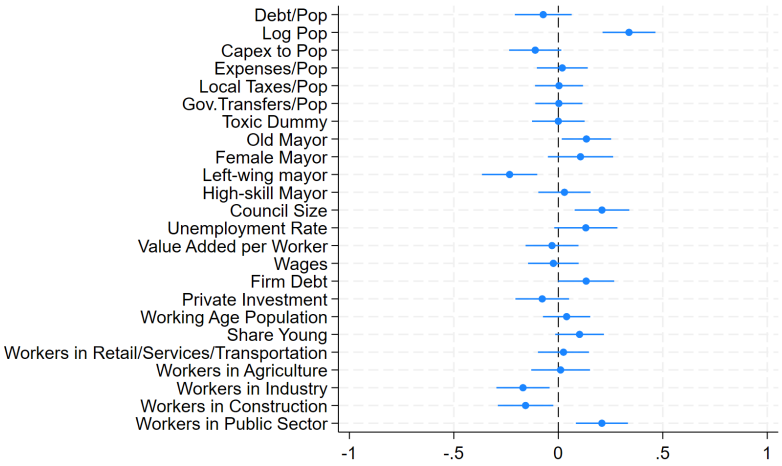


Figure A.2
Regression Coefficients between Municipal Characteristics and Dummy for High Political Competition Municipalities - Matched Sample

Note: This figure displays the OLS coefficients for the univariate regressions of a set of municipal characteristics on a dummy variable equal to one if the municipality is classified as high political competition. The exercise is performed in our matched sample (treated group + matched control group). For the sake of comparison, all municipal characteristics have been standardized to obtain empirical distributions with a mean of zero and a standard deviation of one. Standard errors are clustered at the department level.

Table A.1
Toxic Debt and Debt Accumulation - Debt Relief Program

	(1)	(2)	(3)
Panel A:	Toxic debt relief program - Participation		
	Low Political Competition	High Political Competition	High-Low
Toxic Debt (0/1)	0.409***	0.350***	-0.059
	(0.037)	(0.055)	(0.059)
Municipal Controls	Y	Y	Y
Area FE	Y	Y	Y
Observations	576	394	970
R^2	0.337	0.368	0.350
	(1)	(2)	(3)
Panel B:	Δ_{08-20} Net Debt per capita		
	Low Political Competition	High Political Competition	High-Low
Toxic Debt (0/1)	0.250***	-0.024	-0.274***
	(0.035)	(0.068)	(0.074)
Municipal Controls	Y	Y	Y
Area FE	Y	Y	Y
Observations	576	394	970
R^2	0.334	0.332	0.342

Note: This table presents the OLS coefficients from regressing a dummy for participation to the toxic debt relief program (Panel A) and on the change in net municipal debt over the period 2008-2020 (Panel B) on a dummy for the presence of toxic debt on the balance-sheet of municipalities in the matched sample in 2007. The dependent variable is scaled by municipal population in 2007. The regressions include controls for the logarithm of municipal population, and the amount of debt, municipal investments, operating expenses, local taxes, and central government transfers as per 2007 (all scaled by population), the unemployment rate, value added per worker, wages, firm debt, private investment, the share of working age population, the share of the population with age between 25 and 54 years old, the share of workers in retail/services/transportation, in agriculture, in industry, in construction, in public sector/healthcare, council size, and dummies for old Mayor, Female Mayor, Left-wing Mayor, High-skill Mayor, as well department fixed effects. Standard errors are clustered at the department level, and are reported into parenthesis under the regression coefficients. ***, ** and * indicate statistical significance at the 1%, 5% and 10% level, respectively.

