PUBLIC GOODS UNDER FINANCIAL DISTRESS*

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Abstract

I examine the effects of public debt on municipal services and real outcomes during financial crises using a unique archival dataset of U.S. cities from 1924 to 1943. Unlike today's countercyclical fiscal policies, the Great Depression provides a rare setting to observe fiscal shocks without substantial intergovernmental or Federal Reserve support. My findings show that financial market frictions—especially the need to refinance debt—led cities to sharply cut expenditures, particularly on capital projects and police services. As urban development halted during the Depression, cities with high pre-crisis debt levels faced significant austerity pressures, a decline in population growth, a rise in crime, and a departure of skilled public servants from municipal governments.

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1 Introduction

During economic recessions, local governments in the United States often face financial challenges, including declining revenues and heightened demand for social services. In recent history, 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 Covid-19 pandemic) and the Federal Reserve has made it easier for them to access financing (e.g., $500 billion Municipal Liquidity Facility in April 2020). This form of 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 examine the impact of municipal debt on local public expenditures and real outcomes using a novel dataset on U.S. city finances (revenue, expenditures, and debt), health outcomes, crime rates, and the local public labor force from 1924 to 1943. The Great Depression provides a unique historical setting, as cities faced severe fiscal pressures without modern fiscal stimulus or federal assistance. This context enables me to isolate the effects of financial constraints on local public good provision and assess the broader implications of municipal distress in times of economic downturn.

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. The local public labor force shrunk more in high leverage cities, with more-educated and higher-skilled workers leaving high-debt city governments and school districts after the Depression at a greater rate than their counterparts in low-leverage cities. I further find suggestive evidence that population growth slowed and property crime rates rose in those cities. Given the preponderance of evidence that the quality and quantity of local public goods provide economic benefits to local economies, the costs of municipal financial distress were large.[1]

The specific channel I use to identify financial distress is the size and timing of public debt repayment. The consequences of financial fragility during economic crises have been widely studied

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

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 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 (property), financial markets were in turmoil, and intergovernmental transfers or stimulus could not prop up struggling cities. This paper examines how financial constraints shaped local spending decisions and their consequences on city growth, health, crime, and the composition of the local public labor force during this period.

(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. As a result, they had to react to the initial downturn of the Depression 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, 1930s, and 1940s.

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

[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.

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 effect of financial 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. Even though the current structure in the U.S. relies on countercyclical transfers from the federal to state and local governments in times of crisis, this fiscal arrangement is ultimately a political choice that could change in the future, as it did in the past.[4]

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 in New York, Massachusetts, Ohio, Indiana, and California for the years 1924 - 1938 and 1941-1943. 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 and 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. With falling tax revenues during the Depression, cities had

[4]Prominent examples of the federal government unwilling to provide support for failing cities is President Ford's reluctance to support a bailout of New York in 1975 ("Drop Dead") and President Trumps threats of withholding federal funds to cities that did not cooperate with federal immigration authorities or those that experienced prominent civil unrest in 2020.

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. Additionally, 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.

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 three to seven percentage point decrease across various service expenditures and a 15 percentage point decrease in capital investment relative to cities in the 25th percentile during 1929 - 1938. By the early 1940s, I find that this gap vanished for service expenditure, yet the gap in capital investment remained. I find that highly levered cities, on average, received lower credit ratings than their low debt counterparts after, but not before, the Great Depression. The cost of borrowing and issuing bonds was higher during the Depression for higher-levered cities, which may help explain why these cities failed to maintain or upgrade their infrastructure.

I then attempt to unpack financial leverage into two distinct mechanisms. The first is through a 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 the investment cycle 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 similar cities that did not face the same acute financial shock during the Depression. 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 after 1933. The demand for public services and investment—and the correlation between leverage and local demand—does not seem to explain the observed effect of leverage on expenditure during the Great Depression.

I conclude my analysis with a discussion on the impact of city debt on real outcomes: population growth, crime, health, and the composition of the local public workforce. I find that one standard deviation increase in the amount of quasi-exogenous debt is related to 0.91 percentage point decrease in population growth, 15.6 more robberies, and 61.8 more burglaries, with large though noisy impact on motor vehicle thefts as well. These estimates amount to 10 - 15 percent of the baseline averages in 1930. Using micro-level data, I find a 1.3 percent increase in the likelihood of a male worker exiting the public sector in high-debt cities. Those who exited the public sector typically moved into occupations that ranked lower on the occupational income distribution, as measured by 1950 median earnings. I further find evidence that public sector workers from high-debt cities who left (or lost) their jobs during the Depression tended to positively select into other occupations by 1940, faring better than those from low-debt areas: they were more educated, older, and held higher-paying jobs outside the local public sector. That is, more educated and higher skilled workers were less likely to be employed by high-debt city governments after the Depression as compared to low leverage cities.

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)).[5] Yet, we know relatively little about the effects on municipalities, especially during financial market failures.[6] 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. 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 and their labor force 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.

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

[5]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).

[6]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.

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 goods spending cuts after the onset of the Great Depression using a difference-in-differences design. Section 5 explores the mechanisms and looks at the impact on various city outcomes. Finally, section 6 provides concluding remarks.

2 Historical Background

This section briefly 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)).

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.[7] 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

[7]Using data from the *Historical Statistics*, Online Appendix Figure A.2 plots the share of non-military spending by level of government in the United States from 1900 to 1970.

governments, such as the Federal Emergency Relief Administration (FERA) and the Works Progress Administration (WPA).

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.

The narrative evidence from this period shows that contemporary observers understood the risks cities were taking when issuing debt in order to fuel urban growth. 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)).[8]

[8]There are several reasons why a local jurisdiction would hesitate to default 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. 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."

3 Data

3.1 City-level sources

3.1.1 City Financials

I begin by describing the main features of my novel, annual data on municipal finances. Overall, the dataset contains over twelve thousand observations on revenue, expenditure, and debt across 730 municipalities between 1924 and 1943. 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 16.9 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 Online 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*.[9] Before 1931, this report also covered all cities with a population of over 30,000, but the reporting was curtailed after federal 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.,

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

Boston appears in both the Census and MA State documents), the statistics from the Census are used.

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)

3.1.2 Other City Data

I merge city financials with city 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, toll bridge bonds, 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.

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 (Corporation (1992)), 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). I obtain city-level annual crime rates for murder, rape, robbery, aggravated assault, burglary, and motor vehicle theft from the the Federal Bureau of Investigation's Uniform Crime Reporting (UCR) system, which were first digitized for the 1930s by Fishback et al. (2010). Lastly, I obtain annual death by cause data for 1927-1938 from the U.S. Census Bureau's "Mortality Statistics" publication (Janas (2024a)) and construct a

measure of total deaths due to communicable or waterborne diseases per 100 thousand people.[10]

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), welfare service expenditure, outlay expenditure, and police and fire protection 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 1932-1933, followed by steep declines by 1937. 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)

3.2 Linked Census Records

The primary outcome variables regarding local public government workers come from the 100 percent count U.S. Census records. This paper focuses on working-age adults (ages 22-60) who reported working in the local public administration or educational services.[11] These workers were the ones who were most likely to be affected by Great Depression expenditure cuts found in the previous sections.

I used the crosswalks provided by the Census Tree Project (Price et al. (2023a), Price et al. (2023b)) and IPUMS publicly available Census data (Ruggles et al. (2024)) to link records over time.[12] In total, the 1930-1940 sample of local government workers includes over 292 thousand individuals living in cities with available debt data, of whom 51 percent were men. This linked sample - which cover roughly 37 percent of the urban local public workforce in 1930 - is not perfectly

[10] Diseases in these category are the following: typhoid fever, malaria, smallpox, measles, scarlet fever, whooping cough, diphtheria, influenza, erysipelas, meningococcus meningitis, tuberculosis, bronchitis, pheumonia, diarrhea, and poliomyelities.

[11] 1950 industry codes of 936 and 888.

[12] For more details about how these links were created, see Price et al. (2021) and Buckles et al. (2023).

representative: white, older, and those leaving in the Pacific states are relatively over-represented. To address this issue, I use inverse probability weighing in my empirical analysis, creating weights after predicting the characteristics associated with a successful link.

I construct three primary outcome variables using decadal changes: a binary variable taking the value of 1 if the individual reported leaving the local public sector, the logarithm of the change in the individual's occupational income score, and the change in the percentile rank of the individual occupational income score. I further use total school years completed, actual reported weekly wages in 1940, and geographical mobility from the 1940 Census in additional analyses.

4 Leverage and Expenditures During the Great Depression

I define municipal financial leverage as the ratio of a city's bonded debt to assessed property values.[13] To ensure robustness, I also use alternative measures, including total debt (bonded plus short-term debt) relative to total city revenue, interest expense relative to tax revenue, and total debt per capita, showing that the main results are not sensitive to the specific definition of financial leverage. Using a regression framework, I explain cross-sectional variations in pre-Depression leverage, finding that these differences are largely driven by historical, long-term investment and repayment trends. I then outline my empirical approach, which uses these measures to compare local public good provision in highly leveraged versus less-leveraged cities before and during the Depression. The section concludes by examining the relationship between leverage, the Depression, the provision of various local public goods, and credit ratings.

4.1 Municipal financial leverage

Leverage, defined as the relative amount of debt to equity, is crucial in lending and investment decisions, as it amplifies returns on investment. In the municipal context, debt primarily consists of long-term bonded debt, repaid over twenty to fifty years, and short-term loans typically repaid within the fiscal year. Quantifying municipal equity or assets, however, is more complex. From a financing perspective, leverage measures a city's capacity to repay its debt and the associated risk of new debt issuance. My primary measure uses the property tax base, given that property taxes represented the majority of city revenue at the time. Alternative definitions incorporate total city

[13] This measure was theoretically used in some states to prevent cities from issuing additional debt once they reached a certain threshold. However, exemptions were common, and this cap was rarely binding. For more, see Chamberlain (1928).

revenue and population[14]

Figure III shows the distribution of leverage measures in my sample at the end of fiscal year 1929, excluding cities with zero debt (8 percent of the sample). Each measure is highly skewed to the right: the average city had 4 percent of property values as outstanding bonds, 12 percent of revenue allocated to interest expenses, debt amounting to 1.53 times annual revenue, and nominal 52 dollars in debt per capita.

(Figure III around here)

The variation in municipal leverage results from the historical patterns of debt issuance and repayment, current asset values (or their assessments), and taxation levels. The amount of debt issued, in turn, is limited by state constitutional constraints—which changed infrequently over the period covered in this paper—and by capital outlay needs, while debt repayment depends on the maturity structure and interest rates. By 1929, what role does each factor play in explaining pre-Depression leverage?

(Table II around here)

Table II decomposes the variation in 1929 leverage using the covariates available in the data. For easier interpretation, covariates are standardized to a mean of zero and a standard deviation of one. The two strongest predictors are state fixed effects and population (column 1), which together explain 17 percent of the variation in leverage, with historical leverage differences (columns 3–6) accounting for an additional 35 percent.

It is unsurprising that state fixed effects account for a significant share of debt level variation for several reasons: states varied in how they regulated municipal debt issuance, influenced which municipal securities savings banks and insurance companies could invest in, and differed in urbanization patterns across the 19th century. The persistence of leverage within cities aligns with the fact that the average bond in my sample was issued in 1918. Given that cities issue debt to fund capital outlays, it also follows that the total outlays from 1924 to 1929 (column 2) explain an additional 11 percent of the leverage variation by 1929.

(Figure IV around here)

Figure IV provides an initial look at whether leverage correlates with public goods provision

[14]All four measures, regardless of the specific definition, strongly predict municipal bond default during the Depression, as shown in Table A2. See the Online Appendix for details.

during the Depression. I split the sample into the top ("High Leverage") and bottom terciles ("Low Leverage") based on bonded debt-to-property values, compute three-year rolling averages of real and nominal expenditure for each group, and standardize these averages relative to 1928. The figure reveals no significant differences in public service expenditures (e.g., wages for police, sanitation, and health departments) between high and low leverage cities from 1925 to 1929. However, it shows a positive difference in capital infrastructure spending (e.g., roads) for high-leverage cities in this period. From the early 1930s, cuts in both types of public expenditure were deeper in "High Leverage" cities compared to "Low Leverage" ones, with the gap widening to over 20 percent for both service and capital expenditures by 1936 and remaining into the early 1940s.[15] Nominally, I observe a small decline in high leverage cities on average for service, which is a sharp break from the 1925-1930 trend (3 percent annual increase on average). The nominal decline in capital expenditure, of course, is even more pronounced. I further observe a diverging pattern in police employment across city types, with a 6 percent decline in the police force in high-leverage cities by 1936 but a 1 percent increase in low-leverage cities.

Two mechanisms potentially link leverage with public good provision during a crisis. The first is a refinancing, or supply-side, channel: greater leverage means increased difficulty borrowing and a heavier refinancing burden when credit tightens, diverting resources from public services to debt repayment. The second is a demand-side channel: high-leverage cities may have begun large infrastructure projects before the Depression, anticipating population growth, and would thus reduce or halt investment when that growth failed to materialize during the Depression. Before assessing the relative contribution of each channel, I examine whether leverage was associated with different municipal policies during the Depression.

4.2 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 five periods:

$$y_{it} = year_t + city_i + \theta X_{it} + \sum_{j \neq 1927,1928} \beta_j \times period_{j \in t} \times leverage_{29,i} + \epsilon_{it} \tag{4.1}$$

The coefficients of interest are β_j, representing the average marginal change in spending outcomes in high vs. low leverage cities during five periods: j = 1924-26 (pre-period), 1927-

[15] The relative drop in real expenditure in the 1941–1943 period reflects inflation and federal restrictions on cities' purchases of heavy equipment and building supplies due to World War II.

1928 (reference), 1929-1933 (early Depression), 1934 - 1938 (late Depression), and 1941-1943 (post Depression). Here, t denotes the year, and i the city. The variable $leverage_{29,i}$ is a continuous measure of 1929 financial leverage, defined as per-capita bonded debt to assessed property values. The dependent variables are log per capita real city-level expenditures. The regressions are estimated using OLS for all service expenditure outcomes. Due to a non-trivial number of cities with zero capital outlays at various points in time, 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). In my preferred specification, control variables in X_{it} include a set of region-by-year 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 former 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 latter, this section reports the results after controlling for region-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.

