Title

The Fiscal Effects of Housing Prices: Evidence from School Districts

Abstract

This paper examines COVID-19 pandemic led to changes in the housing market in the United States that led residents to move away from city centers to suburbs, and that has potential fiscal implications for the local governments. Considering the unit of data at the school district level from 2006-22, I employ difference-in-differences methods to measure the impact of changes in the housing market due to COVID, on local government's revenues and expenditures in the New York State (NYS). Results indicate evidence of an increase in revenues generated from collecting property taxes. The effect is mainly driven by districts at the intermediate distance from the city, which are relatively less dense areas. The overall expenditures did not increase significantly, but I found a slight growth in spending toward debt services, employee benefits, and general government needs.

Keywords: COVID-19, Housing Value, Local Government Finance, School Spending, Taxation, Causal Inference

JELs: E62, R30, R10

1. Introduction

Urbanization has historically been expanding globally and is a major source of growth, development, and knowledge spillovers. As a share of the global population, the urban areas expanded from 34% in 1960 to 56% in 2020, and in the United States, it has risen from 70% to 82.5% over this period (Glaeser, 2012; Nieuwerburgh, 2022; Gupta et al., 2021). In the U.S., the largest cities, like New York City, Los Angeles, and San Francisco had been the main attraction for high-skilled workers and employers, especially with a concentration on finance and technological industries. Consequently, the stronger residential demand with geographical constraint, resulted in soaring rental and housing prices across these big cities, which became almost unaffordable to average-income households (Gyourko et al., 2013; Nieuwerburgh et al., 2010, Favilukis et al., 2022; Nieuwerburgh, 2022). This pattern almost reversed in 2020 with the COVID pandemic that augured major changes in the housing market, elicited by a massive migration response to the pandemic. It led to closing businesses and forced office employees to work from home (Nieuwerburgh, 2022; Gupta et al., 2021). Before the pandemic, it was less than 5 percent work from home, and it surged to 61.5 percent of full-paid working days worked at home in May 2020. The trend declined in 2022 to around 30 percent, though remains significantly higher than pre-pandemic[1].

The pandemic tremendously hit cities like New York City with higher out-migration from the urban core to suburbs in search of safer grounds and more affordable cities, facilitated by more work from home. However, as the pandemic remained longer and there were more Covid variants, it further impelled employers to keep return-to-work plans and the Covid-induced migration patterns seemed to be more persistent. Many households transitioned from temporarily renting a

[1] U.S Survey of Working Arrangements and Attitudes (SWAA).

suburban home to purchasing a suburban home relatively declining residential rents and prices in the densest areas (Ramani et al., 2021; Gupta et al., 2021; Liu et al, 2021; Althoff et al., 2020; Rosenthal et al., 2022). Figure 1 shows the distribution of the Zillow housing price index for New York State across school districts in 2020. These implications of the pandemic-induced surge in work-from-home and migration are limited not only to changing the real estate market but also to potentially wider spillovers in areas such as local government, thereby impacting the provision of public goods.

However, while a sizeable literature has focused on the COVID-19 effect on the housing sector, little is known about its implications on local governments. Property taxes are a key source of revenue for local and state governments, with a contribution of approximately 71.7 percent of local tax collections in the states. Previous studies have found a decline in housing prices in the city centers post-pandemic, thus raising some interesting implications in public finance.

On average in 2018, New York State collected $3,025 per capita from property taxes, making it the fifth highest, following the District of Columbia, New Jersey, New Hampshire, and Connecticut (U.S. Census and Tax Foundation)[2]. In 2021, it ranked four in state & Local Property Tax Collections per Capita. The local governments rely heavily on property tax collection for public goods including funding schools, roads, police departments, and fire and emergency medical services. However, Stijn (2022) points out that the out-migration from cities and the limited ability of the governments to issue debt put pressure on either raising tax rates or limiting public goods and services. This consequently makes a city less attractive for households and firms as well and are likely to migrate out, which further hits the government's budget. The property tax

[2] Data facts: https://taxfoundation.org/all-research-data/?post_types=all-data#results

collections in NYC were expected to decline by 5.4% or $1.7 billion in fiscal year 2022. Chernick et al., 2020; Gordon et al., 2020; Gordon and Reber, 2020 analyzed government policy response to the pandemic and its relation to financial institutions and constraints and future magnitudes of state and local government revenues.

These few studies mention the implications on local governments, but there is little evidence to date on how COVID-19 has impacted their revenues and expenditures. Also, COVID hit work-from-home and out-migration from city centers, resulting in changes in the real estate sector, with a decline in housing prices in city centers, and thus consequently a decline in government revenues. However, at the same time, this created a higher demand for housing in suburbs that led to increasing rental and residential real estate values, and thus potentially (theoretically) increases the property tax revenues for local government. Therefore, it gives room to explore questions like how it overall impacts the property tax revenues. If there is a "one-time" positive revenue shock for local governments, how does local government change their spending behavior on local public goods? Should there be a need to revise property taxes based on COVID-19 shock? These tax implications will unfold gradually because whether the impact would be just short run or long run, will depend on factors like how governments form their budgets and reallocation of resources, the tax rate adjustment often follows market value changes with a lag, and if I expect the work from home to be a new normal to be more persistent. The heterogeneities could also be related to income taxes across states.

The purpose of this paper is to examine the fiscal effects of the COVID-19-induced housing market on local government. I contribute to this literature by exploring the causal impact of the COVID-led changes in the housing value on local government financing in the state of New York. To do so, I measure the magnitude of changes in earnings and spending behavior using the NYS

comptroller dataset and housing price data from Zillow for the New York State. I use the difference-in-difference approach, by taking housing value as an exogenous shock to the districts and finding the effect on local revenues from property taxes and expenditures. I model the approach for New York State because NYC was among the most hit cities across the US in COVID and has a higher migration from the city. Also, the revenue patterns as measured by the NYS comptroller show a relatively steeper growth of around 5 percent in property tax revenue as compared to previous years, at the district level aggregating by zip codes outside New York City. The growth trend was increasing consistently in previous years to about 1-2 percent annually. In 2021, the upstate counties in New York like Albany, Hamilton, Clinton, and Rensselaer show higher growth from property taxes for the local government. The total expenditures of the local government including from all sources like education, debt services, transportation, cultural activities, etc. It depicts a flatter growth curve and is consistent over time annually.

The empirical analysis has several conclusions. First, the districts experiencing a higher housing price post-pandemic, have increased revenues from the property tax collection. The overall expenditures have not significantly changed. However, I find the increase in expenditures towards debt, employee benefits, and general government purposes. Our results are robust to various sensitivity checks described in the paper. I also find our results robust to a placebo test, in which the period of shock is randomly assigned. My main results are driven by districts in the intermediate distance from the city. Second, the effects are stronger in relatively denser districts. I also observe a slightly higher revenue in low-income districts but higher spending in high-income level districts. Overall, our results do find significant implications for the local government finances, resulting from the COVID-induced changes in the housing market.

The rest of our paper is organized as follows: Section 2 gives a brief background. Section 3 describes the data and Section 4 outlines the baseline model of the effect of the housing market on local government financing. Section 5 presents empirical results; section 6 documents the robustness checks and section 7 discuss heterogeneity. Sections 8 and 9 are discussion and conclusion, respectively.

2. Background

A large and growing literature investigates the effect of COVID-19 on the real estate sector. Gupta et al. (2021) used zip code level data for the top 30 U.S metropolitan areas, to find COVID-19 caused a flattening of the bid-rent curve. The higher exposure to WFH led to the decline in house price and rent in the city centers, and increased away from the center, thereby implying future rental growth implied by property price changes. Ramani et al. (2021) studied the impact of a pandemic on the location demand for housing. They also found a decline in housing demand in city center neighborhoods and areas with higher population density. It is mainly driven by the lesser need for living close to telework-compatible jobs post-pandemic and the dwindling attraction of consumption amenities. They examine the migration patterns and real estate markets within and across US cities due to COVID and rising WFH. They term it as "donut effect" which depicts the movement of activity out of city centers to the suburban areas. Couture et al. (2021) use cell phone data and find an outflow of people from New York City. While Liu et al. (2020) studied the effect of COVID on the demand for density in the US housing market, Davis et al. (2021) examined the effect of COVID on housing prices in major cities across the U.S. Kahn et al., (2020) and Cajner et al., (2020) study the impact on private labor markets of the coronavirus crisis and the shutdowns. Some papers studied the effects of COVID-19 in a spatial equilibrium design (Delventhal et al., 2020; Brueckner et al., 2021; Althoff et al., 2020; Graja et al., 2020).

There are a few studies that explored the policy implications in other sectors but are yet understudied. To understand the fiscal implications of COVID, it is necessary to know a bit about property taxes and how they are allocated across regions. Tax revenue, in general, is the product of a tax rate to a tax base[3]. Property taxes differ across local governments even at the district level. Thus, local officials can raise or lower the tax rate on an annual basis and may have some degree of influence over the property tax base. Additionally, they are one of the important sources of revenue collection for state and local governments. In 2020, property taxes in the United States comprised around 32.2 percent of local and state tax collections (Figure 3). The property tax, which is used in all fiscally standardized cities (FiSCs,) in the U.S., accounts for a quarter of general revenue, but nearly two-thirds of tax revenue in the average FiSC. Figure 10 from the tax foundation, depicts the median property taxes paid across states at the county level, with higher concentration in the states like New York, New Jersey, and Virginia. Theoretically, since property taxes are imposed on housing values, it is likely to surge with the increase in housing prices in the region. Figure 11 depicts the property taxes paid, as a percentage of home value[4]. The map illustrates the distribution of how property taxes are paid, as a percentage of owner-occupied housing value. These taxes are levied by the government based on several factors, like the fair market value of the property, assessment value, etc.[5]. I can see from the map that it varies a lot

[3] The tax revenue data is net of all collections from property taxes. So, it implicitly accounts for assessment values.

[4] This figure is taken from Tax foundation.

https://taxfoundation.org/data/all/state/state-local-tax-collections/

[5] The data used in this paper is net revenue collection for the districts, thus implicitly take assessment values into account for those regions.

across states, and the rates depend on how states fix taxes. For instance, the higher taxes in states like Texas, and New Jersey impose high property taxes with other major tax categories.

