PUBLIC GOODS UNDER FINANCIAL DISTRESS*

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Abstract

I study the effect of crises on local public good provision using a comprehensive, novel, archival panel data on U.S. cities and municipal bonds during the 1920s and 1930s. Unlike the modern status quo of countercyclical fiscal stimulus, the Great Depression provides a unique empirical laboratory to study the consequences of fiscal shocks. Cities issued vast amounts of debt to fund infrastructure projects and provide important public services during rapid urbanization in the early 20th century. The financial crisis during the Great Depression, however, quickly put an end to urban growth. I estimate the effect of financial leverage on municipal spending and investment and find a significant impact of pre-crisis debt on municipal austerity. I disentangle finance-driven from demand-driven mechanisms and find strong evidence of a significant negative impact of financial market frictions. Cities that were forced to refinance during the Depression drastically cut public expenditure, especially capital outlays and police services.

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1 Introduction

During economic recessions, local governments in the United States often face financial challenges, including declining revenues and increased demands for social services. In response, the U.S. federal government has implemented generous grant programs to provide assistance to these local governments (e.g., $350 billion Local Fiscal Recovery Fund during the Coronavirus pandemic). This intergovernmental countercyclical fiscal stimulus is a relatively new policy tool - before the New Deal in the 1930s, the involvement of the federal government in local affairs was limited to minor grants for vocational education, and cities were left to their own devices when recessions hit (Wallis (2000)). Since then, policymakers have operated under the assumption that a sharp contraction in local public spending, if left unabated, would have large negative direct and indirect consequences to the broader economy.

In this paper, I test this assumption and explore the effect of macroeconomic crises on American cities in a fiscally decentralized period of U.S. history: the Great Depression. The historical context, unlike the modern one, provides a unique empirical laboratory to study the consequences of fiscal shocks and offers an opportunity to derive unbiased quantitative estimates of municipal financial distress. By examining what happens when municipalities face the possibility of default without an implicit (or explicit) guarantee of stimulus from higher levels of governments, I shed light on the broader implications of financial distress and its impact during economic downturns.

Briefly, I find that financially constrained cities significantly and quickly implemented austerity measures in both service expenditure and capital investment. The urban growth in infrastructure that preceded the Great Depression was virtually halted as cities prioritized debt repayment. City councils defunded police and firefighting departments, neglected to maintain transportation networks, and cut education spending. Given the preponderance of evidence that these local public goods provide economic benefits to local economies, the costs of municipal distress were large.[1]

The specific channel I use to identify financial distress is public debt. The consequences of financial fragility during economic crises have been widely studied for both households and firms, and research has shown that the effects of financial crises are not evenly felt: highly indebted households and firms with fractured creditor relationships seem to bear the brunt of recessions (Chodorow-Reich (2014), Mian et al. (2013)). Yet, the impact of economic shocks on leveraged local governments has received much less attention, despite the vast size of the municipal bond market—$4 trillion as of

[1]Please see Glaeser (2013) for a comprehensive review of the research on the costs and benefits of urban local expenditure.

2021.[2] My setting, moreover, is particularly relevant as cities invested in infrastructure to accommodate the large influx of rural-to-urban migrants, and financial leverage increased substantially in the first decades of the 20th century (Figure I). As a result, the likelihood of financial distress rose once the Depression decimated the underlying tax base for local governments (real estate), financial markets were in turmoil, and intergovernmental transfers or stimulus could not prop up struggling cities. In a departure from prior work, I study public good provision in an empirical context in which highly indebted cities face necessary trade-offs between defaulting on financial obligations and providing local public goods.

(Figure I around here)

The historical context allows me to overcome two key challenges confronted by empirical research on modern-day cities. First, not only were local governments the main public service providers before and during the Depression, they were also largely independent from state and federal intervention before the New Deal. As a result, they had to react to the initial downturn of the Depression (1929 - 1933) without modern-day policy instruments such as fiscal stimulus.[3] Intergovernmental transfers, however, present an identification challenge to the study of city financial constraints because fiscal support from state and federal governments can smooth out economic and financial shocks. This paper overcomes this challenge by going back to the 1920s and 1930s.

Second, the systematic financial distress of cities experienced during the Depression is a historically rare but potentially devastating event, and studying it is particularly important to inform policy responses to future crises. In fact, recent research shows that the current financial health of municipalities in the United States is deteriorating (Giesecke et al. (2022)). In terms of an empirical laboratory, the Depression is close to ideal: cities neither experienced the economic shocks of Depression uniformly nor did they lever up equally during the first half of the 20th century, which creates across-city variation that enables me to study the causal effect of financial

[2]The existing literature has emphasized the importance of credit to governments, linking changes in a government's ability to borrow to its public services and investment provision. However, given that the majority of external financing comes from the municipal bond market—which has grown consistently in recent U.S. history—much of this research has paid particular attention to the role of credit *booms* that have made it easier for municipalities to access financing. On the other hand, direct causal evidence on the role of debt-driven financial constraints for local public good provision during a financial *crisis* is challenging to establish.

[3]Their failure to provide adequate support to the unemployed (a quarter of the labor force) is why the Roosevelt administration introduced a new fiscal regime centered around the Federal government, which included the transfers that are common today. The Federal Emergency Relief Administration provided over $500mil to states and cities in grants and loans, while the Works Progress Administration and the Social Security Act greatly increased the scope of the Federal government's involvement with unemployment and assistance. By 2006, transfers accounted for 38 percent of all local government revenues.

constraints on local public good provision. If the link between financial constraints and public good provision is significant, this should be observable in the most prominent financial shock of the 20th century. Importantly, however, the historical context does not limit the applicability of my results, as countries around the world operate under fiscally decentralized systems without significant federal government transfers (Stegarescu (2005)). Moreover, even though the current federalism in the U.S. relies on transfers, the fiscal arrangement between governments is ultimately a political choice that could change in the future, as it did in the past.

I construct a historical dataset from multiple novel archival sources on U.S. cities to investigate these questions. First, I digitize the *Financial Statistics of Cities* produced by the Bureau of the Census, which reports city revenue and expenses only for cities with a population of over 100,000 before and during the Great Depression. I expand the scope of this dataset by digitizing and standardizing annual financial transaction reports for the near-universe of cities with a population over 1,000 (770) in New York, Massachusetts, Ohio, Indiana, and California for the years 1924 - 1938. To my knowledge, these are the only states to report annual data on local public good provision during this time. The granularity of the data allows me to study specific spending programs at the city level (e.g., infrastructure) and directly control for observed federal and state government transfers originating, for example, from the New Deal programs. Furthermore, I observe both the amount of - and in some cases, the duration of - debt and total assessed property values, which I combine to construct financial leverage, my proxy for financial constraints. Finally, I supplement the city-level data by building a second database of over 28,000 municipal bonds contained in *Moody's Manual of Governments* in 1929, the primary source of information on government bonds at the time.

To measure variation in leverage, I exploit a channel that works through the cost side of a city income statement and the liability side of its balance sheet—the interest and debt channel—that has been largely ignored so far in the public good provision literature. Following the financial economics literature, I use four ways of measuring leverage before the Depression (Kaplan and Zingales (1997)). Hypothetically, there are numerous reasons why financial leverage is a good proxy for financial constraints in this setting. First, with falling tax revenues during the Depression, cities had to choose which expenditures to maintain and cut. One significant expenditure they faced was debt repayment and interest, which varied substantially across cities and whose significance rose in proportion with leverage. Second, highly leveraged agents are closer to defaulting on existing obligations and hence may be credit rationed by a recovering financial sector because of information asymmetries (Bernanke (1983), Stiglitz and Weiss (1981)). In fact, in the context of 1930s U.S.

cities, the leverage ratios I define below are the same ones used by state regulators and credit rating institutions to measure municipal creditworthiness and, thus, the price of credit. Lastly, as I describe in more detail in Section 2, municipal default before the establishment of Chapter 9 in the Bankruptcy Code was costly, and higher levered cities were closer to insolvency. Thus, city governments had to weigh the long-lasting repercussions of default with the consequences of short-run spending cuts.

To estimate the impact of leverage on local public good provision, I compare expenditure in more or less constrained cities before and after the onset of the Great Depression using a difference-in-differences framework. I find that municipalities in the 75th percentile of leverage saw a five percentage point decrease across service expenditures and a 15 percentage point decrease in capital investment relative to cities in the 25th percentile. These results are conditional on dynamic state effects, contemporaneous city revenue, and historical population trends. I then explore the impact on different types of public goods and on credit ratings, and I find a significant effect on police and firefighting spending, capital investment (outlays), and quantitatively smaller but significant effects on the other categories, such as health and sanitation. Finally, I find that highly levered cities, on average, received lower credit ratings than similar cities that went into the Depression with lower leverage. This result provides evidence that the cost of borrowing and issuing bonds was higher during the Depression for higher-levered cities, which may help explain why these cities spent less on infrastructure.

I then attempt to unpack leverage into two distinct mechanisms. The first is through a causal refinancing supply-side channel: greater leverage corresponds to more difficulty borrowing and more onerous refinancing burdens when credit tightens, causing a transfer of resources from public services to debt repayment. The second is through a non-causal demand-side channel: cities with high leverage may also have been the ones that started large infrastructure projects in pre-Depression years and thus would not have invested during the Depression years regardless.

I study the refinancing channel by exploiting the quasi-exogenous timing of bonds becoming due. The financial market crash of 1929 and the recession that followed led to a collapse of bond markets in the early 1930s (Hillhouse (1936)). As a result, municipalities could not easily issue new debt to repay the principal owed on bonds that were becoming due during this time. Cities with more of these outstanding bonds were plausibly more constrained in allocating revenue between debt service and public goods. These bonds, however, were primarily issued well in advance of the onset of the Depression such that the specific timing of these debt-repayment shocks was unlikely to be

driven by the demand for new investment during the Depression. Using newly collected bond-level data, I use the variation in the proportion of a city's debt issued *before* the Depression that was contractually obligated to be repaid *during* it as a proxy for financial constraints. The experiment thus compares public good provision in two similar cities that have different levels of potentially exogenous amounts of debt maturing during a specific window of time when a bad financial event occurred (Almeida et al. (2009), Benmelech et al. (2019)).

I find that cities with more debt maturing during the Depression curtailed public good provision on capital outlay (construction) and public service expenditure more than similarly leveraged cities that did not face the same financial shock. Specifically, roughly half of the baseline effect can be attributed to refinancing frictions. Furthermore, I find that cities in counties with banking panics during 1930-1933 implemented more severe austerity policies compared to those cities in counties where the banking sectors was not as damaged. This results suggests that financial intermediation costs for cities were large.

I then turn my focus on demand-side factors to disentangle debt-driven financial constraints from local demand for public goods. Using a wide array of proxies for local demand for public infrastructure, I find that the results for the early Depression period are not significantly attenuated when I exclude cities with plausibly low-demand. That is, unlike financing constraints, the investment cycles explanation cannot account for the steep and prolonged declines in urban growth during the 1930s, and especially not the persistent effect during 1934-1936. The demand for public services and investment—and the correlation between leverage and local demand—does not seem to explain the majority of observed effect of leverage on expenditure during the Great Depression.

This paper contributes to several strands of literature. First, the existing literature on financial constraints has extensively explored their impact on firm investment (Kaplan and Zingales (1997); Fazzari et al. (1988) and the implications for macroeconomic policy (Gertler and Gilchrist (1994); Bernanke et al. (1996)).[4] Yet, we know relatively little about the effects on municipalities, especially during financial market failures.[5] Most closely, my paper is related to Adelino et al. (2017) and Yi (2020) who study the effect of credit supply shocks on public good provision in the contemporary context in the United States. While Adelino et al. (2017) studies effects when municipal credit constraints are alleviated, this paper investigates them when constraints are tightened.

[4]Examples of research on financial constraints for firms during the Great Depression include Benmelech et al. (2019), Ziebarth (2013), and Lee et al. (2015). For evidence of financial constraints in the modern context, see, for example, Chodorow-Reich (2014) and Almeida et al. (2009).

[5]A notable exception is Cromwell et al. (2015), which describes the experience of Florida cities after the Great Recession, extrapolating away from any financial market frictions.

A priori, there is little reason to expect that these effects are symmetric during a crisis, especially considering the amount of federal and state government support that cities receive today. Complementary to the work on banking regulation changes that hindered modern U.S. municipal bond issuance by Yi (2020), I study municipalities during a financial crisis when local governments were largely fiscally independent from higher levels of government, which has important implications for empirical identification and policy design.[6]

Second, I contribute to the economic history literature of the public sector during the Great Depression in the U.S., which has primarily focused on federal programs stemming from the New Deal, such as the Federal Emergency Relief Administration and the Works Progress Administration (Fishback and Wallis (2012). This literature has found that Federal programs had a positive impact on retail consumption (Fishback et al. (2005)), in-migration (Fishback et al. (2006)), and crime reduction (Fishback et al. (2010)), among others. This paper is among the first to study how *local* governments responded to the Great Depression. Notably, I expand on the work on cities first introduced by Siodla (2020), who explores fiscal strain in the largest 93 U.S. municipalities during the Great Depression. While that work explains fiscal strain on city budgets using tax delinquency and debt, the focus of this paper is isolating debt-driven financial constraints from demand-side factors across a heterogeneous cross-section of cities by utilizing new and comprehensive data on local public goods and municipal bonds during the 1920s and 1930s.

Lastly, this paper also adds to the broader literature on urban public economics and local economic development in the U.S. during the first half of the 20th century. Specifically, this literature has found large positive effects of local urban infrastructure investments on public health (Ferrie and Troesken (2008); Cutler and Miller (2005)), large spillovers on private economic activity (for example, Kline and Moretti (2014)), and a strong connection between residential construction and the rise of municipal debt (Gunter and Siodla (2018)). I extend this literature by showing how financial shocks originating from the financing arrangements of these infrastructure initiatives at the local level contributed to lower public good provision during the Depression.

The rest of the paper is organized as follows. Section 2 describes the historical context and institutional details of local public good provision in the first half of the 20th century. Section 3 then describes the construction of the dataset. Section 4 tests whether financial leverage drove public

[6]For example, the Covid-19 crisis has decreased local revenues and increased demands on health, education, and other services during the pandemic, which led to the creation of the $500 billion Municipal Liquidity Facility (MLF) by the Federal Reserve in April 2020. Policymakers recognized that funding pressures and disruptions in credit markets might adversely impact municipalities and pledged to act as a lender of last resort.

goods spending cuts after the onset of the Great Depression using a difference-in-differences design. Section 5 explores the mechanisms. Finally, section 6 provides concluding remarks and goals for future research.

2 Historical Background

This section describes the institutional setting of public good provision and debt in the U.S. during the first half of the 20th century. The period from 1900–1940 represents a crucial inflection point in the economic development of the U.S. economy. Before the Great Depression and the World Wars, local and state governments were the primary taxation authorities and largest public spenders. The transition from a fiscal system dominated by local government to one of local-state-federal cooperation was characterized by the federal government raising revenue through new sources (individual income, excise) and distributing taxes back to states and localities (Wallis (1984)).

Local governments. Since the mid-19th century, local governments - e.g., cities, counties, and school districts - have undertaken infrastructure projects in education, roads, and public utilities. Cities also invested in police and firefighting departments, built publicly-funded hospitals to care for the poor, and constructed jails and public libraries. As a result, local government, not the federal government, became the largest public spender (and debtor) in the U.S. Using data from the Historical Statistics, Figure A.3 plots the share of non-military spending by level of government in the United States from 1900 to 1970. Before 1932, the relative shares for each level were roughly 50 percent local, 25 percent state, and 25 percent federal. After 1940, relative shares were approximately 10 percent local, 5 percent state, and 85 percent federal. A significant driver of increasing federal government expenditures was public relief programs instituted by the New Deal (e.g., Social Security), though most were administered alongside state and local governments, such as the Federal Emergency Relief Administration (FERA) and the Works Progress Administration (WPA).

Municipal debt. Using data from the Commercial and Financial Chronicle, Figure I plots the average annual municipal bond sales for the interwar period. The yearly average municipal bond sales in the 1920s stood at the unprecedented height of $1.1 billion, while the preceding ten-year average was $417 million. Three key factors trace this expansion of public infrastructure

First, the first four decades of the 20th century are referred to as the "high-school movement" due to the substantial rise in enrollment in secondary education from 10 percent in 1900 to 70 percent by 1940 (Goldin and Katz (1997)). The increase in schooling necessitated the construction of schools and investments in equipment to furnish them. To finance these construction projects, cities and school districts issued bonds, which were eagerly bought by wealthy private individuals and state savings banks due to regulatory limitations on fiduciaries and tax exemption (Brown (1922)). Second, significant rural-to-urban migration led to increased urban density and a surge in demand for new investments in electrification and sanitation: power plants, sewers, and water supply systems. Third, the rise of the automobile and the beginning of the suburban migration in the latter part of the period led to the construction of paved roads and public transportation systems.

Whether or not the local debt boom in the 1920s was consequential for cities during the Depression is the first question of this paper. Qualitatively, the narrative evidence from this period shows that contemporary observers understood the risks cities were taking. For example, on Dec. 4, 1922, the *Wall Street Journal* stated that "the consequence will not come today or tomorrow, but we shall see a number of bankrupt townships and counties before we are many years older, as an incident of the next spell of bad times. The thing is as certain as tomorrow's sunrise. The real estate values on which the present taxes are assessed are for the most part grossly inflated." Unlike firms that can cut losses and exit the market due to macroeconomic shocks, municipalities cannot be liquidated or sold to private investors. However, they can lay off public workers and severely limit services when faced with financial constraints, a warning issued by economists at the time (Upson (1935)).