4.3 Baseline Results

4.3.1 Leverage and expenditure

Table III presents OLS regression results with the outcome variable as the log of total per-capita public service expenditure and debt revenue (Panel A) and Poisson pseudo-maximum likelihood estimates with per-capita capital outlay as the outcome. Column (1) includes only year and city fixed effects. Specifications (2) and (3) add controls for population trends—population

size groups (less than 10k, 10k-100k, and 100k+) in 1930, and population growth in the 1920s. Specification (4) further controls for total non-debt per-capita revenue and lagged total non-debt per-capita revenue, while specification (5) includes Census region-by-year fixed effects.

Across all specifications, I observe no statistically significant pre-trends among cities at different leverage levels. However, as the Depression began, the results reveal a divergence in spending, ability to raise external funds, and capital investment. Column (5) in Panel A shows that one standard deviation in leverage is associated with a 3-log-point decrease in annual service expenditure in the early Depression period and a 7-log-point decrease in the later Depression period. Column (6) shows a persistent 27-35 log-point drop in debt revenues after 1929.

(Table III around here)

The results for capital outlays in Panel B are even more pronounced. Again, across all specifications, highly leveraged cities did not invest more just before the Depression, conditional on the covariates described. Column (5) indicates that one standard deviation in leverage is associated with an 11-log-point decrease in annual outlays, or roughly 30 percent of the average outlay decrease in the early Depression period. This difference grew over time, reaching 20 log points for high-leverage cities by the early 1940s.

4.3.2 Composition of public goods and cost of capital

I next examine the effects on different types of spending, showing that substantial negative impacts on capital outlays (infrastructure spending) coincide with increased borrowing costs for highly indebted cities during the Depression.

Figure V plots the estimated coefficients from Equation 4.1 as an event study, with each period replaced by the fiscal year instead of pooled periods. The largest leverage-induced decreases in expenditure occur in capital outlays, particularly in 1934, and include payments for police and fire departments and road and highway expenditures. Consistent with the aggregate results from the previous section, I observe minimal differences in pre-Depression trends for these variables, even at an annual level. After the Depression's onset in 1929, spending on road and highway maintenance and police budgets dropped by approximately 6 and 10 log points, respectively, per standard deviation of leverage relative to their 1928 baselines. By 1933, cities reduced funding for their administrative functions, and by 1943, the leverage impact on non-capital-outlay spending had dissipated.

(Figure V around here)

Returning to the significant impacts on infrastructure, I find that highly indebted cities also experienced an increase in their cost of capital compared to other cities, helping to explain their disproportionately lower investment levels. I assess the effect of leverage on a city's cost of capital using credit ratings as a proxy. Credit ratings, both historically and currently, closely correlate with the cost of issuing municipal bonds. I use annual ratings from the *Moody's Manual of Governments* from 1929 to 1938, with ratings ranging from AAA (best) to CA (worst), which I convert to numerical values (AAA = 10, AA = 9, A = 8, etc.). Figure VI shows the average Moody's rating for the first (low leverage) and third (high leverage) terciles of leverage. While most cities in both groups held AAA ratings before the Depression, a divergence emerged by 1933, with low-leverage cities rated about 0.8 notches higher than high-leverage cities by 1936.

(Figure VI around here)

I conduct a series of robustness checks, with results reported in the Online Appendix. First, I use three alternative measures to confirm the results are consistent across different definitions. Second, I address potential concerns that court-imposed austerity measures on defaulted cities, rather than financial constraints across highly indebted cities, might drive these patterns. Excluding cities officially in "default" at any point during 1930-1937 leaves the main results unchanged. Third, I examine potential non-linearities in the continuous leverage measures by using a discrete above- and below-median leverage indicator, which does not alter the main findings. Finally, I address potential biases from the varied data sources used in the sample, confirming the results hold even when each data source is excluded one by one.[16]

In summary, I find robust evidence that financially constrained cities reduced public good provision during the Great Depression. This relationship is consistent across different leverage measures and only appears after the onset of the Depression. What underlying mechanisms might explain this behavior?

5 Mechanisms

In this section, I examine the relative importance of two mechanisms by which leverage may influence public good provision during a crisis: the refinancing (supply-side) versus the investment

[16] Full details are in Online Appendix Tables A1, A3, A4, and A5.

cycle (demand-side) channels. I first present evidence indicating that plausibly exogenous refinancing shocks were the primary drivers of expenditure adjustments in the 1930s. I then conduct multiple tests to exclude low-demand cities from my sample and find that the demand channel is relatively insignificant.

5.1 Leverage and refinancing debt

I break down financial leverage into short-run versus long-run cashflow shocks, providing direct evidence that the inability to refinance debt during the Depression was a key driver of the results in Section 4. I approach this in two ways. First, I forecast expected bond repayments and show that the leverage effect is notably higher in cities that needed to refinance a large share of their debt portfolio during the financial crisis. Second, I find that cities with more severe banking panics from 1930 to 1933 experienced larger effects.

To isolate the impact of long-term debt-related financial constraints, I leverage the quasi-exogenous maturity structure of local debt when cities issue long-term bonds with staggered expiration dates (e.g., 5, 10, 30, and 50 years). This structure allows financial leverage to be broken down into cashflow shocks occurring at different times, which provides two identification advantages. First, while debt issuance around 1930 may be endogenously linked to 1930s outcomes, debt issued 10 or 20 years before the Depression is likely less so. For example, a city intending to refinance a 20-year bond from 1911 would have faced significant difficulty doing so in 1931 amidst financial market turmoil. Second, bond duration choices are influenced by market norms, borrowing amounts, and are typically set at the state or national level, which helps mitigate local endogeneity concerns (Chamberlain (1928)). I also find no significant difference in historical bond interest rates between cities with more or less debt coming due during the Depression—a point I revisit in the next section.

I utilize variation in each city's bond portfolio maturity structure to identify plausible exogenous shocks by merging a city-level panel of local public good provision with novel bond-level data. Specifically, I collected "Schedule of Bonded Debt" data from the 1929 *Moody's Manual of Governments*. For each bond, the data includes the issuance year, maturity year, outstanding amount in 1929, interest rate, and bond purpose (e.g., road construction). The *Manual* contains information on over 28,000 bonds across 316 cities in my sample. Summary statistics are provided in Table I, Panel C.

To reduce measurement error from using different historical data sources, I aggregate the

outstanding bond amounts listed in $Moody's$ at the city level and compare these totals to the 1929 balance sheet data, retaining only cities where listed bonds cover at least 90 percent of the reported total debt. I further refine the sample to cities where the reported total bonded debt is within 20 percent of the sum of outstanding bonds in $Moody's$, ensuring that forecasted cash-flow repayment shocks closely approximate the actual shocks faced by cities during the early 1930s. Additional details on validating bond-level data are provided in Online 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. Online Appendix Table A6 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 IV presents the results using bond repayment shocks where the outcome variable is log real per-capita service expenditure (Panel A) and real per-capita capital outlay expenditure (Panel B). Columns (1) - (4) use the four leverage definitions. As before, control variables include population, population growth, total non-debt revenue, and region by year fixed effects.

(Table IV 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 during 1929 - 1938. By 1941-1943, moody leverage no longer plays a role in the decline of capital expenditures, in contrast with the results for the non-shocked measures shown in Panel B of Table III. The persistent nature of capital expenditure austerity into the 1940s cannot be explained through the refinancing channel. In all, these results indicate that re-financing constraints during the Great Depression contributed significantly to the decline in local public expenditure during the Depression.[17]

5.1.2 Leverage and local banking conditions

Accessing bond markets was not the only refinancing risk cities faced during the Depression. When local banking conditions deteriorated, cities struggled to secure loans for capital projects from banks, which could hinder local public expenditure if refinancing was indeed a critical channel. This section examines whether the municipal leverage effect was more pronounced in counties that experienced severe banking panics. I find that the interaction between panics and leverage became

[17] Online Appendix Table A7 shows that the results from Table IV are unchanged when defaulters are excluded from the sample.

significant after 1933: highly leveraged cities in counties with banking panics reduced their capital outlay expenditures by 30 percent more than those in counties without panics.

I use two proxies for county-level banking panics during the Depression. The first is newly digitized data on national-chartered bank balance sheets at the county level from the Office of the Comptroller of the Currency's annual reports for 1929 and 1931 Janas (2024b).[18] I calculate the log change in county-level loans on national bank balance sheets between 1929 and 1931. The second proxy is county-level data from the Federal Deposit Insurance Corporation on the total amount of suspended banking deposits from 1930 to 1933, which I use to construct the share of all bank deposits suspended over these four years.

I estimate a triple difference-in-differences specification by interacting these two measures with leverage, period, and leverage x period variables, following the approach in Equation 4.1. Table V reports the estimated coefficients, with real per capita capital outlays as the outcome variable, estimated using Poisson pseudo-maximum likelihood. Column (1) shows that, for cities in counties with the average share of suspended deposits (18 percent), the negative leverage impact in 1934-1938 was 0.06 dollars per capita (0.36 x 0.18) more than for cities in counties without bank suspensions. This amount is roughly 38 percent of the baseline estimates from Table III, Panel B, and this impact persisted into the early 1940s. Column (2) shows similar results using bank loan growth as the proxy: the average county experienced a 16 log-point decrease in bank loans, leading to an additional 0.05 dollars per capita reduction in expenditure due to leverage.

(Table V around here)

Admittedly, city defaults can lead to bank failures, suggesting that findings based on local banking conditions could be influenced by reverse causality. However, two points suggest that bank failures primarily constrained city governments' ability to repay or secure new credit. First, according to evidence from the 1930s, refinancing short-term obligations during bank failures was a pressing issue for cities. A survey of over 1,000 governments found that, as of 1933, slightly more than half of state, city, and county governments had funds in closed banks (Faust (1934)). These municipalities collectively had over 98 million dollars in failed banks, with an estimated aggregate balance of 400-500 million dollars across all governments—approximately 2 percent of all outstanding principal. Second, bank-level data on failures from Richardson (2007) shows that depreciation of bond values accounted for only 24 percent of bank suspensions. Combined with the

[18] County-level reporting in these reports ends in 1931.

fact that municipal and state bonds comprised only 10-15 percent of all bonds held by national and state commercial banks, it is unlikely that municipal defaults significantly contributed to bank failures.[19]

In summary, I find strong evidence that refinancing of both long-term bonds and bank loans played an important role in how leverage impacted municipal expenditure during the Depression.

5.2 Leverage and demand

The second mechanism through which financial leverage may influence local public good provision is on the demand side. This channel is particularly relevant for infrastructure investment: because highly indebted cities had already undertaken these investments in prior years, it was easier for them to reduce infrastructure spending when their financial situations worsened. High-leverage cities, therefore, may have been less inclined to invest further in the 1930s, regardless of the Depression and the subsequent cuts to public spending.[20]

A classic example of this cycle is the 1920s Florida boom and bust. Drawn by the warm climate and affordable land, migrants flocked to Florida coastal cities: Census data shows Miami grew from just under 30,000 residents in 1920 to over 110,000 by 1930. In response, local governments built infrastructure—including schools, roads, and irrigation systems—anticipating continued population growth; local government debt rose from 23 dollars per capita in 1912 to 337 dollars by 1931 (Joffe (2012)). During the Depression, tourism and internal migration to Florida halted, and with much of the needed infrastructure already in place, Florida cities largely ceased further construction.

To investigate whether this type of boom-and-bust cycle explains my main findings, I use various proxies for forward-looking local government demand for new infrastructure and re-estimate models on subsets of cities. Across a range of proxies, I find little evidence that municipal behavior differed substantially. If investment cycles, rather than financial constraints, were driving the observed patterns, I would expect to see null or significantly lower estimates once "low-demand" cities were removed from the sample. Instead, I find no consistent evidence that demand-side factors significantly weaken the leverage effect during the Depression. The following paragraphs describe these proxies, with heterogeneity results presented in Figure VIII.

[19] Aggregate bank balance sheet data is from the 1929 Annual Report of the Comptroller of the Currency.

[20] Figure V shows no significant pre-trends in capital outlays or debt issuance between high- and low-leverage cities immediately before the Depression.

(Figure VIII around here)

I first categorize cities as "high" or "low" infrastructure demand based on pre-1930 bond issuance behavior. Using data from $Moody's$, I proxy for future demand in two ways: (1) the outstanding value of bonds issued in 1925-1929 as a proportion of total issued and outstanding bonds, and (2) the average age (measured as 1929 minus the issuance year) of each city's bond portfolio, weighted by the outstanding value of each bond. I assume that cities with a high value of (1) are those with relatively new infrastructure, suggesting low demand for additional investment in the 1930s. Similarly, cities with a low value of (2) likely completed recent investments, implying lower future demand.

Panel A in Figure VIII shows the estimated leverage x period coefficients from Equation 4.1, with 90 percent confidence intervals across different city subsamples where the outcome variable is real per-capita capital outlay. The "Base" bars represent baseline results from cities with bond-level data available. The "Cities with above-median 1925-1929 issuance" bars reflect results limited to cities that issued more than the median share of bonds during 1925-1929, while "Cities with below-median average bond age" include only cities with relatively new bond portfolios. Control variables are consistent with those in the baseline results. Overall, there are minimal differences between the baseline results and those from cities that recently issued bonds.

In Panel B, I distinguish between young (potentially growing) and old (established, dense) cities based on incorporation year as a proxy for long-term municipal investment. In 1930, the median city age (1930 minus incorporation year) in my sample was 57 years. The green bars represent results for younger cities, while the red bars show results for older cities. While there is some attenuation and reduced precision, the estimates remain similar or even larger once young, rapidly growing cities—like those in Florida experiencing abrupt declines in demand during the Depression—are excluded.

Finally, in Panel C, I address the potential interaction between municipal outlays and federal government infrastructure spending through New Deal programs like the Works Progress Administration (WPA) and the Reconstruction Finance Corporation (RFC). The concern here is that federal infrastructure funds may have been directed to financially constrained cities, potentially crowding out municipal investment. This could have caused endogenous shifts in demand for municipally funded projects in these areas, confounding the leverage effect on capital outlays and potentially biasing the baseline estimates upwards. However, I find little evidence supporting this in Panel C: estimates from cities in counties with below-average New Deal spending are not significantly

different from baseline results after 1933.

