Annexation and the Making of the Sun Belt: Municipal Boundary Expansions and Local Public Finance*

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Abstract

Sun Belt cities grew their municipal boundaries nearly six-fold between 1945 and2000, while Northern cities, constrained by state-level differences in annexation powers, saw little expansion. Using newly digitized data, we find the average expansion during this boom increased municipal population by 24%. Through a difference-in-differences design, we evaluate how these large boundary expansions impacted municipal finance and public good provision. Results show a persistent decline in per capita expenditures and employment, alongside a short-run decline in police and fire services that eventually returns to the level of similar non-annexing cities. These findings suggest annexing cities continued to provide core municipal services to newly incorporated areas and successfully leveraged economies of scale in certain high fixed costs services.

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I. Introduction

Between 1945 and 2000, the average Sun Belt city grew in land area by nearly a factor of six, while the average city elsewhere grew by a factor of two. This growth was not merely relative catch-up—the average Sun Belt city surpassed the average non-Sun Belt city in area by the 1950s, and by 2000, all ten of America's largest cities by land area were in the Sun Belt. This divergence stemmed from state annexation laws that allowed cities in Sun Belt states to expand into unincorporated areas, while municipalities in Northern states had few legal options to grow. As a result, some urban areas developed large central city-governments, while others maintained relatively small central cities fenced in by a large number of surrounding municipalities. City planners believed that the spatial growth of a central city's boundaries was consequential for local governance: proponents of annexations argued they would lower costs, increase revenue, and prevent suburbanites from free-riding on central city public goods (Dixon and Kerstetter (1959)). As post-war suburbanization shocks threatened the financial stability of many cities, the ability of Sun Belt cities to expand and retain their tax bases may have allowed them to remain attractive environments in terms of municipal services and taxes (Rusk (2013)).

In this paper, we examine large annexation shocks to investigate how changes in municipality size affected local public finance in the United States and whether the difference in city growth contributed to the rise of the Sun Belt. To estimate the effects of boundary expansions, we digitize annual annexation data published in the Municipal Yearbooks between 1948 and 1968 and employ a staggered difference-in-difference design around large annexation events. The data come from annual surveys on the square mileage and population of annexed areas provided directly by municipal governments to the International City Planner's Association. We supplement the annexation data with data from the Annual Survey of Governments and construct an annual panel of city boundary changes and municipal revenues, expenditures, and employment. Our empirical strategy allows us to estimate the short- to medium-run effects of these boundary expansions.

We find that the average large annexation in our sample increases a city's population by 45,000 people—a 24% increase. Our findings suggest that these large increases in population allow costs to be dispersed across the larger population: our estimates suggest a 20%–25% decrease in per capita current expenditures, a 12% decrease in total employment per capita, and a 18% decrease in revenues per capita, all of which persist nine years out from the annexation event. These reductions in per capita expenditures may reflect economies of scale, where similar or better levels of public goods are provided more efficiently, or alternatively, they could indicate reduced public service quality, particularly if newly incorporated areas receive lower levels of public good provision after annexation.

The persistent decrease in aggregate current expenditure contrasts with the patterns for policing and fire protection, where spending in annexing cities declines in the short run but returns to the level of similar non-annexing cities nine years out. These results suggest that after an annexation, cities were unable to immediately scale operations for two categories of municipal services, but within the medium-term had adjusted to providing services to newly connected areas. Since spending gaps close for public goods that are likely to be labor intensive and have closer to constant returns to scale, the overall reduction we see in spending might be generated by scale effects rather than a reduction in provision.

Finally, results for total debt issued suggest that city planners may have used these expanded tax bases to increase access to credit, although the results are noisily estimated. We plan to augment our analysis of municipal credit by digitizing data from Moody's Municipal Manuals in future work. This data includes information on all bonds issued by municipalities, their credit ratings, and local property tax rates.

The size of municipal boundaries relative to urban areas may affect government efficiency through several channels: namely, scale effects, local public good spillovers, and heterogeneity in constituents[1] Empirical estimates of these forces are rare, in the case of public good spillovers and heterogeneity, or inconclusive, in the case of scale effects. As a result, our

[1]For examples, see the models of Tiebout (1956), Alesina and Spolaore (1997), and Besley and Coate (2003).

estimates have bearings for the literature that finds mixed returns to scale in the similar but distinct reform of inter-municipal co-operation (Tricaud (2021), Reingewertz (2012), Blesse and Baskaran (2016) Cobban (2019), Frere, Leprince, and Paty (2014) , Blom-Hansen et al. (2016), Allers and Greef (2018), Luca and Modrego (2021)). Inter-municipal co-operation refers to the agglomeration of municipal services across several municipalities, such as the formation of a joint police department: while co-operation is not exactly the same as the enlargement of single municipality's boundaries, the effects of these policies should jointly depend on the scale effects present in local public good provision.

Our estimates differ from the existing estimates in several respects: first, the estimates in the existing literature come from settings outside the United States where local public finance rules may differ significantly; second, they reflect estimates for municipalities of significantly larger populations. For example, in Tricaud 2021, which considers intermunicipal co-operation in France, the average municipality size is 1,800. The discontinuity around which the effect of municipality size is estimated in Narasimhan and Weaver (2024) is 1,000 people. In our sample, the average municipality is the central city of a metropolitan area and has a population of 215,000. And, in contrast to the aforementioned papers, we find evidence that increased size allowed for cities to realize economies of scale.

This paper also contributes to the literature on the historical development of cities and municipal services in the United States, particularly in the post-war period. Prior work has documented the productivity advantages of cities driven by agglomeration forces (Bleakley and Lin 2012, Hall, Matti, and Zhou 2020, Rosenthal and Strange 2008), and the municipal services necessary to resolve the urban externalities that arise from this agglomeration (Glaeser 2013, Geddes and Troesken 2003, Ferrie and Troesken 2008, Cutler and G. Miller 2005 Anderson, Charles, and Rees 2022). This paper extends this work by examining a regional divergence in municipal scope that took place after city governments had already introduced municipal police, fire protection, water, sewage, and waste management, and asks how this divergence in municipal scale affected the provision of these services.

This paper contributes to the ongoing debate over the causes of the rise of Sun Belt cities in post-war America. Previous research has attributed the Sun Belt's robust economic performance and population growth in the latter half of the 20th century to various factors: a relatively business friendly environment relative to a high-wage, high-union, and high-tax North (Perry and Watkins 1977); the flow of federal investment in the form of defense contracting (Markusen 1991); amenity improvements through technological change (i.e. air conditioning); and housing supply (Glaeser and Tobio 2008). We add to this literature by exploring the role of municipal finance and public good provision in the development of the Sun Belt.

This paper proceeds as follows: in Section II., we describe in further detail the institutions and rules that governed annexation in this period and present some stylized descriptives; Section III. explains our data sources; Section V. describes the empirical design; Section VI. provides our main estimates; and Section VII. concludes and poses future avenues to expand the work in this paper.

II. Background

> *"... [Oklahoma City] had to expand or be hemmed in by small satellite communities... With annexation, the city tax base would continue to expand, and the city could control wealthy suburbs and outlying industries"*[2]

A central challenge of post-war municipal finance was "the Metropolitan problem": the question of how to structure local governance, taxation, and public service provision in increasingly sprawling and potentially fragmented metropolitan areas (Nolting and Arnold (1952)). The fear of a metropolitan area composed of many small municipalities was one of duplicated costs, limited returns to scale, coordination issues and inequality induced by strategic sorting across jurisdictions. One solution to such a problem is to liberally allow for

[2]Smallwood (1977)

the expansion of municipal boundaries through annexation or consolidation. Annexation had been a popular policy in the late 19th and early 20th centuries: Philadelphia consolidated to its county borders in 1854, Manhattan and the Bronx joined with the three remaining boroughs of Brooklyn, Queens, and Staten Island in 1898, Los Angeles became the largest city in the United States in land area through annexation in the 1920s. However, cities, at various points, encountered resistance to annexations, halting their expansions outward: Boston was rebuffed by Brookline in 1874, Chicago by Evanston in 1894, and Los Angeles by Beverly Hills in 1923.

As the Supreme Court would affirm in its decision in *Hunter v. Pittsburgh (1907)*, a city's ability to annex places without their approval was entirely a decision of the state legislature (Shoked (2023)). These state-level rules were rules regarding two factors: (1) the legal ability of existing municipalities to expand their boundaries into surrounding territory; and (2) the ease by which surrounding areas could incorporate into municipalities of their own and thereby protect themselves from annexation. While states had initially been willing to allow unilateral annexation (i.e. annexation without the approval of a majority in the *annexed* area), the string of wealthy suburbs resisting annexation by central cities that began with Brookline in 1874 slowly shifted states, particularly in the Northeast and Midwest, towards severely restricting the annexation powers of cities (Shoked (2023)).

In their review of state annexation laws, Dixon and Kerstetter (1959) survey the variety of annexation rules that had been set in place by the mid-20th century: in Texas, municipalities had the right to *unilaterally* annex territory into the city; in six states, cities had no legal annexation method; in most other states, municipalities were only allowed to expand into territory with approval from a majority of residents in the *annexed* territory. The necessity for approval in the annexed territory in particular drew the ire of urban and municipal planners who viewed the policy as privileging the welfare of a select population over potential gains for the entire population (Rusk (2013)). As an example of these skewed incentives, we can look at Boston's failed 1874 annexation of Brookline: 6,291 of 7,775 voters

in Boston approved Brookline's annexation, only 292 of 1,006 voters in Brookline approved the annexation ("Annexation: Result of Yesterday's Voting" (1873)). Annexation's proponents argued that Brookline's vote reflected the preferences of a much smaller population than the city of Boston, whose population would have stood to gain from the annexation.