City choices. There are several reasons why a local jurisdiction would prefer cutting local public good provision over defaulting on its debt. Before the establishment of Chapter 9 of the Bankruptcy Code in 1937, the process of defaulting was costly and time-consuming. In general, creditors first needed to obtain a "writ of mandamus" ruling from a state or federal court. A judge first needed to check the legitimacy of the defaulting bonds, then issue a judgment, after which a creditor could petition public officials to levy and collect a tax sufficient to pay the judgment. If a city refused to pay, bondholders would organize and sue the defaulting city.

Depression Defaults. Default is one possible outcome of financial distress. In this paper,

I use the default data collected by Joffe (2012) to explore whether financial leverage impacted local public goods above and beyond any unobserved default provisions that may have imposed austerity on local governments. What follows is a brief discussion of municipal defaults during the 1930s - for a more in-depth discussion about the geographical distribution and drivers of default, I refer the interested reader to Joffe (2012).

According to the most recent estimates, the Depression caused over 4,800 municipal bond defaults during the 1930s (Fons et al. (2011)). Property tax revenues fell due to a slump in the housing market and tax delinquency[7] Additionally, the early 1930s was a period of organized tax revolts (Beito (1989)) in addition to banking panics that induced default for cities holding funds in a suspended or failed bank.[8] Finally, as predicted by observers in the decade prior, local officials were faced with sizable municipal bond repayments that were typically scheduled to mature all at once. This maturity problem was especially acute for cities that expanded in the decades prior to the Depression by financing infrastructure investment with long-term bonds that became due during the Depression.[9]

Much of what we know about municipal defaults during the Great Depression comes from the work of Joffe (2012), Hempel (1964), and Hillhouse (1936)[10]. In his research, Joffe collects information from a weekly newspaper called the *Bond Buyer* over the 1930s, and aggregates reports of governments struggling to meet principal or interest payments. He focuses on cities, counties, and special districts in nine states (NC, FL, NJ, AR, LA, SC, MI, OH, CA) and finds that default was driven by revenue shocks when debt service costs were high.

Importantly, once a city was sued for default, it was effectively barred from accessing capital from regulated asset-managing fiduciaries such as insurance companies and state savings banks. Many state regulators produced lists that named firms or public entities in which these institutions could invest. According to Hillhouse (1936) (pg. 419) , a default "may cause a loss of this favored status for fifteen or twenty-five years, thereby materially narrowing the market for future bond issues. Thus, when one large city of the Southwest defaulted in 1898, and again in 1904, it was withdrawn from New York State's legal list and was not reinstated until in the late 1920s." Thus, a

[7]For example, according to Dun and Bradstreet (1936), the delinquency rate in Detroit rose from 10.8 percent in 1930 to 34.8 percent in 1933.

[8]A 1933 survey of over 1,200 state, city, and county financial officials found that half had funds in closed banks (Faust (1934))

[9]Some cities set aside revenue in "sinking funds" to meet these large balloon payments. However, these funds typically invested the cash in assets that later declined in value during the Depression, so many governments could not roll over maturing issues.

[10]I thank Marc Joffe for sharing his default data and knowledge.

city in distress had to decide between losing access to capital markets for the long run or reducing public goods in the short run.[11]

3 Data

I begin by describing the main features of my novel, annual data on municipal finances during the 1920s and 1930s. Overall, the dataset contains over ten thousand observations on revenue, expenditure, and debt across 850 cities between 1924–1938. In 1930, over 44.7 million people lived in these cities - roughly 64.7% of the U.S. urban population. The median population is about 8,000, and the average number of observations in my panel is 13.3 years. Unless otherwise noted, I deflate all dollar figures using the Consumer Price Index (Federal Reserve Bank of Minneapolis (2020)).

I digitize and standardize municipal financial statements from various state agencies for Massachusetts, New York, Indiana, Ohio, and California. To the best of my knowledge, these five states are the only ones that produced annual statistics for municipalities before, during, and after the Great Depression. While all states report statistics on revenue sources, expenditures, and debt levels, the granularity varies by state. For example, Massachusetts (highest quality) reports taxes collected by source (property, corporate, personal income), while Indiana (lowest quality) aggregates all taxes into one category. Within states, the reporting is constant over time. California and Ohio report detailed expense categories (e.g., administrative wages vs. inspection services vs. police officer wages), and one state, Massachusetts, reports a detailed account of new debt issues and bond retirements. In all cases, the reported figures are actual payments and receipts reported after the conclusion of a fiscal year. Please see Appendix C for more information on these reports. Summary statistics are shown in Table I, Panel A.

(Table I Panel A around here)

I complement the above dataset by digitizing reports from the U.S. Bureau of the Census. The Census has been collecting data on large cities (with a population over 100,000) since 1905 and publishing statistics in reports called *Financial Statistics of Cities*.[12] Before 1931, this report also covered all cities with a population of over 30,000, but the reporting was curtailed after federal

[11] According to Hillhouse (1936) (pg. 427), the prospect of higher taxation post-default was yet another factor that discouraged it: "It is natural that private capital should avoid communities in which local governments are in financial troubles, since this usually means that there has been mismanagement of local governmental affairs and that property is subject to heavy tax burdens. It also serves as a warning that if creditors are successful in litigation, property may be subject to levies to pay judgments."

[12] These reports are available from the digital library maintained by the Federal Reserve Bank of St. Louis (FRASER).

budget cuts during the Great Depression. In all, data on 93 cities is available for all years in my sample period. In cases when a city from this source is duplicated in the State documents (e.g., Boston appears in both the Census and MA State documents), the statistics from the Census are used.

I then merge my dataset with the default data collected by Joffe (2012). From his database of approximately 5,000 defaults, I keep defaults of city general bonds, city sewer project bonds, city toll bridge bonds, city waterworks bonds, and school districts bonds between 1930 and 1937. I create two binary variables: the first (*default-city*) takes the value of 1 if the city defaulted on its general obligation bonds (e.g., City of Chicago) and zero otherwise, and the second (*default*) takes the value of 1 if the city or any of the special districts within it (e.g., Chicago Park District) reported a default.

Next, I hand collect bond-level data from *Moody's Manual of Governments* for 1929. The *Manual* was sold to retail investors in the U.S. and contained quantitative security-level data, a qualitative review of major industries in a city, and Moody's credit rating. The advantage of this source is that it provides detailed information on the debt structure, such as past borrowing behavior and future repayment structure, which is useful for isolating mechanisms, as I describe in more detail in Section 5. Concretely, this data allows me to see that the city of Chicago issued a 4% bond in 1920 with an outstanding balance of $50,000 that was left to be repaid annually in 1936–1950. In total, the data contains information on close to 30 thousand bonds outstanding across 316 cities in 1929. Summary statistics are shown in Table I, Panel B.

(Table I Panel B around here)

Finally, I use city and county-level characteristics from various other sources to complement the analysis: city-level population from the Decennial Census (U.S. Census Bureau), county-level bank suspensions between 1930 and 1933 from the Federal Deposit Insurance Corporation (FDIC), newly digitized building permits data of the number and value of public construction projects for the 260 largest U.S. cities during 1921-1929 from the Bureau of Labor Statistics, and county-level New Deal spending from Fishback et al. (2003). Summary statistics are shown in Table I, Panel C.

(Table I Panel C around here)

Figure II shows how total service expenditure (all besides outlay), non-welfare service expenditure (all besides outlay and welfare), outlay expenditure, and welfare expenditure evolved

over the sample period, in real dollars. The figures were normalized to have a value of 1 in 1930. Peak nominal spending occurred in 1929 while the peak real per-capita spending peaked in 1933, followed by steep declines by 1934. Notably, the most severe and immediate drop in spending was in capital outlays. On average across all cities, construction spending decreased by 60 percent from 1929 levels. Across city size, I observe that construction spending declined to zero by 1935 in 25 percent of small cities that reported any construction spending in 1930. City officials also curtailed current (non-capital) non-welfare expenditures, but less drastically and later in the 1930s. Police and firefighting protective services declined by 20 percent, government expenses by 10 percent, and health department payments by 15 percent.

(Figure II around here)

4 Leverage and Expenditures During the Great Depression

I define municipal financial leverage in four complementary ways. I discuss the limitation of each measure and how each can, theoretically, proxy for unobserved city fundamentals and creditworthiness. Using a simple regression framework, I explain the cross-sectional variation in pre-Depression leverage and find that differences can be mostly attributed to historical, long-run differences in investment and repayment. I then discuss my empirical approach that uses these measures to compare local public good provision across levered and unlevered cities before and during the Depression. I conclude this section by examining the association of leverage, the Depression, provision of various local public goods, and credit ratings.

4.1 Municipal financial leverage

Leverage is the relative amount of debt to equity used for amplifying returns on investment, and it is one of the most important factors in lending and investment decisions. In the municipal context, debt is relatively straightforward: cities issue bonded debt (long-term) that is repaid over twenty to fifty years but also borrow from banks to meet short-term needs, typically within the same fiscal year. What is less straightforward, however, is quantifying municipal equity or assets. The goal of this paper is to investigate the robustness of the relationship between leverage - broadly defined - and local public good provision. It is not, however, to adjudicate the appropriateness of any one measure.

I use four complementary, albeit correlated, leverage measures: (1) bonded debt to assessed

property values[13], (2) total debt (bonded plus short-term debt) to total city revenue, (3) interest expense to tax revenue, and (4) total debt per capita. On the financing side, all of these ratios evaluate a city's ability to repay existing debt and determine the riskiness of new debt, depending on the debt-repayment income stream: ratio (1) uses the property tax base, (2) uses total city revenue, (3) uses only tax revenue, while (4) uses population. All four measures are considered by credit rating agencies as valid leverage metrics. All four are imperfect - for example, assessed property can be manipulated by assessors who are biased employees of the city - but, taken together as a whole, they paint a picture of the financial condition of a city. In fact, all four measures are strong predictors of municipal bond default during the Depression, as shown in Table II.

(Table II around here)

Figure III plots the distribution of leverage measures in my sample at the end of fiscal year 1929. All four are highly skewed to the right. The average city has 4 percent of property values outstanding as bonds, 12 percent of revenue going towards interest expense, debt that equals 1.53 times the annual revenue, and 60 dollars (1961) in debt per capita.

(Figure III around here)

4.2 What determines municipal leverage?

The variation in municipal leverage is, mechanically, a function of the history of debt issued/repaid, contemporaneous asset values (or assessment of thereof), and taxation levels. In turn, the amount of debt issued is constrained by state constitutional limitations - which change infrequently - and the amount of capital outlay, while debt repaid is determined by the maturity structure and the interest rate. By 1929, what is the relative importance of each factor in explaining pre-Depression leverage?

(Table III around here)

Table III decomposes the variation in 1929 leverage to available covariates in my data. To ease interpretation, the covariates were standardized to have a mean zero and a standard deviation of one. The two best predictors are state fixed effects (column 1), which explain 17 percent of the variation in leverage, as well as differences in historical leverage (columns 5 - 8), which account

[13]This exact measure was used in some states (in theory) to prohibit cities from issuing more debt after it reached a certain level. However, exemptions were frequently given, and this cap was rarely binding. For more, see Chamberlain (1928).

for 30 percent. That state fixed effects explain a sizable portion of the variation in debt levels is not surprising for a number of reasons: state-level regulation varied on the amount and the way in which cities could issue deb, the municipal securities that savings banks and insurance companies could invest in, and the spatially concentrated nature in which the states urbanized across the 19th century. That leverage is highly persistent within cities is consistent with the fact that the average bond in my sample was issued in 1918. Since cities issue debt to finance outlays, it is also no surprise that the difference in the total sum of outlays (column (4)) in the five-year interval between 1924-1929 also explains an additional 15 percent of the variation by 1929. Differences in contemporaneous asset valuations, surprisingly, do not additionally explain the variation in leverage. Unobserved historical bond repayment must, by construction, account for the remaining 34 percent of the variation in pre-Depression leverage.

There are two different mechanisms through which leverage can be associated with public good provision during a crisis. The first is through a causal refinancing supply-side channel: greater leverage corresponds to more difficulty borrowing and larger refinancing burdens when credit tightens, causing a transfer of resources from public services to debt repayment. The second is through a non-causal demand-side channel: cities with high leverage may also have been the ones that started large infrastructure projects in pre-Depression years and thus would not have invested (or continued investing) during the Depression years once projected population growth did not materialize. Before discussing the relative contribution of each channel, I first investigate whether leverage was associated with different policies during the Depression.

(Figure IV around here)

Figure IV offers a first-pass assessment of whether leverage is related to public goods provision during the Depression. I compute the debt to revenue ratio in 1929 for each city and separate the sample into those that are in the top ("High Leverage") or bottom tercile ("Low Leverage"), and standardize expenditure in each group relative to the 1928 average. This figure shows no differences in public service expenditure (e.g., wages paid for police, sanitation, and health departments) or long-term infrastructure spending (e.g., roads) across the two groups of cities from 1925 to 1929. However, beginning in 1930, cuts to both types of public expenditure in "High Leverage" cities surpassed those in "Low Leverage" cities. By 1936, the gap between these city types widened to over 20 percent in both service and capital outlay expenditure.

4.3 Empirical approach

To systematically test the significance of the patterns in Figure IV, I utilize the panel structure of my data and use a difference-in-differences research design with three periods:

$$y_{it} = year_t + city_i + \theta X_{it} + \sum_{j \neq 1928} \beta_j \times period_{j \in t} \times leverage_{29,i} + \epsilon_{it} \tag{4.1}$$

The coefficients of interest are β_j, representing the average marginal change in spending outcomes in high vs. low leverage cities during three periods: j = 1926-27 (pre-period), 1929-1933, and 1934 - 1936, with 1928 serving as the omitted reference time period. Here, t denotes the year, and i the city. The variable $leverage_{29,i}$ is a continuous measure of 1929 financial leverage, defined as the per-capita bonded debt to assessed property value, total debt to city revenue, interest expense to tax revenue, or total debt per capita. The dependent variables are log per capita city-level outcomes. The regressions are estimated using OLS for all service expenditure outcomes. Due to zero capital outlays in some cities, I estimate capital outlay regressions using Poisson pseudo-maximum likelihood. The fixed effect $city_i$ captures time-invariant city-specific variables that could also affect average spending levels (e.g., geographic location), while $year_t$ captures time-varying macroeconomic shocks that do not vary by city (e.g., monetary policy). The regression uses the sample period (1924–1936). In my preferred specification, control variables in X_{it} include a set of data source-by-year (state-by-year for cities under 100 thousand in population and one for cities above 100 thousand) fixed effects to account for known regional dynamics of Depression severity (Rosenbloom and Sundstrom (1997)), contemporaneous and lagged non-debt revenues to account for both the economic Depression shocks and the inter-temporal budgeting process of municipalities, log city population in 1930 interacted with year fixed effects as well as the change in log city population between 1920 and 1930 to account for heterogeneous effects correlated with city size and past growth. I cluster all standard errors at the city level.

A causal interpretation relies on the assumption that differences in public good provision would have been the same across cities with different financial leverage in the absence of the Great Depression, and that financial leverage was more or less randomly assigned by the eve of the Depression. One testable implication of the first assumption is that provision was evolving similarly immediately before the Depression, and the estimated coefficients on the pre-period interaction term in Equation 4.1 should reveal if that was indeed the case. Regarding the second, this section reports the results after controlling for state-level trends and city-level population growth dynamics that

determine a large, predictable portion of the variation in financial leverage, which leaves a plausibly random portion of the variation that is due to long-run debt issuance. However, in section 5, I consider an explicit quasi-random assignment of cashflow shocks based on bond-level information.

4.4 Baseline Results

4.4.1 Leverage and revenue

I begin by presenting the relationship between financial leverage and the amount of revenue - by type - collected before and during the Depression. Consistent with a financial frictions narrative, I find that highly levered cities significantly reduced revenue coming from debt issuance after the Depression started. However, I find no evidence that these leverage constraints limited cities in the amount of local taxes or total non-tax revenue they collected.

(Table A1 around here)

Each column of Table A1 shows the results when the outcome variable is log per-capita intergovernmental transfers ("IG"), debt receipts ("debt")[14], local tax revenue ("tax"), and total non-debt revenue ("total"), which includes local tax revenue and commercial city revenue. Each specification controls for population trends interacted with year as well as data-source by year fixed effects. Columns "debt" paint a consistent picture across all measures of financial leverage: cities in the 75th percentile of leverage reduced their debt-related receipts by 30 percent relative to those in the 25th percentile during both the initial downturn and the second phase of the Depression. Clearly, with this sudden shock to the ability of these municipalities to access financial markets, budgets and expenditure had to be re-adjusted. I explore the adjustments on the provision side in the following section.

4.4.2 Leverage and expenditure

I first describe the baseline results using the four leverage measures for all cities in the sample. Table IV presents the OLS regression results when the outcome variable is the log total per-capita public service expenditure (Panel A) and the Poisson pseudo-maximum likelihood estimates when the outcome is per-capita capital outlay. The specification in column (1) includes no covariates besides year and city fixed effects. Specifications (2) and (3) control for population trends - popupation and population groups (less than 10k, 10k-100k, and 100k+) in 1930, population growth in

[14]Dis-aggregated revenue data is not available for every city and the sample size decreases in some columns.

the 1920s - while specification (4) further controls for total non-debt per-capita revenue and lagged total non-debt per capita revenue. Specification (5) adds Census region by year fixed effects while specification (6) adds data source by year fixed effects. I report the coefficients of interest (leverage x period) in the first three rows.