In New York State, the property tax is local tax and ad valorem in nature. It means that the amount is based on the value of the real property[6]. The state collected around 31.4 percent of taxes from the real estate sector, at the state and local level. In terms of the state and local property tax per capita, it ranked 4th, with a collection of $3,118 per capita, more than the national average of $1,810 per capita. The question is where do these tax collections go? The local governments use most of these resources to fund public services such as public schools and education, construction, medical services, general government services, etc. The funds are used at local levels including counties, towns, villages, school districts, and cities. Evans et al. (2019) find many local governments increased property tax rates, offsetting declining property tax bases and increasing local revenue.

During COVID, there were speculations that the coronavirus may influence the locational preferences that can significantly depress the property values in the cities and hence local government property revenues of the cities. Chernick et al. (2020) evaluated the potential fiscal effects on cities of the coronavirus-induced recession for fiscally standardized cities (FiSCs) and projected a fall in revenues post-COVID. Similarly, Clemens et al. (2020), Gordon et al. (2020), and Gordon and Reber (2020) forecast future magnitudes of state and local government revenue shortfalls. Green et al. (2020) explore the relationship between fiscal pressures on state and local governments and their employment effect due to the COVID crisis. They looked at the state-level effect of sales tax, as a source of revenue and its causal effect on employment. Clemens et al.

[6] Source: New York State Department of Taxation and Finance;

(https://www.tax.ny.gov/pit/property/learn/proptax.htm).

(2021) also examine the employment response of state and local governments to the fiscal shock and federal relief package in the context of COVID-19. Gordon et al (2020) studied the effect of revenue sources for school districts during economic downturns in payments from their state governments.

There are a few studies that look at property taxes and migration standpoints. Gustafson et al. (2022) examine the market's pricing risks to municipalities arising from the shift in location preferences induced by the pandemic. investors have changed their estimates of the level or uncertainty of municipalities' future cash flows, potentially risking financial distress. Giesecke et al. (2022) estimated a causal impact of property taxes on migration. They find that the local governments adjust tax rates to maintain stable tax revenues but there is no effect on public employment levels and limited adjustments of public services. A few studies have explored the disintegrated local income tax policies across states, that have produced the phenomenon of "tax wars" arising due to WFH (Agrawal et al., 2022).

While these studies have explored the effects of COVID and local governments, it is still an unexplored area to measure the explicit impact of COVID on public finance. Our research contributes to the literature by examining the effects of COVID-induced changes in housing prices on public finance.

To my knowledge, this is the first paper to model the COVID-induced housing market effects on public finance. I contribute to the literature in several ways. First, though the studies have explored the consequences of COVID on the government's revenues, most of it is centric on budgeting across cities and Metropolitan Statistical areas (MSAs). Some papers mentioned above inform that the COVID resulted in declining housing prices in the city centers, because of working from home, looking for a safety net, and migration during a pandemic. This at the same time

potentially resulted in relatively surging prices in upstate New York. This potentially led to the generation of higher tax revenues for local governments. It raises interesting questions for local taxation. What are the causal effects of such an increase in property taxes due to residential migration in suburbs post-COVID? How much is the one-time positive shock, if any, has local governments received due to increasing housing prices? What are the implications for spending behavior at the suburbs' regions with more earnings? I am looking at the effect of the housing effect on the finances of local government in the areas outside New York City.

Figure 12 shows the significant increase in housing prices in post-pandemic aggregated at the county level in New York State[7]. Figure 13 shows the distribution of revenues and expenditures across states. I do find an overall increase in local finances, both in terms of revenues and expenditures. A few counties do reflect a decline in spending post-COVID. Looking at Figure 1 for districts in the state, I observe districts near and at intermediate distance from New York City have relatively higher housing price values. Additionally, the growth rates for revenues from property taxes and expenditures by local government show a similar distribution at the school district level.

Second, this study is built upon the data using geo-coding information of zip codes, and school districts to get all variables at the school district level. Most of the literature on COVID and housing markets has used data for MSAs and zip levels. However, I build the data to model the school districts as the tax collection by local governments also varies with the districts.

Third, previous studies in this literature have done asset models, ordinary least squares, and fixed effects methods. By doing so, there may occur endogeneity and biasedness issues. I attempt to take housing prices as a shock to districts away from the city and thus define

[7] I used our raw data at school district level and aggregated to county level to simplify the visuals of the graph.

exogenously in the model. Besides our baseline difference-in-difference approach, I performed propensity score matching as robustness to control for the selection bias problem.

3. Data

I construct an original panel dataset that combines information on the housing value index in New York State, local government revenues and expenditures, census data on the socio-economic characteristics of school districts, and data on work-from-home (WFH). I use school districts of New York State as the unit of observation[8].

Zillow price indices: The housing data comes from Zillow housing data[9]. I use the information on the Zillow Housing Value Index (ZHVI), which considers seasonal adjustments and housing characteristics. The data includes housing for both single-family and multi-family units at the zip code level.

To match the data at the same unit as local finance, that is at the school district level, I aggregated the Zillow housing prices from zip code to school district level using the population-weighted average of zip codes within each school district.

Housing data from zip code to school district level- geodata: The assignment of zip codes to school districts is based on geodata (using shapefiles) from Integrated Public Use Microdata Series- Geographic Information System (IPUMS-GIS)[10] shapefiles at both the levels respectively. The shapefiles include data on the zip code tabulation area (ZCTA). I used crosswalk files to match ZCTA with zip code before finally averaging at the school district level. The conversion steps are explained in Appendix 1.

[8] I take districts outside NYC for looking at the impact on local government finances.

[9] Publically available, https://www.zillow.com/research/data/

[10] IPUMS-GIS, https://www.nhgis.org/

Local finance data: I combine the annual data on the school district level for local government finances from 2006-22. The data is collected from the Office of the New York State Comptroller[11]. The dataset contains all the sources of revenues and expenditures by the local government at various levels- city, county, fire district, school district, town, and village. I use information on revenue collected from real property taxes by combining all the components associated with property taxes. The expenditures are in areas including cultural and recreational activities, education, debt services, general government, and social services[12]. The final dataset has 681 school districts.

I then combine the aggregated Zillow housing data with the local financing dataset by matching each school district and constructing them in the panel format from 2006-22. I combine our dataset with data from the National Center for Education Statistics (NCES)- Education Demographic and Geographic Estimates (EDGE)[13] 2014-18 on socio-economic characteristics- median household income, fraction of the population at or below the poverty line, fraction white, fraction rural, fraction age 65 or older, and fraction of adults 25 and older with a bachelor's degree.

I restrict our main sample in several ways. First, I limit the sample to traditional school districts, namely unified school systems, and thus drop charter schools, college-grade systems, vocational or special education systems, non-operating school systems, and educational service

[11] Office of NYS comptroller, https://www.osc.state.ny.us/reports/finance/2022-fcr/taxes

[12] I drop social services as it has almost all missing observations. It does not affect the total expenditures, excluding social services.

[13] NCES-EDGE, https://nces.ed.gov/programs/edge/ .The American Community Survey Education Tabulation (ACS-ED) is a custom tabulation of the ACS produced for the National Center of Education Statistics (NCES) by the U.S. Census Bureau.

agencies[14]. Second, I drop a few observations on school districts where I do not have information on local finance and housing value. Third, in the step of aggregating zip codes at the school district level. I aggregated the zip codes for which I got the information from the GIS data. The final sample consists of 681 school districts located in New York State over the period 2006–2022. Table 1 in columns 1 and 2 presents summary statistics for the full sample for the outcome measure used in the analysis. It presents the means and standard deviations of the model.

4. Model and Estimation

The difficulty in estimating the causal effect of COVID-induced housing prices is that the districts are nonrandom. For instance, the districts that have been hit with steeper price shocks are more likely to observe positive revenues. Thus, comparing districts with revenue changes from those that did not see the change might yield biased estimates. To overcome this issue, I use difference-in-differences to estimate the effect. For this, I estimate a two-way fixed effects model where I compare districts as treatment and control groups, depending on threshold values of housing price shock.

4.1. Treatment and Outcome Variables

I construct the binary treatment of housing value, ZHVI (as the consequent shock is from COVID-19) for the year 2020 based on its 75th percentile. It is set equal to one if the school district has a housing value above this threshold and is equal to zero if the school district has a value below it.

To frame the second model, I also used housing value to describe - time positive revenue shock on local spending. The timing of the shock is defined from 2020. For this, I then separated the school districts into two groups- I combined the districts in one group for their revenue greater

[14] No data on these schools for the main variables observed in our model.

than the average revenue shock; the other group defined with revenue of the districts below the overall average revenue. Table 1, columns 3 and 4 depicts the summary statistics of the school districts in the treatment group, and columns 5 and 6 present a summary for the control group.

4.2. Event study

To examine the effect of the housing market on revenues and expenditures, I employ a difference-in-differences identification strategy. I begin with an event-study specification of the following form:

$$y_{it} = \sum_{-4}^{2} \gamma_j T_{j,it} + X_{ic}\theta_t\kappa + \delta_c + \lambda_t + \eta_{it} \quad (1)$$

where y_{it} denotes an outcome of interest for district i in state New York in year t; $T_{j,it}$ represents a series of lead and lag indicator variables for when school district i has higher housing value than the overall average. X_{ic} is a vector of school district characteristics in counties at baseline interacted with a linear time trend, θ_t; δ_t is a vector of county fixed effects; λ_t is the time fixed effects and η_{it} is a random disturbance term. I re-center the year a housing price shock happens so that $T_{0,it}$ always equals one in the year the shock happens, that is 2020 in district i.

I include indicator variables for 1 to 4 or more years before the shock or more years before COVID ($T_{-4,it}$ - $T_{-1,it}$) and 2 years after the beginning of COVID ($T_{1,it}$ - $T_{2,it}$). Note that $T_{-4,it}$ equals one in all years that are 4 or more years before COVID, and $T_{2,it}$ equals one in years that are 2 years after COVID. In all the analyses, I consider the year of treatment the year 2020.

The coefficients of primary interest in equation (1) are the γ_j's which represent the difference-in-differences estimates of the impact of housing value on our outcomes of interest in each year from t_{-4} to t_2. The estimated coefficients on the lead treatment indicators ($\gamma_{-4}, \ldots, \gamma_{-1}$) provide evidence on whether our outcomes were trending before the time of COVID in district i. If increased housing price induces exogenous increases in district revenues,

expenditures etc., these lead treatment indicators should generally be small in magnitude and statistically insignificant. The lagged treatment indicators (γ_{+1}, γ_{+2}) allow the effect of housing shock on the outcomes of interest to evolve slowly over time. Given that treatment occurs at the district level, in all specifications I cluster the standard errors at the school district level.