Table A.2
Toxic Debt and Municipal Outcomes - Sub-periods

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A:	$\sum_{08-13}$ Interests per capita			$\sum_{14-20}$ Interests per capita		
	Low Political Competition	High Political Competition	High-Low	Low Political Competition	High Political Competition	High-Low
Toxic Debt (0/1)	0.031***	0.035***	0.005	0.107***	0.092***	-0.014
	(0.005)	(0.008)	(0.010)	(0.012)	(0.017)	(0.019)
Municipal Controls	Y	Y	Y	Y	Y	Y
Area FE	Y	Y	Y	Y	Y	Y
Observations	576	394	970	576	394	970
R^2	0.879	0.880	0.879	0.610	0.681	0.636
	(1)	(2)	(3)	(4)	(5)	(6)
Panel B:	$\sum_{08-13}$ Investments per capita			$\sum_{14-20}$ Investments per capita		
	Low Political Competition	High Political Competition	High-Low	Low Political Competition	High Political Competition	High-Low
Toxic Debt (0/1)	-0.120*	-0.367***	-0.247*	-0.099	-0.409***	-0.310*
	(0.071)	(0.119)	(0.147)	(0.098)	(0.111)	(0.156)
Municipal Controls	Y	Y	Y	Y	Y	Y
Area FE	Y	Y	Y	Y	Y	Y
Observations	576	394	970	576	394	970
R^2	0.700	0.662	0.686	0.634	0.543	0.601
	(1)	(2)	(3)	(4)	(5)	(6)
Panel C:	$\sum_{08-13}$ Local taxes per capita			$\sum_{14-20}$ Local taxes per capita		
	Low Political Competition	High Political Competition	High-Low	Low Political Competition	High Political Competition	High-Low
Toxic Debt (0/1)	0.031	-0.002	-0.033	0.054	-0.063	-0.116
	(0.063)	(0.056)	(0.071)	(0.078)	(0.078)	(0.096)
Municipal Controls	Y	Y	Y	Y	Y	Y
Area FE	Y	Y	Y	Y	Y	Y
Observations	576	394	970	576	394	970
R^2	0.775	0.841	0.800	0.709	0.759	0.727
	(1)	(2)	(3)	(4)	(5)	(6)
Panel D:	Δ_{08-13} Debt per capita			Δ_{14-20} Debt per capita		
	Low Political Competition	High Political Competition	High-Low	Low Political Competition	High Political Competition	High-Low
Toxic Debt (0/1)	0.137***	0.043	-0.094*	0.328***	0.071	-0.257***
	(0.029)	(0.047)	(0.055)	(0.048)	(0.068)	(0.076)
Municipal Controls	Y	Y	Y	Y	Y	Y
Area FE	Y	Y	Y	Y	Y	Y
Observations	576	394	970	576	394	970
R^2	0.297	0.376	0.331	0.247	0.280	0.263

Note: This table presents the OLS coefficients from the regressions presented in Table 3, Table 4, Table 7, and Table 8, split into two sub-periods. The dependent variables are scaled by municipal population in 2007. The regressions include controls for the logarithm of municipal population, and the amount of debt, municipal investments, operating expenses, local taxes, and central government transfers as per 2007 (all scaled by population), the unemployment rate, value added per worker, wages, firm debt, private investment, the share of working age population, the share of the population with age between 25 and 54 years old, the share of workers in retail/services/transportation, in agriculture, in industry, in construction, in public sector/healthcare, council size, and dummies for old Mayor, Female Mayor, Left-wing Mayor, High-skill Mayor, as well department fixed effects. Standard errors are clustered at the department level, and are reported into parenthesis under the regression coefficients. ***, ** and * indicate statistical significance at the 1%, 5% and 10% level, respectively.

Table A.3
Municipal Voter Priorities - IFOP Poll (2020)

What role did each of these municipal policies play in your vote?	Crucial	Important but not crucial	Secondary	Total
Financial and debt management	64	30	6	100
Healthcare services	62	33	5	100
Security and safety	62	32	6	100
Local taxes	60	34	6	100
Cleanliness and landscaping	60	36	4	100
Employment and economic development	54	39	7	100
Urbanism	54	40	6	100
Education and schools	50	40	10	100
Pollution	48	42	10	100
Environment	46	40	14	100
Local stores	46	44	10	100
Social services	44	43	13	100
Public transportation	41	43	16	100
Traffic	40	44	16	100
Housing	32	50	18	100
Early childhood education	32	52	16	100
Parking	30	46	24	100
Culture	29	52	19	100

Note: This table displayed the results from a poll run by IFOP for CNEWS and Sud Radio after the 2020 Municipal elections. Complete results and methodology are available at https://www.ifop.com/wp-content/uploads/2020/03/117215-Rapport-JDV-MUNI20-DET-18h30.pdf (in French).

B Proof of Proposition 5.1

We start the proof by noting that in all politicians' strategies, it is always optimal to finance investment entirely with debt (that is, set $I = D$ and $T = 0$). Without loss of generality, we assume that voters vote for the mayor when indifferent between voting for the mayor and the challenger. We characterize below the equilibrium level of investment first without, and then with, a toxic debt shock. We then show that the decline in investment following a toxic debt shock is larger in politically contested municipalities, defined as those such that the mayor political advantage $\tilde{\theta}_M$ is below the threshold $\overline{\theta} + \theta_{Tox}$.

Investment choices without a toxic debt shock.

To simplify the exposition, let us define $\overline{\theta} \equiv \lambda(I^V - I^P) - (D_O + I^V)^\gamma + (D_O + I^P)^\gamma = \lambda(\left(\frac{\lambda}{\gamma}\right)^{\frac{1}{\gamma-1}} - \left(\frac{\beta+\lambda}{\gamma}\right)^{\frac{1}{\gamma-1}}) + \left(\frac{\beta+\lambda}{\gamma}\right)^{\frac{\gamma}{\gamma-1}} - \left(\frac{\lambda}{\gamma}\right)^{\frac{\gamma}{\gamma-1}}$. We show below that when the net political advantage of the mayor, that we can define $\tilde{\theta}_M \equiv |X_m - X_C| - |X_m - X_M| + \theta_M - \theta_C$ (where X_m denotes the ideology of the median voter), is higher than $\overline{\theta}$, choosing $I^* = I^P$ for the mayor is a dominant strategy.