Across all specifications, I do not observe statistically significant pre-trends across cities at different leverage levels. However, once the Depression hits, the results show a divergence in spending and investment, regardless of which leverage measure is used. Columns (6) through (9) show that one standard deviation in leverage is associated with a 1.5 log point decrease in annual service expenditure in the early Depression period and a 2.5-3 log point decrease in the later period (1934-36). Said differently, a city in the 25th percentile of financial leverage going into the Depression spent 2.2 percent more on local public good provision during the first four years of the Depression (1929-1933) and percent more in the second half of the Depression (1934-1936) relative to a city in the 75th percentile.

(Table IV around here)

The results for capital outlay in Panel B are even starker. Again, across all specifications, I do not observe that highly leveraged cities invested more immediately prior to the Depression, conditional on the covariates described above. Columns (6) through (9) show that one standard deviation in leverage is associated with a 15 log point decrease in annual outlays, or roughly 30 percent of the average outlay decrease, in both the 1929 - 1933 and 1934 - 1936 periods.

The average effects presented so far, however, mask large heterogeneity across the different levels of leverage. In Figure A.1, I present the results when *leverage* takes on four discrete values: no debt, and three terciles of leverage. The omitted baseline category is the lowest tercile. While "No debt" cities increased their spending relative to just the first tercile, the largest negative impacts occur for the cities in the 3rd (highest) tercile - the estimates are roughly double in magnitude of the average found in Table IV.

4.4.3 Composition of public goods and cost of capital

I next explore the effects on different types of spending, and I show that large negative effects on capital outlays - infrastructure spending - coincide with an increase in the cost of borrowing for highly indebted cities during the Depression.

The granularity of my dataset allows me to investigate the effect by type of public expenditure. Figure V plots the estimated coefficients from Equation 4.1 as an event study, where each

period is a year and leverage is debt to revenue in 1929. The largest leverage-induced decreases in expenditure appear in capital outlays, payments for police and fire departments, as well road and highway expenditures. Consistent with the aggregated results from the previous section, there is little difference in the pre-Depression trends for these variables, even at the annual level. After the onset of the Depression, spending on the maintenance of roads and highways and police budgets decreased by approximately 6 log points per standard deviation in leverage, annually.

(Figure V around here)

Returning to the large effects on infrastructure, I find that highly indebted cities also saw their cost of capital increase relative to other cities, which helps explain why their investment was disproportionately lower. I examine the effect of leverage on a city's cost of capital by using credit ratings as a proxy. Credit ratings, now and historically, correlate closely with the cost of issuing municipal bonds. I use annual ratings from the *Moody's Manual of Governments* from 1929 to 1939. The ratings range from AAA (best) to CA (worst), which I transform into numerical values by assigning 10 to AAA and subtracting 1 for each level below AAA (AA = 9, A = 8, etc.). Figure VI plots the average Moody's rating for the first (low leverage) and third (high leverage) terciles of the debt-to-revenue ratio. The vast majority of cities in both groups were AAA rated before the Depression, but starting in 1933, there was a divergence between the two groups. By 1936, low-leverage cities were 0.8 ratings above high-leverage ones.

(Figure VI around here)

I conduct a series of robustness checks to alleviate several concerns. The first concern is that court-imposed austerity measures on defaulted cities - and not financial frictions across highly indebted cities - are driving the observed patterns. I exclude cities that officially were in "default" at any point during 1930-1937 and the main results do not change. The second concern is about the continuous nature of the leverage measures and possible nonlinearities. Using a discrete above and below median leverage indicator, however, does not change the interpretation of the main findings. The third concern is about the different sources of data used in the sample. Yet, the results hold when I exclude sources of data one by one - the results are not driven by any one particular source. The details can be found in Tables A2, A3, and A4.

4.4.4 Takeaways

To summarize, I find strong evidence that financially constrained cities cut public good provision during the Great Depression. This relationship is robust across different measurements of leverage and appears after, but not before, the onset of Depression. What are the underlying mechanisms that would explain this behavior?

5 Mechanisms

In this section, I explore the relative importance of the two different mechanisms through which leverage can be associated with public good provision during a crisis: a causal refinancing supply-side channel and a non-causal demand-side channel. Simply put, the concern with the latter is that demand and prior investment can be negatively related (investment cycles), even in the absence of a financial crisis. I first present evidence showing that plausibly exogenous refinancing shocks are the main drivers of expenditure adjustments during the 1930s. I then use a multitude of tests to exclude low-demand cities from the sample and find that the demand channel, though pertinent to some degree in the early 1930s, cannot explain much of the persistent effects after 1933.

5.1 Leverage and refinancing debt

I unpack financial leverage into short-run vs. long-run cashflow shocks and present direct evidence that the inability to refinance debt during the Depression was a key determinant of the results found in Section 4. I do so in two ways. First, I forecast the expected bond repayments and show that the leverage effect loads significantly on cities that had to refinance a large share of their debt portfolio during the financial crisis. Second, I find larger effects in cities that had more short-term debt on their balance sheets as compared to those with little short-term debt in counties where at least one commercial bank failed.

To isolate the impact of long-term debt-driven financial constraints, I take advantage of the quasi-exogeneous maturity structure of local debt when cities issue long-term bonds that expire at different points in time (e.g., 5, 10, 30, and 50 years). This phenomenon not only permits a deconstruction of financial leverage into cashflow shocks at different points in time, but it also provides two advantages for identification. First, while debt issuance around 1930 may be endogenous to outcome variables in the 1930s, debt issued 10 or 20 years prior to the Depression is plausibly less so. For example, a city planning to refinance a 20-year bond issued in 1911 would find it difficult

to do so in 1931 with the financial markets in turmoil. Second, the choice of bond duration is related to market norms, and the quantity borrowed and is typically determined at the state or national level, which alleviates local endogeneity concerns (Chamberlain (1928)). In fact, I do not find any difference in historical bond interest rates between cities with more or less debt becoming due during the Depression, a point I return to in the next section.

I utilize the difference in the maturity structure of each city's bond portfolio to identify plausible exogenous shocks by merging my city-level panel of local public good provision with novel bond-level data. Specifically, I collected the "Schedule of Bonded Debt" information from *Moody's Manual of Governments* in 1929. For each bond listed, the data includes the year the bond was issued, the year it matured, the amount outstanding in 1929, the interest rate, and the bond's purpose (e.g., road construction). In total, the *Manual* contains information on over 28 thousand bonds across 316 cities in my sample. Summary statistics are in Table I, Panel C.

In order to minimize measurement error arising from using two different historical data sources, I aggregate the amount outstanding of bonds listed in $Moody's$ to the city level and compare the totals to the balance sheet data in 1929, and keep only those cities where the bonds listed cover at least 90 percent of the total debt reported. I further trim the sample to those cities where the reported total bonded debt is within 20 percent of the sum of outstanding bonds reported in $Moody's$, ensuring that forecast cash-flow repayment shocks are close approximations of the actual ones faced by cities during the first half of the 1930s. More information regarding validating bond-level data appears in Appendix D.

5.1.1 Repayment forecasts

I produce forward-looking estimates of long-term bond repayment during a "bad state" in the future, which serves as my proxy for debt-driven, short-run financial constraints. Concretely, I define a "shock" measure as the fraction of total bonded debt that matures in 1930—1935.

$$shock_{30,j} = \frac{\sum_{t=1930}^{1935} \sum_{\forall i \in j} repay_{i,t}}{\text{Total Debt}_{29}} \tag{5.1}$$

where $repay_{i,t}$ is the estimated repayment for bond i for city j in year t.

To alleviate concerns regarding systematic differences, I first present evidence that cities below and above the median of the $shock_{30,j}$ variable were similar in many respects. Table A5 displays the average population, revenue, property values, local public good expenditure, and bond

interest rates in the 1920s for these two groups of cities. Those with above-median values are slightly smaller, but are otherwise not significantly different from those in the below-median group. Crucially, there is no difference in historical borrowing costs as proxied by the interest rates for 1920s bonds. That is, the $shock_{30,j}$ variable is not picking up systematic differences in risk - and thus prices - in these securities that could otherwise be indicative of unobserved differences driving the results of the effect of leverage on local public good provision.

To illustrate the identifying variation of this strategy, Figure VII plots the average repayment over time by quartile of $shock_{30,j}$. Cities in the largest quartile were obligated to repay between 5 and 12 percent of their debt per year in the early 1930s and less in the 1940s and 1950s (solid red triangles), while those least affected maintained a steady 3–4 percent per year throughout 1930–1950 (solid circles). In essence, the empirical strategy compares outcomes in cities that had maturing schemes that resembled the red and orange lines (concentrated during the Depression) with those that resembled the green lines (evenly distributed).

(Figure VII around here)

To isolate the plausibly exogenous portion of leverage, I multiply each of the leverage measures by $shock_{30,j}$ and call the resulting measures $moodyleverage$. This leads to the following modification in my main specification:

$$y_{it} = year_t + city_i + \theta X_{it} + + \sum_{j \neq 1928} \omega_j \times period_{j \in t} \times moodyleverage_{29,i} + \epsilon_{it} \tag{5.2}$$

The coefficients of interest are now ω_j, which represent the marginal change in spending outcomes in high vs. low "shocked" cities as proxied by the value of bonds maturing during 1930-1935.

Table V presents the results using bond repayment shocks where the outcome variable is per-capita capital outlay expenditure, estimated using Poisson pseudo-maximum likelihood. Column (1) reproduces the baseline results using the non-shocked measures within the sample of cities with $Moody's$ data. Column (2) reports the estimates when *both* leverage and moody-leverage measures are used in the same specification. Columns (3) - (6) show the results when only the other shocked leverage measures are used. As before, control variables include population, population growth, total non-debt revenue, and data-source by year fixed effects.

(Table V around here)

Across all specifications, the standardized coefficients for moody-leverage account for a significant portion of the leverage effect found in the baseline results. In fact, the standardized moody leverage coefficients are roughly twice as large as the standardized measures on just leverage when both are included in the specification, as in column (2). The significantly large moody-leverage coefficient is consistent across the three other leverage measures: one standard deviation in moody leverage resulted in a 12-15 percentage point drop in investment during the 1930s. In all, these results indicate that re-financing constraints during the Great Depression played a large role in municipal capital investment during the Depression.

5.1.2 Leverage and local banking conditions

Accessing bond markets was not the only type of refinancing risk faced by cities during the Depression.When local banking conditions deteriorate, cities may struggle more in securing non-tax revenue if refinancing was, in fact, an important channel of local public expenditure. I investigate whether the municipal leverage effect was stronger in counties that experienced a worse banking panic in this section. I find that the interaction between panics and leverage is significant in the post-1933 period: highly leveraged cities located in counties with banking panics reduced their capital outlay expenditure by 15 log points more than leveraged cities elsewhere.

I use two proxies for county-level banking panics during the Depression. The first comes from newly digitized county-level data on national-chartered bank balance sheets from the Office of the Comptroller of the Currency annual reports for 1929 and 1931.[15] I compute the log change in county-level loans (median = minus 8 percent) and create a binary variable taking the value of 1 if the city in my sample was in a county with below average loan growth ("loan decline"). Second, I use county-level level data from the FDIC on the amount of all banking deposits that were suspended between the years 1930 and 1933. Similarly, I construct a binary variable "bank failure" that takes the value of 1 if city was located in a county with above-median share of 1930 deposits in suspended banks in those four years.

I estimate a triple difference-in-differences specification by interacting this variable with the leverage and period dummies as in Equation 4.1. Table VI report the estimated coefficients where the outcome variable is per capita capital outlays, estimated using Poisson pseudo-maximum

[15] County level reporting in these annual reports stops in 1931.

likelihood as in the baseline case. Across all leverage measures, the results show that the post-1933 interaction between pre-Depression leverage and banking panics was a significant contributor to municipal capital outlay decline.

(Table VI around here)

Admittedly, city default can lead to bank failure, and thus differences in findings based on local banking conditions can be driven by reverse causality. However, two pieces of evidence suggest that bank failure hampering the ability of a city government to repay or obtain new credit is the main direction. First, according to evidence from the 1930s, refinancing of short-term obligations during periods of bank failure was a salient issue for city governments. Using a survey of over 1,000 governments, research has found that slightly more than half of state, city and county units had funds in closed banks as of 1933 (Faust (1934)). The municipalities surveyed had a total of over 98 million dollars deposited in failed banks, with an estimated aggregate balance for all governments between 400 and 500 million total - roughly 2 percent of all principal outstanding. Second, according to bank-level evidence of bank failures compiled by Richardson (2007), depreciation of bond values caused bank suspension in only 24 percent of cases - combined with the fact that municipal and state bonds accounted for 10 to 15 percent of all bonds and securities held by national and state commercial banks, it is unlikely that municipal defaults played a large role in bank failures.[16]

In summary, I find strong evidence that refinancing of both long-term bonds and short-term working capital bank loans was an important channel through which leverage affected municipal expenditure during the Depression.

5.2 Leverage and demand

The second mechanism through which financial leverage can be associated with provision is the non-causal demand-side channel. This channel can be especially strong in the case of infrastructure investment: because they had already completed these investments in prior years, it was easier for highly indebted cities to cut infrastructure spending when their financial situation worsened. That is, high-leverage cities were also the ones who did not plan on investing more in the 1930s *regardless* of the Depression and the ensuing cuts to public spending.[17]

The canonical example of this channel is the boom and bust cycle of the 1920s in Florida.

[16] Aggregate bank balance sheet information was taken from the 1929 Annual Report of the Comptroller of the Currency

[17] Even though Figure V shows no significant pre-trends between high and low-leverage cities immediately before the Depression, it is still plausible that the same trends in infrastructure spending fulfill different demands in these cities, which would also affect future investment decisions.

Drawn by the warm climate and cheap land, migrants flocked to Florida ocean-side cities: according to the Census Bureau, Miami grew from just under 30 thousand inhabitants in 1920 to over 110 thousand by 1930. In response, local governments built infrastructure - schools, roads, special irrigation districts - with the expectation of future population growth: in per capita terms, local government debt rose from 23 dollars in 1912 to 337 dollars by 1931 (Joffe (2012)). During the Depression, tourism and internal migration to Florida halted, and with the new infrastructure in place, Florida cities stopped building.

I investigate the importance of this type of demand channel by proposing various proxies of forward-looking local government demand for new infrastructure. Across a wide range of proxies, I do not find that municipal behavior differed to a large extent. Had investment cycles - and not financial frictions - been driving the observed relationships I have presented so far, I would find null or significantly lower estimates once low-demand cities are removed from the sample. On the contrary, I do not find consistent evidence of attenuation of the leverage effect Depression due to demand side factors. I describe the various proxies in the following subsections and the heterogeneity results are summarized in Figure VIII.

(Figure VIII around here)

I first classify cities into “high" and “low" infrastructure demand cities based on pre-1930 bond issuance behavior. Using the bond-level data obtained from $Moody's$, I proxy for future demand in two different ways: (1) the outstanding value bonds issued in 1925–1929 as a proportion of the total amount issued and (2) the average age (computed as 1929 minus the year issued) of each city's bond portfolio, weighted by the outstanding value of each bond. Conceptually, I am assuming that cities with a large value of (1) are also cities that have newer infrastructure and in which demand in the 1930s would be low. Likewise, cities with a low value of (2) are cities that have more recently invested and would hypothetically not need new investment in the 1930s.

Panel A in Figure VIII plots the main estimates of interest, along with their 90 percent confidence intervals, of Equation 4.1 in various subsamples of cities where the outcome variable is per-capita capital outlay. The bars "Base" provide baseline results using the sample of cities for which bond-level data is available. The bars "No recent issuers" exclude cities that issued more than 28 percent (top quartile) of all their bonds outstanding between and including 1925–1929, according to data from $Moody's$. Finally, the bars "No young portfolio" exclude cities with an average bond age of 6 or less (bottom quartile). Control variables remain the same as in the baseline results. I

find that investment cycles may have mattered some in the early Depression period (1929-1933), but they cannot explain the longer run effects in 1934-1936. I find that the estimates for 1929-1933 are attenuated by 20 to 30 percent once low-demand cities are excluded from the sample.

In Panel B, I extend this line of reasoning to the full sample of cities by investigating what happens in cities with low levels of *realized* investment during the pre-Depression period (1924-1929). I construct a measure of total per-capita outlay for those six years and discard the top half of spenders. The bars "Only below median of 1920s outlay" presents the estimates. Predictably, the estimates become less precise due to the loss of half of the sample. The magnitude, however, remains the same in 1929-1933 and *increases* substantially in 1934-1936. Taken together, the evidence presented in Panels A and B is mixed at best.

In Panel C, I separate young (potentially growing) versus old (established, dense) cities based on each city's year of incorporation. City age, unlike the preceding five years of outlay, proxies for "lifetime" municipal investment. The median age in 1930 - defined by 1930 minus the year of city incorporation - in my sample is 57 years. The bars "Only old cities" show the estimates are quantitatively similar once young booming towns (like the coastal Florida cities) where expansionary demand abruptly halts during the Depression are excluded.