When annexation resurged as a policy tool, after a lull during the Great Depression and Second World War, it emerged into the policy context that had been shaped by annexation debates earlier in the 20th century. Therefore, only city leadership in certain states found themselves capable of annexing. Nevertheless, there was a resurgence in the popularity of annexation. In 1948, 145 square miles were annexed into American cities; by 1960, roughly 1,000 square miles were being annexed annually (Nolting and Arnold (1965)). This "boom" was however, not evenly distributed across the country, although there were several possible pathways to expansion: Texan cities, with their legal right to unilateral annexation, expanded swiftly and liberally; cities elsewhere triumphed in the face of more restrictive laws, as was the case with Columbus, whose pro-annexation mayor leveraged the politics of access to the water to convince surrounding territory to fold into the city; and finally certain cities benefited from legal intervention from the state legislatures—as was the case with Atlanta's 1952 annexation.

This paper focuses on the specific post-war period in the history of annexation in the United States for two reasons. The first is practical: data on municipal finance and boundary changes become readily available only in the post-War period. The second is that, as argued above, this period reflects an important period for annexation as a policy in the United States: as most cities faced large suburbanization shocks, only certain cities were able to expand outward to continue to incorporate the suburban tax base. In fact, while annexation laws remained liberal in certain states until the 2010s, annexations never achieved a similar popularity: in terms of magnitude, the annexation shocks of the immediate post-war period, with cities adding dozens and sometimes hundreds of square miles in the span of a couple years, would remain significantly larger than most later annexations.

III. Data

III.i. Data Sources

Annexations We digitize data on annual boundary and population changes from the Municipal Yearbooks, which were published by the International City Planners Association annually between 1934 and 2014. Between 1948 and 1968, given the resurgence of annexations, the Municipal Yearbooks collected annual surveys of cities and their annexation activity, including questions about the square mileage and population of annexed areas. In certain years, they also asked about services needed in the annexed areas, and the city planners' expectations of short or long-run returns to the annexation. In most years, almost all cities responded to the surveys: in the cases in which a survey was not responded to, it is noted in the municipal yearbooks.

Annual Population Because we lack annual data on population, we impute annual population series using the population data included in the Municipal Yearbooks, as well as the decadal Census data. The underlying assumption to this process is that annexation induced large jumps in population in a given year and that all other population growth would have occurred gradually over time. To do this, we assign non-annexation population growth to a linear annual trend, and the observed annexed population to the annexation event year. To illustrate this process, take the hypothetical example of City X: lets say we observe City X with a population of 100,000 in 1950 and 150,000 in 1960, and an annexation of 30,000 people in 1955. The annual series will then include linear growth of 2,000 people a year, with a jump of 30,000 people in 1955.

City Government Finances We use annual data on municipal spending and revenue from the Annual Survey of Governments, which begins collecting data in 1952. These data include information on spending and revenue by category and, because our sample of annexing cities

includes only relatively large cities, covers the entire universe of cities in our sample.

City Government Employment We use annual data on municipal employment from the Census Bureau that is compiled for cities between 1952 and 2012. Although these data cover different cities over time, they are always available for cities in our sample, because they are sufficiently large to consistently be in the sample.

III.ii. Sample Construction

We restrict our sample to all cities with a population above 75,000 in 1990, comprising 296 cities. We identify treatment cities by several criteria: first, we restrict to events that would have a sufficient pre- and post-treatment window between 1952 and 1968, where we can impute annual population series; second, we exclude cities that have multiple treatment events in the window, to avoid muddling the estimated treatment events. We do permit short clusters of years where several large annexations take place, and in these cases, we take the first year as the treatment year. We only consider large annexations of more than 20 square miles.

These criteria leave twenty-one treatments in our sample, concentrated mostly in the South, West, and Mid-West. For each of these treatment events, we identify cities that do not report annexation events within a 15-year window and include them as candidate donors to the synthetic control.

IV. Descriptive Facts

This section provides descriptive evidence for two key aspects of post-war municipal expansions: the annexation behavior of cities and trends in municipal revenues and spending during the annexation boom.

Figure 1 compares annexation patterns between Sun Belt and non-Sun Belt cities.[3]

Panel A displays the average land area of cities over time, while Panel B shows the percentage of a metropolitan area's population living within its largest municipality. Before World War II, cities across regions shared similar characteristics: they averaged around 30 square miles in area, and approximately 40%–45% of metropolitan populations resided in the largest municipality. Between 1944 and 1990, however, cities underwent significant territorial expansion, following a period of relatively stable boundaries from 1934-1944.

This expansion was highly uneven across regions: Sun Belt cities expanded dramatically, increasing their land area sixfold, while cities outside the Sun Belt experienced minimal growth. In the Sun Belt, the average city grew to 188 square miles by 2000, making the average Sun Belt city in 2000 larger than nearly all cities in land area in 1944.[4] Similarly, although the share of population living in the largest municipality declined in both regions, the decrease was substantially greater outside the Sun Belt, dropping from 46 percent in 1950 to 31 percent in 2000, while the Sun Belt share only declined from 42 to 39 percent, and in fact slightly increased during the peak of annexations in 1960. These patterns demonstrate that annexation was concentrated in Sun Belt cities, was large in scale, and enabled these cities to maintain a greater proportion of their metropolitan population during suburbanization.

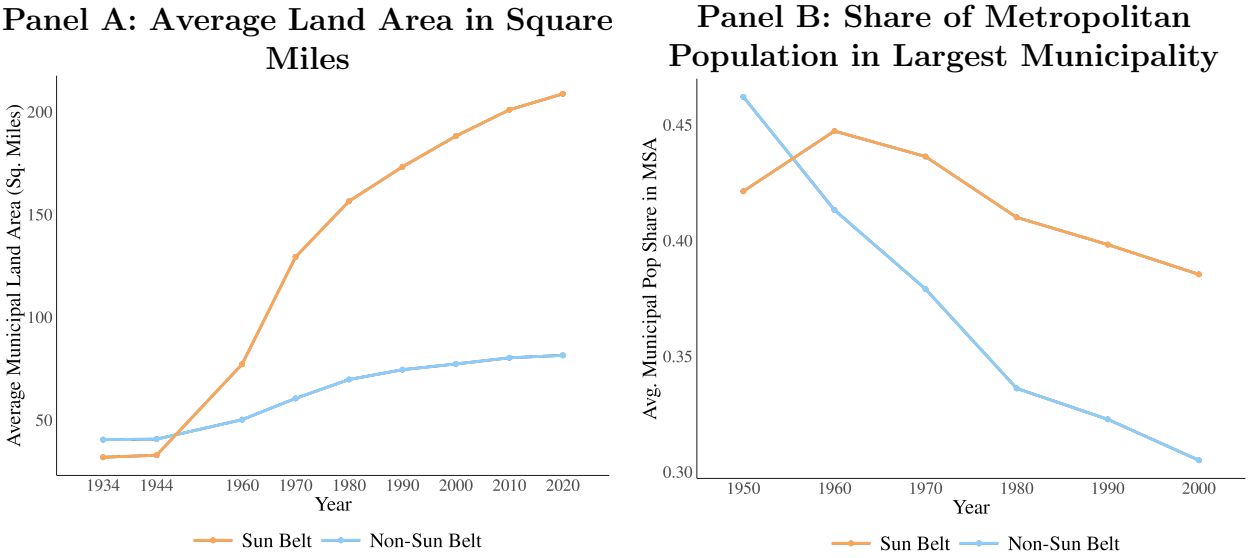
Table 1: Population Changes in 1940 City Boundaries versus Annexed Areas, 1940-1990

	1940	1990			
	1940 City	1940 City	Pct. Δ City	Annex	Total
Houston	384,514	331,704	-13.8%	1,303,777	1,631,766
Dallas	294,734	219,063	-25.5%	799,906	1,006,877
Oklahoma City	204,424	142,817	-30.4 %	318,453	444,719
Detroit	1,623,452	1,027,974	-36.7 %		1,027, 974
Boston	770, 816	574,283	-25%		574, 283

[3]We define a Sun Belt city as any city in the following states: Alabama, Arizona, Arkansas, California, Florida, Georgia, Louisiana, Mississippi, Nevada, New Mexico, North Carolina, Oklahoma, South Carolina, Tennessee, and Texas. These correspond to the states mostly south of the Parallel 3630 north.

[4]Only four cities: Los Angeles, New York, Chicago and New Orleans had a 1944 land area exceeding 188 square miles.

Figure 1: Municipal Annexation by Sun Belt Region



NOTES: This figure shows differences in annexation for cities in the Sun Belt and outside of the Sun Belt. Sun Belt city is any city in the following states: Alabama, Arizona, Arkansas, California, Florida, Georgia, Louisiana, Mississippi, Nevada, New Mexico, North Carolina, Oklahoma, South Carolina, Tennessee, and Texas. Panel A shows the average land area in square miles of cities over time, while Panel B shows the share of a metropolitan area's population contained within its largest municipality. The sample includes the a balanced panel of the most populous cities within each MSA in 1990, where the city has a 1990 population of at least 75,000 and an MSA population of at least 200,000. This corresponds to 64 Sun Belt cities/MSAs and 66 non-Sun Belt cities/MSAs. Sources: Municipal Year Book (1934-1960), Boundary and Annexation Survey (1970-2020), and Decennial Censuses.