In sum, I do not find strong evidence supporting demand-driven explanations for the decline in local public good provision, particularly in capital investments, during the Great Depression. Pre-Depression financial leverage remains a robust predictor of public spending cuts across various samples of cities with plausibly lower service or investment demand. I proxied for demand in several complementary ways: through bond-level data for construction project age, by city age, and by proximity to federal public works spending from the New Deal. Across all cases, the effect of leverage remains quantitatively consistent across the range of plausible municipal demand levels.

5.3 Impact on Growth, Health, and Crime

The debt-driven expenditure cuts shown in the previous section plausibly imposed real costs on local communities. For example, research has shown that local infrastructure spending during later decades helped stimulate regional economies (Kline and Moretti (2014))) and that sanitation spending reduced waterborne disease rates between 1902 and 1929 (Cain and Rotella (2001)). It stands to reason that smaller police budgets may have encouraged more criminal activity or that cutting infrastructure made some cities less appealing for migrants and firms, whether it be via higher transportation costs or less access to reliable electricity. In this section, I empirically investigate whether a shock to local public goods can have adverse consequences for urban growth by studying the relationship between debt and population growth, death rates due to communicable diseases, and crime rates in the 1930s.

(Table VI) around here)

Table VI presents suggestive evidence that highly leveraged cities experienced slower population growth and higher property crime rates in the 1930s. I estimate a regression model where the outcome variable is a standardized measure of log population growth between 1930 and 1940 (column 1), the standardized change in death rates per 100 thousand of communicable diseases between 1927-1929 and 1933-1935 (column 2) and in various crime rates between 1930-1931 and 1932-1933. The primary explanatory variable is standardized *moodyleverage*—the quasi-exogenous amount of debt a city faced for refinancing during the first five years of the Depression—while control variables account for other potential explanations related to retail sales growth between 1929 and 1933, population in 1930 and population growth in 1920-1930, and the total per capita city expenditure in 1930.

I find that one standard deviation in *moodyleverage* is associated with a 0.91 percentage point decrease in population growth, 15.6 more robberies, and 61.8 more burglaries, with large though noisy estimates on motor vehicle thefts as well. These estimates amount to 10 - 15 percent of the baseline averages in 1930. I do not find strong evidence that the incidence of violent crime was impacted (columns 6-8). Though imprecisely estimated, I further find a positive relationship with increase in the city-wide death rates due to communicable diseases.

5.4 Impact on the Local Public Workforce

Finally, I examine the impact of city debt on the local public workforce. Using a sample of linked census records of 1930 local government workers (detailed in Section 3.2), I estimate a regression model where the outcome variable is either a binary indicator of whether an individual left the public sector by 1940 or a change in occupational standing. The primary independent variable is *moodyleverage*—the quasi-exogenous amount of debt a city faced for refinancing during the first five years of the Depression—while control variables account for observable push and pull factors in the individual's city of residence and household characteristics. Specifically, I include the change in per-capita county retail sales from 1929 to 1933 to control for the severity of the Depression unrelated to financial factors, city population and total city revenue in 1930 to control for labor market thickness for local public sector workers, region fixed effects, a fourth-order age polynomial, and indicators for the number of children, marital status, sex, and race to account for known factors influencing job change likelihood.

(Table VII around here)

Table VII presents the results. In aggregate, 46 percent of local government workers in 1930 had left the public sector by the end of the decade. A one standard deviation increase in *moodyleverage* is associated with a statistically insignificant 0.4 percent increase in the likelihood of exiting the public sector among all workers (column 1). However, this null effect masks a strong male worker response (column 2) who exited the public sector in high-debt cities at a 1.3 percentage point higher rate than their male peers. The financial distress documented in the prior section had a pronounced negative impact on male local government workers in high-debt cities.

Male workers who left the public sector during the 1930s often moved into occupations that ranked lower in the occupational income distribution, as measured by 1950 median earnings. Columns (4) - (7) in Panel A reveal that these workers experienced a 4.2 percent reduction in

occupational income scores and a 2.1 percentile decline in relative occupational income standing per standard deviation of leverage. However, the negative impact of leaving the public sector was somewhat less severe in high-leverage cities. In fact, Columns (5) and (7) show that in high-debt areas, the adverse effects of public sector exit were mitigated by 15 to 20 percent.

I investigate whether this attenuation might be attributed to systematic differences in the characteristics of those who left public service. It's plausible, for instance, that workers fired during a debt-induced fiscal crisis were better positioned to secure alternative job opportunities by 1940 due to higher human capital or experience, especially if higher-paying public positions were more likely to be eliminated. Likewise, higher-skilled workers could potentially find other jobs in response to pay or hour reductions in the public sector during crisis periods.

Panel B of of Table VII explores the 1940 characteristics of former public sector workers in relation to *moodyleverage* levels and finds small but notable differences. Column (2) shows that leavers from high-leverage cities were slightly older than those in low-leverage areas. Column (4) indicates that they had, on average, completed 0.063 more years of schooling by 1940, and Column (6) shows a 0.9 percent increase in their log weekly wages by that year. Finally, Column (8) finds they were no more likely to relocate than their counterparts in low-debt cities. Overall, the evidence suggests that public sector workers from high-debt cities who left (or lost) their jobs during the Depression tended to move into other occupations with relatively positive outcomes. Compared to those from low-debt areas, they were more educated, older, and held better-paying jobs by 1940. Put another way, not only did high-leverage cities reduce their local public labor force more significantly by 1940, but the composition of public sector leavers also shifted: more educated and higher-skilled workers were less likely to remain employed by high-debt city governments post-Depression compared to low-leverage cities.

6 Concluding remarks

There is growing evidence that municipalities in the U.S. are facing financial instability, and it's a question of when—not if—the next crisis in local public finance will occur. Understanding how these crises affect the level or composition of local public goods and public sector employment is crucial for policymakers and urban economists. Historically, countercyclical federal and state fiscal stimulus in the U.S. has limited researchers' ability to study these consequences. This paper presents a novel approach by examining a period in U.S. history marked by decentralization and significant fiscal stress: the Great Depression.

Using a unique dataset on local public goods provision and bond issuance across a large sample of cities, I find that financial constraints significantly hindered local public expenditures during the Depression. I identify causal effects through a difference-in-differences analysis, leveraging quasi-exogenous financial shocks from maturing bonds. The findings reveal minimal evidence that the demand-side investment cycle mechanism—a potential confounder associated with financial leverage—accounts for the observed leverage impact. Persistence into the 1940s remains unexplained by a variety of infrastructure demand proxies.

I find suggestive evidence of a negative effect on crime rates and population growth in cities with high financial constraints. I further find the local public labor force contracted more sharply in those cities. The public workers who left their jobs during the Depression generally fared worse in terms of occupational status by 1940. Notably, the composition of public sector departures varied with leverage levels: more educated and higher-skilled workers were less likely to remain employed in high-debt city governments compared to their peers in lower-leverage cities. This differentiated response to debt-induced fiscal shocks plausibly impaired local administration of public goods in cities and schools post-Depression. This paper demonstrates that debt-driven financial constraints can lead to significant cuts in public spending during a crisis with negative downstream consequences. Ultimately, however, spending decisions are political choices - this paper does not address the political economy of local public goods provision or the interaction between local politics and financial constraints during crises, which I leave for future research.

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Table I: Summary statistics

Panel A: City Level Revenue and Expenditure, 1924–1943

	N	Mean	SD	Median	25 pct	75 pct
Population (k)	12,602	40.83	154.02	7.95	4.99	19.56
Total revenue, excluding debt issuance	12,602	84.65	81.68	64.88	39.15	112.99
Tax revenue	12,602	47.45	38.66	32.64	21.02	66.82
All non-tax revenue (earnings)	12,602	26.46	51.04	18.91	8.67	34.94
Debt receipts	11,717	26.01	70.13	3.93	0.00	32.23
All other non-tax, non-debt receipts	12,602	10.74	21.31	2.81	0.00	13.79
Payments: Total service	12,602	48.75	39.42	33.09	21.30	68.58
Payments: government administration	12,602	4.72	3.59	4.04	2.71	5.79
Payments: health and sanitation	12,602	3.84	4.75	2.81	1.01	5.36
Payments: roads and highways	12,602	7.86	6.24	7.14	4.52	10.35
Payments: protection of persons and property	12,602	9.94	9.77	8.79	5.24	13.01
Payments: charities, welfare, and corrections	12,602	5.45	10.19	0.49	0.00	5.70
Payments: recreation	12,602	1.47	2.53	0.81	0.13	2.05
Payments: school and libraries	12,602	11.99	17.61	1.00	0.00	27.67
Other service payments	12,602	3.48	8.54	1.10	0.17	4.01
Public utilites	10,340	12.76	60.23	6.89	3.31	13.28
Interest	12,602	5.28	15.01	3.13	1.16	6.57
Capital outlays	12,602	12.50	24.36	4.69	0.78	15.50
All other non-maintenance, non-outlay payments	11,717	11.09	20.31	4.37	0.11	13.59
Total debt	12,599	123.87	312.22	73.23	32.62	148.89
Total bonded debt	12,602	111.14	305.27	67.47	28.25	132.04
Assessed value of property	9,833	2685.44	3209.81	2283.07	1679.40	3013.03
Defaulted 1930 - 1937 (any district)	12,602	0.13	0.34	0.00	0.00	0.00
Defaulted 1930 - 1937 (city)	12,602	0.12	0.33	0.00	0.00	0.00
Bond debt / assessed value	9,833	0.04	0.04	0.03	0.02	0.06
Interest payment / tax revenue	12,602	0.11	0.13	0.08	0.04	0.15
Debt / total revenue	12,599	1.41	1.56	1.11	0.55	1.91

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

	N	Mean	SD	Median	25 pct	75 pct
Sus. Bank Deposits (1930-33)	727	0.21	0.28	0.14	0.04	0.28
Δ Log(Loans 1931-29)	666	-0.10	0.19	-0.10	-0.17	-0.03
Debt age	382	8.13	2.87	7.79	6.38	9.64
Debt share, 1925 - 1929	382	0.34	0.23	0.32	0.16	0.51
Δ Log(Pop 1920-30)	746	0.24	0.30	0.17	0.04	0.36
City age in 1930	439	92.66	74.66	72.00	32.00	139.00
Total outlay 1924-29 / capita	655	61.26	83.28	39.30	15.79	84.00
WPA grants/capita	733	50.05	30.26	45.66	29.56	63.51
RFC grants/capita	733	41.89	90.65	22.24	11.31	39.00
Murder per 100k	56	9.22	9.04	7.50	3.19	12.70
Rape per 100k	57	4.55	4.12	3.35	1.16	6.28
Robbery per 100k	58	107.67	81.25	105.01	33.29	157.17
Assault per 100k	57	58.69	59.25	37.46	17.23	76.55
Burglary per 100k	57	416.70	242.60	386.46	195.45	575.24
Auto theft per 100k	56	531.68	260.00	509.50	341.45	741.73
Communicable Disease Deaths per 100k	101	208.69	85.04	192.73	155.32	243.48
Δ Log(Pop 1930-40)	746	0.08	0.13	0.05	0.00	0.13

Note: Summary data for all observations across cities in the period 1924–1938, 1941–1943. Panel A: Population is in thousands. All dollar values (revenues, payments, debt) are in per-capita dollars deflated to 1961 using the CPI. 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 Federal Deposit Insurance Corporation. Log loan growth of national banks at the county level comes from the Office of the Comptroller of the Currency. WPA and RFC data come from Fishback et al. (2003). See text for sources for all other variables.

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

	Bonds/Assess			Int/Rev	Debt/Rev	Debt/Capita
	(1)	(2)	(3)	(4)	(5)	(6)
Population (1929)	0.23***	0.23***	0.07*	0.05*	0.06**	0.11***
	(0.05)	(0.07)	(0.04)	(0.02)	(0.03)	(0.03)
Σ Outlay, 1924-29		0.36***	0.18*	0.21***	0.17*	0.69***
		(0.09)	(0.09)	(0.06)	(0.09)	(0.11)
Bonds/Assess (1924)			0.48***			
			(0.04)			
Int/Rev (1924)				0.50***		
				(0.05)		
Debt/Rev (1924)					0.67***	
					(0.04)	
Debt/Capita (1924)						0.56***
						(0.04)
State FE	✓	✓	✓	✓	✓	✓
R-sq	0.18	0.28	0.53	0.55	0.63	0.80
N	697	608	410	608	608	613

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) - (3) use the bonded debt to assessed property value ratio while columns (4) - (6) use interest to tax revenue, debt to revenue, and debt per capita, respectively. Robust standard errors reported in the parentheses.

Table III: Leverage and local public expenditure

Panel A: Financial leverage (1929) and service expenditure

	Outcome: Log(Service Payments/Capita)					Log(Debt Receipts/Capita)
	(1)	(2)	(3)	(4)	(5)	(6)
leverage x 1924-1926	0.00	0.00	-0.00	-0.01	-0.01	-0.06
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.07)
leverage x 1929-1933	-0.02***	-0.02***	-0.03***	-0.02***	-0.02***	-0.26***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.05)
leverage x 1934-1938	-0.09***	-0.09***	-0.09***	-0.08***	-0.07***	-0.36***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.06)
leverage x 1941-1943	-0.05***	-0.04***	-0.04***	-0.02	-0.01	-0.35***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.08)
City FE	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓
1930 Pop x Year		✓		✓	✓	✓
Δ1920-30 Pop x Year		✓	✓	✓	✓	✓
Pop Group x Year			✓			
Revenue				✓	✓	✓
Region x Year					✓	✓
R-sq (within)	0.42	0.45	0.46	0.58	0.62	0.15
N	12,305	12,305	12,305	10,903	10,903	6,911
Mean(y)	3.60					
SD(y)	0.74					

Standard errors in parentheses

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

Panel B: Financial leverage (1929) and capital outlay

	Outcome: Outlay/Capita				
	(1)	(2)	(3)	(4)	(5)
leverage x 1924-1926	-0.02	-0.01	-0.02	0.04	0.05
	(0.06)	(0.05)	(0.06)	(0.05)	(0.05)
leverage x 1929-1933	-0.11**	-0.09**	-0.12***	-0.08*	-0.10**
	(0.05)	(0.04)	(0.04)	(0.04)	(0.05)
leverage x 1934-1938	-0.24***	-0.17***	-0.18***	-0.14***	-0.17***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)
leverage x 1941-1943	-0.38***	-0.32***	-0.31***	-0.29***	-0.21***
	(0.09)	(0.07)	(0.08)	(0.08)	(0.08)
City FE	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓
1930 Pop x Year		✓		✓	✓
Δ1920-30 Pop x Year		✓	✓	✓	✓
Pop Group x Year			✓		
Revenue				✓	✓
Region x Year					✓
R-sq (pseudo)	0.54	0.55	0.55	0.58	0.60
N	12,305	12,305	12,305	10,903	10,903
Mean(y)	12.09				
SD(y)	23.33				

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 in Panel A is log per-capita total service expenditure in columns (1) - (5) or log per-capita revenue generated from debt issuance ("debt receipts") in column (6), both estimated using OLS. In panel B, the outcome variable is per-capita capital outlays, and the model is estimated using Poisson pseudo-maximum likelihood. Standard errors are clustered at the city level. Column (1) contains only city and year fixed effects, while columns (2)–(5) add 1930 population-year fixed effects, 1920s population growth-year fixed effects, contemporaneous and lagged log total non-debt per capita revenue, region-year fixed effects. Leverage is standardized (mean zero and standard deviation of one) bonded debt over assessed property values in 1929.