The last demand-side concern that I consider is the interaction between municipal outlays and federal government spending on infrastructure originating after 1933 from the New Deal programs: Works Progress Administration (WPA) and the Reconstruction Finance Corporation (RFC). Specifically, the concern is that the federal government directed infrastructure funds towards local areas with financially constrained cities, thus crowding out municipal investment. The demand for municipally funded projects may have endogenously shifted downward in these counties, confounding the impact of leverage on capital outlays, and biasing the baseline estimates upward in magnitude.

In Panel D, I test the significance of this interaction empirically by investigating whether the effect is different in counties with low and high federal government spending. Using county-level data from Fishback et al. (2003) on per-capita WPA grants, RFC grants, and total relief spending at the county level, I split the sample of cities into above and below median per-capita federal spending. As before, the "Base" bars report the base regression using cities in counties for which the grant data is available. The "No large WPA", "No large RFC" , and "No large relief" bars report the results in counties with below median per-capita grants from those programs and relief spending. As in Panels A-C, I do not observe significant attenuation between the baseline and subsample

estimates. On the contrary, the evidence points to the opposite effect: financial constraints were more, not less, prominent in cities where federal government stimulus was (relatively) low.

5.2.1 Takeaways

To summarize, I do not find strong evidence in support of purely demand-driven explanations of the decline in local public good provision, especially capital investments, during the Great Depression. I find that pre-Depression financial leverage remains a quantitatively strong predictor of public spending cuts after the initial phase of the Great Depression (1929-1933) in samples of cities that had plausibly less demand for services or investment. I proxied for demand in several complementary ways: by using bond-level data to classify the age of construction projects, by realized capital outlay in the 1920s, by city age, and finally by proximity to Federal government spending on public works projects from the New Deal. In all, the effect of leverage is quantitatively similar across the spectrum of plausible municipal outlay demand.

6 Concluding remarks

There is growing evidence that municipalities in the U.S. are on shaky financial ground. The question is when, not if, the next crisis in local public finance will occur. Clearly, how crises affect the level or composition of local public goods is an important question for policymakers and urban economists. In the contemporary U.S. setting, countercyclical fiscal stimulus prevents researchers from studying these consequences. This paper provides a new approach by going back in U.S. history to a period of decentralization and great fiscal stress: the Great Depression.

Using a novel dataset of local public good provision and bond issuance from a large sample of cities, I find that financial constraints played an important role in hindering local public expenditure during the Depression. I identify causal effects by using a difference-in-differences analysis and using quasi-exogenous financial shocks from bonds becoming due. I find little evidence that the demand-side investment cycle mechanism - a correlated confounder with financial leverage - can account for little of the impact of leverage in the first part of the Depression. The prolonged impact during the second half of the Depression (1934-1936) remains unexplained by a wide range of infrastructure demand proxies.

This paper shows that debt-driven financial constraints can induce significant public expenditure cuts during a crisis and opens up interesting questions about downstream consequences of defunding local public goods and the welfare implications of local public debt issuance. What are

the impacts of defunding the police or of cutting education spending? Of stopping the investment in and maintenance of transportation networks? In the historical context, school enrollment, especially in secondary schools, expanded significantly in the first half of the 20th century. How financing constraints impacted human capital accumulation during the golden era of U.S. public K-12 education certainly warrants a closer examination. The answers to these questions, which I leave for future research, can shed light on the true costs and benefits of local public goods. Moreover, this paper does not address the political economy aspect of local public good provision or how local politics interact with financial constraints or crises. Should granular local political data become available, one interesting direction would be to measure how the leverage effect is impacted by (or impacts) political polarization, especially during the rise of socialism and communism in the first half of the 20th century.

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Table I: Summary statistics

Panel A: City Level Revenue and Expenditure, 1924–1938

	N	Mean	SD	Median	25 pct	75 pct
Population (k)	11,239	52.12	276.46	7.39	4.27	18.51
Total revenue, excluding debt issuance	11,231	36.86	34.04	29.13	17.57	49.51
Tax revenue	11,231	21.57	18.09	15.09	9.51	30.12
All non-tax revenue (earnings)	11,231	11.32	20.45	8.48	3.89	14.68
Debt receipts	9,836	11.72	34.67	1.08	0.00	13.59
All other non-tax, non-debt receipts	11,231	3.97	8.49	0.63	0.00	5.38
Intergovernmental aid share of revenue	11,253	0.05	0.08	0.01	0.00	0.06
Payments: Total service	11,231	21.52	16.79	14.49	9.35	31.77
Payments: government administration	11,231	2.20	1.76	1.86	1.24	2.66
Payments: health and sanitation	11,231	1.73	2.35	1.23	0.42	2.40
Payments: roads and highways	11,231	3.73	3.08	3.28	2.08	4.82
Payments: protection of persons and property	11,231	4.45	3.89	3.87	2.32	5.77
Payments: charities, welfare, and corrections	11,231	2.02	3.98	0.14	0.00	2.14
Payments: recreation	11,231	0.66	1.21	0.34	0.04	0.92
Payments: school and libraries	11,231	5.41	7.72	0.45	0.00	13.07
Other service payments	11,231	1.31	2.74	0.45	0.06	1.70
Public utilites	9,775	5.73	24.85	3.02	1.06	6.16
Interest	11,231	2.59	5.94	1.63	0.60	3.35
Capital outlays	11,231	6.86	13.37	2.46	0.28	8.59
All other non-maintenance, non-outlay payments	9,836	4.34	8.52	1.42	0.00	5.52
Total debt	11,231	59.51	125.37	36.51	16.23	72.93
Total bonded debt	11,231	53.44	121.26	33.40	14.81	64.97
Assessed value of property	10,918	1232.63	1455.60	1033.00	749.56	1388.69
Defaulted 1930 - 1937 (any district)	11,231	0.14	0.35	0.00	0.00	0.00
Defaulted 1930 - 1937 (city)	11,231	0.13	0.34	0.00	0.00	0.00
Bond debt / assessed value	10,918	0.04	0.04	0.03	0.02	0.06
Interest payment / tax revenue	11,230	0.12	0.13	0.09	0.04	0.17
Debt / total revenue	11,231	1.53	1.41	1.19	0.60	2.10

Panel B: Bonds (1929)

	N	Mean	SD	Median	Min	Max
Rate	28,970	4.59	1	4	2	8
Year Issued	28,893	1918.44	8	1921	1871	1930
Repayment Starts	28,810	1932.65	9	1929	1904	1991
Repayment Ends	28,810	1940.72	10	1938	1929	2002
I(type = term)	29,366	0.36	0	0	0	1
Face Value (k)	29,310	261.58	1467	50	0	55000

Panel C: Other City and County Data (Static)

	N	Mean	SD	Median	25 pct	75 pct
Sus. Bank Deposits (1930-33)	776	0.21	0.28	0.13	0.04	0.28
Δ Log(Loans 1931-29)	709	-0.09	0.20	-0.09	-0.17	-0.02
Debt age	386	8.14	2.88	7.80	6.36	9.66
Debt share, 1925 - 1929	386	0.34	0.24	0.32	0.16	0.51
Δ Log(Pop 1920-30)	819	0.25	0.34	0.17	0.04	0.38
City age in 1930	503	84.61	73.68	58.00	24.00	130.00
Total outlay 1924-29 / capita	676	64.24	85.25	40.56	15.81	88.04
WPA grants/capita	783	50.01	30.16	45.66	29.56	65.23
RFC grants/capita	783	45.04	102.85	22.81	11.31	42.33

Note: Summary data for all observations across cities in the period 1924–1938. Panel A: Population is in thousands. All dollar values (revenues, payments, debt) are in per-capita nominal dollars. The sample consists of all cities with at least 8 years of data in the sample time period. Panel B: Outstanding bonds for 332 cities as of 1929 from *Moody's Manuals of Governments*. Type "term" indicates balloon payment bonds. Panel C: Debt age and debt issued in 1925-1929 come from *Moody's* in 1929. Suspended bank deposit data comes from the FDIC. Log loan growth of national banks at the county level comes from the OCC. WPA and RFC data come from Fishback et al. (2003).

Table II: Leverage and defaults

	Bonds / Assessed Value		Int/Rev		Debt/Rev		Debt/Capita	
	City	District	City	District	City	District	City	District
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
leverage	1.48***	1.39**	0.55***	0.55***	0.06***	0.07***	0.16***	0.16***
	(0.54)	(0.54)	(0.19)	(0.20)	(0.02)	(0.02)	(0.04)	(0.04)
Population (1930)	✓	✓	✓	✓	✓	✓	✓	✓
Population Growth (1920-1930)	✓	✓	✓	✓	✓	✓	✓	✓
Revenue (1930 - 1934)	✓	✓	✓	✓	✓	✓	✓	✓
Source FE	✓	✓	✓	✓	✓	✓	✓	✓
R-sq	0.16	0.17	0.16	0.17	0.17	0.18	0.18	0.19
N	703	703	748	748	707	707	708	708
Mean(y)	0.16	0.17	0.14	0.15	0.15	0.16	0.15	0.17
SD(y)	0.36	0.37	0.35	0.36	0.36	0.37	0.36	0.37
Mean(x)	0.045	0.045	0.123	0.123	1.613	1.613	0.616	0.616
SD(x)	0.032	0.032	0.090	0.090	1.070	1.070	0.504	0.504

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: This table presents the estimation results of an OLS regression of default on financial leverage. The outcome variables are binary taking the value of 1 if the *Bond Buyer* reported a city (odd columns) or any road district, municipal improvement district, or school district within the city limits (even columns) to be in default between 1930 - 1937. Control variables include log city population in 1930, log city population growth between 1920 and 1930, log per-capita revenue (each year between and including 1930 - 1934), and data-source fixed effects. Financial leverage in 1929 is specified in the header. Robust standard errors are shown in parentheses.

Table III: Determinants of pre-Depression financial leverage (1929)

	Bonds/Assess					Int/Rev	Debt/Rev	Debt/Capita
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Assessed value of property (1929)		-0.04	-0.04*	-0.17**	-0.07*	0.02	-0.04**	0.03
		(0.02)	(0.03)	(0.08)	(0.04)	(0.03)	(0.02)	(0.07)
Population (1929)			0.23***	0.18***	0.07	0.04***	0.02	0.08
			(0.05)	(0.02)	(0.05)	(0.02)	(0.01)	(0.05)
Σ Outlay, 1924-29				0.42***	0.20***	0.20***	0.18**	0.58***
				(0.10)	(0.07)	(0.06)	(0.08)	(0.09)
Bond debt / assessed value (1924)					0.58***			
					(0.05)			
Interest payment / tax revenue (1924)						0.48***		
						(0.06)		
Debt / total revenue (1924)							0.70***	
							(0.04)	
Total debt (1924)								0.75***
								(0.05)
State FE	✓	✓	✓	✓	✓	✓	✓	✓
R-sq	0.17	0.17	0.20	0.35	0.66	0.56	0.65	0.82
N	787	787	787	646	448	643	641	646

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: This table presents the results of an OLS regression of financial leverage ratios in 1929 on covariates. All covariates were standardized to have a mean of 0 and a standard deviation of 1 to ease interpretation. Columns (1) - (5) use the bonded debt to assessed property value ratio while columns (6) - (8) use interest to tax revenue, debt to revenue, and debt per capita, respectively. Robust standard errors reported in the parentheses.

Table IV: Leverage and local public expenditure

Panel A: Financial leverage (1929) and service expenditure

	Bonds / Assessed Value						Int/Rev	Debt/Rev	Debt/Capita
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
leverage x 1926-1927	0.03	0.16	0.10	0.10	0.19	0.17	0.05	-0.00	0.01
	(0.21)	(0.21)	(0.22)	(0.19)	(0.21)	(0.23)	(0.10)	(0.01)	(0.01)
leverage x 1929-1933	-0.03	-0.20	-0.04	-0.40**	-0.31	-0.40*	-0.21**	-0.02***	-0.03*
	(0.21)	(0.21)	(0.21)	(0.20)	(0.21)	(0.23)	(0.10)	(0.01)	(0.02)
leverage x 1934-1936	-0.88**	-0.99**	-0.60	-1.22***	-0.89***	-0.95***	-0.48***	-0.05***	-0.09***
	(0.38)	(0.38)	(0.38)	(0.30)	(0.33)	(0.32)	(0.13)	(0.01)	(0.02)
City FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
1930 Pop x Year		✓		✓	✓	✓	✓	✓	✓
Δ1920-30 Pop x Year		✓	✓	✓	✓	✓	✓	✓	✓
Pop Group x Year			✓						
Revenue				✓	✓	✓	✓	✓	✓
Region x Year					✓				
Source x Year						✓	✓	✓	✓
R-sq (within)	0.05	0.11	0.12	0.30	0.32	0.36	0.39	0.37	0.37
N	7,499	7,499	7,499	7,415	7,415	7,415	7,930	7,459	7,470
Mean(y)	2.87						2.84	2.87	2.86
SD(y)	0.72						0.73	0.72	0.70
Mean(x)	0.045						0.123	1.613	0.616
SD(x)	0.032						0.090	1.070	0.504

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Panel B: Financial leverage (1929) and capital outlay

	Bonds / Assessed Value						Int/Rev	Debt/Rev	Debt/Capita
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
leverage x 1926-1927	3.19**	2.89*	3.12**	0.94	0.94	2.05	0.93	0.14**	0.10
	(1.51)	(1.55)	(1.53)	(1.25)	(1.40)	(1.54)	(0.62)	(0.05)	(0.10)
leverage x 1929-1933	-1.66*	-2.30*	-1.86	-4.17***	-4.21***	-4.20***	-1.36**	-0.07	-0.14*
	(0.97)	(1.35)	(1.38)	(0.95)	(1.04)	(1.05)	(0.55)	(0.05)	(0.07)
leverage x 1934-1936	-6.08***	-5.71**	-4.66*	-7.17***	-7.18***	-3.89**	-1.47**	-0.18***	-0.38***
	(1.70)	(2.54)	(2.52)	(2.28)	(2.19)	(1.82)	(0.75)	(0.06)	(0.10)
City FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
1930 Pop x Year		✓		✓	✓	✓	✓	✓	✓
Δ1920-30 Pop x Year		✓	✓	✓	✓	✓	✓	✓	✓
Pop Group x Year			✓						
Revenue				✓	✓	✓	✓	✓	✓
Region x Year					✓				
Source x Year						✓	✓	✓	✓
R-sq (pseudo)	0.57	0.58	0.58	0.60	0.61	0.62	0.63	0.62	0.58
N	7,466	7,466	7,466	7,382	7,382	7,382	7,908	7,426	7,437
Mean(y)	7.15						6.97	7.11	6.68
SD(y)	13.66						13.74	13.72	10.05
Mean(x)	0.045						0.123	1.613	0.616
SD(x)	0.032						0.090	1.070	0.504

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: This table presents the estimation results of Equation 4.1 where the outcome variable is log per-capita total service expenditure in Panel A (estimated using OLS) and per-capita capital outlays (estimated using Poisson pseudo-maximum likelihood) in Panel B. Standard errors are clustered at the city level. Column (1) contains only city and year fixed effects, while columns (2)–(6) add population, population group (under 10k, 10k-100k, 100k+), 1920s population growth-by-year fixed effects, contemporaneous and lagged log total non-debt per capita revenue, region by year controls, and source by year fixed effects. The 1929 leverage measure used is defined in the header. Columns (7) - (9) reproduce specification (6) using the other leverage measures. Cities with no debt are excluded from the sample.

Table V: Bond repayment and capital outlays

	Bonds / Assessed Value			Int/Rev	Debt/Rev	Debt/Capita
	(1)	(2)	(3)	(4)	(5)	(6)
leverage x 1926-1927	0.54	0.10				
	(1.48)	(1.91)				
leverage x 1929-1933	-4.25***	-1.11				
	(1.38)	(1.82)				
leverage x 1934-1936	-4.62*	-2.43				
	(2.45)	(2.68)				
moody leverage x 1926-1927		1.56	1.81	0.46	0.21*	0.08
		(5.38)	(4.31)	(1.21)	(0.12)	(0.27)
moody leverage x 1929-1933		-12.82**	-15.33***	-3.25*	-0.27**	-0.31
		(5.72)	(4.23)	(1.66)	(0.11)	(0.22)
moody leverage x 1934-1936		-9.05	-14.41**	-0.49	-0.38*	-0.90**
		(7.82)	(7.33)	(1.85)	(0.19)	(0.35)
City FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
1930 Pop x Year	✓	✓	✓	✓	✓	✓
Δ1920-30 Pop x Year	✓	✓	✓	✓	✓	✓
Revenue	✓	✓	✓	✓	✓	✓
Source x Year	✓	✓	✓	✓	✓	✓
R-sq (pseudo)	0.62	0.62	0.62	0.62	0.62	0.53
N	2,735	2,735	2,735	2,765	2,757	2,724
Mean(y)	10.25	10.25	10.25	10.48	10.35	9.46
SD(y)	17.58	17.58	17.58	18.00	17.67	11.19
Mean(leverage)	0.045	0.045	0.045	0.123	1.613	0.616
SD(leverage)	0.032	0.032	0.032	0.090	1.070	0.504
Mean(moody-leverage)		0.018	0.018	0.054	0.659	0.303
SD(moody-leverage)		0.012	0.012	0.039	0.403	0.186

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: This table presents the Poisson pseudo-maximum estimation results of Equation 4.1 where the outcome variable is per-capita capital outlay. Column (1) provide baseline results using the sample of cities for which bond-level data is available. Column (2) uses both leverage and moody-leverage as explanatory variables. Columns (3) - (6) use only moody-leverage. Control variables include population, population growth, contemporaneous and lagged log total non-debt per capita revenue, data source by year fixed effects. Pre-Depression financial leverage variable is specified in the header. Standard errors are shown in parentheses and are clustered at the city level.