In Table 1, we decompose 1940 to 1990 population growth for select cities into growth within the 1940 city boundaries and within territory annexed between 1940 to 1990.[5] We document that Houston, Dallas, and Oklahoma City all lost population within their 1940 city boundaries, and that population growth occurred mostly through annexed territories. These patterns are striking considering that a naive comparison of 1940 to 1990 population growth would suggest tremendous growth for cities like Houston and Dallas—growing from 380,000 to 1.6 million and 220,000 to 1 million, respectively. However, our analysis suggests that annexation accounted for more than the entirety of this growth. By 1990, 1.3 million of Houston's 1.6 million residents resided in territory that had been annexed between 1940 and 1990. Notably, the population associated with annexed areas in 1990 is more than even the total of Houston's population growth between 1940 and 1990—a product of the fact that Houston, Dallas, and Oklahoma City all lost population within their 1940 city boundaries. To give a sense of scale to these patterns, the change in central 1940 city population for Dallas and Oklahoma City, at 25 and 30% respectively, are not remarkably different from the 25% and 36% declines that took place in cities like Boston and Detroit, places that did not have similar opportunities to expand outwards.

While, of course, the patterns of growth and decline across American cities in this period was determined by the interaction of varied and complex forces—among them white flight, de-industrialization, and technological change such as air conditioning—these results suggest that naive comparisons of city populations mask true underlying trends. While we cannot observe what the central city populations would have been had Dallas, Houston, or Oklahoma City not been able to annex, the descriptive patterns documented here do suggest that accounting for municipal boundary changes reveals a pattern of central city flight that was more prevalent than sheer populations would suggest. Only some cities, however, had a policy lever—annexation—that could be employed to combat the declines in municipal revenue that would come from central city flight—which is the divergence we examine in

[5]We identify 1940 city boundaries using data from the Urban Transition Historical GIS project (Logan et al. 2024)

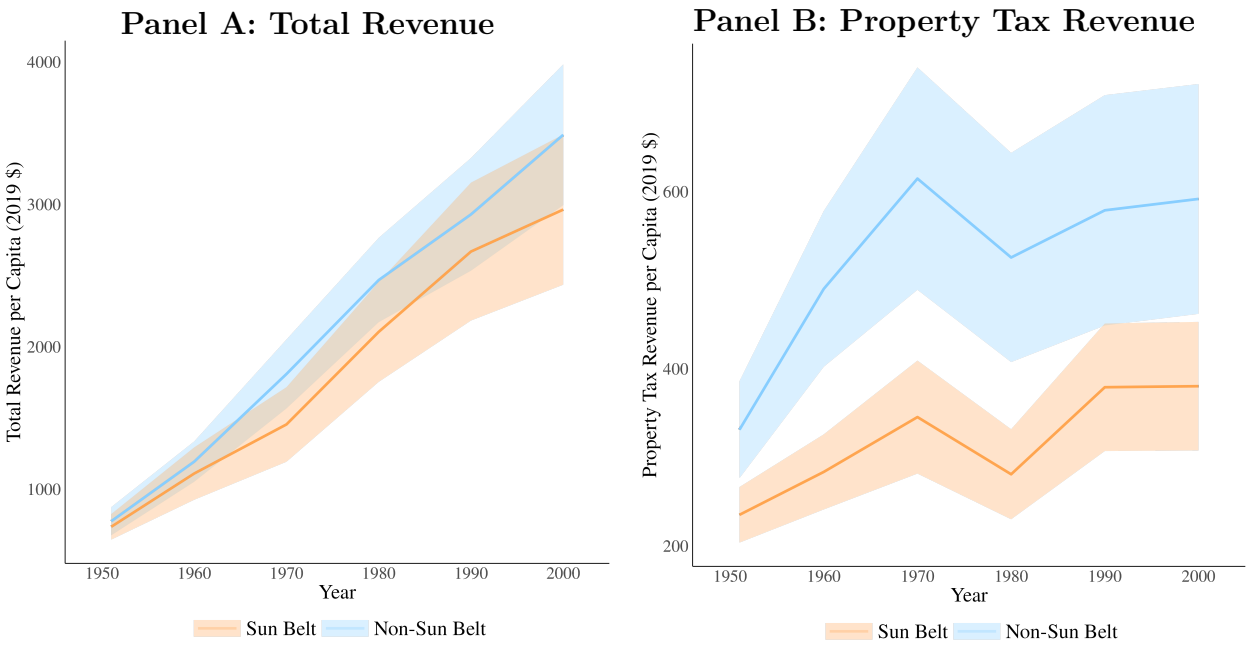
this paper. However, we can only conduct this exercise for cities for which we have digitized 1940 city maps, courtesy of Urban Transition Project (Logan et al. 2024), and therefore cannot document similar trends for the entirety of our sample.

Figure 2 illustrates municipal revenue trends for Sun Belt and non-Sun Belt cities during and after the annexation boom of the 50s and 60s. Panel A demonstrates per capita revenue growth over time, revealing that average city revenue more than tripled in real terms by 2000, with similar growth patterns both in and outside the Sun Belt. Panel B shows that non-Sun Belt cities began with substantially higher per capita property tax revenue in 1950, which peaked around 1970 before leveling off. This figure highlights three key insights: first, this period witnessed dramatic expansion in municipal government size; second, despite the annexation boom in the Sun Belt, revenue growth remained comparable to the rest of the country; and third, Sun Belt cities relied on different revenue streams than their non-Sun Belt counterparts.

Figure 3 documents trends in municipal expenditure patterns across Sun Belt and non-Sun Belt states. Panel A shows the growth in per capita current expenditures (variable costs); while both regions had similar expenditures in 1950, non-Sun Belt cities experienced somewhat higher growth over time. In contrast, Panel B reveals that per capita capital outlay (fixed costs) followed remarkably similar trends across both regions, with a notable spike between 1950 and 1970 (during the height of the annexation boom) before leveling off. Figure 4 then looks expenditures across four major subcategories of spending: police, fire, utilities, and highways. In 1950 the average city had similar patterns of spending in both levels and spending across categories. However, this figure highlights distinct regional differences in spending growth patterns. While police and fire protection expenditures closely track each other both in and outside the Sun Belt, though growing somewhat faster outside the Sun Belt, spending on utilities spiked in Sun Belt states between 1970 and 1990, whereas highway expenditure growth was consistently growing faster in non-Sun Belt cities.

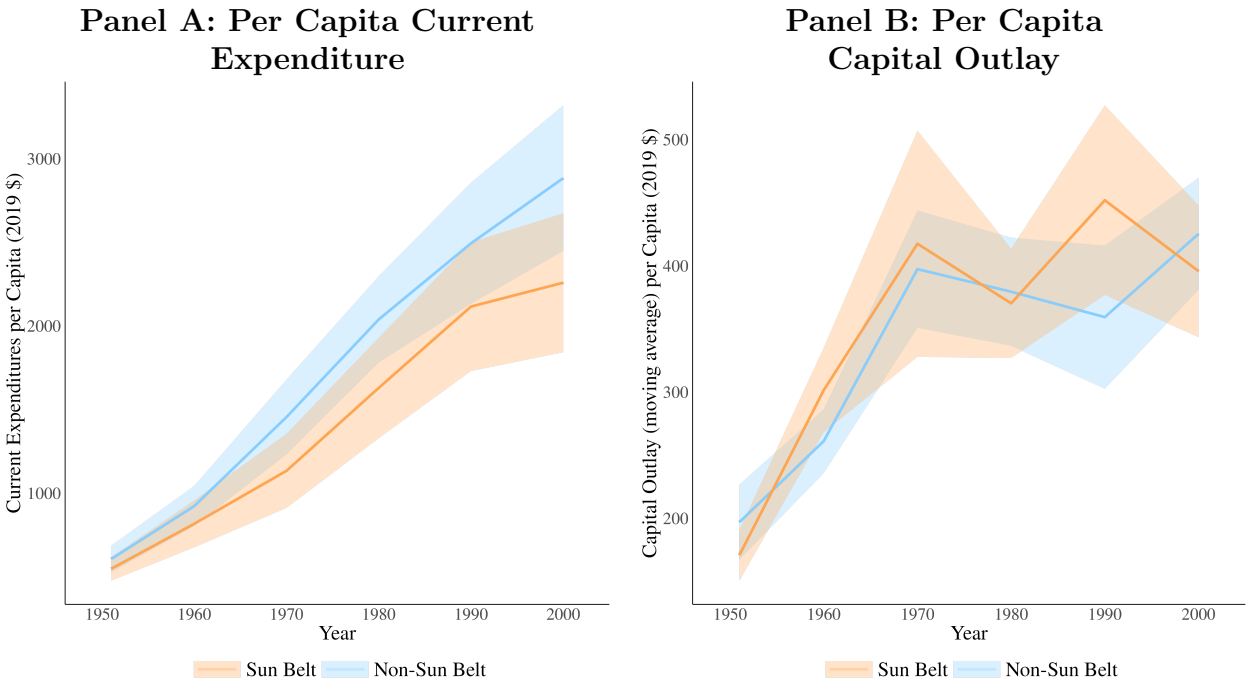
This section highlights the dramatic growth of American cities in the postwar period,

Figure 2: Trends in Municipal Per Capita Revenue by Sun Belt Region



NOTES: This plot shows trends in average municipal revenue in 2019 dollars. Panel A shows per capita total revenue (dollars) from 1950-2000. Panel B shows per capita revenue from property taxes. For both plots, average trends are broken out by Sun Belt and non-Sun Belt cities. A Sun Belt city is any city in the following states: Alabama, Arizona, Arkansas, California, Florida, Georgia, Louisiana, Mississippi, Nevada, New Mexico, North Carolina, Oklahoma, South Carolina, Tennessee, or Texas. Each plot shows the mean and 95% confidence interval of the mean across cities in that year. The sample includes the most populous cities within each MSA in 1990, where the city has a 1990 population of at least 75,000 and an MSA population of at least 200,000. This corresponds to 64 Sun Belt cities/MSAs and 66 non-Sun Belt cities/MSAs. Source: Census of Governments.