The inclusion of county fixed effects in equation (1) implies that our estimates are identified within counties' variation in school district exposure to increase housing value. Thus, the specifications control for differential trends in our outcomes of interest that are common to all districts within a county and across time.

In the most parsimonious specification, X_{it} includes school district level socio-economic characteristics including median income, fraction of educated BA and above, fraction of the population at or below the poverty line, fraction white, fraction 65 or older.

4.3.Difference-in-Difference (DiD) Model

I complement the event-study specification with a standard difference-in-differences model to increase the precision by estimating within both the pre-and post-house price effect periods:

$$\log(y_{it}) = \alpha_0 + \alpha_1 \, \mathrm{Treat}_{it} + X_i\theta_t + \delta_c + \lambda_t + \varepsilon_{it} \qquad (2)$$

where $Treat_{it}$ is an indicator that takes the value of one in from the year 2020 when housing values started to change in district i, ε_{it} is a random disturbance term, and all other terms are as defined in equation (1).

The coefficient of primary interest in equation (2) is α_1 which represents the difference-in-differences estimate of the effect of treatment (housing value, HPI shock) on our outcomes of interest. It is defined as follows: Let Y(0) and Y(1) denote potential outcome variables, where 0 denotes for districts with no shock and 1 denotes districts with shock. The observed outcome for a school district is Y = HPIshock x Y(1) + (1-HPIshock) x Y(0). To examine how HPIshock affects

public finance outcome variables in school districts, and rates in rural areas, I wish to estimate the average treatment effect on the treated (ATT), i.e. the parameter α_1 where

α_1 = E(Y(1)-Y(0)|HPIshock=1) = E(Y(1)|HPIshock=1) - E(Y(0)|HPIshock=0)

To control the unobserved county heterogeneities on outcome variables, I include a set of county-specific fixed effects, δ_c. The year-specific fixed effects λ_t control the HPI shock to outcomes. The random variable ε_{it} is an error term. Then I look at the effect of housing value on different components of expenditure in the following regression:

$$\log(y_{it}^{e}) = \alpha_0 + \alpha_1 \, \mathrm{Treat}_{it} + X_i\theta_t + \rho_c + \lambda_t + \varepsilon_{it}, \quad (3)$$

where $log\ (y_{it}^{e})$ is the vector of various types of expenditures including- culture and recreation, education, debt, employee benefits, and general government.

5. Empirical Results

I first report the results from event studies for equation 1. Then, I discuss the estimated coefficients of the effects of HPI shock outcome variables based on the DiD approach.

5.1. Event Study

I begin our analysis by examining the impact of housing prices on local government revenues and expenditures at the school district level using the event-study model described above. I estimate equation (1) for our baseline sample of school districts from 2006 to 2022, and plot estimated γ_j's and associated 90% confidence intervals from these regressions.

Figure 2 shows that since after the year of COVID housing value shock, the local government revenue increased significantly by approximately 0.5 percent. Importantly, the point estimates are near zero and statistically insignificant in housing prices before COVID. Therefore,

I see no evidence of a pre-trend in local revenue prior to COVID. Figure 3 shows similar, though slightly attenuated impacts of housing shock on school district total expenditures. Again, the point estimates are near zero and statistically insignificant before COVID.

One noticeable pattern in the revenue and expenditure results is that the effects of the housing shock have benefited the local governments as a one-time positive shock in generating relatively more revenues, while the total expenditures have not yet significantly increased. It is not immediately clear why this would be the case, as another possible scenario could have been that the housing prices increase in counties where people migrated during COVID and districts immediately and permanently reap the property tax benefits, leading to a sudden increase in the level of revenues, but no change in the trend for expenditures. The possible scenario could have been that the housing value increased suddenly with migration to areas away from city centers, leading to an increase in the level of revenues collected from property taxes, but no change in the trend.

I next examine whether a housing shock translates into components of expenditures, and toward what types of expenditures districts allocate its resources. Figure 4 shows that some of the components of expenditures increase in a similar pattern over time as total revenues after COVID. Figure 4 shows the expenditure on culture and recreation has not changed significantly. Spending on repaying debts increased significantly after the shock (Figure 5). Figure 6 depicts the district's spending towards educational services with the generation of revenues after COVID-19, followed by a decline in 2022. Similarly, I find a slightly significant increase in employee benefits (Figure 7), while Figure 8 depicts a significant share of expenditures that have increased towards services for the general government.

The possible explanation for the results is that I am examining the impact relative to the year of the COVID and have the data for only two years after COVID-19 to find the trend. But I still observe that in the short run, the local government seeks to spend their revenues towards the more crucial components in the districts, while the other areas of spending are more of the long-term phenomenon, and thus I don't see them significantly changing just after the COVID shock.

5.2.Difference-in-difference Estimates

I present the difference-in-differences (DD) estimates of the impact of housing value on local government finances in Table 2. Results based on equation (2) with binary treatment of school districts are presented in columns 1 and 2. Row 1 presents that the housing value shock post-COVID causes about a 0.04 percent increase in local government revenues from property taxes. the effect is statistically significant while controlling for a basic set of covariates: median income, a fraction of people with a degree BA or higher, a fraction of poverty, a fraction of whites, and a fraction of people aged 65 and above, all interacted with a linear trend. Row 2 depicts the rise in spending behavior in school districts, with a slight increase in total expenditure, though insignificant while including controls. The reason that total revenues increase slightly higher than the expenditure in our data is because the gains from increasing property prices are directly part of revenue sources for the local government. This means that with COVID since many people shifted from the city center to the suburban region, that led to an increase in demand for housing and thus led the prices to inflate for local areas. The local government collected more revenue post-COVID from property taxes, consequently leading to a one-time positive revenue change in the suburbs. However, the spending of these resources would depend on how and when the districts allocate the finances towards the welfare of the districts. I then present the effect of housing prices on spending on local activities (table 2). In terms of expenditures, I find that spending on debts,

education, and general government purposes has statistically increased by 0.13 percent, 0.01 percent, and 0.07 percent, respectively.

The fixed effect model results in Table 2 find that the increase in housing prices led to more spending in areas like culture and recreation activities, education, employee benefits, and general government. The difference in difference estimates finds a significant impact on spending in education, employee benefits, and general government.

6. Robustness checks

6.1. Robustness Check: Sensitivity Analysis

In this section, I conduct sensitivity checks to examine the robustness of our results about the way I construct our sample and implement the difference-in-differences analysis. I proceed with our preferred specification, which is the DD model with the expanded set of controls (Table 2, column 2). The first row of Table 3 replicates our baseline preferred model for comparison purposes. The other rows depict the sensitivity results.

In our first check, I changed the threshold used to segregate the control and treatment groups in our analysis. Instead of the 75^{th} percentile, I take the random threshold as the mean housing value index and use it to define the new control and treatment group and regress equation 2 with a mean threshold. The results are robust, with a statistically significant impact on revenue, and insignificant for overall total expenditures. I performed the same model for various types of expenditures used in our study. I find expenditures on debt, education, and general government statistically significant and thus robust to our baseline model. In our second check, made sample year restrictions to cater to the structural change in the 2007-08 crisis. I find the results are still robust.

In the third check, I omit the outliers for school districts with higher and lowest changes in revenue in the 2020 housing value shock. Specifically, I restrict our sample from the revenues of the bottom 1 percentile and top 99 percentile of the school districts. I find the results robust to our baseline model. In the fourth and fifth checks, I limit only the bottom 1 percentile and top 99 percentile school districts, respectively. I find the results like our baseline model. In the final check, I changed some of the controls and found the results robust, except general employee expenditures insignificant.

6.2. Robustness check: Placebo Test

One of the drawbacks in our approach potentially could be that I'm defining COVID as also the period of housing value shock in our model; thus, I need to use caution in interpreting the findings since some will be statistically significant by chance. In addition, there remains the possibility that our results are influenced by omitted variables. To address these issues, I conduct a placebo test by dropping all years from the actual period of shock. Then I randomly assigned the year 2017 as the year of shock. Given the random data-generating process, the PLACEBO-house coefficient of housing value should have no significant estimate on local finances- revenues and expenditures, with a magnitude, close to zero. Otherwise, it would indicate a misspecification of our empirical model.

I estimate equation 2 with the PLACEBO-house variable. Table 4 shows the effect on revenues and total expenditures is statistically insignificant, meaning that the null hypothesis of coefficients of PLACEBO-house as zero cannot be rejected, suggesting that there is no effect with the PLACEBO-house variable. I also present the placebo test on my event study design in Figure 15 and Figure 16. I find no effect on the placebo house variable, thus robust to the event study

effect. It also confirms that the model correctly controls for the confounding factors and there is no omitted variable bias.

6.3. Robustness: Propensity Score Matching

I next estimate the average treatment effects based on propensity score matching. Since our model is non-random in assigning treatment and control groups, I check for potential selection bias for robustness to our baseline model (Hirano et al., 2003; Becker et al., 2002). Figure 14 depicts that most of our data has common support and thus I have no problem for the treated and control group districts. Table 8 depicts that the housing price shock has significantly increased the local government revenues from property taxes, but has no effect on overall expenditures, robust to our baseline results. The spending is observed most significant in paying for debts, education, employee benefits, and general government purposes.

7. Heterogeneity

7.1. Distance-based:

While the average effect of housing shock has a significant impact on local finances, I next explore whether the results are driven by some variations across school districts. For our first heterogeneity estimation, I segregated the districts into three groups by distance: group 1 includes districts near to city, group 2 has districts with intermediate distance, and group 3 for districts far from the city. I obtain the school district latitude and longitude coordinates from the IPUMS Census Bureau's Gazetteer files and use these coordinates to calculate the distance of each district from the centroid of counties in the city[15]. Table 5 presents the effects of housing shock on local government finance

[15] I present distance results from the centroid of Bronx County to all districts in the main table. I calculated distance from other counties and found similar results, and therefore not mentioned here.

by “distance” group. Column 1 depicts the outcome for districts near a city that have an insignificant effect on revenue and expenditures. Column 2 depicts the effect for the district at an intermediate distance from the city. I find that these districts are mainly driving the change in finances. They receive a significant positive shock of housing prices on the revenues from property taxes. the overall expenditure did not significantly change. However, the districts have increased spending towards paying debts, employee benefits, and other general government purposes, robust to our baseline model. The districts very far away from the city have an insignificant effect.

This strengthens our prediction that the COVID-19 shock led to increasing housing prices in the districts relatively far from the city, which translated into increasing revenues and expenditures in those districts. The possible explanation for the overall insignificance of housing shock on expenditures is that I have only 2 years of observation for the effect. The spending behavior is mostly on more important components and for others, it might be over time and depending on the nature of working from home and transition to the suburbs.