Table VI: Leverage and banking conditions

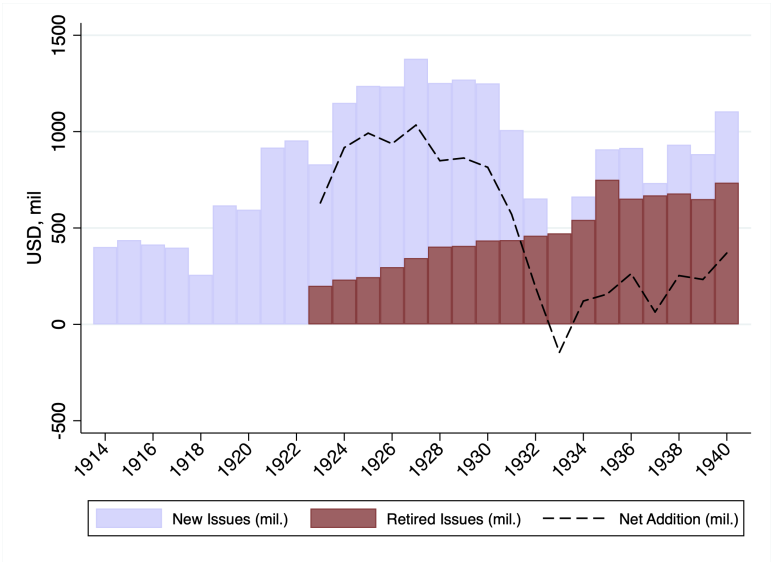
	Bonds / Assessed Value		Int/Rev		Debt/Rev		Debt/Capita	
leverage x 1926-1927	-1.28	3.17*	-0.08	1.41*	0.09	0.21***	0.10	0.22*
	(1.60)	(1.86)	(0.70)	(0.73)	(0.07)	(0.06)	(0.14)	(0.12)
leverage x 1929-1933	-4.70**	-4.93***	-1.20	-1.49**	-0.03	-0.06	-0.03	-0.14
	(2.00)	(1.40)	(0.91)	(0.73)	(0.08)	(0.06)	(0.10)	(0.09)
leverage x 1934-1936	-1.73	0.14	-0.33	-0.03	-0.13	-0.07	-0.20	-0.13
	(2.52)	(1.92)	(1.00)	(0.86)	(0.09)	(0.07)	(0.14)	(0.12)
leverage x 1926-1927 x loan decline	0.65		0.80		-0.04		-0.09	
	(1.94)		(0.88)		(0.08)		(0.13)	
leverage x 1929-1933 x loan decline	0.77		0.06		-0.04		-0.11	
	(2.14)		(0.87)		(0.07)		(0.09)	
leverage x 1934-1936 x loan decline	-6.87**		-2.39**		-0.13		-0.31*	
	(2.67)		(1.12)		(0.10)		(0.16)	
leverage x 1926-1927 x bank failure		-3.66*		-1.75		-0.19**		-0.24**
		(2.21)		(1.07)		(0.08)		(0.11)
leverage x 1929-1933 x bank failure		1.91		0.37		-0.03		0.00
		(1.94)		(0.74)		(0.05)		(0.08)
leverage x 1934-1936 x bank failure		-9.79***		-3.43***		-0.24***		-0.47***
		(2.82)		(1.11)		(0.08)		(0.14)
City FE	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
1930 Pop x Year	✓	✓	✓	✓	✓	✓	✓	✓
Δ1920-30 Pop x Year	✓	✓	✓	✓	✓	✓	✓	✓
Revenue	✓	✓	✓	✓	✓	✓	✓	✓
Source x Year	✓	✓	✓	✓	✓	✓	✓	✓
R-sq (within)	0.62	0.62	0.62	0.63	0.62	0.62	0.57	0.58
N	6,493	7,126	6,960	7,608	6,537	7,181	6,548	7,181
Mean(y)	7.49	7.32	7.25	7.12	7.46	7.29	7.02	6.85
SD(y)	13.98	13.90	13.76	13.84	13.99	13.90	10.22	10.16
Mean(x)	0.045	0.045	0.123	0.123	1.613	1.613	0.616	0.616
SD(x)	0.032	0.032	0.090	0.090	1.070	1.070	0.504	0.504

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

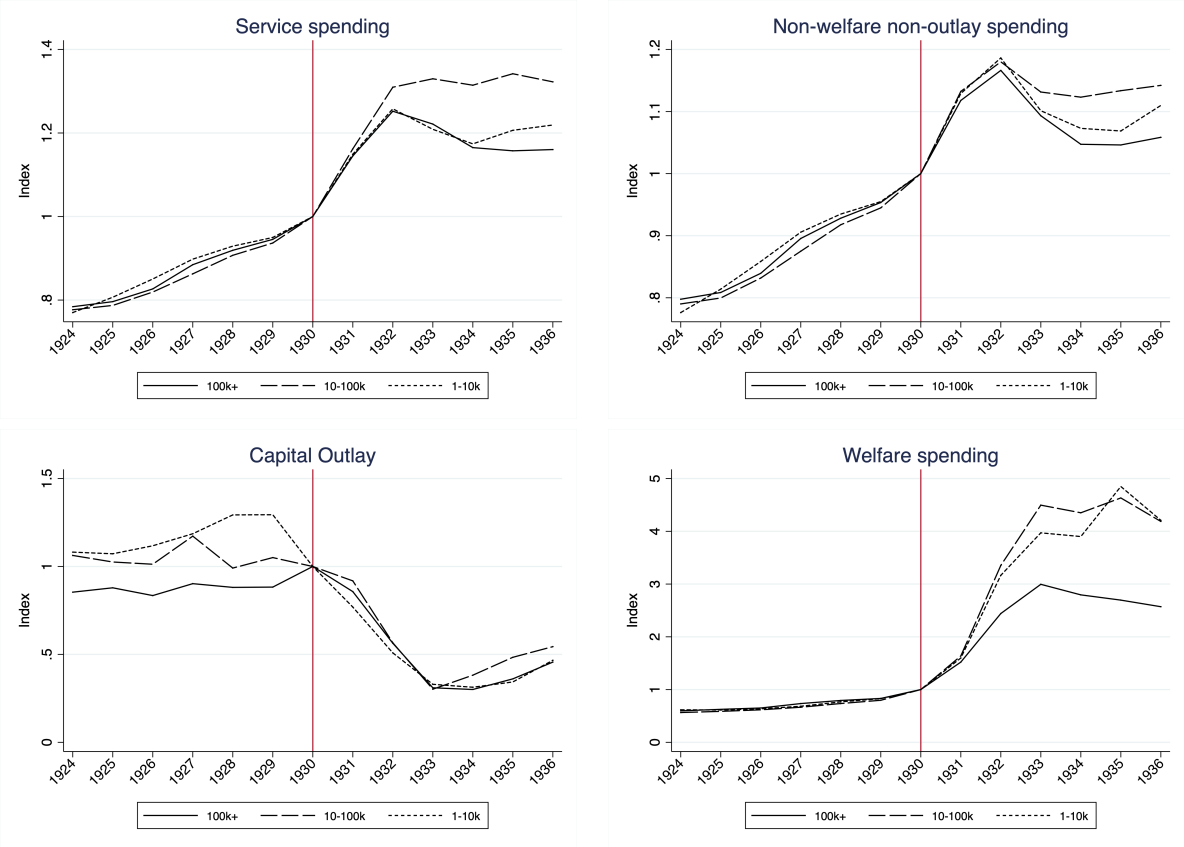
Note: This table presents the Poisson pseudo-maximum estimation results of Equation 4.1 augmented with a triple interaction term with a binary loan decline variable taking the value of 1 if the city was in a county with below-median national bank loan growth between 1929 and 1931 (odd columns) or in a county with above-median share of suspended bank deposits between 1930 and 1933 (even columns). The outcome variable is per-capita capital outlay. Control variables include population, population growth, contemporaneous and lagged log total non-debt per capita revenue, data source by year fixed effects. Pre-Depression 1929 financial leverage variable is specified in the header. Standard errors are shown in parentheses and are clustered at the city level.

Figure I: Municipal debt sales and retirements



Note: This figure plots the volume of municipal bond sales and retirement as reported by Hillhouse (1936) in Tables 1 and 5. The original source of the data is the State and Municipal Compendium (June issue of the *Commercial and Financial Chronicle*). The figures for retired issues were not compiled before 1923. Net addition (black dashed line) is defined as new issues minus retired issues. Values are nominal.

Figure II: Municipal services and outlays (1924 - 1936)

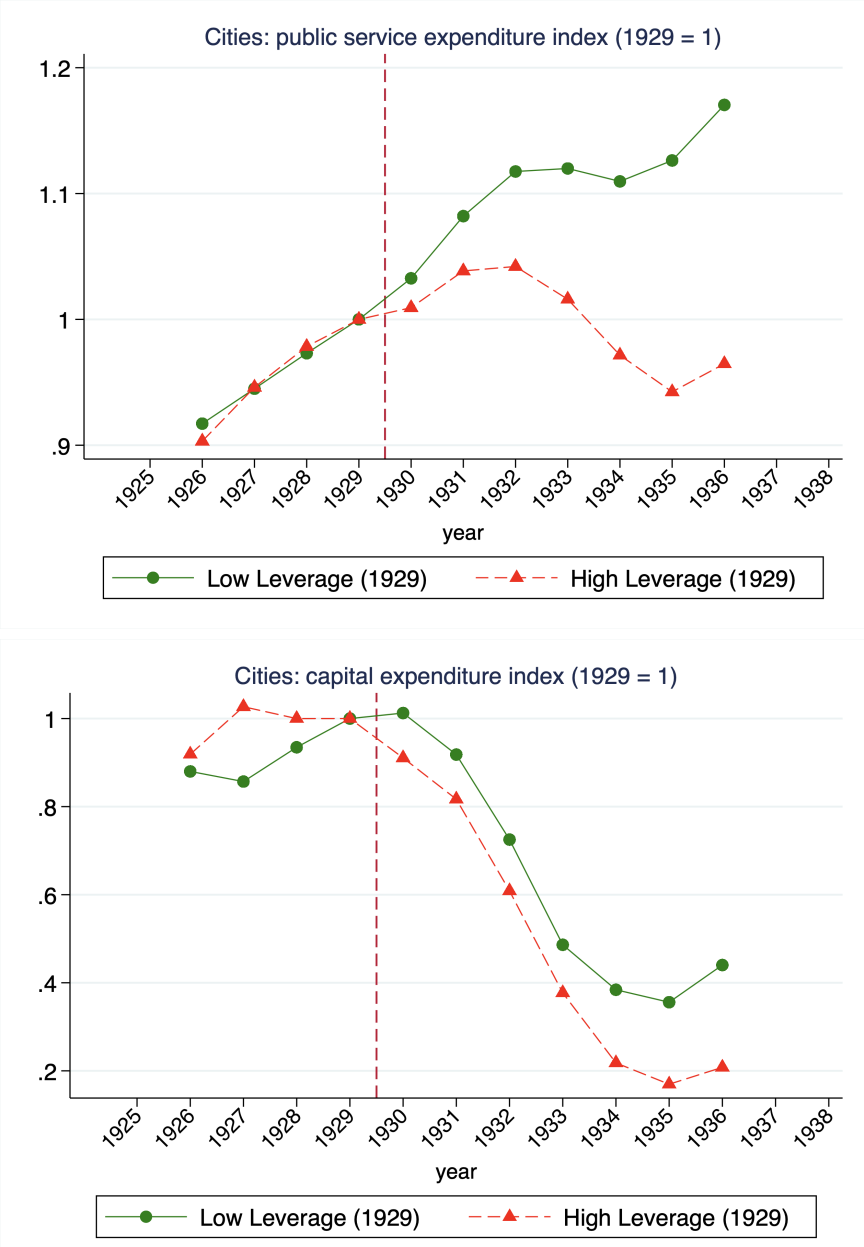


Note: This figure shows average per-capita real expenditures for small, medium, and large cities in Massachusetts, New York, Ohio, Indiana, and California, as well as all cities with a population of above 100 thousand between 1924 and 1938. Averages normalized to have a value of 1 in 1930. Short dash denotes the average for all cities with a population under 10 thousand (in 1930), long dash is the average for cities in 10-100 thousand range, and the solid line is for all cities with more than 100 thousand.

Figure III: Pre-Depression municipal financial leverage ratios

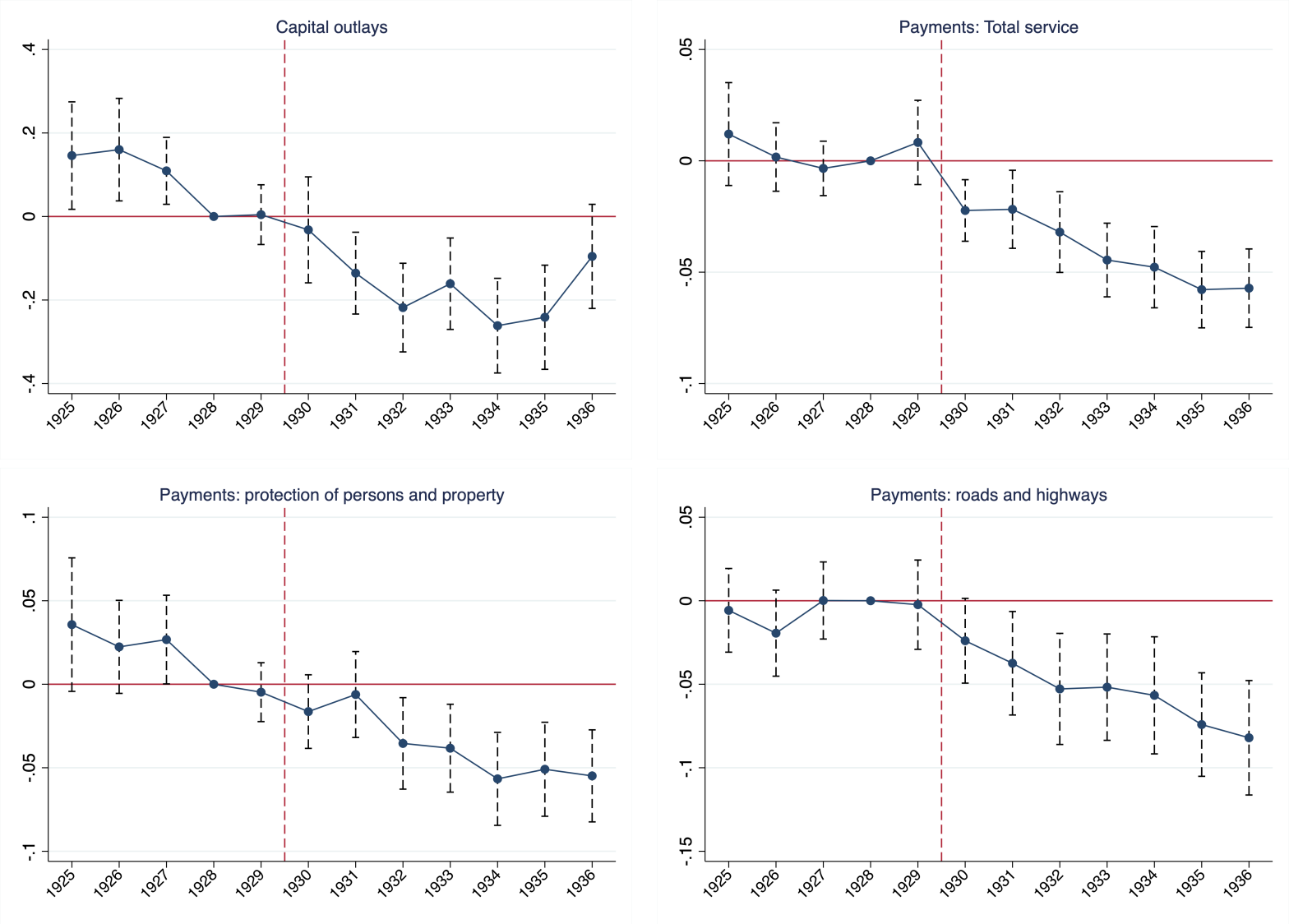
Note: This figure plots the distributions of the four financial leverage ratios for all cities in the sample at the end of the 1929 fiscal year. Cities with no debt are omitted from the sample.