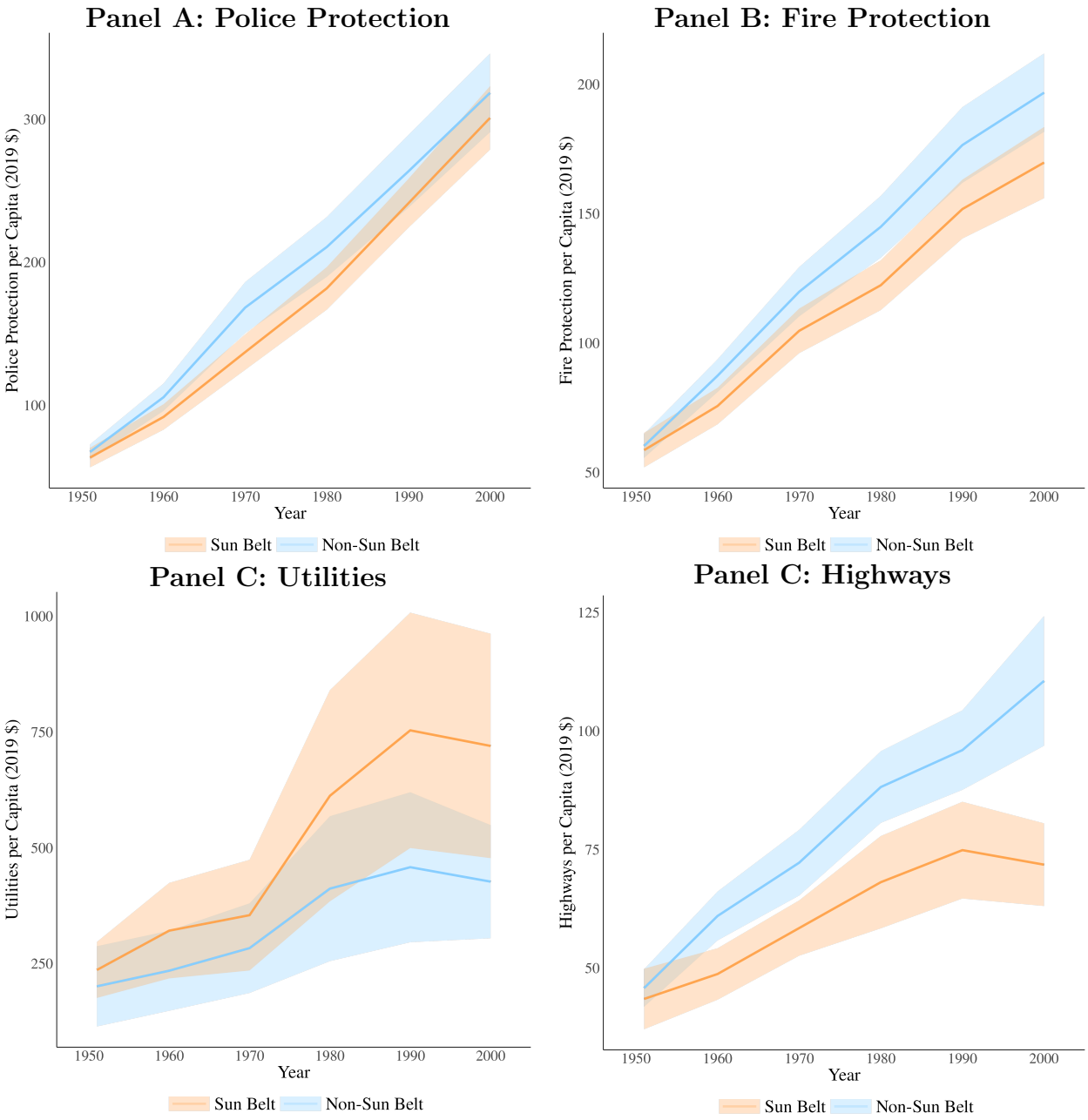
Figure 3: Trends in Municipal Expenditure by Sun Belt



NOTES: This plot shows trends in average municipal expenditure in 2019 dollars. Panel A shows per capita current expenditure (dollars) from 1950-2000. Panel B shows per capita capital outlay (3-year moving average). For both plots, average trends are broken out by Sun Belt and non-Sun Belt cities. A Sun Belt city is any city in the following states: Alabama, Arizona, Arkansas, California, Florida, Georgia, Louisiana, Mississippi, Nevada, New Mexico, North Carolina, Oklahoma, South Carolina, Tennessee, or Texas. Each plot shows the mean and 95% confidence interval of the mean across cities in that year. The sample includes the most populous cities within each MSA in 1990, where the city has a 1990 population of at least 75,000 and an MSA population of at least 200,000. This corresponds to 64 Sun Belt cities/MSAs and 66 non-Sun Belt cities/MSAs. Source: Census of Governments. Source: Census of Governments.

both in territory and municipal budgets. Sun Belt cities expanded their borders substantially, enabling them to maintain a larger share of metropolitan populations during a period of mass suburbanization. However, the implications for municipal finance are unclear. While cities were growing everywhere, per capita growth rates in revenue and expenditure were somewhat greater outside the Sun Belt. This pattern supports multiple interpretations: if local public goods exhibit increasing returns to scale across certain categories, then Sun Belt cities—where a greater share of metropolitan populations resided within central city boundaries—would face lower per capita costs in providing public amenities compared to regions where central cities contained smaller portions of the metropolitan population. Alternatively, residents in the Sun Belt might simply have different preferences regarding public amenities. To distinguish between these interpretations, data on the actual level of public good provision is necessary.

Figure 4: Trends in Municipal Expenditure by Sun Belt Region and Spending Type



NOTES: This plot shows trends in average municipal expenditure in 2019 dollars by spending subcategory. Average trends are broken out by Sun Belt and non-Sun Belt cities. Sun Belt city is any city in the following states: Alabama, Arizona, Arkansas, California, Florida, Georgia, Louisiana, Mississippi, Nevada, New Mexico, North Carolina, Oklahoma, South Carolina, Tennessee, and Texas. Each plot shows the mean and 95% confidence interval of the mean across cities in that year. The sample includes the most populous cities within each MSA in 1990, where the city has a 1990 population of at least 75,000 and an MSA population of at least 200,000. This corresponds to 64 Sun Belt cities/MSAs and 66 non-Sun Belt cities/MSAs. Source: Census of Governments. Source: Census of Governments.

V. Empirical Strategy

We now turn to estimating the impact of large annexations on municipal finance outcomes within individual cities.

Our main estimating equation is a stacked synthetic control difference-in-differences around large annexation events. The estimating equation is as below.

$$Y_{it} = \sum_{n=-T}^{T} \beta_n \cdot EventTime_n \cdot Annex_i + \alpha_i + \mu_t + \epsilon_{it} \tag{1}$$

Here, Y_{it} reflects the outcome of interest, for example, municipal tax revenue per capita. $Annex_i$ is a dummy that identifies treated cities. $EventTime_n$ are standard event-time indicators. To control for secular trends in municipal spending, we include year fixed-effects μ_t. Finally, α_i identifies group fixed-effects where the group is identified as the treatment-synthetic control pairing.

V..a. Synthetic Control Construction

For each treatment city-year in our sample, we construct a synthetic control city by matching, within region, on pre-period population three and four years prior to the event, as well as baseline 1950 demographics—share Black, share native, and share native-born. We then use the weighting scheme generated by the synthetic control to construct all other outcomes for the synthetic control city.