7.2. Density-based:

As another heterogeneity check, I performed difference in difference model, based on grouping the district by density. Column 1 in Table 6 presents the results for districts with lower density and column 2 includes results for districts with higher density areas[16]. I find the effect of housing prices significantly increased the revenues for both groups. However, the overall expenditures have increased for districts with relatively denser areas.

[16] I used land area of all districts from the shapefiles from IPUMS. The density variable is then defined as population per square mile of the area.

7.3. Income levels across districts:

The final heterogeneity test is based on income levels across school districts. Using American Community Survey Education Tabulation (ACS-ED) 2014-18 data, I grouped the districts as low-income and high-income areas[17]. I find the effect of housing shock to be significant in lower-income districts, though the overall expenditures increased for the higher-income districts (table 7). I observe a higher spending behavior towards paying for debts and general government purposes for those districts.

8. Discussion

Overall, my results find that COVID-induced changes in the housing market affected the finances of the local government. I find an overall growth in revenues for the upstate New York districts. As Gupta et al. (2021), and Ramani et al. (2021) provide evidence that pandemic, with options for work from home and people leaving cities to move to suburbs, my data finds the higher real estate prices in areas outside the city. Figure 13 shows an increase in the housing price index aggregated at the county level.

Further, as mentioned before, some studies find that the COVID reduced the revenues of local and state governments. The findings of this paper conflict with much of the existing literature (Chernick et al. (2020)). There are several explanations for the same. First, the previous holds for city-centric revenues of the local governments. This paper focuses on the property tax revenues earned by governments in the districts outside the city. The policy implication is that I do believe the loss of welfare for cities in terms of generating lower revenues post-pandemic, but there are certain other areas, outside the city, that may have received a welfare gain. Second, unlike previous

[17] To make groups based on income, I used median values of the total population in the distribution of districts.

research, this paper hypothesizes the causal effect of the exogenous housing price shock on these districts.

In terms of overall expenditures, I do not find any significant changes due to housing price shock. This is possible because I have only two data points to explore the budgetary effects in the long run. However, I find a slight increase in spending on debt services and general government. These are mainly driven by districts in intermediate distance to the city and relatively lower-density areas. Chakrabarti et al (2013) and Chakrabarti et al. (2015) looked at the impact of the Great Recession across the states of New Jersey and New York, respectively. They find reduced spending most in wealthy districts in New York State and poorer ones in New Jersey. Instead of the COVID crisis, I see similar findings at the district level.

This also leaves the scope for future research in several ways. This paper attempts to see the overall effect on public finance through the channel of property taxes. however, in a state like New York, income taxes are another important way of earning revenues for the government. Additionally, whether the housing prices are likely to increase more in suburbs would again depend on whether the work from home remains a new normal culture for the firms. If so, the migration might be more permanent and thus may be reflected in taxation. Also, these changes post-pandemic might be reflected in future tax rates and fiscal stress. Thus, there is furthermore to explore how it will affect the welfare from the public finance standpoint.

9. Conclusion

In this paper, I provide causal evidence of the impact of COVID-19-induced housing price shocks on the local government finances. Using data on local property revenues and spending from the NYS comptroller and housing prices from Zillow, I employ a difference-in-differences methodology, exploiting the variation in the districts upstate New York. My findings demonstrate

a significant effect on revenues, though the overall expenditures did not increase. My findings are robust to using different control groups, different lengths of pre- and post-periods, and different sample blocks.

The granularity of the data allows us to explore heterogeneous effects across different districts. I find the school districts at the intermediate distance from the city to have the most significant impact on local finances. Additionally, the less dense districts earned more revenue. I find a slight heterogeneity for lower-income districts as well.

Appendix 1: District House price aggregation

I constructed the measure of district-level housing values from 2000-22 as follows- Within each district, there are J zip codes. I weight the zip code indices by the 2010 zip code decennial population, $n_{j,2010}$ as a share of the 2010 district aggregate population

$\omega_j = \frac{n_{j,2010}}{\sum_{j=1}^{J} n_{j,2010}}$;

where $\sum_{j=1}^{J} \omega_j = 1$.

Thus, the district-level housing price outcome is population-weighted zip code price average, that is

$P_{d,t} = \sum_{j=1}^{J} \omega_j P_{j,t}$

References

Agrawal, D.R., Brueckner, J.K., 2022. Taxes and telework: The incidence of state income taxes in a work-from-home economy. SSRN 4162196.

Althoff, L., Eckert, F., Ganapati, S., Walsh, C., 2020. The city paradox: Skilled services and remote work. SSRN 3744597.

Becker, Sascha O., Ichino, Andrea, 2002. Estimation of average treatment effects based on propensity scores. The Stata Journal (2002) 2, Number 4, pp. 358–377.

Cajner, T., Crane, L. D., Ryan A.D., John, G., Adrian, H.P., Hurst, E., Kurz, C., Yildirmaz, A., 2020. The U.S. Labor Market during the Beginning of the Pandemic Recession. National Bureau of Economic Research. Working Paper 27159.

Chakrabarti, R., Livingston, M., Setren, E., 2015. The Impact of the Great Recession on School District Finances: Evidence from New York. Economic Policy Review 21(1). http://www.ssrn.com/abstract=1979694.

Chakrabarti, R., Sutherland, S., 2013. New Jersey's Abbott Districts: Education Finances during the Great Recession. Current Issues in Economics and Finance 19(4). http://www.ssrn.com/abstract=2276973.

Clemens, J., Veuger, S., 2021. Politics and the distribution of federal funds: Evidence from federal legislation in response to COVID-19. Journal of Public Economics.

Couture, V., Dingel, J.I, Green, A., Handbury, J., Williams, K.R, 2021. Measuring movement and social contact with smartphone data: a real-time application to COVID-19. Journal of Urban Economics: 103-328. https://doi.org/10.1162/edfp_a_00245.

Favilukis, J., Mabille, P., Van Nieuwerburgh, S., 2022. Affordable Housing and City Welfare. The Review of Economic Studies.

Fraja, D., Gianni, J.M., Rockey, J.C., 2020. Zoom shock: The Geography and Local Labor Market Consequences of Working from Home, Working Paper.

Giesecke, O., Mateen, H., 2022. Local governments' response to fiscal shocks: Evidence from Connecticut. SSRN.

Glaeser, E., 2012. Triumph of the City: How our greatest invention makes us richer, smarter, greener, healthier, and happier.

Gordon, N., Sarah, R., 2020. Federal aid to school districts during the COVID-19 recession. Natl. Tax J. 73 (3), 781–804.

Gordon, T., Dadayan, L., Rueben, K., 2020, State and local government finances in the COVID-19 era" Natl. Tax J. 73 (3), 733–758.

Green D, Loualiche, E., 2020. State and local government employment in the COVID-19 crisis. Journal of Public Economics, 193.

Gupta, A., Mittal, V., Peeters, J., Nieuwerburgh, S.V., 2021. Flattening the curve: Pandemic-induced revaluation of urban real estate. NBER Working Paper 28675.

Gustafson, M., Haslag, P., Weagley, D., Ye, Z., 2022. A flash in the pan (demic)? migration risks and municipal bonds.

Gyourko, J., Mayer, C., Sinai, T., 2013. Superstar cities. American Economic Journal: Economic Policy 5. 167–99.

Hirano, K., Imbens, G.W., Ridder, G., 2003. Efficient estimation of average treatment effects using the estimated propensity score. Econometrica, 71(4). pp.1161-1189.

Kahn, L. B., Lange, F., Wiczer, D.G., 2020. Labor Demand in the Time of COVID-19: Evidence from Vacancy Postings and UI Claims. Working Paper 27061. National Bureau of Economic Research.

Liu, S., Su, Y., 2021. The impact of the COVID-19 pandemic on the demand for density: Evidence from the US housing market. Economics letters. 207, 110010.

Morris, D.A., Ghent, A.C, Gregory, J., 2021. The Work-at-Home Technology Boon and its Consequences, Working Paper.

Nieuwerburgh, S.V., Weill, P.O., 2010. Why has house price dispersion gone up? The Review of Economic Studies. 1567–1606.

Ramani, A., Bloom, N., 2021. The Donut effect of COVID-19 on cities. Technical Report. National Bureau of Economic Research.

Rosenthal, S.S., Strange, W.C., Urrego, J.A., 2022. Are city centers losing their appeal? Commercial real estate, urban spatial structure, and covid-19. Journal of Urban Economics 127, 103381.

Nieuwerburgh, S.V.,2022. The Remote Work Revolution: Impact on Real Estate Values and the Urban Environment, NBER Working Paper No. 30662.

Wang, B., 2022. Housing market volatility under COVID-19: Diverging response of demand in luxury and low-end housing markets. Land Use Policy, 106191.

William, E.N., Schwab, R.M., Wagner, K.l., 2019. The Great Recession and Public Education. Education Finance and Policy 14(2): 298–326.

Tables and Figures

1. Tables

Table 1: Summary Statistics (in millions)

	Full Sample		Districts with HPI		Districts w/o HPI	
	1	2	3	4	5	6
	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
Total revenue	3.08	3.7	6.7	4.7	2.1	2.7
Total expenditure	5.9	7.9	9.4	7.8	5.1	7.7
Components of Expenditure						
Culture and recreation	3.8	4.4	3.8	4.4	1.3	1.8
Debt services	3.1	3.7	7.0	4.7	2.1	2.6
Education	3.0	3.7	6.8	4.8	2.1	2.7
Employee benefits	3.0	3.7	6.8	4.8	2.1	2.7
General government	3.0	3.7	6.8	4.8	2.1	2.6
Control variables*						
Median income	14.7	47.3	23.7	84.1	13	32
Fraction BA or Higher	0.1	0.1	0.1	0.0	0.1	0
Fraction White	0.8	0.1	0.7	0.1	0.9	0.1
Fraction Poor	0.0	0.0	0.0	0.0	0.0	0.0
Fraction Age 65+	0.1	0.0	0.1	0.0	0.1	0.0

Note: Number of Districts are 681 and Number of Observations are 10,955.

* Values are for overall revenue and expenditures in million dollars.