Figure IV: Leverage and local public goods during the Great Depression



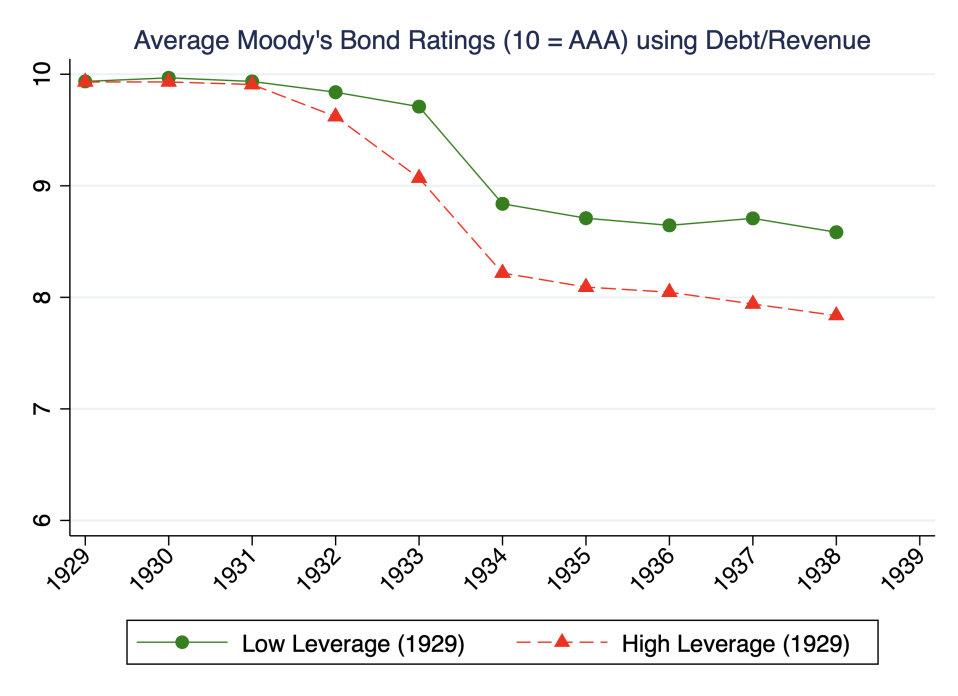
Note: This figure plots a 3-year rolling average of total public service expenditure (top) and capital (bottom) in cities by leverage. "Low Leverage" captures cities in the first tercile of debt/revenue in 1929 and "High Leverage" denotes those in the third tercile. All values are normalizted to 1 in 1929.

Figure V: Leverage and local public goods in generalized difference-in-differences



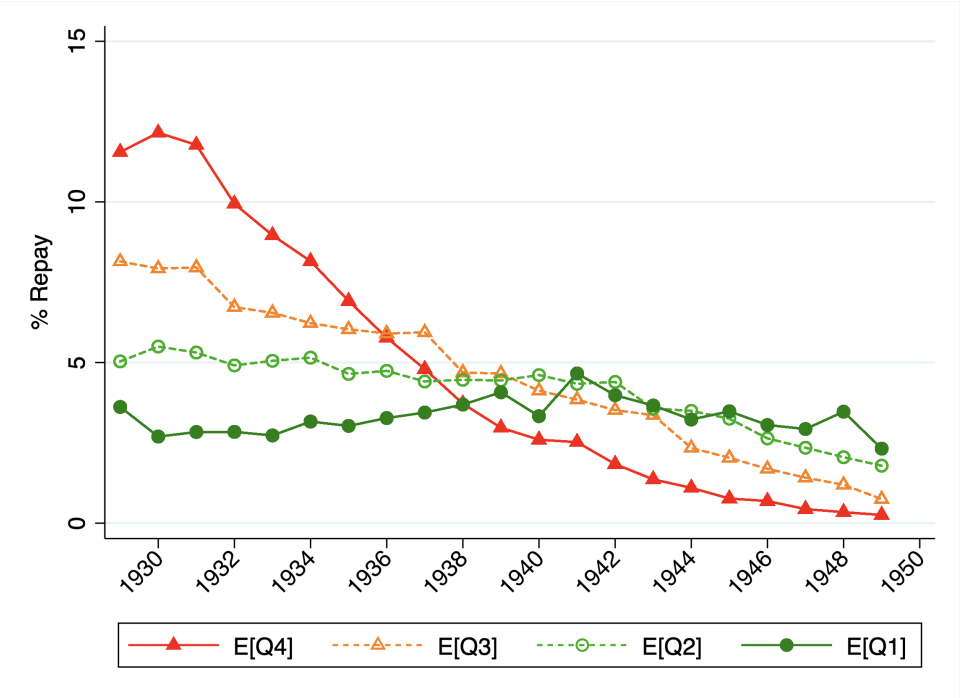
Note: This figure shows the estimated coefficients on $period_{j=t} \times leverage_{29,i}$ in Equation 4.1 where period denotes each individual year using debt to revenue as the leverage measure. Payment panels are estimated using OLS and Capital Outlays panel is estimated using Poisson pseudo-maximum. Service expenditure refers to total public service expenditure (i.e., total payments not including capital expenditure or financing costs). Roads Pmt. refers to all expenditure for the maintenance of public roads and highways. Protection is police, jails, and firefighting costs. Capital outlay is expenditure costs for construction projects. All standard errors are clustered at the city level. Ninety percent confidence intervals are denoted by dashed lines. The omitted year and year-post interaction is 1928. The dashed red line denotes the official start of the Great Depression in the U.S.

Figure VI: Moody's credit ratings



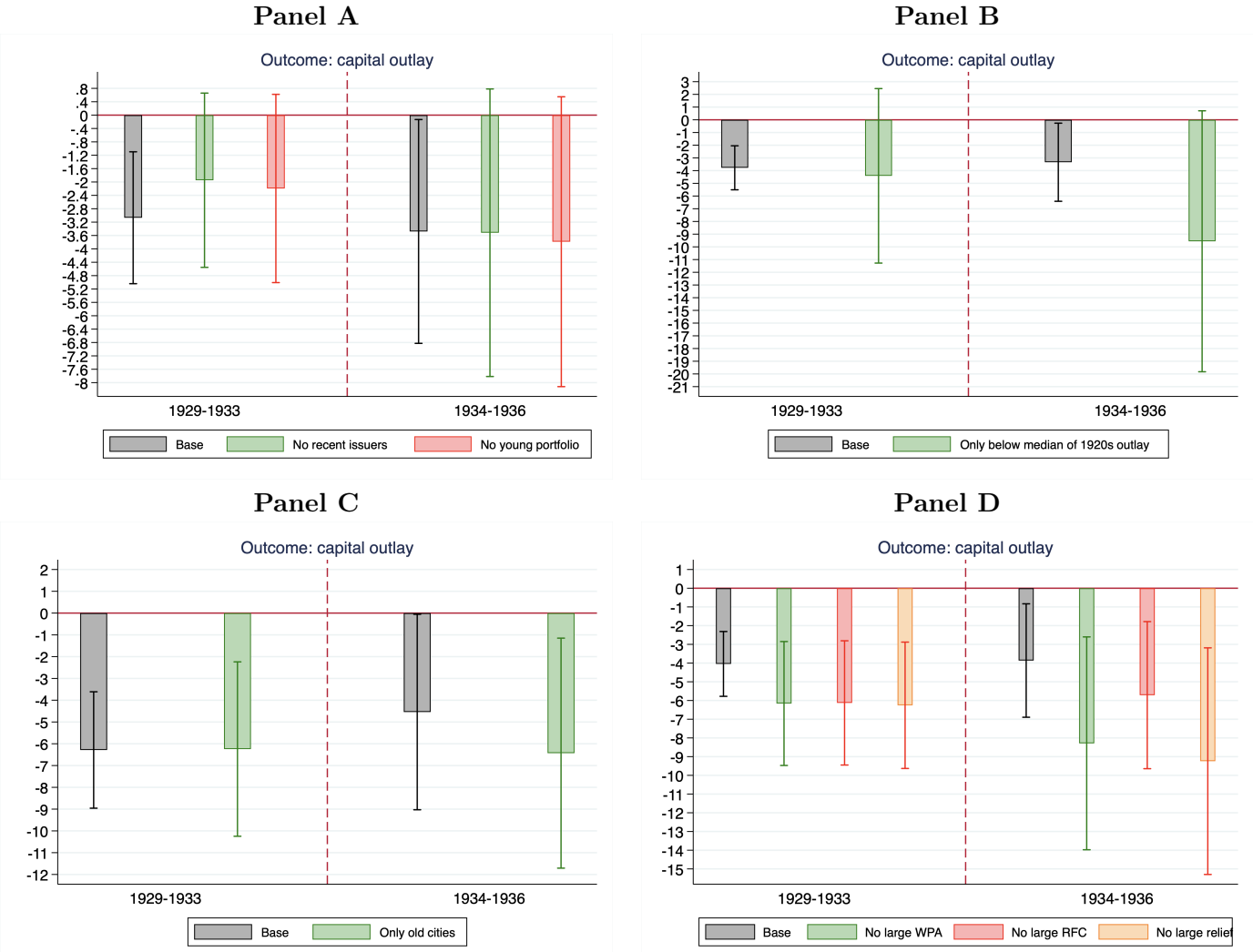
Note: This figure plots the average Moody's Bond rating of cities by leverage. Low leverage is defined as the first tercile of debt to revenue in 1929 and high leverage is denoted by the third tercile. The sample includes 189 cities with complete ratings data from 1929 to 1940. To go from ratings to numbers, I assign the rating of AAA the value of 10, AA to 9, and so on.

Figure VII: Annual repayment based on repayment shock quartile



Note: This figure shows the average annual repayment of bonds across 1930–1935 city repayment quartiles. Repayment quartiles are computed in 1929 and remain static by city. For example, the solid red line with triangle markers shows the average percentage of bonds that were contractually obligated to be repaid in each year for those cities in the largest projected repayment quartile as of 1929, while the solid green line with circle markers shows it for those in the lowest repayment quartile.

Figure VIII: Excluding low-demand cities



Note: This figure shows the estimated coefficients on $period_{j=t} \times leverage_{29,i}$ in Equation 4.1 for the period 1929-1933 and 1934-1936 for the full sample of cities (grey) vs. subsamples of cities based on various measures of forward-looking infrastructure demand. The outcome variable is per capita capital outlay and the regressions are estimated using Poisson pseudo-maximum. In Panel A, the green bars denote the estimates when cities in the highest quartile of share of bonds issued during 1925-1929 are excluded from the sample, while the red bars denote them when cities in the lowest quartile of bond portfolio age are excluded. In Panel B, the green bars denote the estimates when cities with above median capital outlay spending between 1924 and 1929 are excluded. In Panel C, the green bars denote the estimates when cities with below-median age (1930 minus year of incorporation) are exclued. Finally, in Panel D, I excluded cities in counties with with above-median New Deal and Reconstruction Finance Corporation expenditures. The standard errors are clustered at the city level and the ninety percent confidence intervals are denoted by the lines.

Appendix

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A Appendix Tables

A.1 Leverage and Revenue

Table A1

	Bonds / Assessed Value				Int/Rev				Debt/Rev				Debt/Capita			
	IG	Debt	Tax	Total	IG	Debt	Tax	Total	IG	Debt	Tax	Total	IG	Debt	Tax	Total
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)				
leverage x 1926-1927	1.89	2.95	-0.04	0.08	-0.09	1.61	0.09	0.05	0.03	-0.02	-0.00	-0.00	0.01	0.02	-0.03	-0.03
	(1.22)	(3.54)	(0.32)	(0.30)	(0.57)	(1.45)	(0.12)	(0.12)	(0.05)	(0.11)	(0.01)	(0.01)	(0.10)	(0.21)	(0.02)	(0.02)
leverage x 1929-1933	-2.24*	-9.22***	-0.41	0.13	0.16	-2.76**	-0.12	-0.09	-0.01	-0.30***	0.00	0.01	-0.04	-0.44**	-0.01	0.00
	(1.21)	(3.00)	(0.26)	(0.30)	(0.55)	(1.26)	(0.10)	(0.11)	(0.05)	(0.09)	(0.01)	(0.01)	(0.09)	(0.19)	(0.02)	(0.02)
leverage x 1934-1936	-4.68**	-10.29***	-0.34	0.32	-0.03	-3.52**	0.37**	0.32*	-0.05	-0.40***	0.05***	0.04***	-0.18	-0.64***	0.00	0.01
	(2.11)	(3.58)	(0.45)	(0.47)	(0.88)	(1.68)	(0.16)	(0.17)	(0.08)	(0.11)	(0.01)	(0.01)	(0.16)	(0.22)	(0.03)	(0.03)
City FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1930 Pop x Year	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Δ1920-30 Pop x Year	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Source x Year	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
R-sq (within)	0.39	0.16	0.38	0.32	0.38	0.14	0.39	0.30	0.39	0.15	0.40	0.33	0.39	0.14	0.38	0.33
N	5,106	4,237	7,499	7,499	5,575	4,571	8,009	8,009	5,143	4,316	7,543	7,543	5,137	4,268	7,554	7,554
Mean(Y)	-0.698	1.814	2.900	3.465	-0.580	1.726	2.865	3.433	-0.672	1.797	2.900	3.468	-0.704	1.785	2.878	3.451
SD(Y)	1.933	1.998	0.712	0.647	1.906	1.993	0.727	0.665	1.940	1.997	0.714	0.651	1.925	1.972	0.693	0.625
Mean(X)	0.045	0.045	0.045	0.045	0.123	0.123	0.123	0.123	1.613	1.613	1.613	1.613	0.616	0.616	0.616	0.616
SD(X)	0.032	0.032	0.032	0.032	0.090	0.090	0.090	0.090	1.070	1.070	1.070	1.070	0.504	0.504	0.504	0.504

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: This table presents the estimation results of Equation 4.1 where the outcome variable is log per-capita revenue. Standard errors are clustered at the city level. Columns "IG" use intergovernmental transfers from state and federal governments as revenue. Columns "Debt" use receipts from debt issuance. Columns "Tax" use local tax receipts. Columns "Total" include all non-debt revenue. Control variables include population, population growth, and data-source by year fixed effects. Standard errors are clustered at the city level.

A.2 Leverage and local services, excluding defaulted cities

Table A2

Panel A: Financial leverage (1929) and service expenditure, excluding defaulting cities

	Bonds / Assessed Value						Int/Rev	Debt/Rev	Debt/Capita
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
leverage x 1926-1927	0.14	0.24	0.21	0.26	0.41**	0.47*	0.11	0.00	0.02
	(0.22)	(0.22)	(0.24)	(0.19)	(0.21)	(0.24)	(0.12)	(0.01)	(0.02)
leverage x 1929-1933	0.16	-0.05	0.07	-0.23	-0.14	-0.17	-0.15	-0.02**	-0.03
	(0.22)	(0.23)	(0.23)	(0.21)	(0.22)	(0.24)	(0.11)	(0.01)	(0.02)
leverage x 1934-1936	-0.46	-0.69	-0.38	-0.99***	-0.55	-0.64*	-0.37**	-0.05***	-0.08***
	(0.42)	(0.43)	(0.43)	(0.33)	(0.36)	(0.36)	(0.15)	(0.01)	(0.03)
City FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
1930 Pop x Year		✓		✓	✓	✓	✓	✓	✓
Δ1920-30 Pop x Year		✓	✓	✓	✓	✓	✓	✓	✓
Pop Group x Year			✓						
Revenue				✓	✓	✓	✓	✓	✓
Region x Year					✓				
Source x Year						✓	✓	✓	✓
R-sq (within)	0.05	0.10	0.12	0.30	0.32	0.36	0.39	0.37	0.37
N	6,297	6,297	6,297	6,245	6,245	6,245	6,803	6,311	6,300
Mean(y)	2.90						2.86	2.90	2.88
SD(y)	0.72						0.73	0.73	0.71
Mean(x)	0.043						0.112	1.510	0.579
SD(x)	0.031						0.084	1.019	0.473

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Panel B: Financial leverage (1929) and capital outlays, excluding defaulting cities

	Bonds / Assessed Value						Int/Rev	Debt/Rev	Debt/Capita
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
leverage x 1926-1927	1.65	0.80	1.14	1.02	1.67	2.13	1.25	0.14**	0.11
	(1.61)	(1.62)	(1.75)	(1.65)	(1.83)	(1.88)	(0.78)	(0.06)	(0.12)
leverage x 1929-1933	-2.78**	-4.71***	-4.53***	-4.67***	-4.00***	-4.76***	-1.64**	-0.09*	-0.17**
	(1.11)	(1.27)	(1.25)	(1.16)	(1.15)	(1.14)	(0.66)	(0.05)	(0.08)
leverage x 1934-1936	-8.13***	-10.44***	-9.45***	-10.74***	-9.91***	-6.01***	-2.58***	-0.20***	-0.41***
	(1.77)	(1.80)	(1.81)	(1.81)	(1.89)	(2.07)	(0.78)	(0.08)	(0.12)
City FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
1930 Pop x Year		✓		✓	✓	✓	✓	✓	✓
Δ1920-30 Pop x Year		✓	✓	✓	✓	✓	✓	✓	✓
Pop Group x Year			✓						
Revenue				✓	✓	✓	✓	✓	✓
Region x Year					✓				
Source x Year						✓	✓	✓	✓
R-sq (within)	0.53	0.55	0.55	0.56	0.57	0.59	0.60	0.59	0.56
N	6,264	6,264	6,264	6,212	6,212	6,212	6,781	6,278	6,267
Mean(y)	7.04						6.85	7.06	6.70
SD(y)	11.54						11.75	11.63	9.92
Mean(x)	0.045						0.112	1.510	0.579
SD(x)	0.032						0.084	1.019	0.473

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: This table presents the estimation results of Equation 4.1 where the outcome variable is log per-capita total service expenditure in Panel A (estimated using OLS) and per-capita capital outlays (estimated using Poisson pseudo-maximum likelihood) in Panel B. Both panels exclude defaulting cities (1930-1937). Standard errors are clustered at the city level. Column (1) contains only city and year fixed effects, while columns (2)–(6) add population, population group (under 10k, 10k-100k, 100k+), 1920s population growth-by-year fixed effects, contemporaneous and lagged log total non-debt per capita revenue, region by year controls, and source by year fixed effects. The 1929 leverage measure used is defined in the header. Columns (7) - (9) reproduce specification (6) using the other leverage measures. Cities with no debt are excluded from the sample.