To see this, note that $\tilde{\theta}_M \geq \overline{\theta}$ implies $-|X_m - X_M| + \theta_M + \lambda.I^P - (D_O + I^P)^\gamma > -|X_m - X_C| + \theta_C + \lambda.I^V - (D_O + I^V)^\gamma$, and therefore $U_{m,M}(I^P) > U_{m,C}(I^V)$. As $U_{m,C}(.)$ is maximized in I^V, it follows that the mayor is elected if she chooses her preferred investment level I^P irrespective of the investment choice of the challenger.

Suppose now that $0 < \tilde{\theta}_M < \overline{\theta}$. We conjecture and check below that the Nash equilibrium has the following form: Challenger strategy: I^V; Mayor strategy: $I^* < I^P$ such as $U_{m,M}(I^*) = U_{m,C}(I^V)$.

To check whether these strategies form a Nash equilibrium, we show below that there is no profitable deviation for neither the challenger nor the mayor. In the candidate equilibrium above, note that the mayor wins the election with probability 1.

If challenger chooses investment below I^V or above I^V, in both cases, this reduces the utility of the median when voting for the challenger, and the challenger still loses the election with probability 1.

Turning to the mayor, first note that because $\tilde{\theta}_M > 0$, $U_{m,M}(I^*) = U_{m,C}(I^V)$ implies that $I^* > I^V$. If the mayor chooses investment below I^*, she still wins with probability 1 (as this increases even further the utility of the median voter when voting for the mayor), but this decreases the mayor utility (because $(\beta + \lambda).I - (D_O + I)^\gamma$ is increasing in I for $I < I^P$). If the mayor instead chooses investment above I^*, she loses the election (as then $U_{m,M}(I > I^*) < U_{m,C}(I^V)$), and the mayor utility drops. This concludes the first part of the proof.

Investment choices with a toxic debt shock.

Following the same steps as for the investment choices without a toxic debt shock, it is straightforward to show that: (i) when $\tilde{\theta}_M - \theta_{Tox} > \overline{\theta}$, the mayor chooses her preferred investment level $I^P - D_{Tox}$, and is elected with probability 1; (ii) when $0 < \tilde{\theta}_M - \theta_{Tox} < \overline{\theta}$, the mayor chooses I^{**} such that $U^{Tox}_{m,M}(I^{**}) = U^{Tox}_{m,C}(I^V - D_{Tox})$ (with $I^{**} < I^P - D_{Tox}$), and is elected with probability 1.

We are left to verify that the decline in investment following a toxic debt shock is larger in

politically contested municipalities, defined as those such that the mayor political advantage $\tilde{\theta}_M$ is below the threshold $\overline{\theta} + \theta_{Tox}$.

In the region in which the mayor advantage is larger, that is $\tilde{\theta}_M > \overline{\theta} + \theta_{Tox}$, investment declines from I^P to $I^P - D_{Tox}$.

To complete the proof, let us now show that the decline in investment following a toxic debt shock is strictly larger than D_{Tox} when $\tilde{\theta}_M < \overline{\theta} + \theta_{Tox}$.

First note that when $\overline{\theta} < \tilde{\theta}_M < \overline{\theta} + \theta_{Tox}$, investment declines from I^P to I^{**}, which is strictly larger than D_{Tox} as $I^{**} < I^P - D_{Tox}$. When $\theta_{Tox} < \tilde{\theta}_M < \overline{\theta}$, investment declines from I^* to I^{**}. Remember that I^* and I^{**} are respectively such that $U_{m,M}(I^*) = U_{m,C}(I^V)$ and $U^{Tox}_{m,M}(I^{**}) = U^{Tox}_{m,C}(I^V - D_{Tox})$. Now, using Equations (5.1), (5.3) and (5.4), observe that $U^{Tox}_{m,C}(I^V - D_{Tox}) = U_{m,C}(I^V) - \lambda D_{Tox}$ and $U_{m,M}(I^*) = U^{Tox}_{m,M}(I^* - D_{Tox}) + \lambda D_{Tox} + \theta_{Tox}$. It follows that $U^{Tox}_{m,M}(I^{**}) = U^{Tox}_{m,M}(I^* - D_{Tox}) - \theta_{Tox}$. Given that both $I^* - D_{Tox}$ and I^{**} are larger than $I^V - D_{Tox}$ and $U^{Tox}_{m,M}$ is decreasing in I for $I > I^V - D_{Tox}$, it follows that $I^{**} < I^* - D_{Tox}$, and therefore the decline in investment is following a toxic debt shock is strictly larger than D_{Tox} in that case.