Table IV: Bond repayment and expenditure

Panel A: Moody leverage and service expenditure

	Bonds / Assessed Value	Int/Rev	Debt/Rev	Debt/Capita
	(1)	(2)	(3)	(4)
moodyleverage x 1924-1926	0.02	0.01	0.01	-0.00
	(0.03)	(0.02)	(0.03)	(0.01)
moodyleverage x 1929-1933	-0.03***	-0.01	-0.02**	-0.00
	(0.01)	(0.01)	(0.01)	(0.01)
moodyleverage x 1934-1938	-0.04**	-0.02	-0.04**	-0.03*
	(0.02)	(0.02)	(0.02)	(0.02)
moodyleverage x 1941-1943	-0.03	-0.04	-0.06**	-0.01
	(0.02)	(0.02)	(0.02)	(0.02)
City FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
1930 Pop x Year	✓	✓	✓	✓
Δ1920-30 Pop x Year	✓	✓	✓	✓
Revenue	✓	✓	✓	✓
Region x Year	✓	✓	✓	✓
R-sq (within)	0.67	0.67	0.68	0.71
N	3,810	3,827	3,829	3,794
Mean(y)	4.06	4.07	4.07	4.05
SD(y)	0.62	0.61	0.61	0.61

Standard errors in parentheses

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

Panel B: Moody leverage and capital outlay

	Bonds / Assessed Value	Int/Rev	Debt/Rev	Debt/Capita
	(1)	(2)	(3)	(4)
moodyleverage x 1924-1926	-0.01	-0.09	-0.11**	0.05
	(0.05)	(0.06)	(0.05)	(0.06)
moodyleverage x 1929-1933	-0.27***	-0.16**	-0.19***	-0.02
	(0.05)	(0.07)	(0.07)	(0.06)
moodyleverage x 1934-1938	-0.29***	-0.17**	-0.36***	-0.19***
	(0.07)	(0.08)	(0.08)	(0.07)
moodyleverage x 1941-1943	-0.16	-0.12	-0.09	-0.12
	(0.13)	(0.15)	(0.12)	(0.09)
City FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
1930 Pop x Year	✓	✓	✓	✓
Δ1920-30 Pop x Year	✓	✓	✓	✓
Revenue	✓	✓	✓	✓
Region x Year	✓	✓	✓	✓
R-sq (pseudo)	0.59	0.58	0.59	0.53
N	3,810	3,827	3,829	3,794
Mean(y)	18.01	18.25	18.23	17.03
SD(y)	30.98	31.18	31.15	21.80

Standard errors in parentheses

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

Note: This table presents the estimation results of Equation 5.2 where the outcome variable is log per-capita total service expenditure (Panel A, estimated using OLS) or real per-capita capital outlay (Panel B, estimated using Poisson pseudo-maximum). Control variables as the same as in Table III and include population, population growth, contemporaneous and lagged log total non-debt per capita revenue, region 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 V: Leverage, banking conditions, and capital outlays

	Outcome: Outlay/Capita	
	(1)	(2)
leverage x 1924-1926 x suspended bank deposits	0.02	
	(0.12)	
leverage x 1929-1933 x suspended bank deposits	-0.04	
	(0.11)	
leverage x 1934-1938 x suspended bank deposits	-0.32*	
	(0.17)	
leverage x 1941-1943 x suspended bank deposits	-0.43**	
	(0.20)	
leverage x 1924-1926 x Δ bank loan growth		-0.19
		(0.15)
leverage x 1929-1933 x Δ bank loan growth		0.14
		(0.16)
leverage x 1934-1938 x Δ bank loan growth		0.33**
		(0.16)
leverage x 1941-1943 x Δ bank loan growth		0.24
		(0.17)
City FE	✓	✓
Year FE	✓	✓
1930 Pop x Year	✓	✓
Δ1920-30 Pop x Year	✓	✓
Revenue	✓	✓
Region x Year	✓	✓
Leverage x Period	✓	✓
Suspended Bank Deposits x Period	✓	
Δ loan growth x Period		✓
R-sq (within)	0.60	0.60
N	10,633	10,359
Mean(y)	11.88	12.09
SD(y)	23.42	23.66
Mean(x)	0.002	0.002
SD(x)	0.998	0.998

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 of leverage x period x county-level share of national bank deposits suspended during 1930-1933 (column 1) and county log national bank loan growth between 1929 and 1931 (column 2). The outcome variable is real per-capita capital outlay. Control variables include population, population growth, contemporaneous and lagged log total non-debt per capita revenue, region by year fixed effects, and the interaction terms denoted in the table. Leverage is standardized (mean zero and standard deviation of one) bonded debt over assessed property values in 1929. Standard errors are shown in parentheses and are clustered at the city level.

Table VI: Leverage and Population Growth, Death Rates, and Crime

	(1) Δ Pop. Growth	(2) Δ Death Rate	(3) Δ Robbery	(4) Δ Burglary	(5) Δ Auto Theft	(6) Δ Assault	(7) Δ Rape	(8) Δ Murder
debt_total29_lev_moody_std	-0.07**	0.10	0.42*	0.37**	0.20	0.05	-0.03	0.04
	(0.04)	(0.10)	(0.24)	(0.17)	(0.19)	(0.22)	(0.14)	(0.16)
Retail Sales	✓	✓	✓	✓	✓	✓	✓	✓
Population	✓	✓	✓	✓	✓	✓	✓	✓
Revenue (1930)	✓	✓	✓	✓	✓	✓	✓	✓
R-sq	0.32	0.08	0.17	0.13	0.09	0.05	0.10	0.20
N	369	97	57	56	55	56	56	55
Std[Y]	0.13	41.72	37.35	167.32	134.98	47.76	3.74	3.37

Standard errors in parentheses

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

Note: This table presents the estimation results of an OLS regression where the outcome variable is the log population growth rate between 1930 and 1940 (column 1), change in the city death rate(per 100 thousand from communicable diseases between 1927-1929 and 1933-1935 (column 2), and the change in various types of crime rates per 100 thousand between 1930-1931 and 1932-1933 in columns (3) - (8). All outcome variables are standardized to have mean zero and standard deviation one to ease interpretation. Control variables include log city population in 1930, population growth between 1920 and 1930, city expenditure in 1930, and log per capita change in county-level retail sales between 1929 and 1933 obtained from Fishback et al. (2003). Robust standard errors are shown in parentheses.

Table VII: Impact on the Local Public Workforce

Panel A: 1930 - 1940 Changes

	Outcome: I(Left Public)			Δ Log(Occscore)		Δ Rank(Occscore)	
	All	Males	Females	Males	Males	Males	Males
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Moody Leverage	0.004	0.013***	-0.005		-0.002*		-0.002
	(0.003)	(0.004)	(0.003)		(0.001)		(0.094)
I(Left Public)				-0.042***	-0.047***	-2.088***	-2.371***
				(0.004)	(0.004)	(0.284)	(0.318)
Moody Leverage x I(Left Public)					0.008***		0.489***
					(0.002)		(0.149)
Retail Sales	✓	✓	✓	✓	✓	✓	✓
Population	✓	✓	✓	✓	✓	✓	✓
Revenue (1930)	✓	✓	✓	✓	✓	✓	✓
Region FE	✓	✓	✓	✓	✓	✓	✓
Age	✓	✓	✓	✓	✓	✓	✓
Household	✓	✓	✓	✓	✓	✓	✓
R-sq	0.08	0.06	0.10	0.01	0.01	0.01	0.01
N	292,238	175,335	116,903	161,213	155,093	161,213	155,093
Mean(y)	0.46	0.54	0.41	-0.02	-0.02	-0.46	-0.44
SD(y)	0.50	0.50	0.49	0.29	0.29	23.78	23.80

Standard errors in parentheses

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

Panel B: 1940 Outcomes

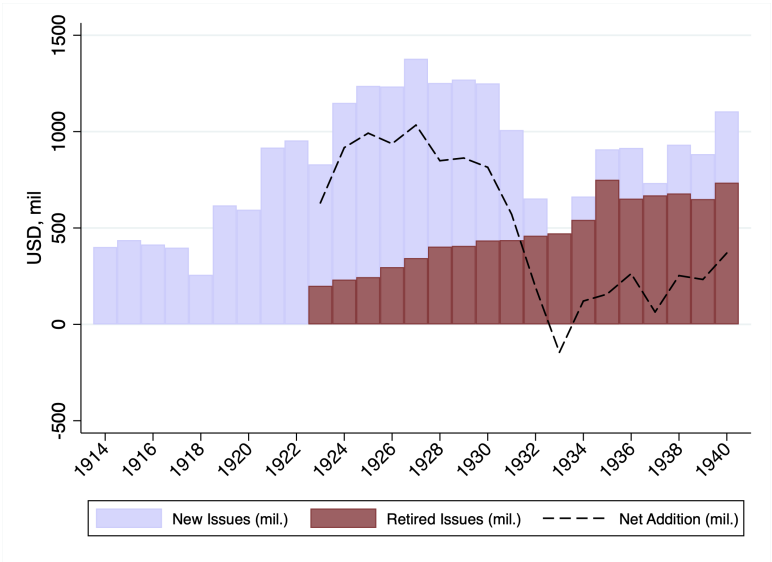
	Age (1940)		Years of Schooling (1940)		Log(Weekly Wages) (1940)		I(Moved Out of City) (1940)	
	Males	Males	Males	Males	Males	Males	Males	Males
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
I(Left Public)	3.005***	2.869***	-1.617***	-1.660***	-0.358***	-0.365***	0.140***	0.143***
	(0.171)	(0.175)	(0.054)	(0.061)	(0.008)	(0.008)	(0.007)	(0.007)
Moody Leverage		-0.091		0.005		0.014**		0.008
		(0.080)		(0.044)		(0.006)		(0.005)
Moody Leverage x I(Left Public)		0.206***		0.063**		0.009***		-0.005
		(0.067)		(0.025)		(0.003)		(0.004)
Retail Sales	✓	✓	✓	✓	✓	✓	✓	✓
Population	✓	✓	✓	✓	✓	✓	✓	✓
Revenue (1930)	✓	✓	✓	✓	✓	✓	✓	✓
Region FE			✓	✓	✓	✓	✓	✓
Age	✓	✓	✓	✓	✓	✓	✓	✓
Household	✓	✓	✓	✓	✓	✓	✓	✓
R-sq	0.14	0.14	0.13	0.13	0.23	0.24	0.08	0.08
N	175,335	175,335	174,902	174,902	140,464	140,464	175,335	175,335
Mean(y)	39.59	39.59	9.86	9.86	3.58	3.58	0.18	0.18
SD(y)	10.55	10.55	4.12	4.12	0.50	0.50	0.39	0.39

Standard errors in parentheses

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

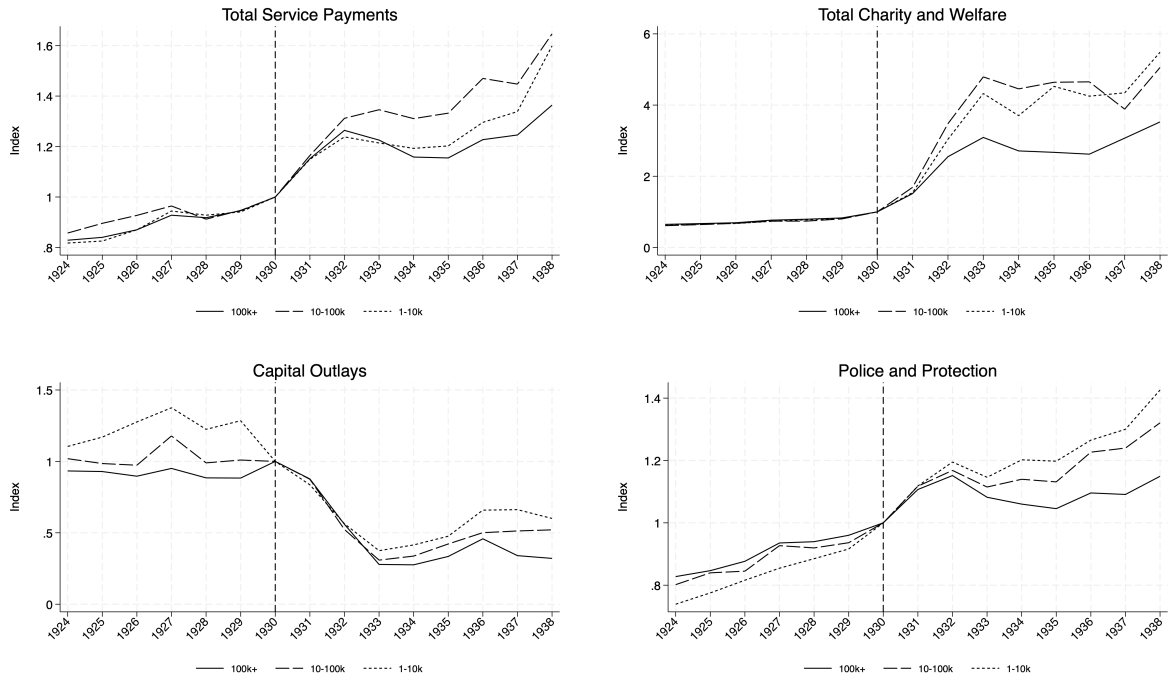
Note: This table presents the estimation results of an OLS regression using a sample of 1930-1940 linked U.S. decennial census records of 21-60 year old urban local government workers. Moody Leverage is total municipal debt in 1929 multiplied by *shock* as defined in Equation 5.1. The outcome variables are denoted in the headers. Control variables include standardized log city population in 1930, Census region fixed effects, a 4th order polynomial in age, city expenditure in 1930, log per capita change in county-level retail sales between 1929 and 1933 obtained from Fishback et al. (2003), and categorical variables denoting the number of children, marriage status, and race in 1930. Regression is weighted using inverse probability weighting. Standard errors are shown in parentheses and are clustered at the city level.