A.3 Leverage and local services, by above/below median leverage

Table A3

Panel A: Above median financial leverage (1929) and service expenditure

	Bonds / Assessed Value						Int/Rev	Debt/Rev	Debt/Capita
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
leverage x 1926-1927	0.02	0.03*	0.02*	0.00	0.01	0.02	-0.01	-0.00	0.03**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)
leverage x 1929-1933	-0.02	-0.03*	-0.02	-0.05***	-0.04**	-0.02	-0.03*	-0.04**	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)
leverage x 1934-1936	-0.15***	-0.15***	-0.13***	-0.15***	-0.12***	-0.06***	-0.07***	-0.11***	-0.08***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
City FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
1930 Pop x Year		✓		✓	✓	✓	✓	✓	✓
Δ1920-30 Pop x Year		✓	✓	✓	✓	✓	✓	✓	✓
Pop Group x Year			✓						
Revenue				✓	✓	✓	✓	✓	✓
Region x Year					✓				
Source x Year						✓	✓	✓	✓
R-sq (within)	0.07	0.11	0.12	0.32	0.34	0.40	0.40	0.40	0.40
N	8,709	8,709	8,709	8,625	8,625	8,625	8,647	8,647	8,647
Mean(y)	2.78						2.79	2.79	2.79
SD(y)	0.74						0.74	0.74	0.74

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Panel B: Above median financial leverage (1929) and capital outlays

	Bonds / Assessed Value						Int/Rev	Debt/Rev	Debt/Capita
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
leverage x 1926-1927	0.13	0.10	0.11	0.02	0.05	0.11	0.13	0.24**	0.10
	(0.09)	(0.10)	(0.10)	(0.09)	(0.10)	(0.13)	(0.09)	(0.12)	(0.12)
leverage x 1929-1933	-0.19**	-0.26***	-0.26***	-0.33***	-0.30***	-0.36***	-0.20**	-0.14	-0.13
	(0.08)	(0.09)	(0.09)	(0.09)	(0.09)	(0.08)	(0.08)	(0.10)	(0.10)
leverage x 1934-1936	-0.42***	-0.46***	-0.41***	-0.48***	-0.42***	-0.35***	-0.27***	-0.27**	-0.36***
	(0.12)	(0.13)	(0.13)	(0.12)	(0.12)	(0.11)	(0.10)	(0.13)	(0.12)
City FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
1930 Pop x Year		✓		✓	✓	✓	✓	✓	✓
Δ1920-30 Pop x Year		✓	✓	✓	✓	✓	✓	✓	✓
Pop Group x Year			✓						
Revenue				✓	✓	✓	✓	✓	✓
Region x Year					✓				
Source x Year						✓	✓	✓	✓
R-sq (within)	0.58	0.60	0.60	0.61	0.61	0.63	0.63	0.63	0.63
N	8,654	8,654	8,654	8,570	8,570	8,570	8,592	8,592	8,592
Mean(y)	6.75						6.76	6.76	6.76
SD(y)	13.75						13.80	13.80	13.80

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: This table presents the estimation results of Equation 4.1 where the outcome variable is log per-capita total service expenditure in Panel A (estimated using OLS) and per-capita capital outlays (estimated using Poisson pseudo-maximum likelihood) in Panel B. Leverage is binary and takes the value of 1 if the city reported above-medium leverage in 1929. Standard errors are clustered at the city level. Column (1) contains only city and year fixed effects, while columns (2)–(6) add population, population group (under 10k, 10k-100k, 100k+), 1920s population growth-by-year fixed effects, contemporaneous and lagged log total non-debt per capita revenue, region by year controls, and source by year fixed effects. The 1929 leverage measure used is defined in the header. Columns (7) - (9) reproduce specification (6) using the other leverage measures. Cities with no debt are excluded from the sample.

A.4 Leverage and local services, excluding sources of data one by one

Table A4

Panel A: Financial leverage (1929) and service expenditure, excluding sources one by one

	Bonds / Assessed Value							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
leverage x 1926-1927	0.07	0.18	0.14	0.18	0.27	0.26	0.10	0.18
	(0.22)	(0.31)	(0.24)	(0.25)	(0.25)	(0.24)	(0.24)	(0.23)
leverage x 1929-1933	-1.00***	-0.34	-0.31	-0.40	-0.40	-0.23	-0.36	-0.40*
	(0.26)	(0.29)	(0.23)	(0.24)	(0.24)	(0.24)	(0.24)	(0.23)
leverage x 1934-1936	-1.52***	-1.04***	-0.86***	-0.98***	-0.96***	-0.61*	-0.87***	-0.95***
	(0.39)	(0.40)	(0.32)	(0.34)	(0.34)	(0.32)	(0.33)	(0.32)
City FE	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
1930 Pop x Year	✓	✓	✓	✓	✓	✓	✓	✓
Δ1920-30 Pop x Year	✓	✓	✓	✓	✓	✓	✓	✓
Revenue	✓	✓	✓	✓	✓	✓	✓	✓
Source x Year	✓	✓	✓	✓	✓	✓	✓	✓
R-sq (within)	0.47	0.36	0.37	0.35	0.34	0.34	0.36	0.37
N	4,970	6,480	6,469	6,238	6,920	6,997	6,997	6,834
Mean(y)	3.03	2.77	2.98	2.72	2.82	2.89	2.88	2.93
SD(y)	0.76	0.70	0.70	0.68	0.70	0.72	0.73	0.72
Mean(x)	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045
SD(x)	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032
Excluded:	CA	CENSUS	IN	MA	NYCITY	NYTOWN	NYVIL	OH

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Panel B: Financial leverage (1929) and capital outlays, excluding sources one by one

	Bonds / Assessed Value							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
leverage x 1926-1927	3.44**	2.18	1.85	2.27	2.34	-0.24	2.54*	2.06
	(1.59)	(2.26)	(1.54)	(1.59)	(1.75)	(1.16)	(1.49)	(1.54)
leverage x 1929-1933	-3.08***	-6.67***	-4.11***	-4.03***	-3.71***	-3.97***	-4.31***	-4.29***
	(1.07)	(1.39)	(1.05)	(1.08)	(1.05)	(1.13)	(1.14)	(1.06)
leverage x 1934-1936	-3.03	-5.63**	-3.75**	-3.70*	-4.36**	-4.16**	-3.94**	-3.54*
	(1.92)	(2.62)	(1.83)	(1.94)	(1.77)	(1.86)	(1.84)	(1.86)
City FE	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
1930 Pop x Year	✓	✓	✓	✓	✓	✓	✓	✓
Δ1920-30 Pop x Year	✓	✓	✓	✓	✓	✓	✓	✓
Revenue	✓	✓	✓	✓	✓	✓	✓	✓
Source x Year	✓	✓	✓	✓	✓	✓	✓	✓
R-sq (psuedo)	0.61	0.62	0.62	0.65	0.61	0.61	0.63	0.63
N	4,959	6,447	6,447	6,205	6,887	6,964	6,964	6,801
Mean(y)	8.84	6.10	7.88	6.43	6.78	7.09	6.98	7.36
SD(y)	15.15	13.63	14.43	14.32	11.33	13.21	13.55	14.15
Mean(x)	0.045	0.045	0.045	0.045	0.045	0.045	0.045	0.045
SD(x)	0.032	0.032	0.032	0.032	0.032	0.032	0.032	0.032
Excluded:	CA	CENSUS	IN	MA	NYCITY	NYTOWN	NYVIL	OH

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: This table presents the estimation results of Equation 4.1 where the outcome variable is log per-capita total service expenditure in Panel A (estimated using OLS) and per-capita capital outlays (estimated using Poisson pseudo-maximum likelihood) in Panel B. Control variables include population, population group (under 10k, 10k-100k, 100k+), and 1920s population growth-by-year fixed effects, contemporaneous and lagged log total non-debt per capita revenue, and source by year fixed effects. The 1929 leverage measure used is bonded debt divided by total assessed property values in 1929. Each column in the table drops the source of data indicated in the last row of the table from the estimation.

A.5 Balance Test on Bond Shocks - 1929 Variables

Table A5

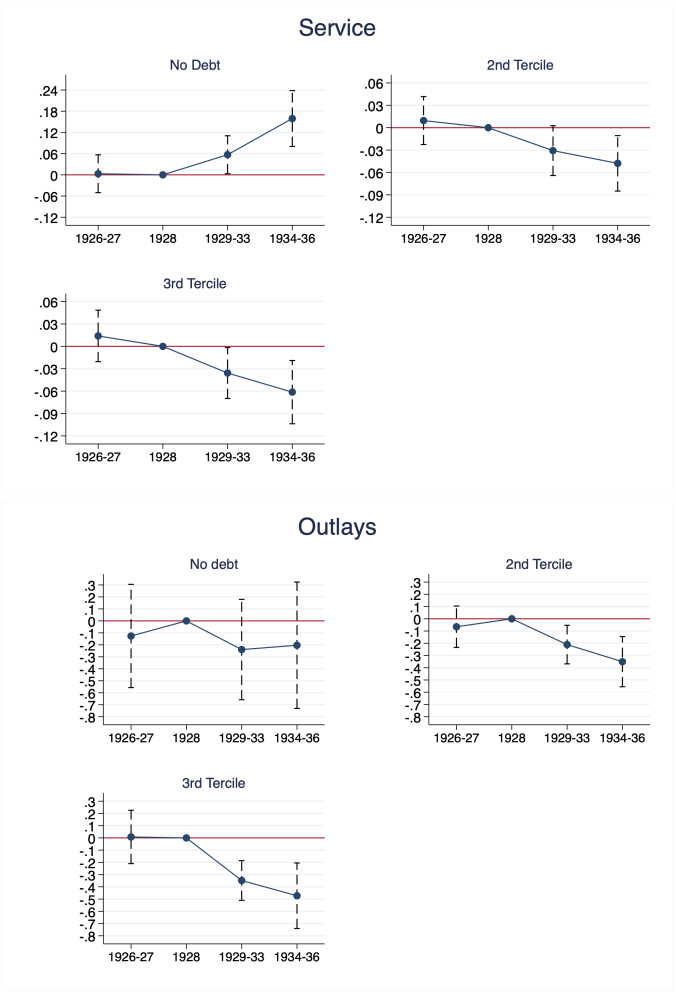
	All	Shock <Median	Shock >Median	Difference
Shock (All)	.381	.25	.501	-.25***
	(.15)	(7.9e-02)	(9.8e-02)	(1.4e-92)
Population (1930)	10.3	10.6	10.1	.515***
	(1.3)	(1.6)	(1)	(2.0e-04)
Total revenue, excluding debt issuance	3.81	3.77	3.85	-.0808
	(.51)	(.53)	(.5)	(.12)
Assessed value of property	7.31	7.29	7.33	-.0462
	(.46)	(.53)	(.39)	(.33)
Payments: Total service	3.18	3.22	3.14	.081
	(.62)	(.6)	(.63)	(.2)
Bond interest rate (1920s), unweighted	4.77	4.79	4.75	.0407
	(.45)	(.4)	(.5)	(.38)
Bond interest rate (1920s), weighted	4.7	4.73	4.66	.0711
	(.47)	(.43)	(.5)	(.13)
Observations	386	185	201	386

Notes: This table presents summary statistics and a t-test between the above-median *shock* and below-median *shock* groups of cities. The variable *shock* is defined as the proportion of 1929 city debt that was contractually obligated to be repaid between 1930 and 1935, inclusive. Revenue and payments are in log per-capita terms. Assessed value is in per-capita nominal terms. Bond interest rates are percents. Weighted indicates weighted measures by log city population in 1930.

B Appendix Figures

B.1 Tercile of leverage and local public goods

Figure A.1

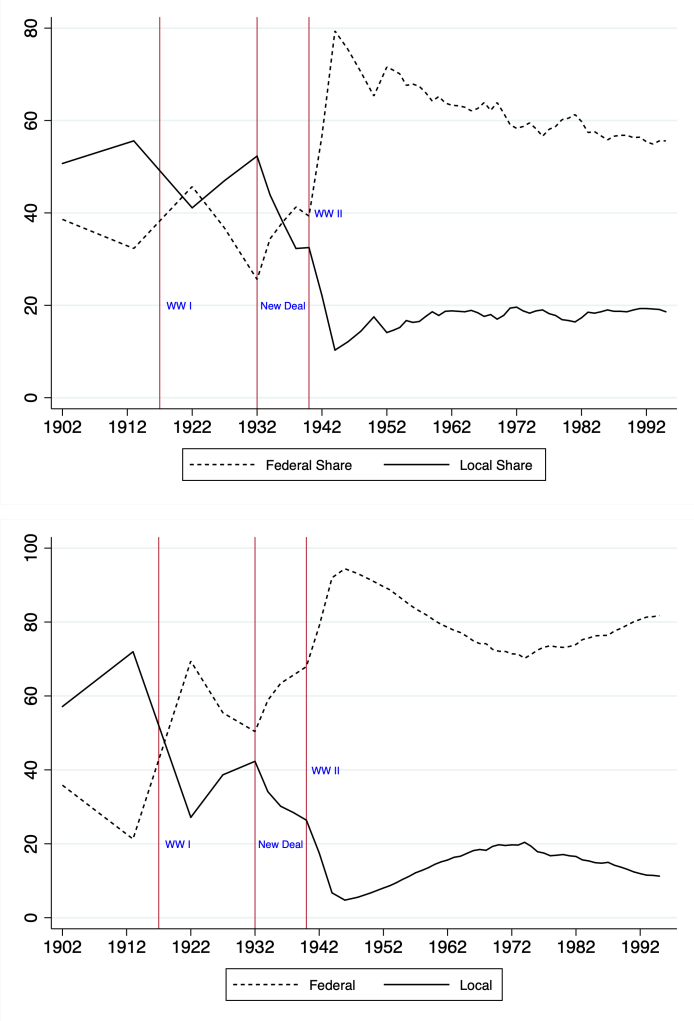


Note: This figure shows the estimated coefficients on $period_{j=t} \times leverage_{29,i}$ in Equation 4.1 where period denotes the four periods described in the text. $leverage_{29,i}$ takes on four values (no debt and three terciles) with the omitted category being the 1st tercile of leverage. The panel "Service" shows the plots when the specification uses log per capita total service expenditure as the outcome variable, estimated with OLS. The panel "Outlays" shows them when the outcome variable is per capital capital outlays, estimated using Poisson pseudo-maximum likelihood. All standard errors are clustered at the city level. Ninety percent confidence intervals are denoted by dashed lines. The omitted year and year-post interaction is 1928.

B.2 Revenue and Debt

Figure A.2

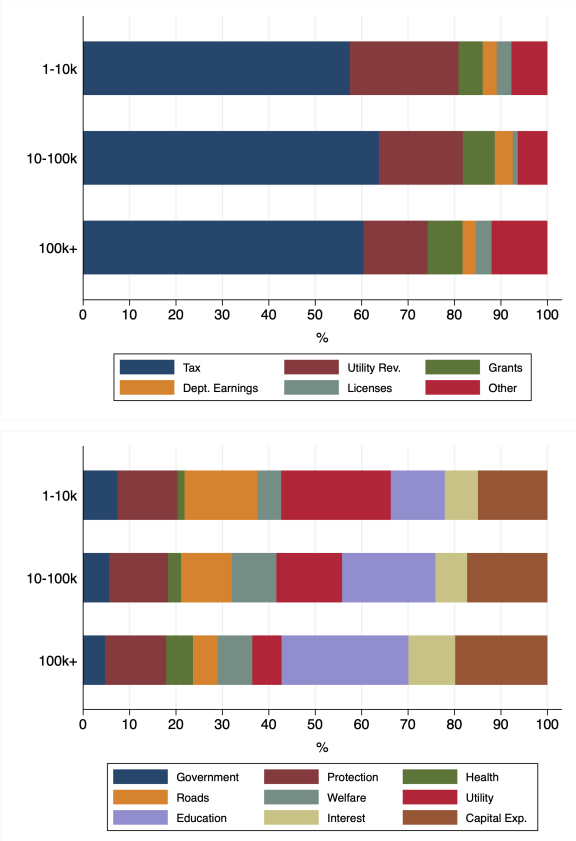
Figure A.3: Revenue [Top] and Debt [Bottom], % of Total



Note: This figure plots total local and federal government revenue and debt as percent of total in the U.S. in the 20th century. Author calculations of data in Historical Statistics of the United States, Series Ea125–131. State government shares are not shown.