Table 2: DiD Effect of Zillow Housing value index (ZHVI) on local finances

	Treatment: ZHVI (0/1)	Treatment: ZHVI (0/1)
	(1)	(2)
Dependent Variables (in log):		
Revenue	0.045***	0.023***
	(0.008)	(0.010)
Expenditures	0.033***	0.010
	(0.010)	(0.009)
Components of Expenditures		
Culture and recreation	0.200	0.037
		(0.203)
Debt services	0.017***	0.127***
	(0.007)	(0.054)
Education	0.016**	0.0150***
	(0.008)	(0.007)
Employee benefits	0.0363***	-0.006
	(0.007)	(0.008)
General government	0.061**	0.063**
	(0.030)	(0.033)
Social services	0.431	0.063
	(0.260)	(0.123)
Expended Controls	No	Yes

Note: Clustered (Census Block Group) standard-errors in parentheses

Significance Codes: ***: 0.01, **: 0.05, *: 0.1

Table 3: Effect of Zillow Housing value index, Sensitivity Checks

	District Total		Debt services		Education		Employee benefits		General govt.	
Specification/ Sample	Rev	Expd	Rev	Expd	Rev	Expd	Rev	Expd	Rev	Expd
Baseline	0.023***	0.010	0.017***	0.128***	0.013**	0.012**	0.037***	-0.006	0.061**	0.063**
	0.010	0.010	0.007	0.054	0.006	0.006	0.007	0.008	0.030	0.033
1	0.0219**	0.013	0.023***	0.075*	0.024***	0.019**	0.022***	-0.008	0.022**	0.049*
	0.010	0.010	0.007	0.049	0.008	0.011	0.008	0.008	0.008	0.031
2	0.0232**	0.002	0.016***	0.115**	0.015**	0.003	0.015**	-0.009	0.014**	0.0435
	0.010	0.009	0.006	0.053	0.007	0.008	0.007	0.008	0.007	0.033
3	0.010*	0.015	0.013**	0.093*	0.009*	0.001	0.013**	-0.007	0.013**	0.061*
	0.006	0.010	0.006	0.053	0.006	0.006	0.006	0.008	0.006	0.033
4	0.023	0.012	0.018***	0.106**	0.012**	0.002	0.017**	-0.005	0.015*	0.069**
	0.010	0.010	0.007	0.054	0.006	0.006	0.008	0.008	0.008	0.033
5	0.009*	0.012	0.013**	0.089*	0.012**	0.002	0.011*	-0.007	0.010*	0.075**
	0.085	0.010	0.006	0.051	0.006	0.006	0.006	0.008	0.006	0.033
6	0.020**	0.017*	0.010**	0.152***	0.019***	0.015**	0.010*	0.001	0.009*	0.049
	0.010	0.010	0.005	0.056	0.008	0.007	0.006	0.008	0.006	0.032
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Clustered (Census Block Group) standard errors in parentheses. Rev: Revenue; Expd: Expenditures. Signif. Codes: ***: 0.01, **: 0.05, *: 0.1. 1 Change Threshold; 2 Restrict sample by year; 3 Remove outliers; 4 Drop higher revenue districts; 5 Drop lowest revenue districts; 6 Expanded controls. FE stands for fixed effects.

Table 4: Effect of Zillow Housing value index, Placebo Test

	District Revenues	District Expenditures
Specification/ Sample		
Baseline	0.030	0.009
	(0.009)	(0.010)
Change Threshold	0.007	-0.006
	(0.008)	(0.007)
Controls	Yes	Yes

Notes: Clustered (Census Block Group) standard-errors in parentheses.

Significance Codes: ***: 0.01, **: 0.05, *: 0.1

Table 5: Heterogeneity by Distance[18]

	1	2	3
	Treatment: ZHVI (0/1)	Treatment: ZHVI (0/1)	Treatment: ZHVI (0/1)
Revenue	0.016	0.044***	0.019
	(0.011)	0.015	(0.016)
Expenditures	0.005	0.031**	-0.018
	(0.008)	(0.016)	(0.011)
Components of Expenditures			
Culture and recreation	0.161	0.112	0.078
	(0.373)	(0.189)	(0.196)
Debt services	-0.001	0.160*	-0.026
	(0.100)	(0.092)	(0.051)
Education	-0.013	0.022	0.018
	(0.009)	(0.010)	(0.014)
Employee benefits	0.013	0.022*	0.004
	(0.009)	(0.013)	(0.014)
General government	0.152	0.097**	0.016
	(0.487)	(0.047)	(0.087)
Expended Controls	Yes	Yes	Yes

Note: Clustered (Census Block Group) standard-errors in parentheses

Significance Codes: ***: 0.01, **: 0.05, *: 0.1

1= districts near city, 2= districts in intermediate distance from city, 3 = districts far from city

[18] 1. I worked with other thresholds as well as a robustness check. Our results are consistent with the results mentioned in the table.
2. I looked at the distance from Bronx County centroid here. I checked for other county centroids as well, the results are not mentioned here but are robust to the finding in the table here.

Table 6: Heterogeneity by Density[19]

	1	2
	Treatment: ZHVI (0/1)	Treatment: ZHVI (0/1)
Revenue	0.044**	0.034***
	(0.019)	(0.012)
Expenditures	-0.022	0.030***
	(0.012)	(0.015)
Expended Controls	Yes	Yes

Note: Clustered (Census Block Group) standard-errors in parentheses

Significance Codes: ***: 0.01, **: 0.05, *: 0.1

1.= low density districts, 2= high density districts

Table 7: Heterogeneities by Income[20]

	Low-income districts	**High income districts**
	Treatment: ZHVI (0/1)	Treatment: ZHVI (0/1)
Revenue	0.044**	0.001
	(0.022)	(0.008)
Expenditures	-0.021	0.0142*
	(0.013)	(0.013)
Components of Expenditures		
Culture and recreation	0.372*	0.075
	(0.193)	(0.214)
Debt services	-0.110**	0.255***
	(0.0512)	(0.086)
Education	0.010	0.003
	(0.010)	(0.008)
Employee benefits	0.011	0.001
	(0.011)	(0.000)
General government	-0.066**	0.0725**
	(0.034)	(0.052)
Expended Controls	Yes	Yes

Note: Clustered (Census Block Group) standard-errors in parentheses

Significance Codes: ***: 0.01, **: 0.05, *: 0.1

[19] I worked with other thresholds as well as a robustness check. Our results are consistent with the results mentioned in the table.

[20] I worked with other thresholds as well as a robustness check. Our results are consistent with the results mentioned in the table.

Table 8: Propensity Score Matching (Effect of Zillow Housing value index (ZHVI) on local finances)

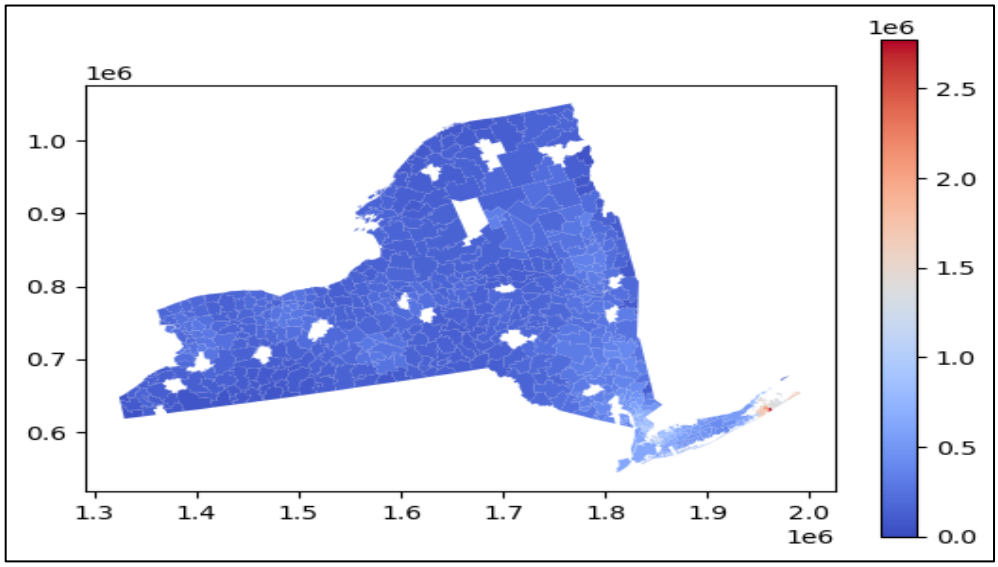
	Treatment: ZHVI (0/1)
Dependent Variables (in log):	
Revenue	0.522***
	(0.139)
Expenditures	0.641
	(0.449)
Components of Expenditures	
Culture and recreation	-0.384
	(0.338)
Debt services	0.436**
	(0.121)
Education	0.633**
	(0.084)
Employee benefits	0.565**
	(0.092)
General government	0.670***
	(0.084)
Expended Controls	Yes

Note: Clustered (Census Block Group) standard-errors in parentheses

Significance Codes: ***: 0.01, **: 0.05, *: 0.1

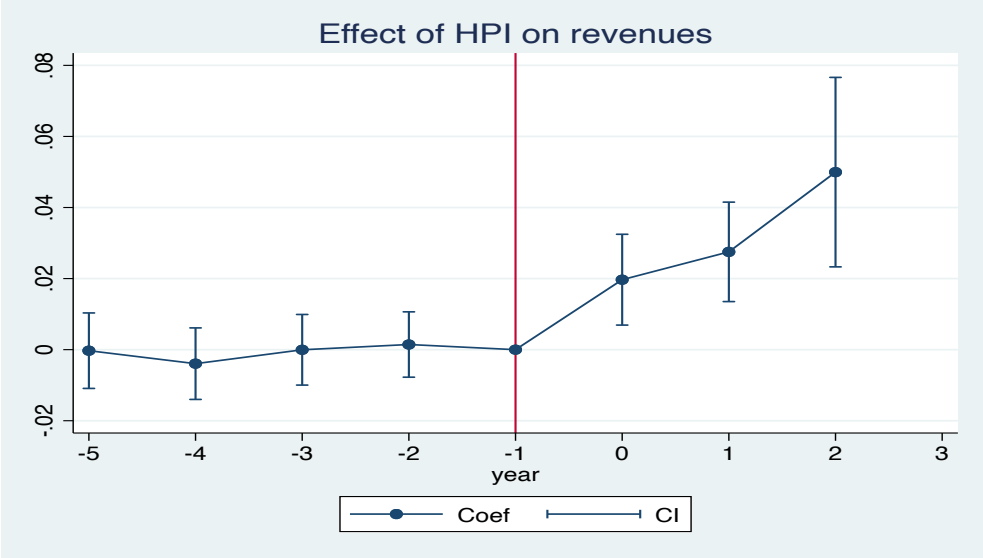
2. Figures

Figure 1: Zillow housing price value in NYS at district level, 2020



Source: Own calculation using Zillow housing value data.