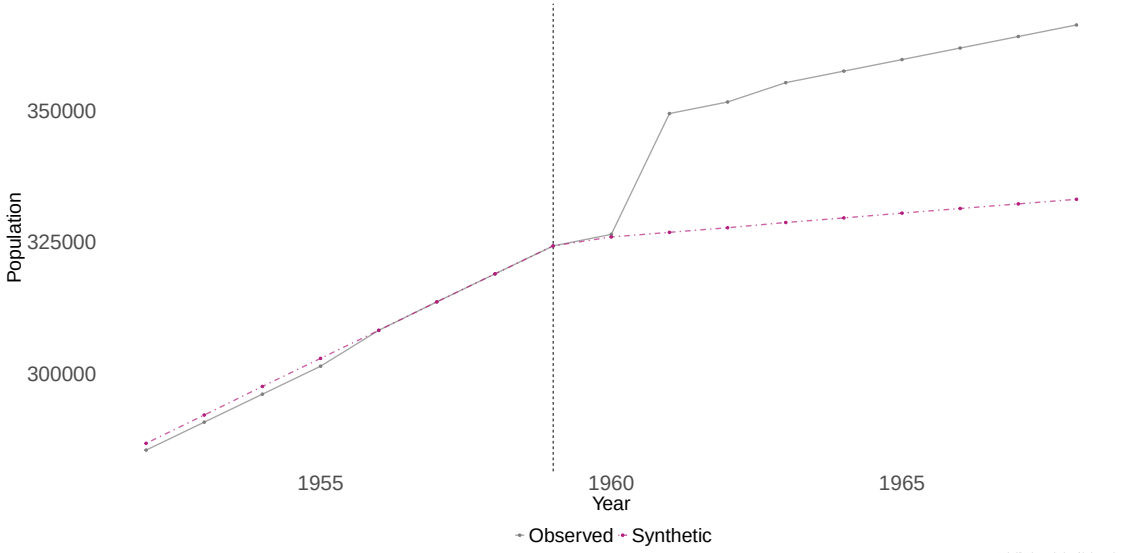
It should be noted that this differs from the standard approach: usually the synthetic control is constructed on the outcome of interest, often matching on that outcome on the pre-period. Population is not our outcome interest, but rather functions as a "first-stage" of the treatment. As a result, while our method functionally imposes parallel trends in the "first-stage", there is no guarantee that the weighting scheme will also generate parallel trends for other outcomes.

To give an example of a weighting scheme generated by this process: synthetic Oklahoma

City is a composite of outcomes from Atlanta, Louisville, Tuscaloosa, Birmingham, and New Orleans, as well as other cities in much smaller shares.

Figure 5 plots the generated annual population series for synthetic and observed Oklahoma City: as mentioned above, because pre-period populations are include in the synthetic control construction, the tightness of parallel trends in years -4 and -1 before the event are a direct result of the synthetic control construction. However, in this case, the fact that the series approximates the observed Oklahoma City population in the 0 year before the annexation population jump is validation that the synthetic control is constructing a reasonable comparison city. The uptick in population post-event documents the divergence in Oklahoma City's population as a result of the annexation.

Figure 5: Observed vs. Synthetic Oklahoma City Population Series



NOTES: This figure shows the population series for actual and synthetic Oklahoma city around its major annexation event in 1959. The dashed red line reflects the constructed synthetic control for Oklahoma City, while the smooth black line represents the actual population series. The vertical dashed line reflects the annexation event. Annual population changes are imputed using estimated population changes from annexation events Municipal Year Books and interpolating between population counts in decadal Census data.

VI. Results

This section reports our primary estimates stacking the twenty-one events in our samples on the impact of major annexation events on population and municipal finance and operation. As the vast majority of these treatment cities fall within the Sun Belt, the analysis speaks to the ways in which the annexation boom contributing to divergence in municipal outcomes between the Sun Belt and the rest of the country.

VI.i. Population

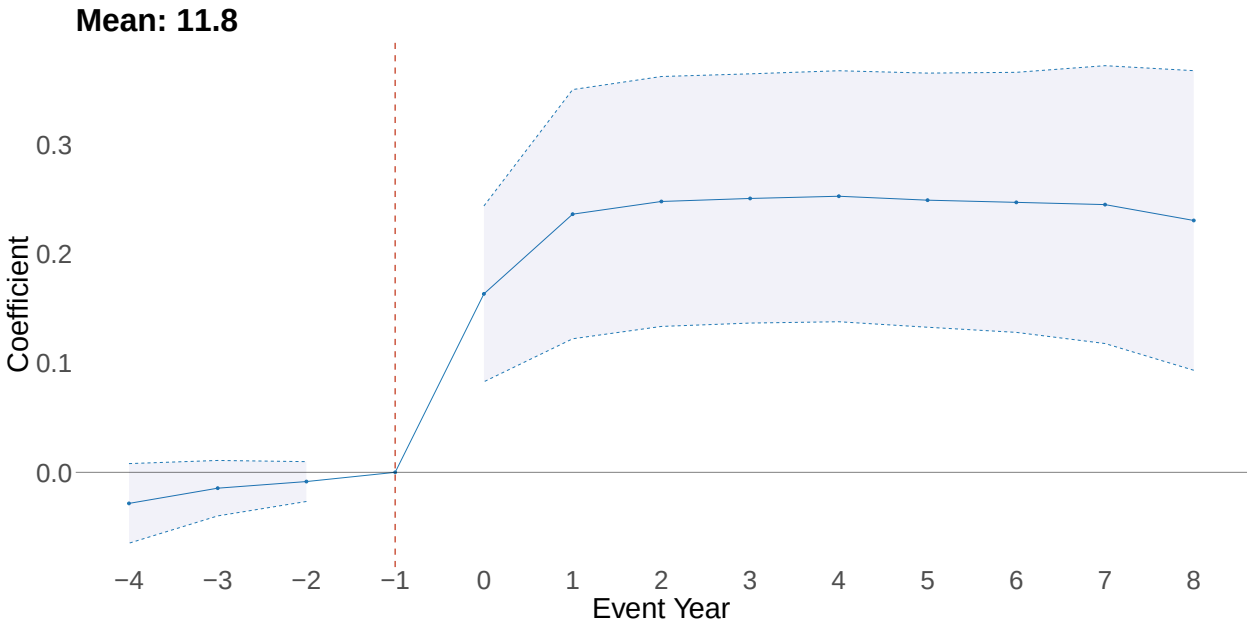
After stacking our twenty-one treatment events, the estimates reflect an increase of roughly 45,000 people, which corresponds to a 24% increase in population from the baseline year. These results are reported in Figure 6. As a result of allowing for multiple annexations to occur in concentrated spurts, the effect almost entirely occurs in the first two years, and then stabilizes around the 24% increase in population. As described in the description of the synthetic control, the close match in the pre-period is not surprising and is a by-product of how the synthetic controls were constructed.

VI.ii. Revenues

In this section, we examine how large annexation events impact total municipal revenues and property tax revenues. For all plots subsequently presented, the left hand panels reflect estimates in log levels and right hand panel reflects the estimates in per capita terms.

Figure 7 shows noisily estimated point estimates suggesting that total revenue increases by roughly 10% following an annexation. We observe a statistically significant reduction in revenues per capita of approximately 20%. Total revenues per capita reflect the average sum paid by residents of the city to the city government. In this sense, this reduction in per capita revenue is particularly notable given that the annexed areas were typically wealthier than the pre-existing municipal core, suggesting that either cities reduced tax rates to pass

Figure 6: Log Population Event Study Estimates



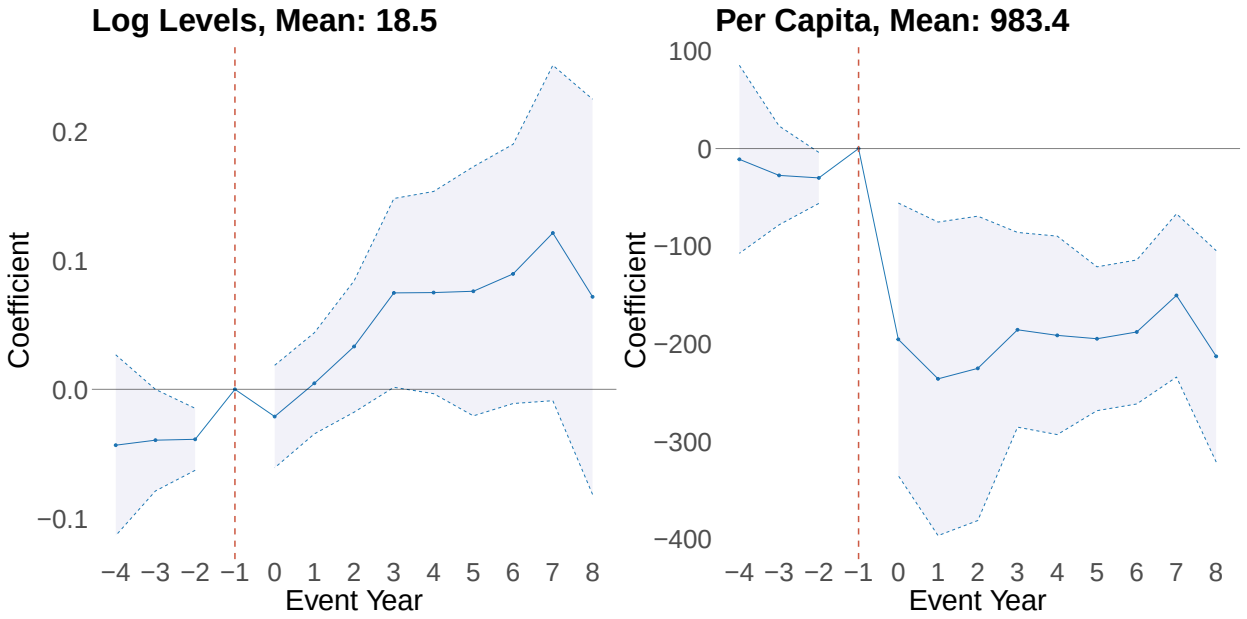
NOTES: This plot shows the estimated event study coefficients for log population, pooling event years into two year bins. The shaded gray area and dashed blue lines reflect the 95% confidence intervals for the estimated coefficients. The baseline mean is reported in the top right of the figure. The vertical redline reflects event year -1.

on efficiency gains to residents or that newly annexed populations were not immediately fully incorporated into the tax base (A. R. Miller and Varon 1962).[6]

Property tax revenue, a key municipal funding source likely to be impacted directly by annexation, shows similar but noisier patterns to overall municipal revenue, as shown in Figure 8. Property taxes slowly increase over three to four years after an annexation, stabilizing at a 20% increase. The slow increase in property tax revenue is plausibly explained by the delay caused by cities' needs to assess new areas. However, several years out from this event, growth in revenue from property taxes in annexing cities stabilize. These results suggest that while there seems to be a slight delay in taxation of newly annexed parts of the city, this alone does not explain the gap in per capita property tax revenue between annexing cities and similar non-annexing cities.