Figure I: Municipal debt sales and retirements



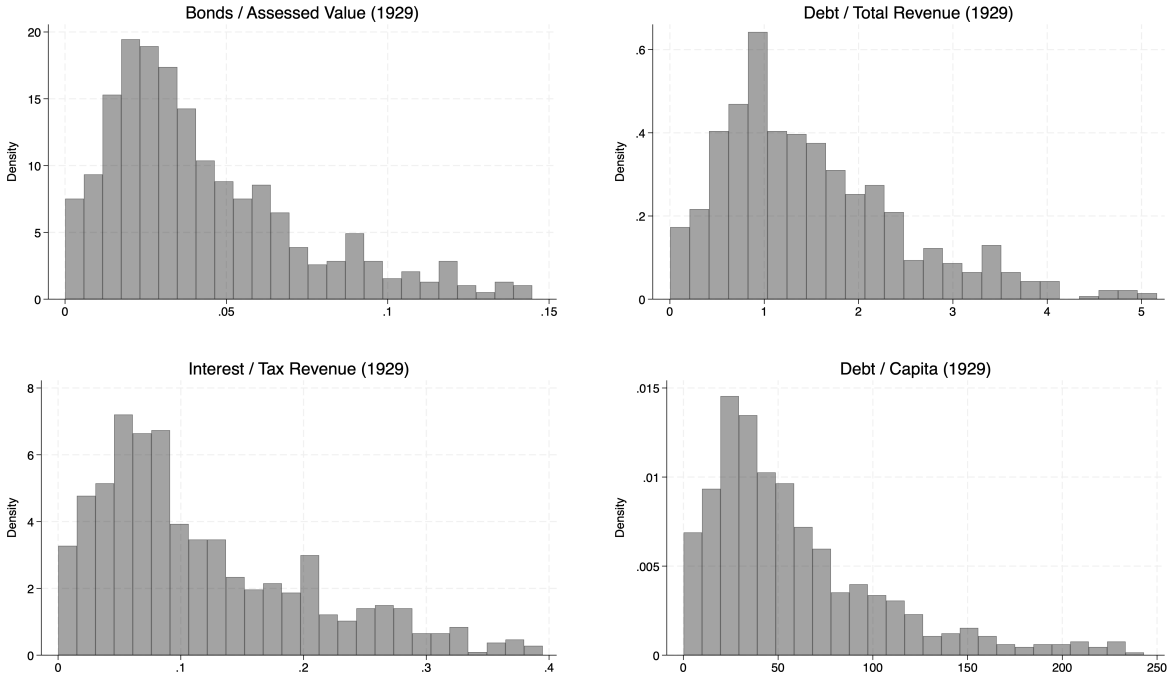
Note: This figure plots the volume of municipal bond sales and retirement as reported by Hillhouse (1936) in Tables 1 and 5. The original source of the data is the State and Municipal Compendium (June issue of the *Commercial and Financial Chronicle*). The figures for retired issues were not compiled 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 - 1938)



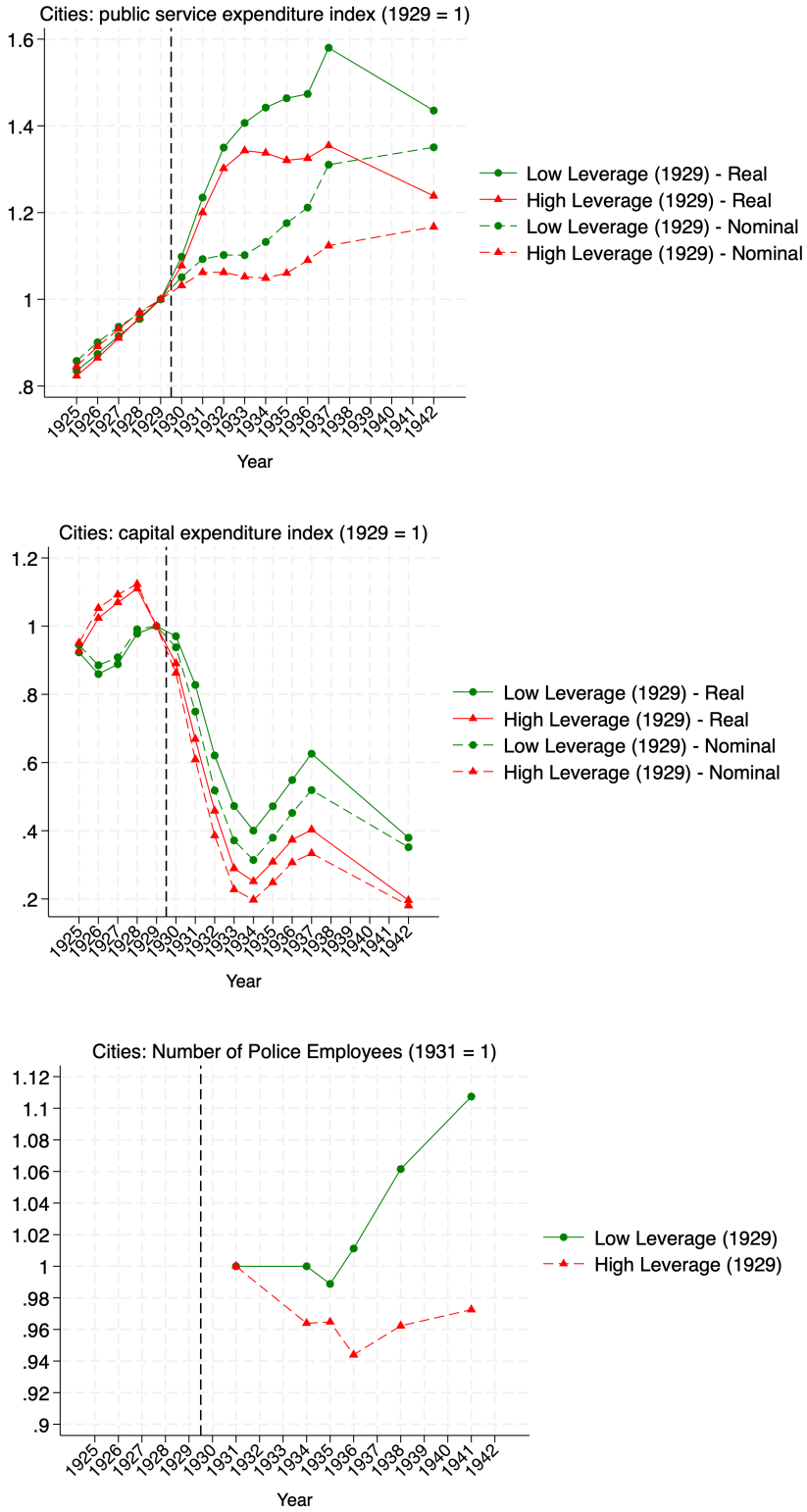
Note: This figure shows average per-capita real expenditures for small, medium, and large cities in Massachusetts, New York, Ohio, Indiana, and California, as well as all cities with a population of above 100 thousand between 1924 and 1938. Averages normalized to have a value of 1 in 1930. Short dash 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



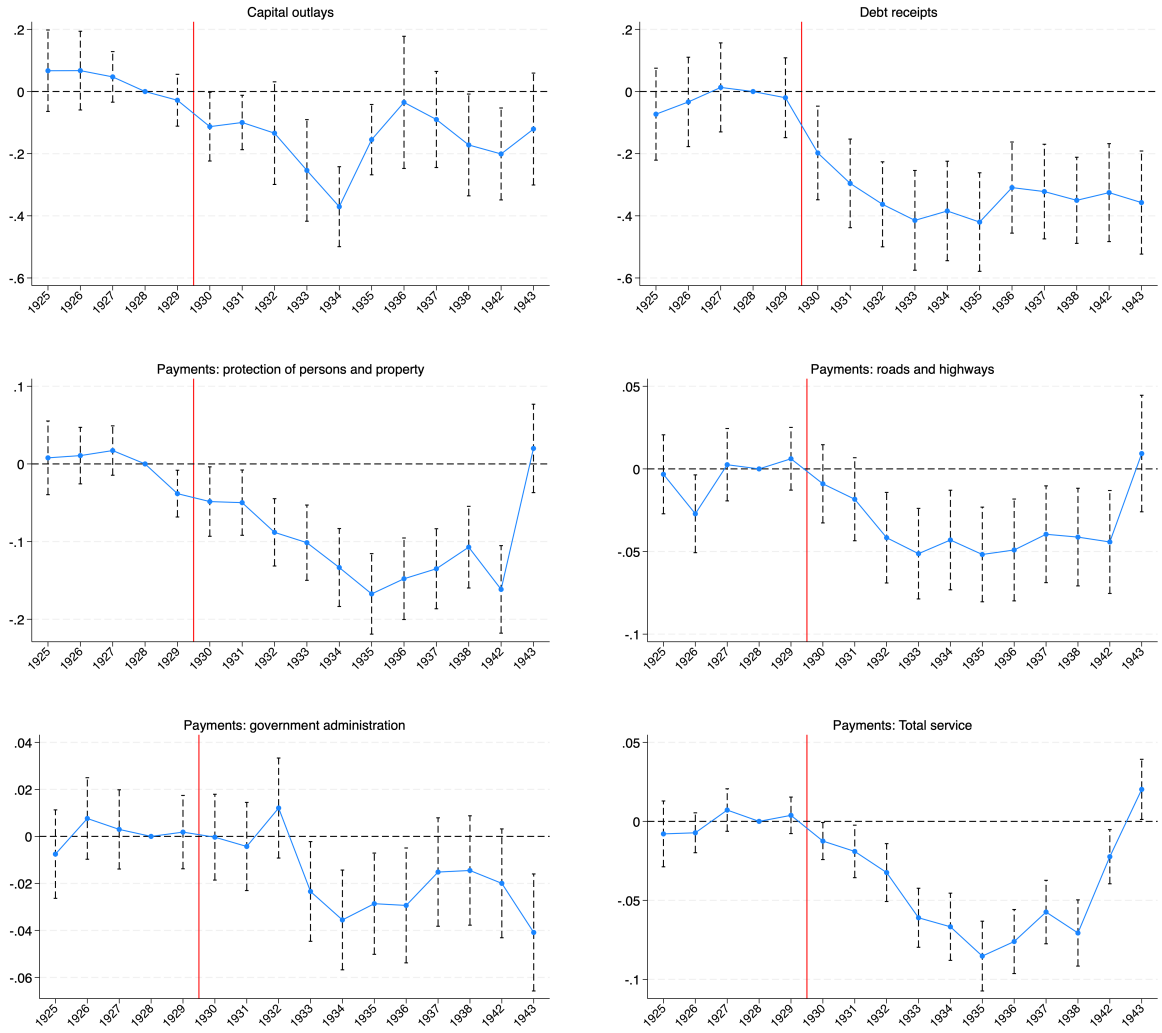
Note: This figure plots the distributions of the four financial leverage ratios (trimmed at the 99 percentile) for all cities in the sample at the end of the 1929 fiscal year. Cities with no debt (roughly 8 percent of all cities) are not shown.

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



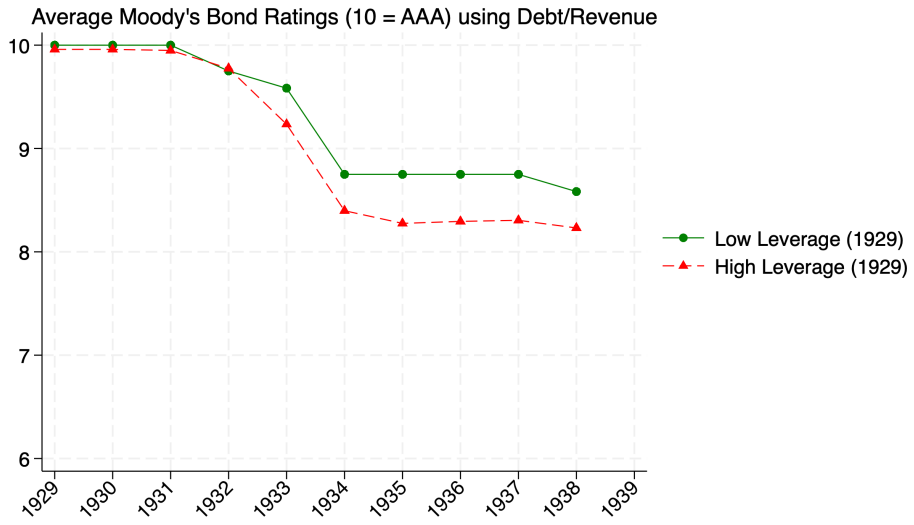
Note: This figure plots a 3-year rolling average [t-1, t, t+1] of total public service expenditure (top) and capital outlay expenditure (middle) in cities by leverage. The bottom figure plots the average employment in police department by year. "Low Leverage" captures cities in the first tercile of bonded debt/assessed property value in 1929 1929 and "High Leverage" denotes those in the third tercile. All averages are normalizted to 1 in 1929.