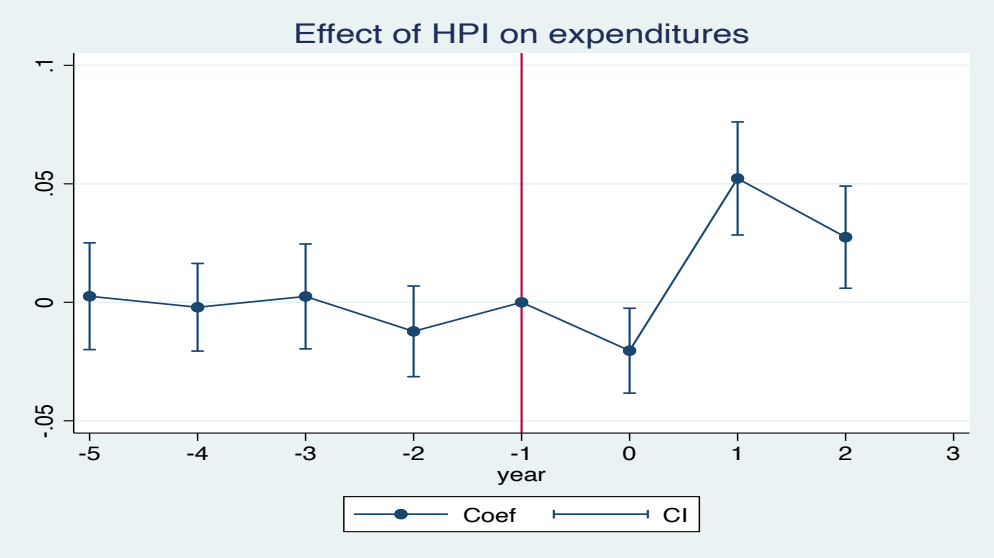
Figure 2: Impact of housing shock on revenues: Event study



Source: Own calculation

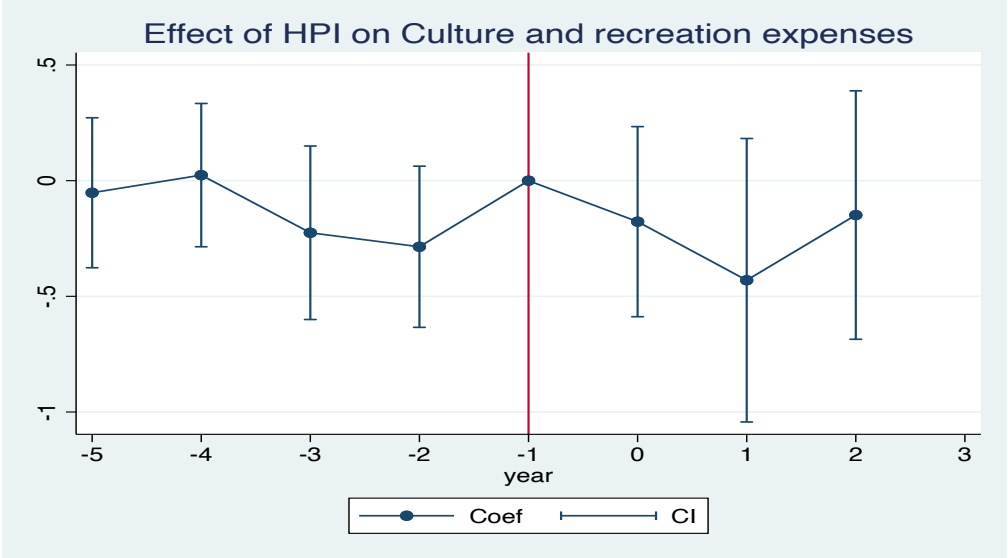
Note: Figure depicts coefficients of interest – indicators for the 4 years before a housing value shock and the years after, with the year before a change serving as the reference– from event study regressions on the local government's revenues at the school district level, based on equation (1).

Figure 3: Impact of housing shock on total expenditures: Event study



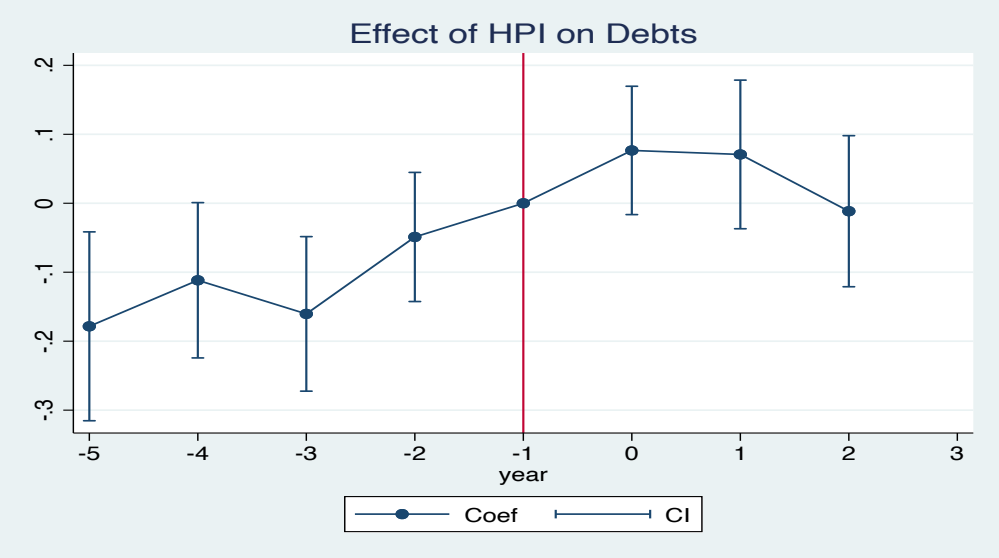
Source: Own calculation

Figure 4: Impact of housing shock on expenditure towards culture and recreation: Event study



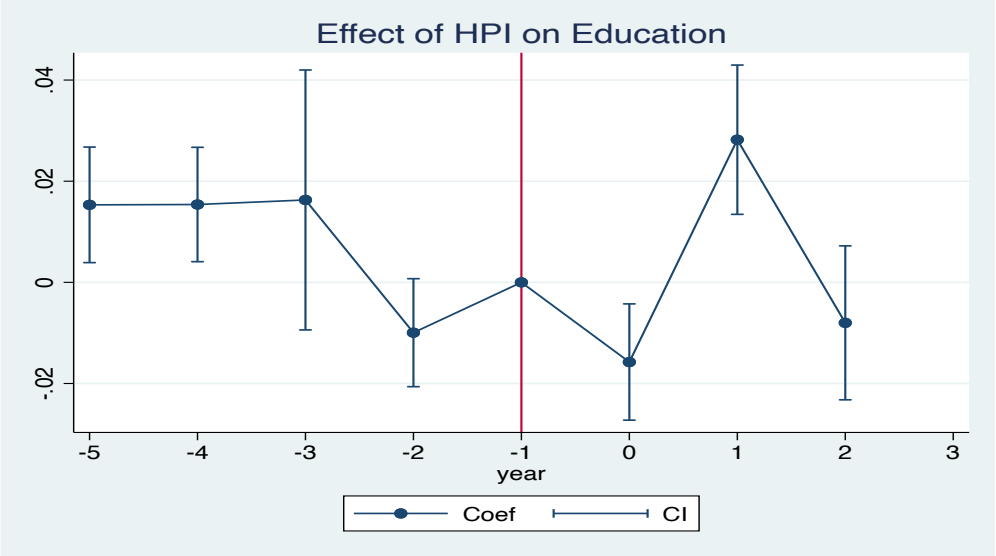
Source: Own calculation

Figure 5: Impact of housing shock on expenditure towards debt: Event study



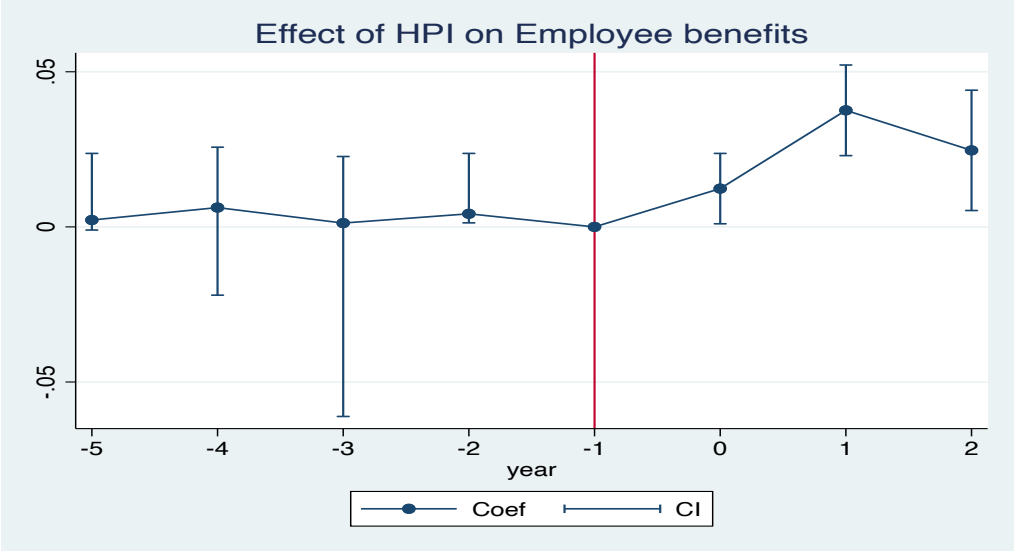
Source: Own calculation

Figure 6: Impact of housing shock on expenditure towards education: Event study



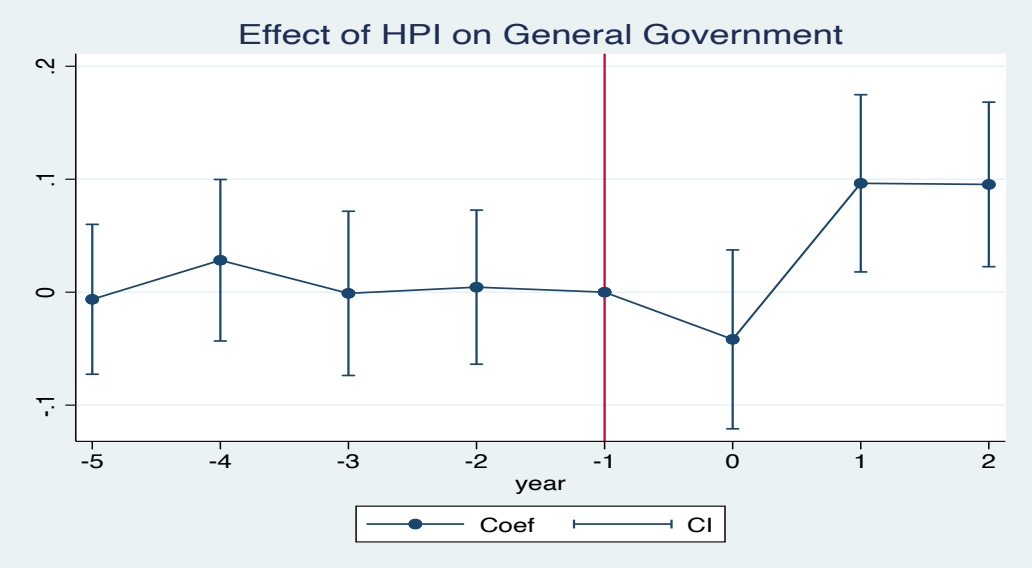
Source: Own calculation

Figure 7: Impact of housing shock on expenditure towards employee benefits: Event study