[6]Ongoing work incorporating property tax rates and assessments from Moody's will help distinguish between these two competing explanations.

Figure 7: Total Revenue Event Study Estimates



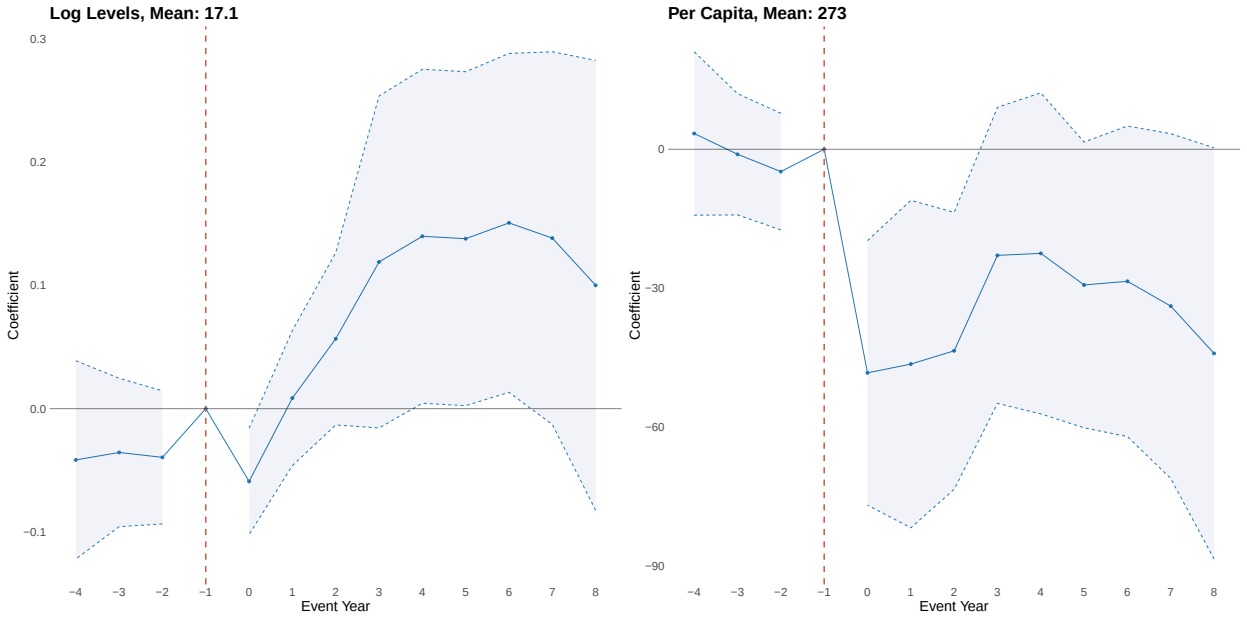
NOTES: This figure shows the impact of annexation on city-level total revenue. The left-hand panel reflects estimated event-study coefficients for log total revenue. The right-hand panel reflects the estimated coefficients for total revenue per capita. The shaded gray area and dashed blue lines reflect the 95% confidence intervals for the estimated coefficients. The baseline mean is reported in the top right of the plots. The vertical red lines reflect event years -1.

VI.iii. Expenditures

In this section, we study how these large annexations impact total expenditures and spending on current expenditures (variable costs) and capital outlay (fixed costs). We find little evidence of reductions in total per capita expenditures following annexation, but observe persistent decreases in per capita current expenditures. This difference is explained by significant increases in capital outlays, which offset the reductions in current expenditures. The estimates for capital outlay, while somewhat noisy, suggest a substantial 40% increase per capita three years after annexation. These results indicate that while overall spending per capita remains stable, this stability masks two countervailing effects: variable municipal costs decrease as they spread over a larger population, while fixed costs increase through major new capital investments required to serve newly annexed territories.

Figure 9 presents the estimates for total expenditures. In log levels, we find evidence that total expenditures increased in levels for the treated cities: this result is in line with cities

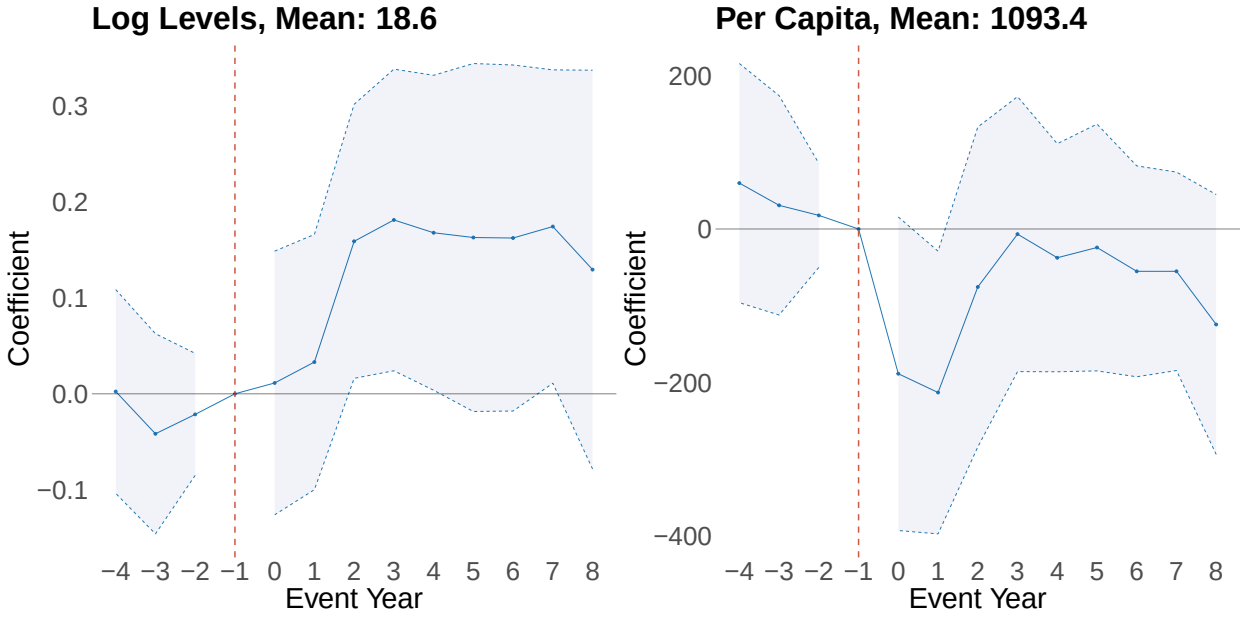
Figure 8: Property Tax Revenue Event Study Estimates



NOTES: This figure shows the impact of annexation on city-level revenue from taxes. The left-hand panel reflects estimated event-study coefficients for log property tax revenue. The right-hand panel reflects the estimated coefficients for property tax revenue per capita. The shaded gray area and dashed blue lines reflect the 95% confidence intervals for the estimated coefficients. The baseline mean is reported in the top right of the plots. The vertical red lines reflect event years -1.

increasing spending to accommodate newly annexed territories. Point estimates are positive starting two years out from annexation, and are statistically significant in certain years. The point estimates suggest a 20% increase in total expenditures, which is roughly proportional to the increase in population. In per capita terms, when the increase in expenditure arises after the first two years, there do not appear to be noticeable decreases in total expenditures.

Figure 9: Total Expenditure Event Study Estimates



NOTES: This figure shows the impact of annexation on city-level total expenditure. The left-hand panel reflect estimated event-study coefficients for log total expenditures, pooling event years into two year bins. The right-hand panel reflects the estimated coefficients for total expenditure per capita. The shaded gray area and dashed blue lines reflect the 95% confidence intervals for the estimated coefficients. The baseline mean is reported in the top right of the plots. The vertical red lines reflects event years -1.