Figure V: Leverage and various categories of expenditure and debt revenue



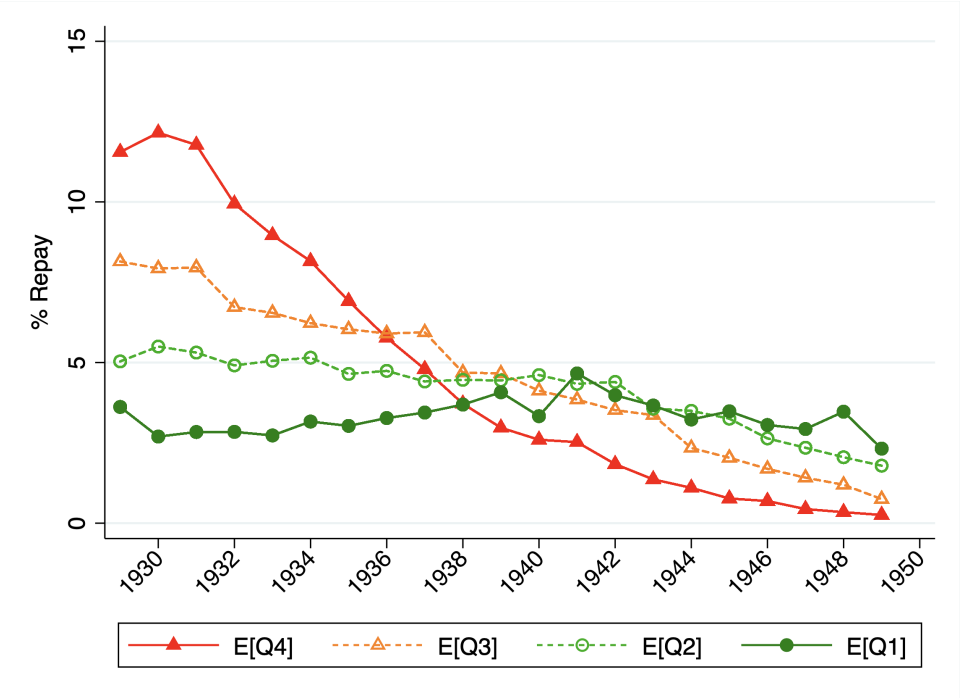
Note: This figure shows the estimated coefficients on $period_{j=t} \times leverage_{29,i}$ in Equation 4.1 where period denotes each individual year using bonded debt to assessed property values as the leverage measure. Payment panels are estimated using OLS and Capital Outlays panel is estimated using Poisson pseudo-maximum. Total service expenditure excludes capital expenditure or financing costs. Roads and highways refers to all expenditure for the maintenance of public roads and highways. Protection of persons and property denotes 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 red vertical line denotes the official start of the Great Depression in the U.S.

Figure VI: Moody's credit ratings



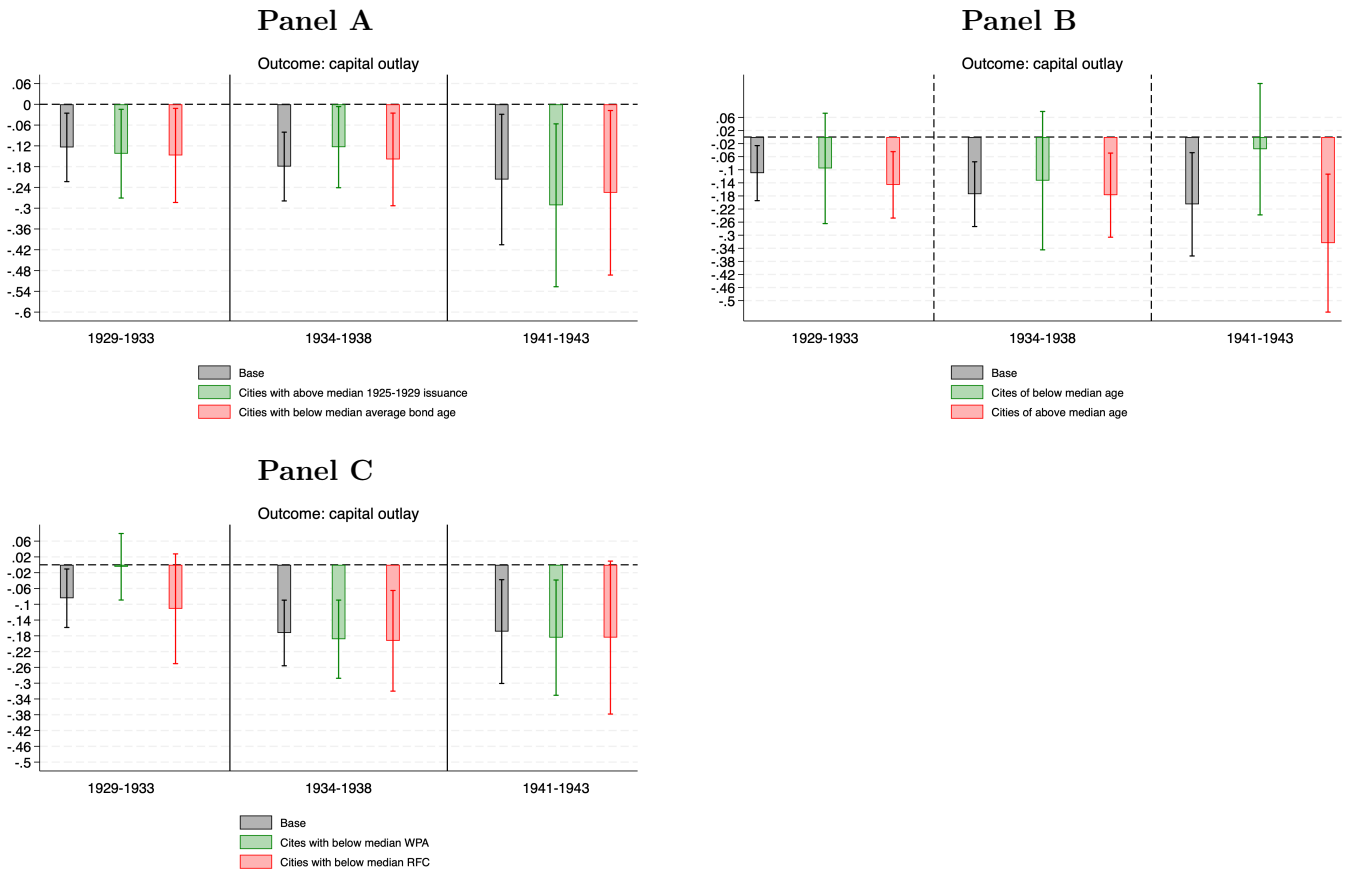
Note: This figure plots the average $Moody's$ Bond rating of cities by leverage. Low leverage is defined as the first tercile of bonded debt/assessed property value1929 and high leverage is denoted by the third tercile. The sample includes 189 cities with complete ratings data from 1929 to 1938. I assign numbers to ratings by subtracting one from each subsequent level, where AAA takes the value of 10, AA takes the value of 9, etc.

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 full sample of cities (grey) vs. subsamples of cities based on various measures of forward-looking infrastructure demand. The outcome variable is real per capita capital outlay and the regressions are estimated using Poisson pseudo-maximum. In Panel A, the green bars denote the estimates when cities with above-median share of bonds issued during 1925-1929 form the sample, while the red bars denote them when cities with below-median age of bond portfolio age are used. In Panel B, the green and red bars denote the estimates when cities with below and above median age are used, respectively. Finally, in Panel C, I exclude cities in counties 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.

Online Appendix

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A Online Appendix Tables

A.1 Leverage measures

Table A1

Panel A: Financial leverage (1929) and service expenditure

	Int/Rev	Debt/Rev	Debt/Capita
	(1)	(2)	(3)
leverage x 1924-1926	0.01	-0.00	-0.01
	(0.01)	(0.01)	(0.01)
leverage x 1929-1933	-0.00	-0.03***	-0.02***
	(0.01)	(0.01)	(0.01)
leverage x 1934-1938	-0.07***	-0.09***	-0.08***
	(0.01)	(0.01)	(0.01)
leverage x 1941-1943	-0.05***	-0.06***	-0.02**
	(0.01)	(0.01)	(0.01)
City FE	✓	✓	✓
Year FE	✓	✓	✓
1930 Pop x Year	✓	✓	✓
Δ1920-30 Pop x Year	✓	✓	✓
Revenue	✓	✓	✓
Region x Year	✓	✓	✓
R-sq (within)	0.61	0.62	0.62
N	10,960	10,953	10,959
Mean(y)	3.63	3.62	3.60
SD(y)	0.75	0.74	0.73

Standard errors in parentheses

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

Panel B: Financial leverage (1929) and capital outlay

	Int/Rev	Debt/Rev	Debt/Capita
	(1)	(2)	(3)
leverage x 1924-1926	0.01	0.12**	0.08**
	(0.06)	(0.06)	(0.04)
leverage x 1929-1933	-0.16***	-0.02	-0.04
	(0.05)	(0.04)	(0.04)
leverage x 1934-1938	-0.25***	-0.21***	-0.16***
	(0.07)	(0.06)	(0.05)
leverage x 1941-1943	-0.33***	-0.19**	-0.23***
	(0.07)	(0.08)	(0.08)
City FE	✓	✓	✓
Year FE	✓	✓	✓
1930 Pop x Year	✓	✓	✓
Δ1920-30 Pop x Year	✓	✓	✓
Revenue	✓	✓	✓
Region x Year	✓	✓	✓
R-sq (pseudo)	0.60	0.60	0.56
N	10,960	10,953	10,959
Mean(y)	12.22	12.03	11.29
SD(y)	23.97	23.62	17.57

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.

A.2 Leverage and defaults

Table A2

	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	0.06***	0.06***	0.07***	0.08***	0.06***	0.06***	0.06***	0.06***
	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)
Population (1930)	✓	✓	✓	✓	✓	✓	✓	✓
Population Growth (1920-1930)	✓	✓	✓	✓	✓	✓	✓	✓
Revenue (1930 - 1933)	✓	✓	✓	✓	✓	✓	✓	✓
Region FE	✓	✓	✓	✓	✓	✓	✓	✓
R-sq	0.16	0.17	0.16	0.17	0.16	0.18	0.17	0.18
N	728	728	729	729	731	731	732	732
Mean(y)	0.14	0.15	0.13	0.14	0.13	0.15	0.13	0.15
SD(y)	0.34	0.36	0.34	0.35	0.34	0.35	0.34	0.35

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 a default indicator 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 Census region fixed effects. Financial leverage in 1929 is specified in the header. Robust standard errors are shown in parentheses.

Table A2 presents the results of a linear probability model estimating the likelihood of default based on standardized financial leverage measures. 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) as being in default from 1930 to 1937. Control variables include the log of city population in 1930, log of city population growth from 1920 to 1930, log per-capita revenue (annually from 1930 to 1934), and fixed effects by Census region. Across all specifications, one standard deviation in leverage is associated with a 5 to 7 percent increase in the probability of default, which equates to roughly 40 percent of the mean.

A.3 Leverage and local services, excluding cities in default (1930-1937)

Table A3

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

	Bonds/Assessed Value	Int/Rev	Debt/Rev	Debt/Capita
	(1)	(2)	(3)	(4)
leverage x 1924-1926	-0.01	0.01	-0.01	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)
leverage x 1929-1933	-0.02***	-0.01	-0.03***	-0.02***
	(0.01)	(0.01)	(0.01)	(0.01)
leverage x 1934-1938	-0.07***	-0.06***	-0.09***	-0.08***
	(0.01)	(0.01)	(0.01)	(0.01)
leverage x 1941-1943	0.00	-0.03**	-0.05***	-0.02
	(0.01)	(0.02)	(0.01)	(0.01)
City FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
1930 Pop x Year	✓	✓	✓	✓
Δ1920-30 Pop x Year	✓	✓	✓	✓
Revenue	✓	✓	✓	✓
Region x Year	✓	✓	✓	✓
R-sq (within)	0.64	0.63	0.64	0.64
N	9,470	9,579	9,534	9,544
Mean(y)	3.64	3.65	3.64	3.63
SD(y)	0.76	0.76	0.76	0.75

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)
leverage x 1924-1926	0.10*	0.04	0.13*	0.10**
	(0.06)	(0.08)	(0.07)	(0.04)
leverage x 1929-1933	-0.08	-0.19***	-0.02	-0.04
	(0.05)	(0.07)	(0.05)	(0.05)
leverage x 1934-1938	-0.19***	-0.31***	-0.23***	-0.15***
	(0.06)	(0.08)	(0.07)	(0.05)
leverage x 1941-1943	-0.12*	-0.34***	-0.18**	-0.21**
	(0.07)	(0.09)	(0.09)	(0.10)
City FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
1930 Pop x Year	✓	✓	✓	✓
Δ1920-30 Pop x Year	✓	✓	✓	✓
Revenue	✓	✓	✓	✓
Region x Year	✓	✓	✓	✓
R-sq (pseudo)	0.57	0.58	0.58	0.55
N	9,470	9,579	9,534	9,544
Mean(y)	11.86	12.12	11.95	11.47
SD(y)	20.16	20.69	20.27	17.63

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 columns (1) - (5) in Panel A or log per-capita revenue generated from debt issuance ("debt receipts"), both estimated using OLS. In panel B, the outcome variable is per-capita capital outlays, and the model is estimated using Poisson pseudo-maximum likelihood. The sample excludes cities that defaulted at any point in 1930-1937 according to the Bond Buyer. Standard errors are clustered at the city level. Column (1) contains only city and year fixed effects, while columns (2)–(5) add 1930 population-year fixed effects, 1920s population growth-year fixed effects, contemporaneous and lagged log total non-debt per capita revenue, region-year fixed effects. Leverage is standardized (mean zero and standard deviation of one) bonded debt over assessed property values in 1929.