Source: Own calculation

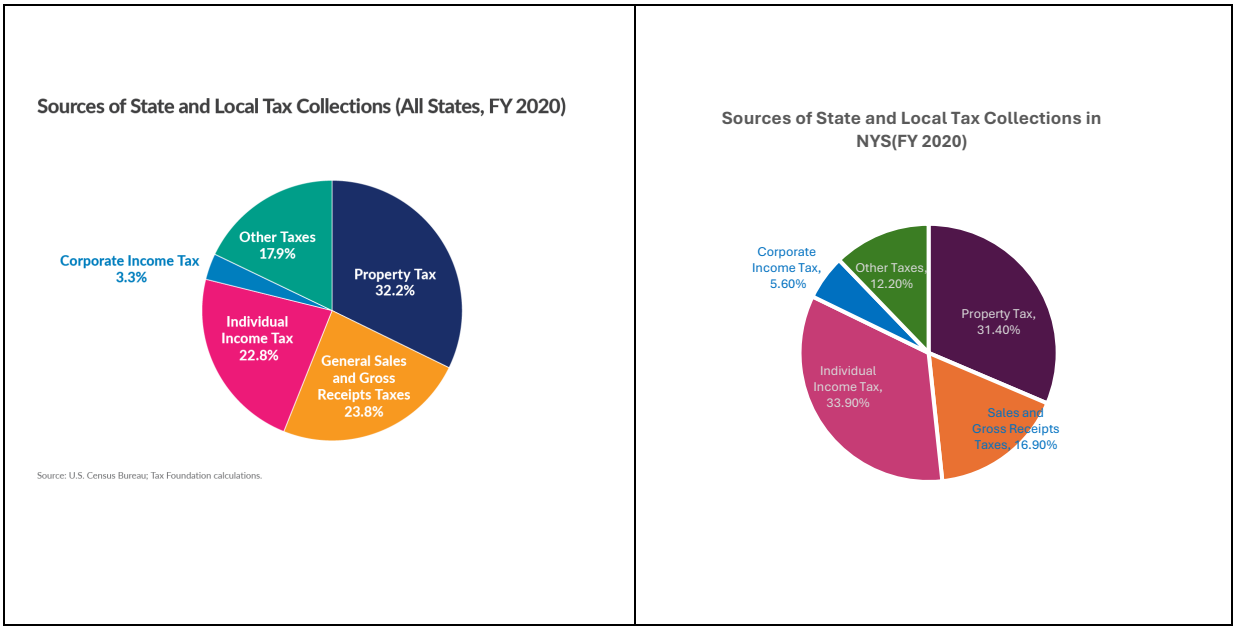
Figure 8: Impact of housing shock on expenditure towards general government purposes: Event study



Source: Own calculation

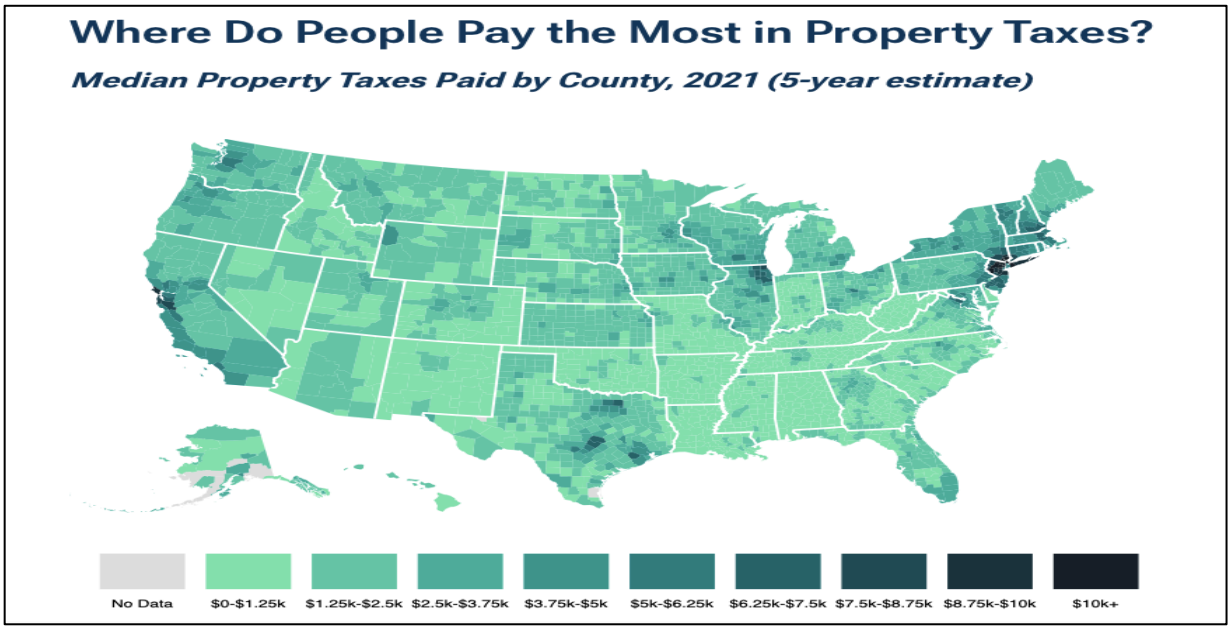
Note: Figures 2.2b, 2.3a-e depict coefficients of interest – indicators for the 4 years before a housing value shock and the years after, with the year before a change serving as the reference– from event study regressions on the local government's overall expenditures and various components of spending at the school district level, based on equation (1).

Figure 9: Property taxes in the United States and NYS, 2020



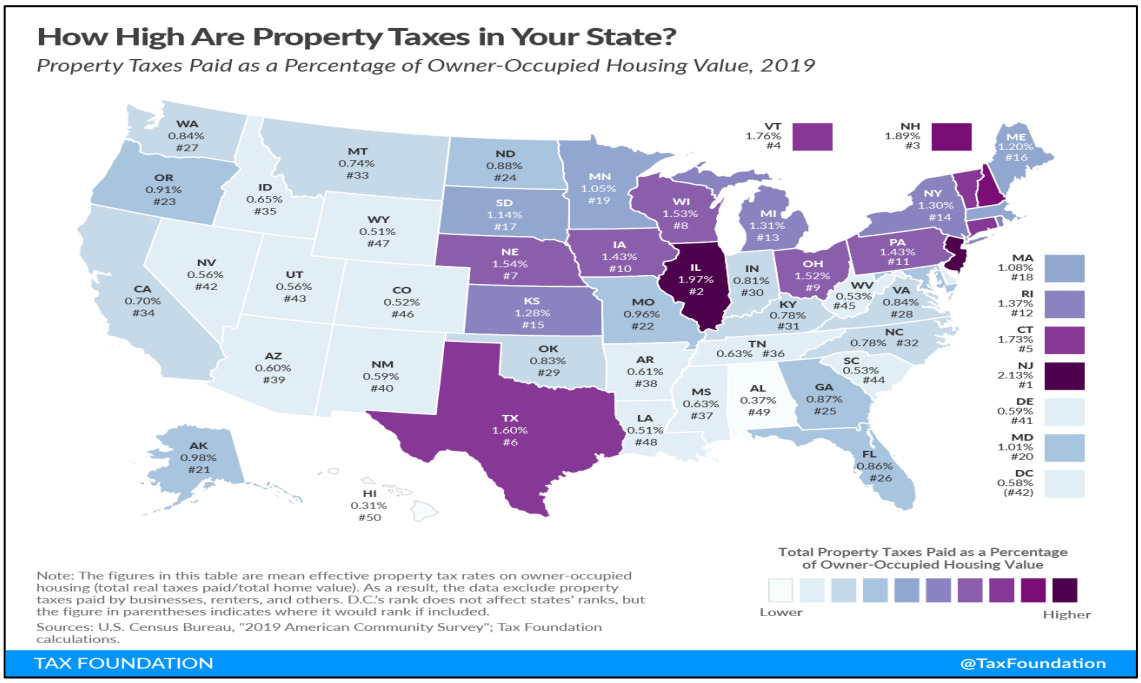
Source: Census Bureau; Tax Foundation.https://taxfoundation.org/data/all/state/state-local-tax-collections/

Figure 10: Median property taxes paid across states at the county level in the US