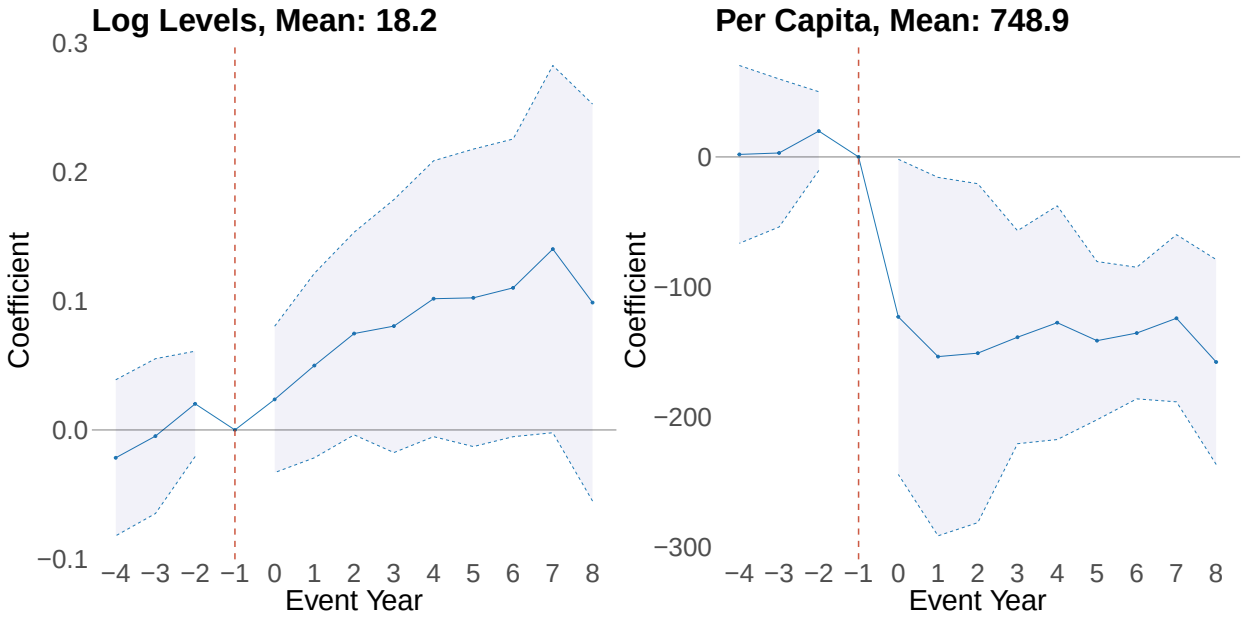
However, in Figure 10, when examining current expenditures, we observe a persistent decrease in per-capita costs. The mean current expenditure per capita the year before the annexation event is $748, and the point estimates suggest that after annexation, costs persistently decrease by 20%. Because these costs reflect annual spending, we interpret these results as suggestive of these cities being able to spread costs over a large population. A competing explanation might be that city governments simply failed to provide services to newly annexed areas, and this would also appear as decreased per capita expenditures. We lean against this interpretation for several reasons: first, the point estimates do suggest

an increase in total and current expenditures; second, the persistent and stable decline in current expenditures nine years out from annexation, suggests that the decreases are not being driven by failures on the municipal governments to accommodate the new population.

The reduction in current expenditures is offset by large increases in capital outlay, as presented in Figure 11. The estimates, though noisy, suggest a 50% increase in annual capital outlays relative to similar non-annexing cities. These increases in levels translate to per capita increases of around 30%. These increases translate to per capita increases of approximately 30%. This pattern indicates that some, but not all, cities make capital investments following annexations that are proportionally larger than their population increases.

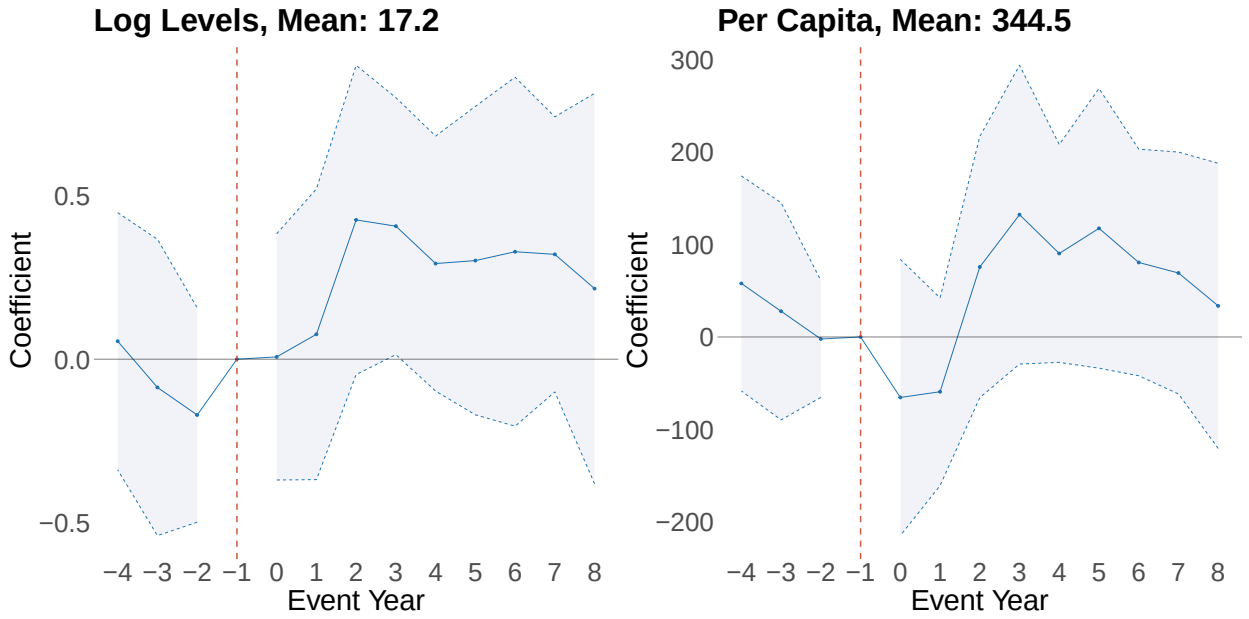
Together, these results suggest that cities leverage economies of scale to provide municipal services at lower per capita costs after annexation, while simultaneously making significant capital investments to support the expanded territory. This combination of reduced operational costs and increased capital investment maintains overall expenditure levels while potentially improving service delivery efficiency.

Figure 10: Current Expenditures Event Study Estimates



NOTES: This figure shows the impact of annexation on city-level current expenditure. The left-hand panel reflect estimated event-study coefficients for log current expenditures. The right-hand panel reflects the estimated coefficients for current expenditure per capita. The shaded gray area and dashed blue lines reflect the 95% confidence intervals for the estimated coefficients. The baseline mean is reported in the top right of the plots. The vertical red lines reflects event years -1.

Figure 11: Capital Outlay Event Study Estimates



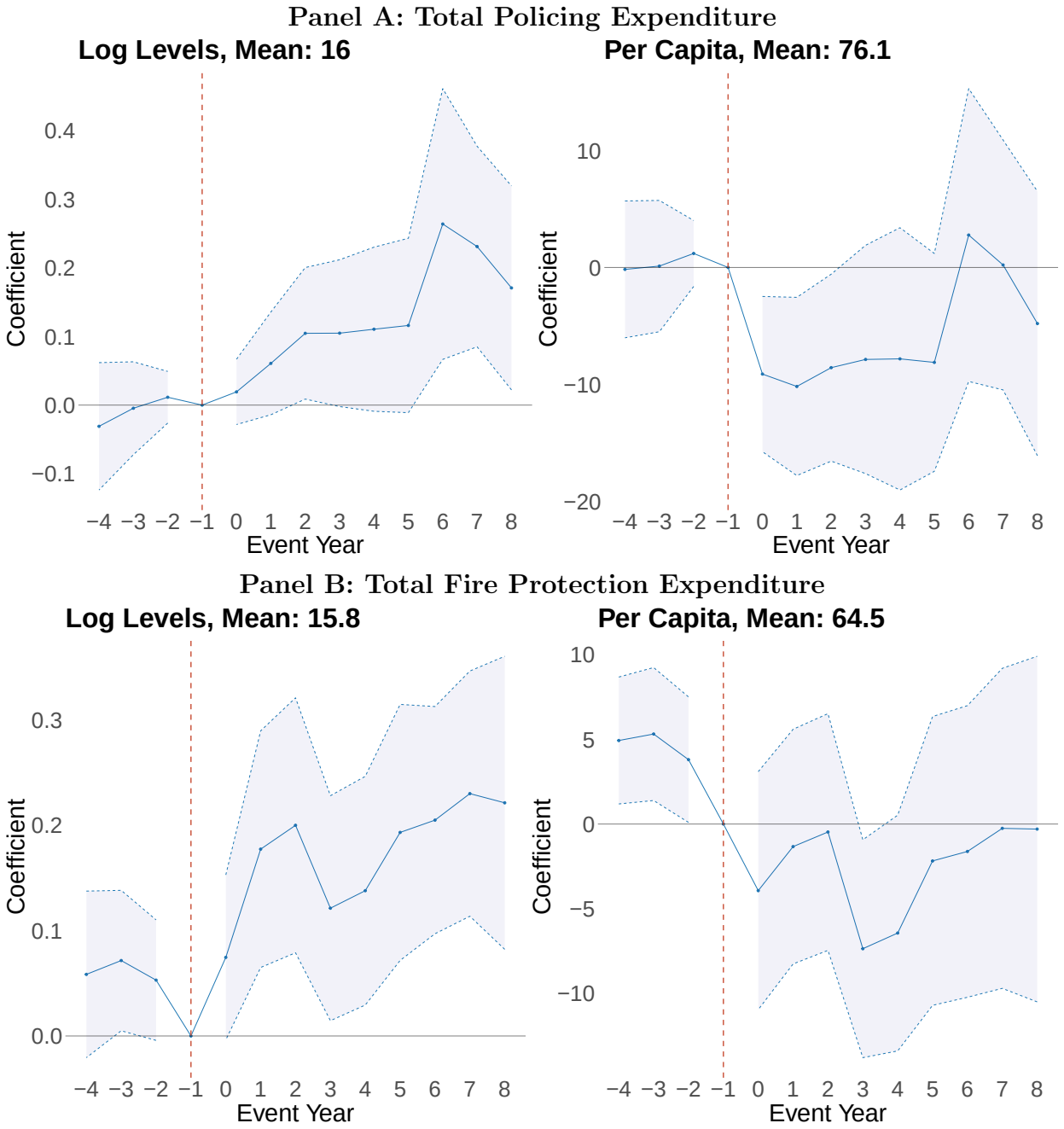
NOTES: This figure shows the impact of annexation on city-level capital outlay. The left-hand panel reflect estimated event-study coefficients for logtotal capital outlay. The right-hand panel reflects the estimated coefficients for total capital outlay per capita. The shaded gray area and dashed blue lines reflect the 95% confidence intervals for the estimated coefficients. The baseline mean is reported in the top right of the plots. The vertical red lines reflects event years -1.