A.4 Leverage and local services, by median leverage

Table A4

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

	Bonds/Assessed Value	Int/Rev	Debt/Rev	Debt/Capita
	(1)	(2)	(3)	(4)
above median leverage x 1924-1926	-0.01	-0.02	-0.02	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)
above median leverage x 1929-1933	-0.04***	0.00	-0.05***	-0.02*
	(0.01)	(0.01)	(0.01)	(0.01)
above median leverage x 1934-1938	-0.14***	-0.11***	-0.14***	-0.15***
	(0.02)	(0.02)	(0.02)	(0.02)
above median leverage x 1941-1943	-0.03	-0.05**	-0.12***	-0.08***
	(0.02)	(0.02)	(0.02)	(0.02)
City FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
1930 Pop x Year	✓	✓	✓	✓
Δ1920-30 Pop x Year	✓	✓	✓	✓
Revenue	✓	✓	✓	✓
Region x Year	✓	✓	✓	✓
R-sq (within)	0.62	0.61	0.62	0.63
N	10,903	10,960	10,953	10,959
Mean(y)	3.61	3.63	3.62	3.60
SD(y)	0.74	0.75	0.74	0.73

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)
above median leverage x 1924-1926	-0.03	0.09	0.14	0.16*
	(0.10)	(0.08)	(0.09)	(0.09)
above median leverage x 1929-1933	-0.23**	-0.20**	-0.09	-0.01
	(0.10)	(0.08)	(0.09)	(0.11)
above median leverage x 1934-1938	-0.33***	-0.39***	-0.44***	-0.14
	(0.11)	(0.08)	(0.10)	(0.12)
above median leverage x 1941-1943	-0.17	-0.36***	-0.21	-0.15
	(0.16)	(0.13)	(0.15)	(0.15)
City FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
1930 Pop x Year	✓	✓	✓	✓
Δ1920-30 Pop x Year	✓	✓	✓	✓
Revenue	✓	✓	✓	✓
Region x Year	✓	✓	✓	✓
R-sq (pseudo)	0.60	0.60	0.60	0.56
N	10,903	10,960	10,953	10,959
Mean(y)	11.96	12.22	12.03	11.29
SD(y)	23.53	23.97	23.62	17.57

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 columns (1) - (5) in Panel A or log per-capita revenue generated from debt issuance ("debt receipts"), both estimated using OLS. In panel B, the outcome variable is per-capita capital outlays, and the model is estimated using Poisson pseudo-maximum likelihood. Standard errors are clustered at the city level. Column (1) contains only city and year fixed effects, while columns (2)–(5) add 1930 population-year fixed effects, 1920s population growth-year fixed effects, contemporaneous and lagged log total non-debt per capita revenue, region-year fixed effects. Leverage is standardized (mean zero and standard deviation of one) bonded debt over assessed property values in 1929.

A.5 Leverage and local services, excluding sources of data one by one

Table A5

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 1924-1926	-0.01	-0.01	-0.01	-0.01	-0.00	-0.01	-0.01	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
leverage x 1929-1933	-0.03***	-0.03***	-0.02***	-0.03***	-0.03***	-0.01	-0.02***	-0.02***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
leverage x 1934-1938	-0.09***	-0.07***	-0.07***	-0.08***	-0.09***	-0.02**	-0.07***	-0.07***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
leverage x 1941-1943	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
City FE	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
1930 Pop x Year	✓	✓	✓	✓	✓	✓	✓	✓
Δ1920-30 Pop x Year	✓	✓	✓	✓	✓	✓	✓	✓
Revenue	✓	✓	✓	✓	✓	✓	✓	✓
Source x Year	✓	✓	✓	✓	✓	✓	✓	✓
R-sq (within)	0.67	0.62	0.65	0.60	0.60	0.59	0.63	0.65
N	7,959	10,203	9,415	9,053	10,039	9,271	10,295	10,086
Mean(y)	3.70	3.57	3.70	3.43	3.54	3.72	3.62	3.65
SD(y)	0.81	0.74	0.74	0.67	0.72	0.71	0.76	0.75
Mean(x)	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
SD(x)	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998
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 1924-1926	0.07	0.04	0.05	0.09	0.10	-0.01	0.05	0.05
	(0.06)	(0.06)	(0.06)	(0.06)	(0.07)	(0.04)	(0.06)	(0.05)
leverage x 1929-1933	-0.09*	-0.11**	-0.08*	-0.08	-0.09	-0.13***	-0.09**	-0.10**
	(0.05)	(0.05)	(0.05)	(0.05)	(0.06)	(0.04)	(0.04)	(0.05)
leverage x 1934-1938	-0.16***	-0.17***	-0.17***	-0.04	-0.16**	-0.26***	-0.17***	-0.16***
	(0.05)	(0.06)	(0.05)	(0.06)	(0.07)	(0.04)	(0.05)	(0.05)
leverage x 1941-1943	-0.23**	-0.22***	-0.20**	-0.22**	-0.07	-0.25***	-0.22***	-0.19**
	(0.09)	(0.08)	(0.08)	(0.09)	(0.09)	(0.08)	(0.08)	(0.08)
City FE	✓	✓	✓	✓	✓	✓	✓	✓
Year FE	✓	✓	✓	✓	✓	✓	✓	✓
1930 Pop x Year	✓	✓	✓	✓	✓	✓	✓	✓
Δ1920-30 Pop x Year	✓	✓	✓	✓	✓	✓	✓	✓
Revenue	✓	✓	✓	✓	✓	✓	✓	✓
Source x Year	✓	✓	✓	✓	✓	✓	✓	✓
R-sq (psuedo)	0.57	0.57	0.58	0.59	0.55	0.56	0.58	0.58
N	7,959	10,203	9,415	9,053	10,039	9,271	10,295	10,086
Mean(y)	6.79	5.28	6.33	4.93	5.32	6.14	5.57	5.85
SD(y)	12.88	11.64	12.43	12.11	9.56	11.65	11.49	12.02
Mean(x)	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
SD(x)	0.998	0.998	0.998	0.998	0.998	0.998	0.998	0.998
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 columns (1) - (5) in Panel A or log per-capita revenue generated from debt issuance ("debt receipts"), both estimated using OLS. In panel B, the outcome variable is per-capita capital outlays, and the model is estimated using Poisson pseudo-maximum likelihood. Each column represents the results when cities from the source identified in the last row are dropped. Standard errors are clustered at the city level. Column (1) contains only city and year fixed effects, while columns (2)–(5) add 1930 population-year fixed effects, 1920s population growth-year fixed effects, contemporaneous and lagged log total non-debt per capita revenue, region-year fixed effects. Leverage is standardized (mean zero and standard deviation of one) bonded debt over assessed property values in 1929.

A.6 Balance Test on Bond Shocks - 1929 Variables

Table A6

	All	Shock <Median	Shock >Median	Difference
Shock (All)	.383	.258	.507	-.25***
	(.15)	(8.3e-02)	(9.6e-02)	(1.7e-90)
Population (1930)	9.0e+04	1.2e+05	5.7e+04	6.6e+04***
	(2.5e+05)	(2.5e+05)	(2.5e+05)	(9.2e-03)
Total revenue, excluding debt issuance	4.48	4.41	4.54	-.128**
	(.52)	(.55)	(.49)	(1.7e-02)
Assessed value of property	7.97	7.94	7.99	-.0516
	(.45)	(.5)	(.39)	(.26)
Payments: Total service	3.81	3.81	3.81	-8.5e-04
	(.61)	(.6)	(.63)	(.99)
Bond interest rate (1920s), unweighted	4.76	4.79	4.74	.0524
	(.45)	(.39)	(.51)	(.26)
Bond interest rate (1920s), weighted	4.7	4.73	4.66	.0758
	(.46)	(.42)	(.5)	(.11)
Observations	382	190	192	382

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.

A.7 Moody Leverage and local services, excluding cities in default (1930-1937)

Table A7

Panel A: Moody leverage and service expenditure

	Bonds / Assessed Value	Int/Rev	Debt/Rev	Debt/Capita
	(1)	(2)	(3)	(4)
moodyleverage x 1924-1926	0.02	0.00	0.01	-0.01
	(0.03)	(0.02)	(0.03)	(0.01)
moodyleverage x 1929-1933	-0.03**	-0.01	-0.03***	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)
moodyleverage x 1934-1938	-0.04*	-0.02	-0.05**	-0.03
	(0.02)	(0.02)	(0.02)	(0.02)
moodyleverage x 1941-1943	-0.02	-0.03	-0.06**	0.00
	(0.02)	(0.03)	(0.02)	(0.02)
City FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
1930 Pop x Year	✓	✓	✓	✓
Δ1920-30 Pop x Year	✓	✓	✓	✓
Revenue	✓	✓	✓	✓
Region x Year	✓	✓	✓	✓
R-sq (within)	0.71	0.70	0.71	0.75
N	3,248	3,260	3,262	3,262
Mean(y)	4.12	4.13	4.12	4.12
SD(y)	0.60	0.59	0.59	0.59

Standard errors in parentheses

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

Panel B: Moody leverage and capital outlay

	Bonds / Assessed Value	Int/Rev	Debt/Rev	Debt/Capita
	(1)	(2)	(3)	(4)
moodyleverage x 1924-1926	0.03	-0.04	-0.09**	0.07
	(0.06)	(0.08)	(0.05)	(0.06)
moodyleverage x 1929-1933	-0.30***	-0.20	-0.23***	-0.00
	(0.08)	(0.13)	(0.08)	(0.06)
moodyleverage x 1934-1938	-0.37***	-0.23*	-0.42***	-0.16**
	(0.08)	(0.14)	(0.10)	(0.07)
moodyleverage x 1941-1943	-0.04	0.00	-0.13	-0.09
	(0.11)	(0.14)	(0.12)	(0.09)
City FE	✓	✓	✓	✓
Year FE	✓	✓	✓	✓
1930 Pop x Year	✓	✓	✓	✓
Δ1920-30 Pop x Year	✓	✓	✓	✓
Revenue	✓	✓	✓	✓
Region x Year	✓	✓	✓	✓
R-sq (pseudo)	0.52	0.51	0.52	0.51
N	3,248	3,260	3,262	3,262
Mean(y)	17.86	17.93	17.91	17.76
SD(y)	23.26	23.42	23.37	22.34

Standard errors in parentheses

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

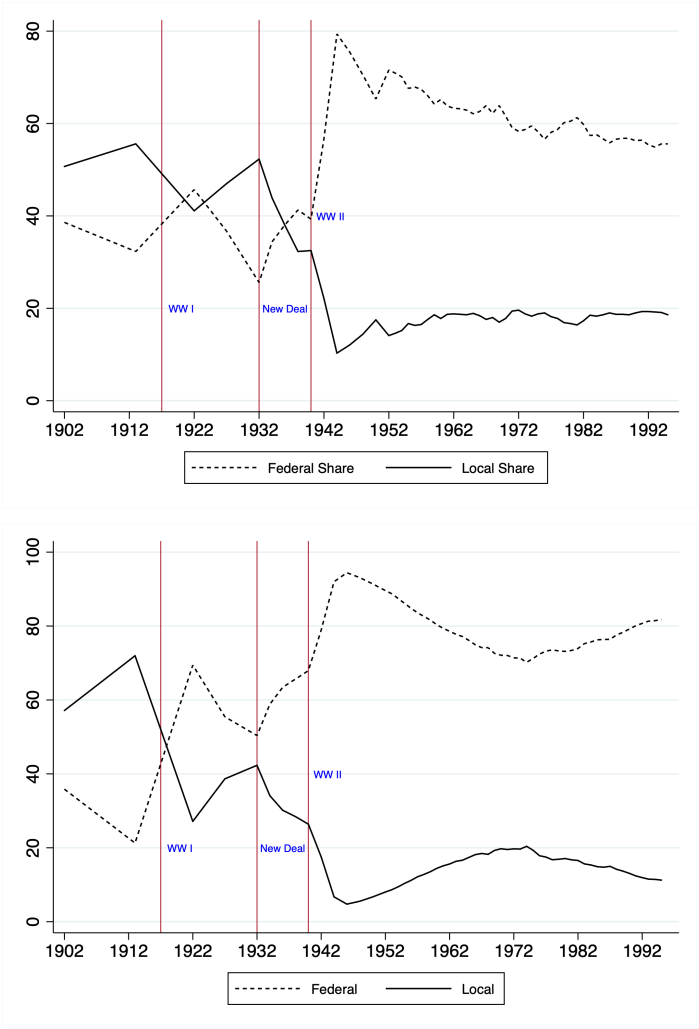
Note: This table presents the estimation results of Equation 5.2 where the outcome variable is log per-capita total service expenditure (Panel A, estimated using OLS) or real per-capita capital outlay (Panel B, estimated using Poisson pseudo-maximum). The sample excludes all cities the defaulted on at least one bond during 1930-1937. Control variables as the same as in Table III and include population, population growth, contemporaneous and lagged log total non-debt per capita revenue, region 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.

B Online Appendix Figures

B.1 Revenue and Debt

Figure A.1

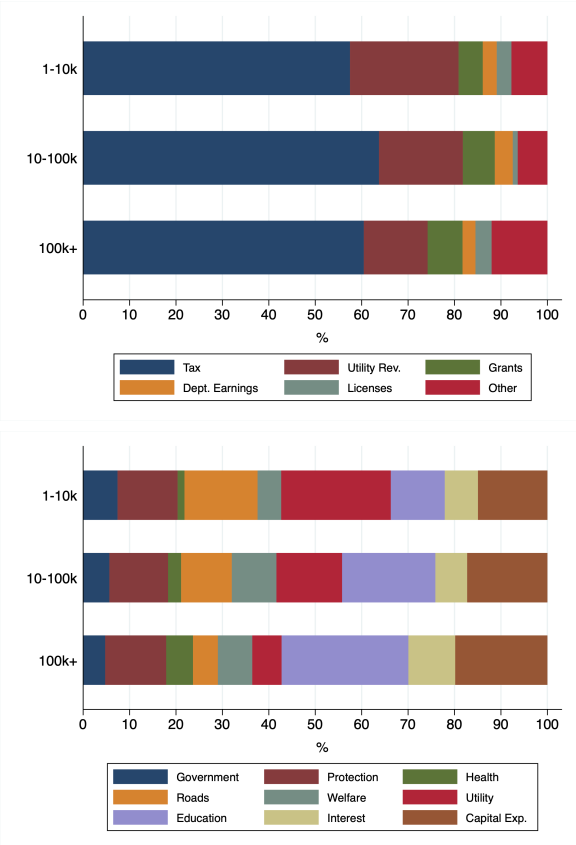
Figure A.2: Revenue [Top] and Debt [Bottom], % of Total



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.