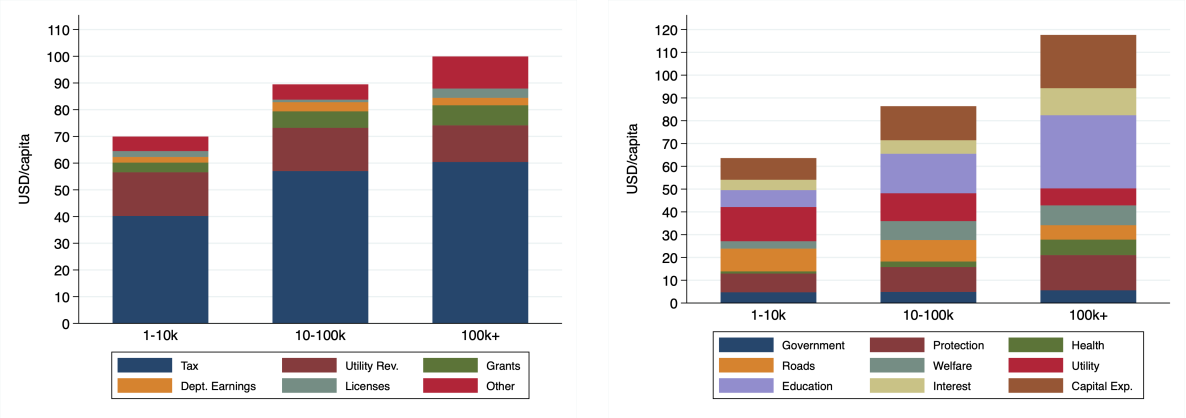
B.3 City Revenue and Payments

Figure A.4: Composition of City Revenue and Expenditure, 1930



Note: The figures show the average composition of city revenue and expenditure in 1930 by population category. Tax includes property tax, local personal income tax, local corporate income tax, and excise taxes. Utility revenue is income from publicly-owned water, gas, and electric utilities. Department earnings is income from government operations. Revenue from special projects is user fees (e.g., tolls). Grants include intergovernmental transfers from the State and Federal governments. Roads expenditure is for maintenance and improvement of roads. Capital expenditure includes construction and land purchases. Protection includes police and fire departments. Health includes all expenses related to the health department and sanitation services. Welfare includes all unemployment benefits, almshouses, and charity hospitals.

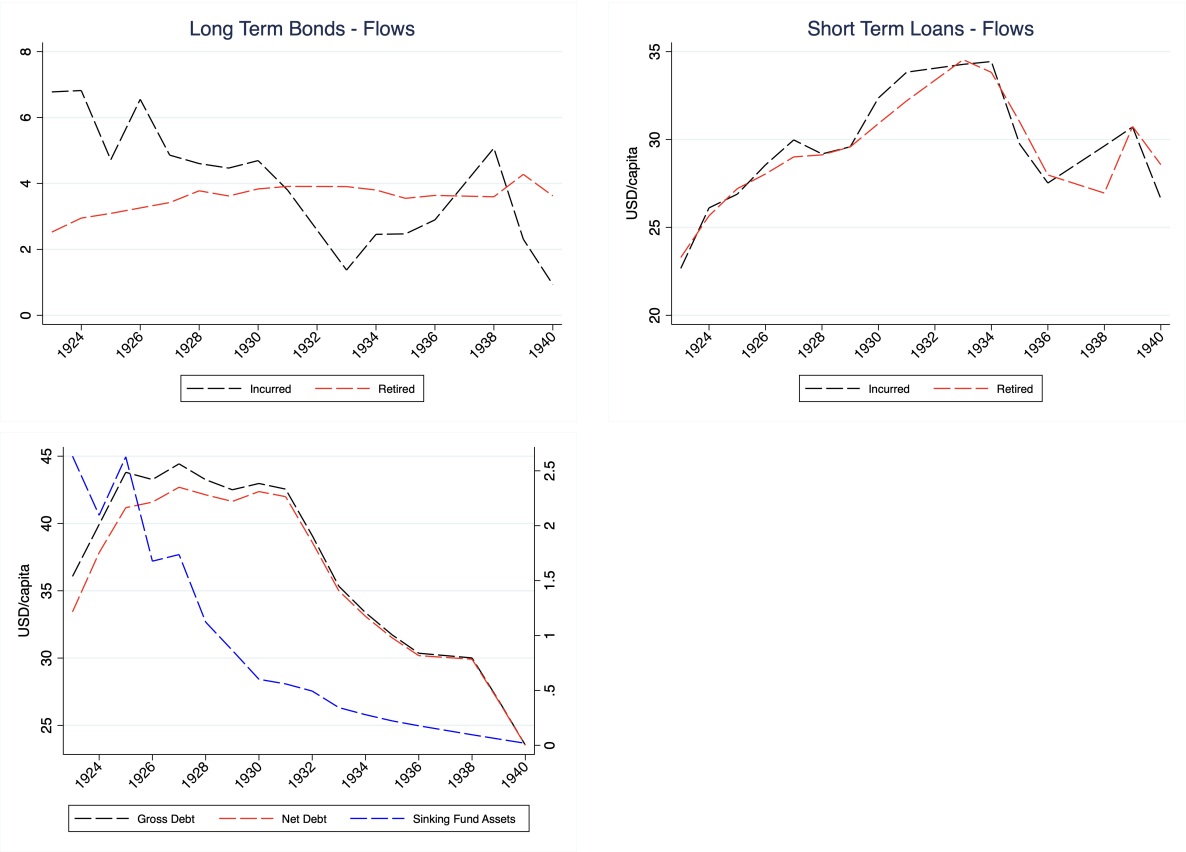
B.4 Composition of City Revenue and Expenditure, 1930



Note: The figures show the average per-capita level (in 1930 dollars) of city revenue and expenditure in 1930 by population category. Tax includes property tax, local personal income tax, local corporate income tax, and excise taxes. Utility revenue is income from publicly-owned water, gas, and electric utilities. Department earnings is income from government operations. Revenue from special projects is user fees (e.g., tolls). Grants include intergovernmental transfers from the State and Federal governments. Roads expenditure is for the maintenance and improvement of roads. Capital expenditure includes construction and land purchases. Protection includes police and fire departments. Health includes all expenses related to the health department and sanitation services. Welfare includes all unemployment benefits, almshouses, and charity hospitals.

B.5 Incurred and retired municipal debt in Massachusetts

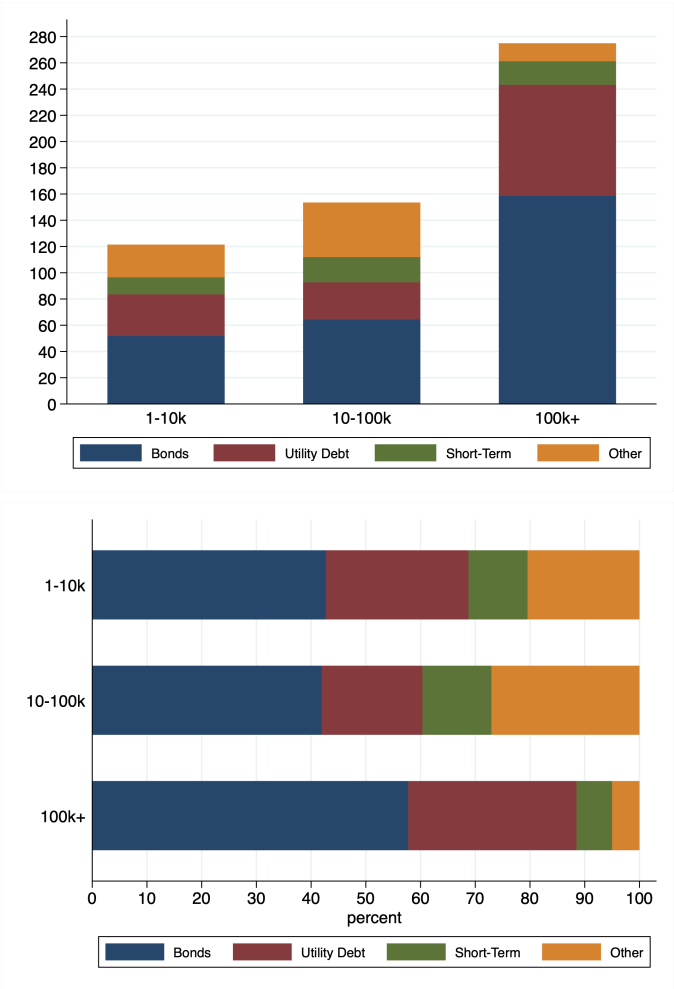
Figure A.5



Note: These figures present the average per-capita debt flows across 108 cities in Massachusetts. Incurred denotes all new bonds issued, and retired denotes all outstanding bonds which were paid off fully during the year. Sinking fund assets consist of cash savings and government securities. Net debt is gross debt minus the sinking fund assets.

B.6 Breakdown of Balance Sheet Debt

Figure A.6



Note: The figures show the average composition of city debt (in 1930 dollars) in 1930 by population category. Bonds are those long-term (typically over 5 years) issued for general funding purposes or for specific infrastructure projects. Short-term loans are those with a duration below 5 years, primarily collateralized by anticipated tax revenue. Utility debt is all debt incurred by public utilities. Other debt includes any debt incurred by special taxing districts within the city, e.g., water reclamation or sewage districts.

C Local Government Sources

City-level data on tax revenues, expenditures, and debt come from various publications produced at the state and federal levels. I describe them in this section.

Massachusetts. Data for Massachusetts cities appear in the report *Statistics of Municipal Finances* produced by the Department of Corporations and Taxation of the Commonwealth of Massachusetts. This annual report, first published in 1905, has three parts: list of financial transactions, cash balances, and debt for all cities (Part 1, around 40 cities), for all towns with a population of over 5,000 (Part 2, around 79 towns), and for all towns with a population under 5,000 (Part 1, around 237 towns). Due to budget constraints, this paper only uses data from Parts 1 and 2.

New York. Data for New York cities, towns, and villages appear in the report *Special Report on Municipal Accounts by the State Comptroller* produced by the New York Department of Audit and Control. This annual report is mandated by law (Article 3 of the General Municipal Law). It contains roughly 25 revenue and 25 expenditure variables across 57 cities, 527 villages, and 932 towns. Due to budget constraints, this project uses only the information for all cities and the largest 50 villages and towns.

Indiana. Data for Indiana cities are obtained from the *Statistical Report for the State of Indiana* compiled by the Division of Accounting and Statistics of the state of Indiana. This annual report aggregates, audits, and revises schedules filed by local officers. Of all the sources used in this project, this one is most limited in scope, with only 15 revenue and 24 expenditure variables. Until 1934, this report also contained judicial statistics of municipal and county courts. This publication contains data on roughly 95 cities.

Ohio. Data for Ohio cities come from the report *Comparative Statistics, cities of Ohio* produced by the Bureau of Inspection and Supervision of Public Offices of the State of Ohio. City auditors are required by law (section 291 of the General Code of Ohio) to report financial statements with the Bureau. The report contains four parts: (1) Receipts, (2) Expenditures, (3) Debt, and (4) Memorandum (supplementary data) and contains data for roughly 100 cities.

California. Data for California cities come from the report *Annual Report of Financial Transactions of Municipalities and Counties of California* produced by the Office of State Controller compiled by the authority of Chapter 550 of the State Code. This report contains detailed reports on payments and revenue sources for roughly 280 California cities.

Examples of services funded by expenditure category

This information accompanies the data provided by the Census Bureau in *Financial Statistics*.

- **Roads.** Maintenance of roads, snow removal, street lighting, and waterways.
- **Education.** All costs related to schools and libraries, supplementary to independent school districts.
- **Welfare.** Charities and poor relief, mental institutions.
- **Health.** Health department, prevention/treatment of communicable diseases, collection of vital statistics, food regulation and inspection.
- **Sanitation.** Sewage disposal, street cleaning, garbage collection, public restrooms.
- **Fire.** Wages of fireman and water costs.
- **Police.** Wages of police officers, building inspectors, employment agencies, examiners.
- **Miscellaneous.** Pension expenses, burial of soldiers, administration of trust funds, judgments against the city.
- **Utility** Utilities such as water supply systems, electricity, gas supply, docks, cemeteries, railways.
- **Recreation.** Maintenance of parks and general recreational areas.
- **Government** Wages of all government workers (council members, mayors, treasurer, judges, etc), cost of elections, and rent on government buildings.

D Moody's

Bond-level data was collected from the publication *Moody's Manual of Governments.* The main limitation of this data source is that bonds are not updated annually by Moody's. For example, I observe (in the 1929 Manual) Chicago bonds that *had* \$50,000 remaining during the years *1924*–1940, but the amount that is still left to be unpaid by 1929 must be estimated by assuming a plausible repayment scheme from 1924 to 1929.

First, I assume that bonds that are not paid off serially (i.e., have one maturity date, "term" bonds) remain on the city's books at full value. Second, I assume a linear repayment structure for bonds that are listed as serial, and I assign the following weight to each bond:

$$weight_{i,t} = \begin{cases} \frac{Y_i(N) - year_t}{Y_i(N) - Y_i(0)} & \text{if type} = \text{serial} \\ 1 & \text{if type} = \text{term} \end{cases} \tag{D.1}$$

where $Y_i(0)$ is the first year of bond i's repayment schedule and $Y_i(N)$ is the last. For example, a \$10,000 bond that matures between 1930–1940 is assigned a weight of 0.9 in 1931, as 90% of the bond is assumed to be outstanding in 1931. For each city, I sum all weight-adjusted bonds to arrive at an aggregate debt figure in each year.

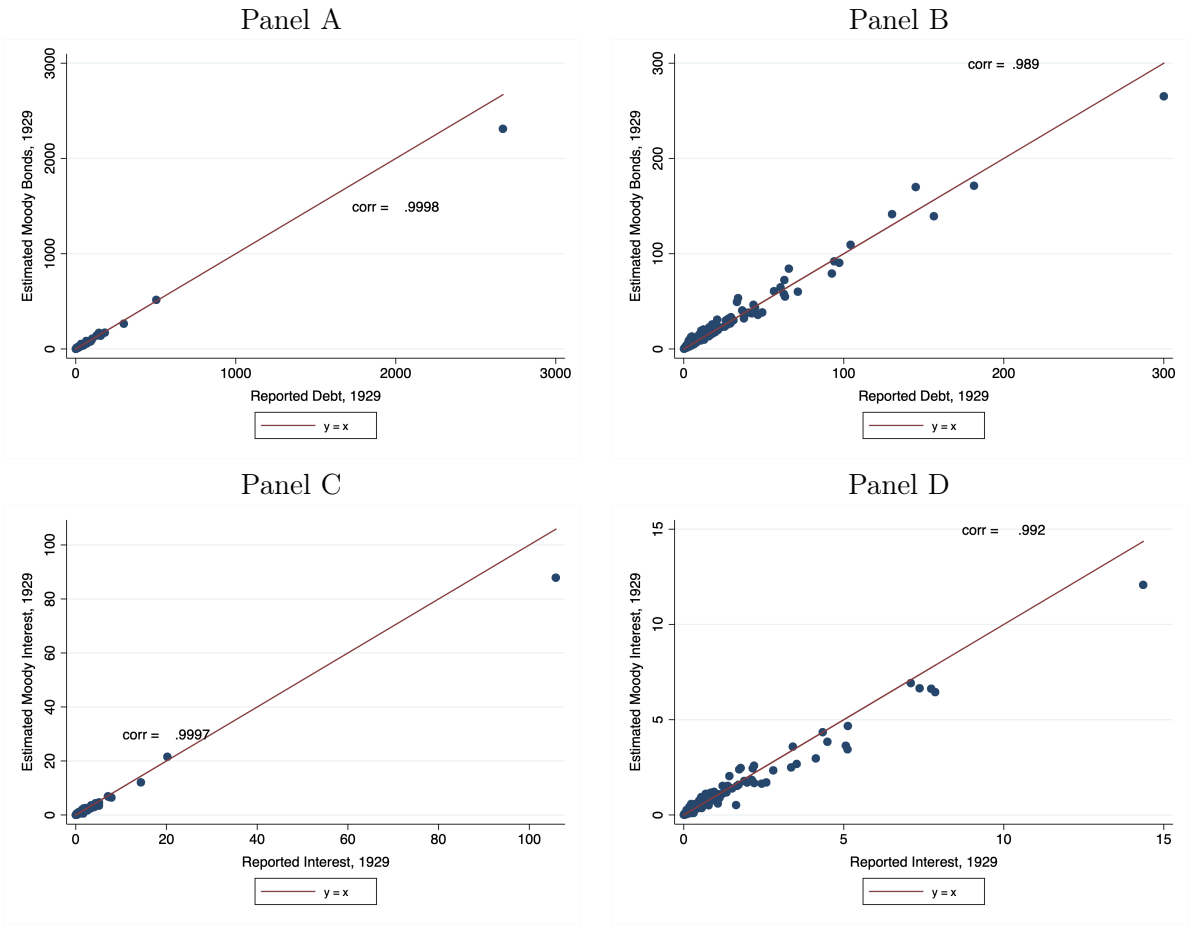
$$Moody_{j,t} = \sum_{\forall i \in j} weight_{i,t} \times face_i \tag{D.2}$$

where the sum is over all reported bonds for city j that have not year matured fully by year t. Furthermore, I compute the total implied interest payment by multiplying the interest rate by the face value and summing across all bonds.

To validate this exercise, I investigate the correlation between imputed Moody aggregates and the totals reported in the financial transactions data. Figure A.7 reports this relationship for total outstanding debt and total interest payments for 1929. With no measurement error, all cities would lie on the 45 degree line. Though imperfect, this imputation strategy produces totals that are close to the truth; the correlation coefficients are 0.98 for debt and interest payments, respectively.

The mean interest rate paid is 4.53. The average bonds in 1929 were issued in 1918. 36% of the bonds were "term" bonds–repaid in full at the end of the maturity period–and the remaining 64% were "serial" bonds–repaid proportionally over time, typically through annual contributions to city-established trust funds called "sinking funds." The median nominal face value of these outstanding

Figure A.7: Moody Bonds vs. Reported



Note: This figure shows the scatterplots of actual reported bonded debt and interest as reported in the financial transactions data vs. estimated bonded debt and interest using data from the *Moody's* Manuals. The red line is the 45 degree line. The graphs on the left (Panels A and C) include outliers (New York and Philadelphia), while the graphs on the right (Panels B and D) exclude them. The sample includes 341 cities. Both axes are in millions of nominal U.S. dollars.

bonds in 1929 was $261,000.