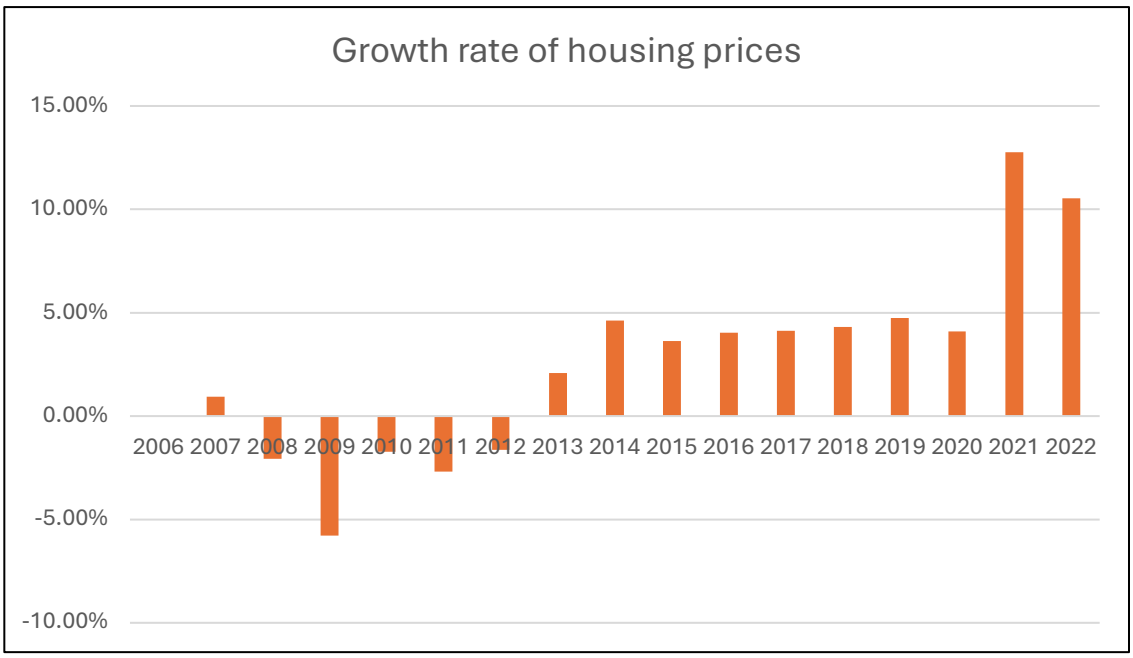
Source: Tax Foundation, U.S. Census Bureau, 2021 American Community Survey, dataset B25103

Figure 11: Distribution of property taxes paid, as a percentage of home value in the US



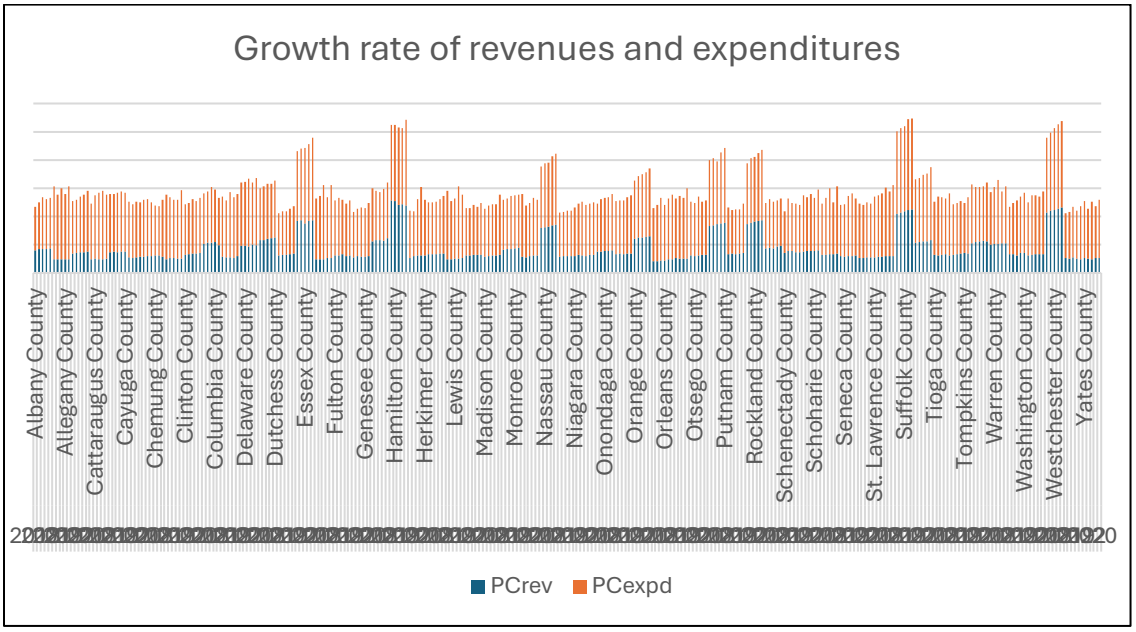
Source: Tax Foundation, U.S. Census Bureau.

Figure 12: Growth rate of Housing price index



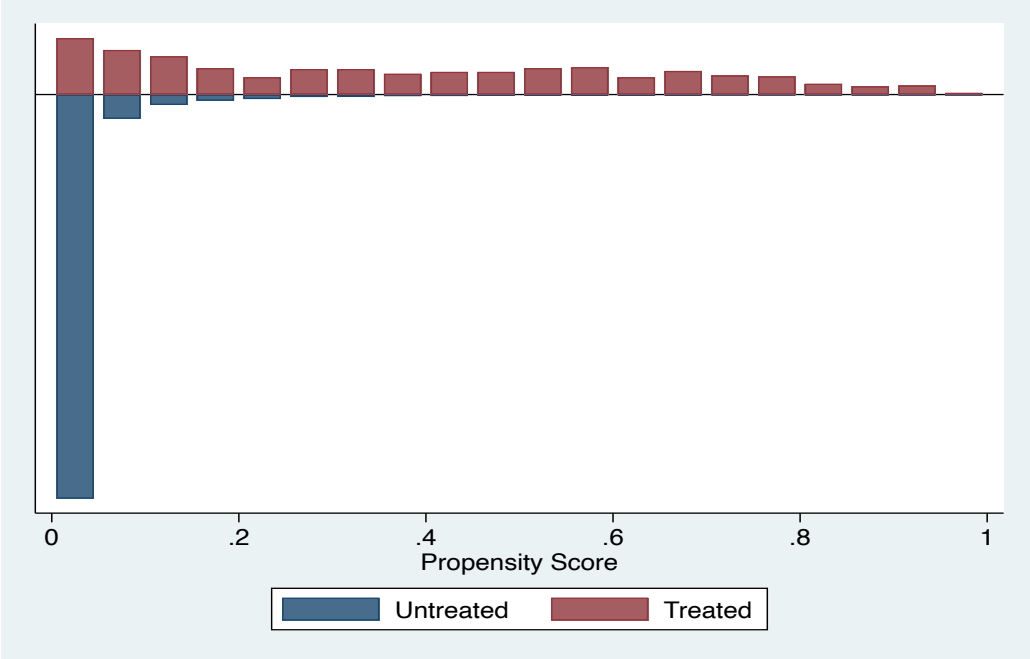
Source: Own calculation using Zillow housing value data

Figure 13: Growth rate of revenues and expenditures



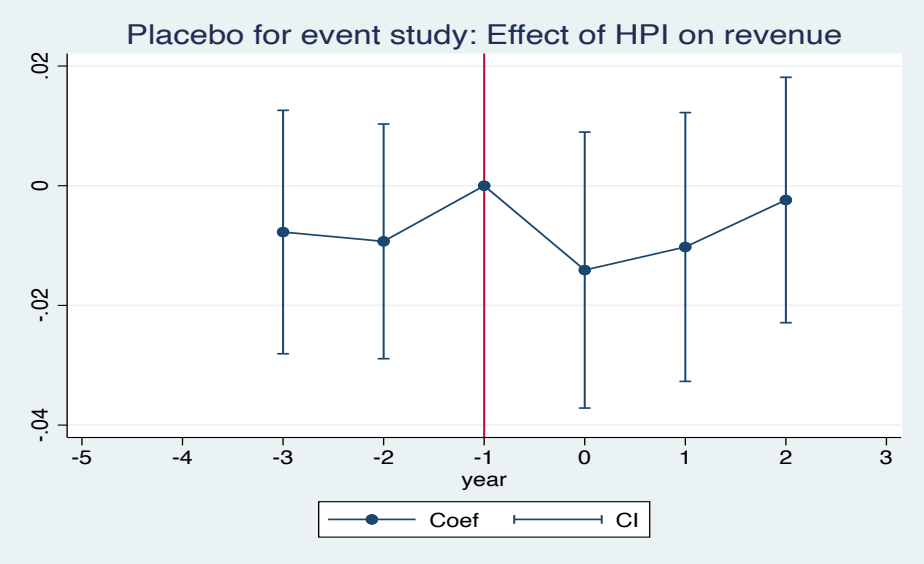
Source: Own calculation using NYS Comptroller data

Figure 14: Common support



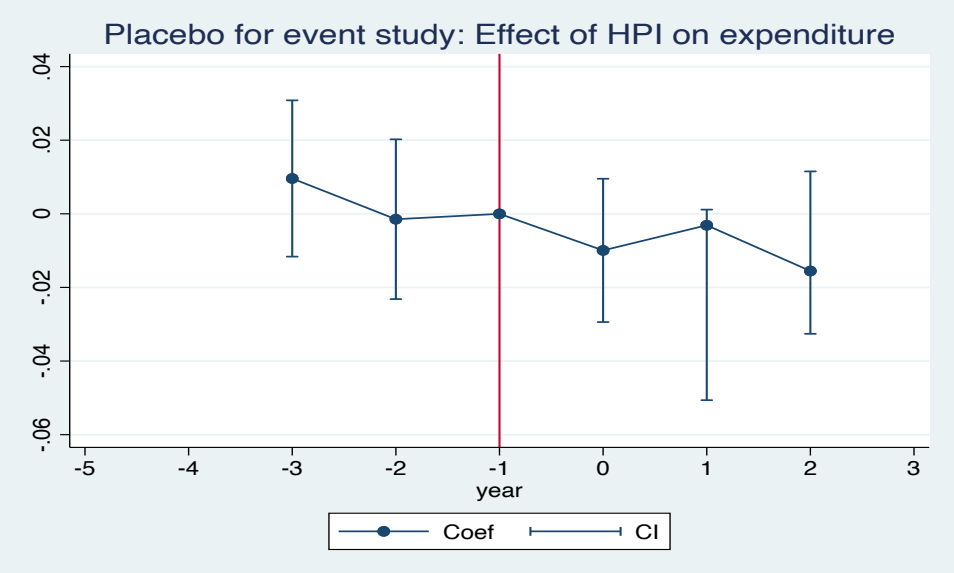
Source: Own calculation

Figure 15: Placebo for event study: Effect of HPI on revenues



Note: Figures depict PLACEBO-house coefficient interest– indicators for the randomly assigned year 2017 as the year of shock and years after, with the year before a change serving as the reference– from event study regressions on the local government's revenues at the school district level.

Figure 16: Placebo for event study: Effect of HPI on expenditure



Note: Figures depict PLACEBO-house coefficient interest– indicators for the randomly assigned year 2017 as the year of shock and years after, with the year before a change serving as the reference– from event study regressions on the local government's overall expenditures at the school district level.