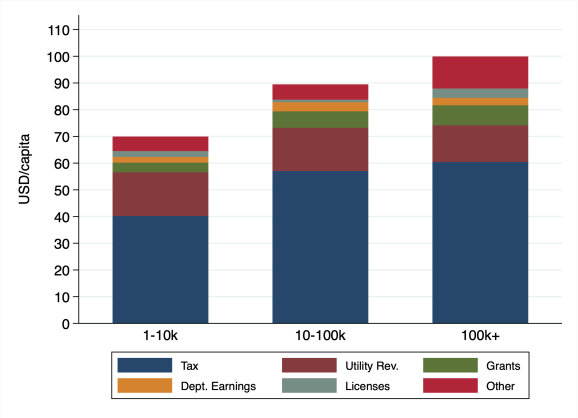
B.2 City Revenue and Payments

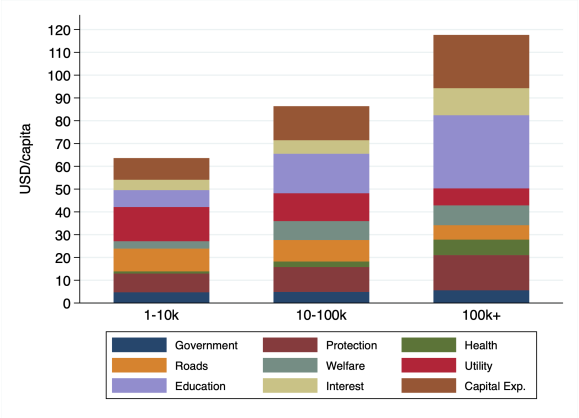
Figure A.3: Composition of City Revenue and Expenditure, 1930



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.3 Composition of City Revenue and Expenditure, 1930

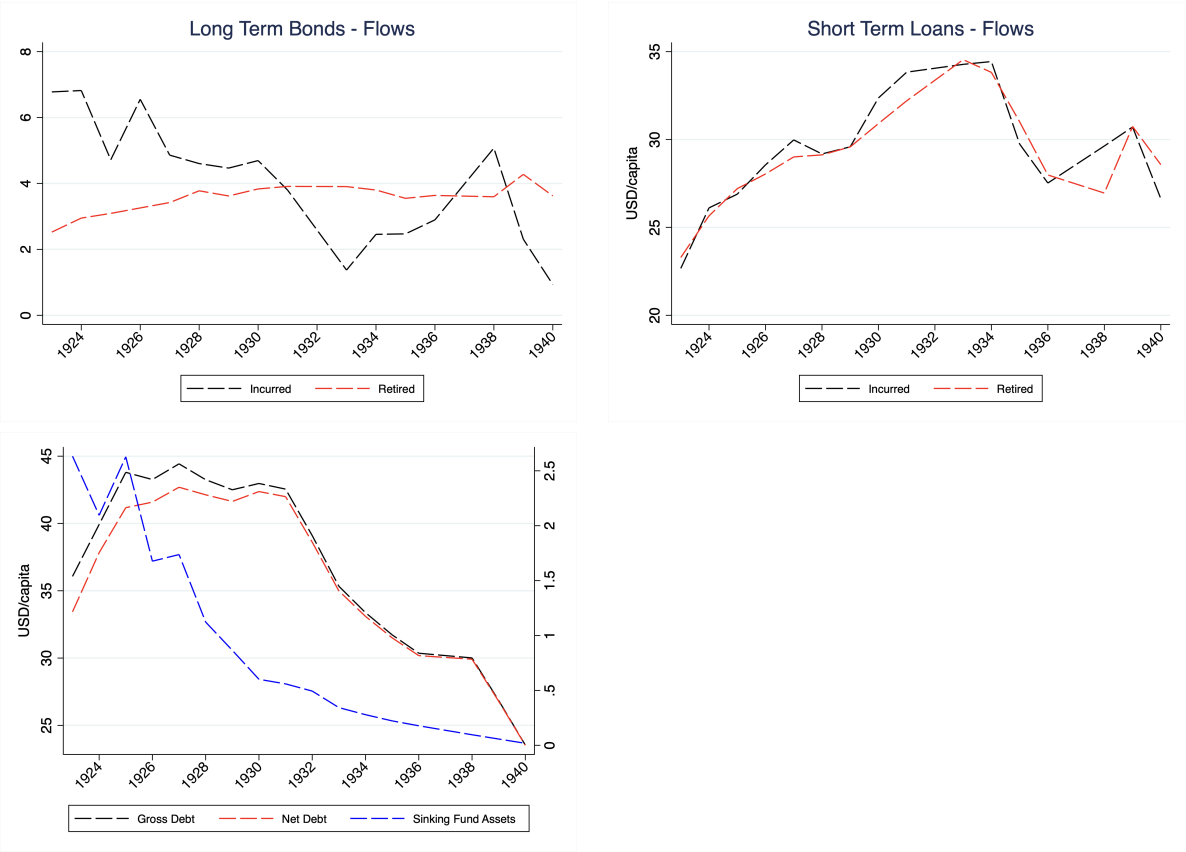




Note: The figures show the average per-capita level (in 1930 dollars) of city revenue and expenditure in 1930 by population category. Tax includes property tax, local personal income tax, local corporate income tax, and excise taxes. Utility revenue is income from publicly-owned water, gas, and electric 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.4 Incurred and retired municipal debt in Massachusetts

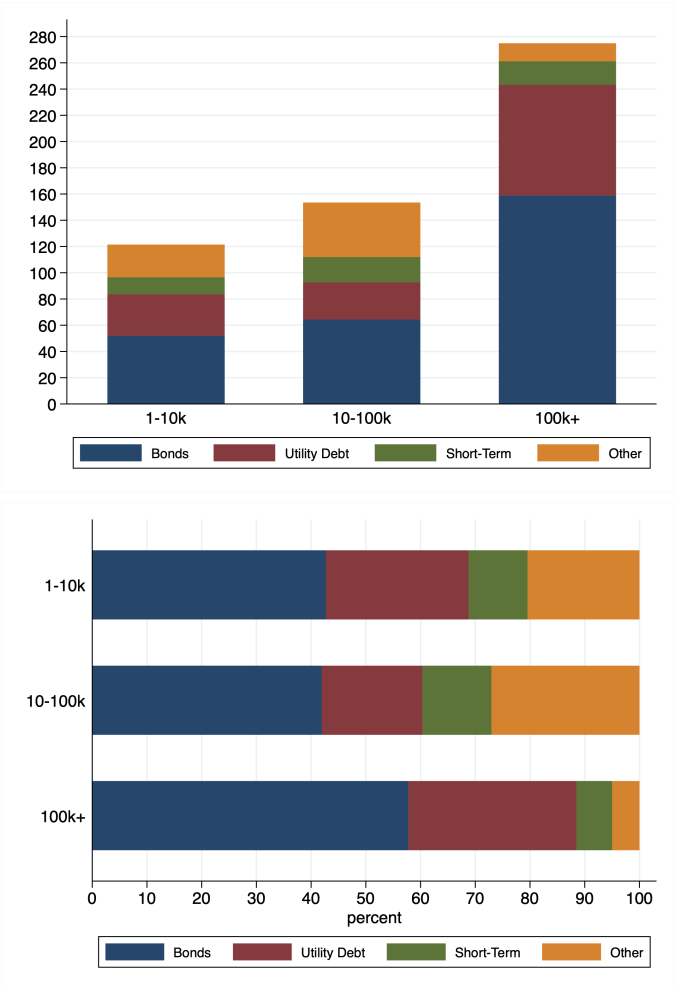
Figure A.4



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.5 Breakdown of Balance Sheet Debt

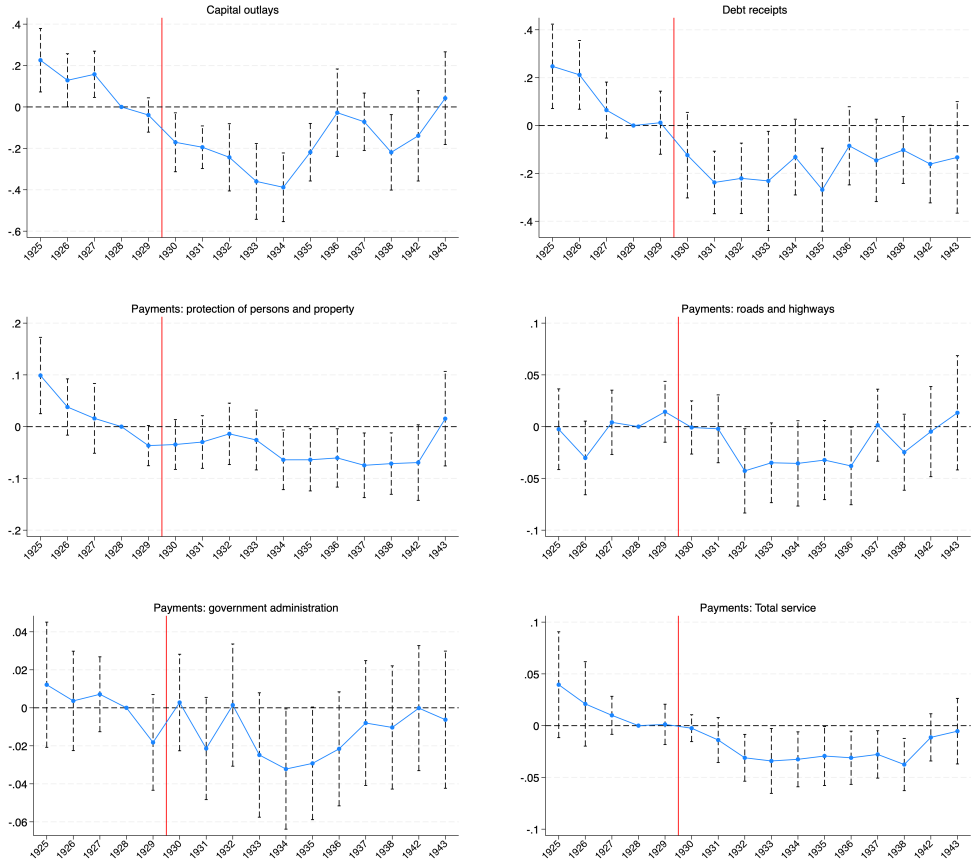
Figure A.5



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.

B.6 Moody leverage and various categories of expenditure and debt revenue

Figure A.6



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 Moody Leverage as the *leverage* measure. Moody Leverage is total municipal debt in 1929 multiplied by *shock* as defined in Equation 5.1. Payment panels are estimated using OLS and Capital Outlays panel is estimated using Poisson pseudo-maximum. Total service expenditure excludes capital expenditure or financing costs. Roads and highways refers to all expenditure for the maintenance of public roads and highways. Protection of persons and property denotes 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 red vertical line denotes the official start of the Great Depression in the U.S.

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.

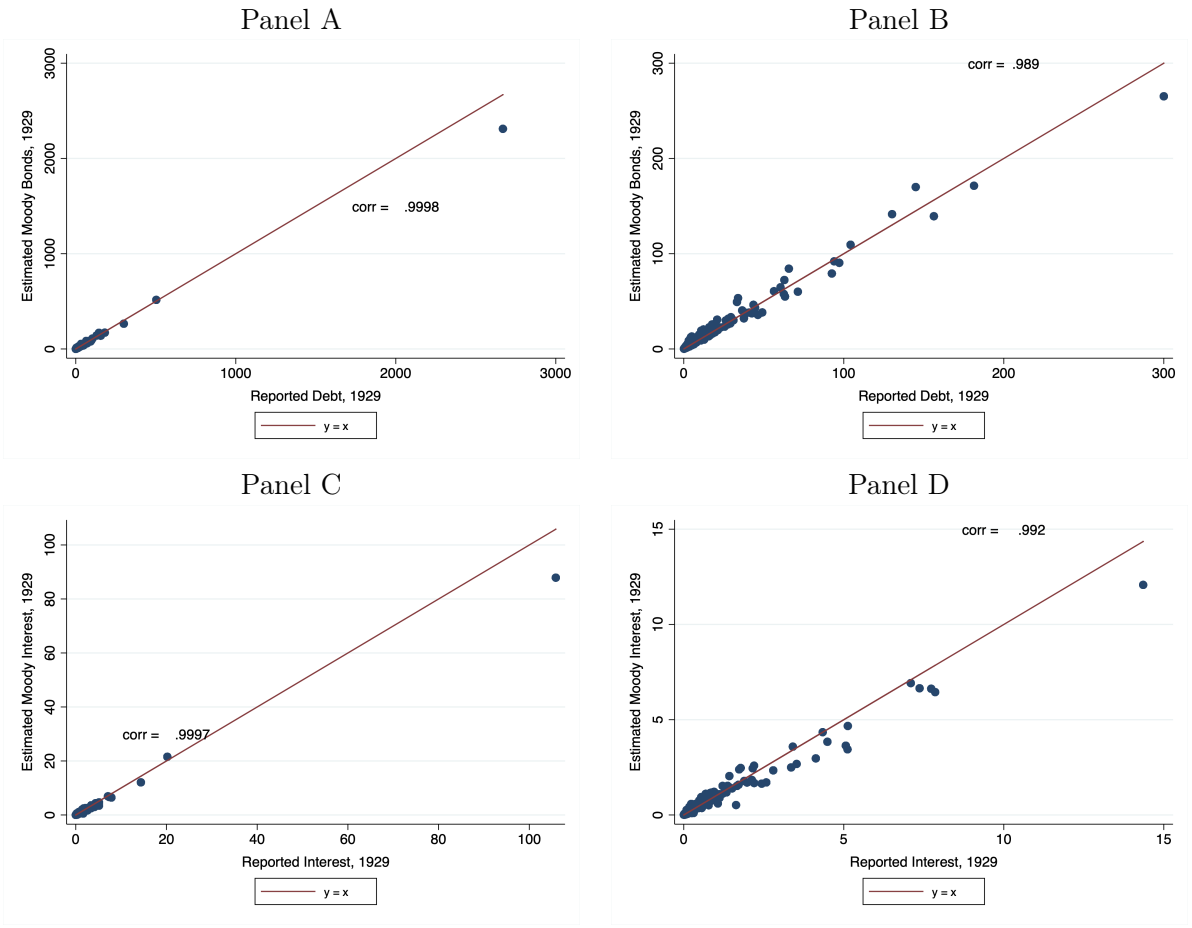
$$Moody_{j,t} = \sum_{\forall i \in j} weight_{i,t} \times face_i \tag{D.2}$$

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.