VI.iii.a. Police and Fire Protection

We identify distinct patterns for high-labor cost public goods: policing and fire protection (Figure 12). These municipal services may require investments that scale proportionally to larger populations and areas, and therefore if municipal services are being provided to newly connected areas we would expect expenditures to scale with population after an annexation. Our estimates confirm these priors: while per capita expenditures on policing and fire protection appear to decrease immediately after an annexation, within nine years of an annexation, spending on both municipal services is similar to non-annexing comparison cities.

These results on expenditures are consistent with cities expanding services to accommodate new populations, and would suggest that the reduction in current expenditures that we observe does not arise from high labor-cost municipal services, but rather from other categories of municipal spending that depend on large fixed cost investments, such as water or sewage treatment.

Figure 12: Police and Fire Expenditure Event Study Estimates

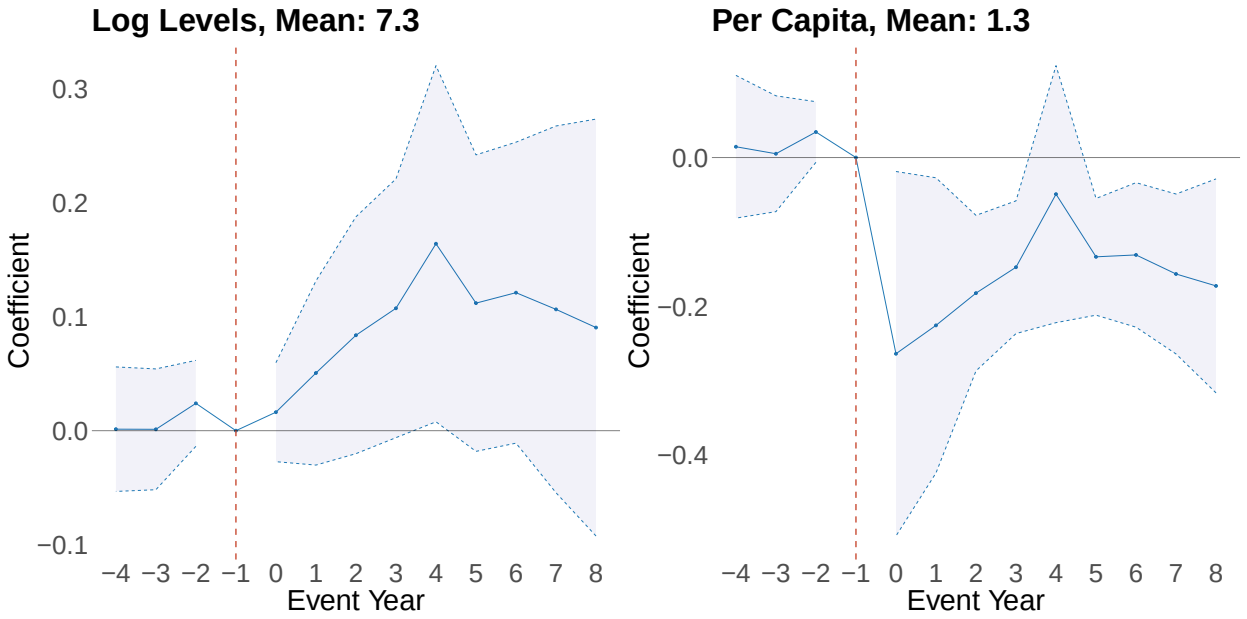


NOTES: This figure shows the impact of annexation on city-level expenditures for policing and fire protection municipal services. Panel A displays policing expenditures, while Panel B shows fire protection expenditures. For each panel, the left-hand side reflects estimated event-study coefficients for log total expenditure. The right-hand side reflects the estimated coefficients for expenditure per capita. The shaded gray area and dashed blue lines reflect the 95% confidence intervals for the estimated coefficients. The baseline mean is reported in the top right of each plot. The vertical red lines reflect event years -1.

VI.iv. Aggregate Municipal Employment

Furthering evidence on returns to scale, we also find persistent reductions in aggregate municipal employment per capita. These results are reported in Figure 13. Similar to some other outcomes, total municipal employment increases in levels in the point estimates, suggesting that cities expand employment as they expand services. Total employment per 100 citizens, however, seems to follow the same pattern as current expenditures and revenues per capita, exhibiting a decrease that persists up to nine years out from the annexation event. The magnitude of the point estimates for total employment per capita are slightly lower than those for current expenditures: they reflect a roughly 15% decrease in total employment per capita. For ease of interpretation, these estimates have been re-scaled to reflect employment per 100 residents, as opposed to employment per capita.

Figure 13: Total Municipal Employment Event Study Estimates

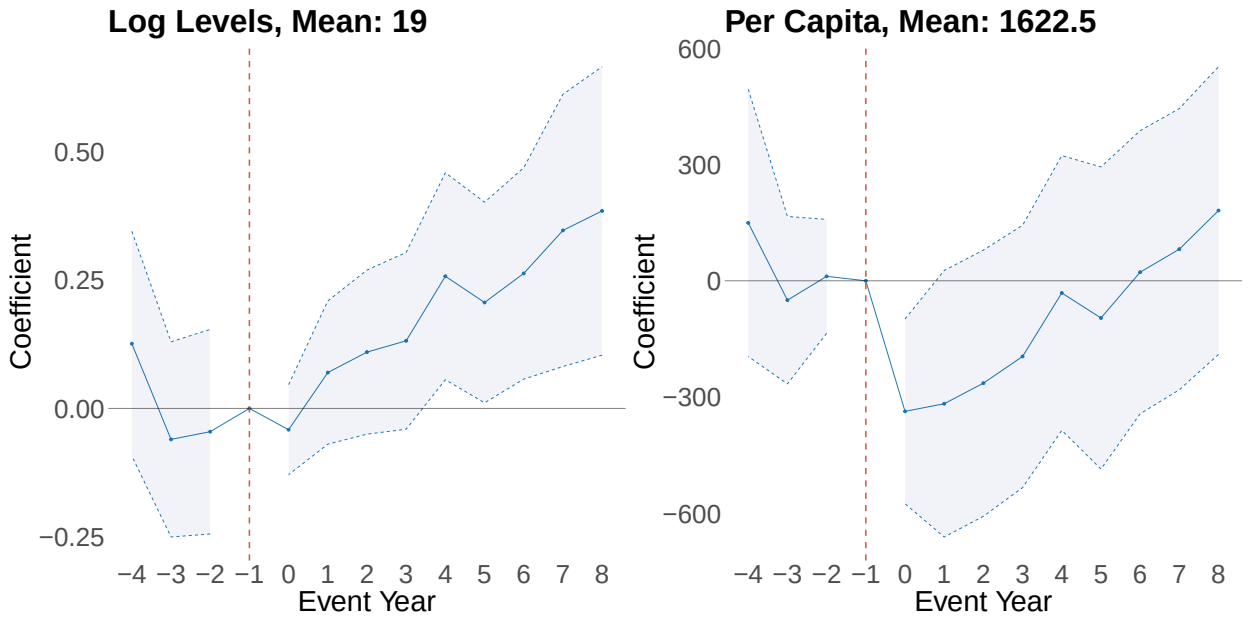


NOTES: This figure shows the impact of annexation on city-level municipal employment. The left-hand panel reflects estimated event-study coefficients for log total municipal employment. The right-hand panel reflects the estimated coefficients for total municipal employment per capita. The shaded gray area and dashed blue lines reflect the 95% confidence intervals for the estimated coefficients. The baseline mean is reported in the top right of the plots. The vertical red lines reflect event years -1.

vi. Total Debt

Finally, we turn to the total debt issued by cities. The left-hand panel shows that the debt levels increase gradually and consistently following the annexation. Here, the point estimates suggest that the increase in debt is larger than the increase in population and in total expenditures. In fact, in per capita terms, the point estimates suggest an increase in per-capita debt. These results are consistent with increases in municipal size increasing the ability of cities to secure bonded debt to finance larger investments.

Figure 14: Total Debt Event Study Estimates



VII. Conclusion

Our results suggest that Sun Belt cities made use of liberal annexation laws to significantly expand their boundaries and populations. In doing so, Sun Belt cities were able to realize modest gains from scale, dispersing current expenditures and municipal employment over larger populations. We also find evidence that lower costs per capita may have translated to lower average bills paid into the municipality. At the same time, we find evidence that these

cities made large capital investments following annexations, and some suggestive evidence that these investments were financed by greater access to bonded debt.

Future work will extend the analysis in this paper by digitizing data on local public good levels (i.e. stocks of police and fire equipment) from the Municipal Yearbooks to examine levels of public goods, as well as data on credit ratings and local property tax rates as outcomes of interest from Moody's Municipal Manuals.

Nevertheless, our current estimates provide some insights into urban development of Sun Belt cities. We find that Sun Belt states, by permitting their municipalities to expand their boundaries outward, also enabled them to spread some costs over a larger population and thereby reduce the total tax bill of residents into the city.

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