Political Control of the State Legislature and Municipal Bond Financing for Affordable Housing[1]

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ABSTRACT

This study investigates whether the tax-exempt municipal bonds have any effect on housing affordability at the state level. Specifically, we compare two different types of housing bonds: Multifamily Housing Bonds that support private affordable housing developers in the rental market and Mortgage Revenue Bonds that support low-income households who want to become a homeowner with a low-interest mortgage. In order to estimate the issuance volume of the housing bonds, we use the political control of the state legislature as an instrument, and find that Democratic or divided-controlled state legislature issues a larger volume of per-capita housing bonds, compared to the Republican-controlled legislature. We also find that, controlling for other affordable housing programs, a 10 percent increase in per-capita Multifamily Housing Bonds leads to a 0.7-0.8 percent decrease in the number of renter households facing housing cost burdens. However, Mortgage Revenue Bonds increase the number of owner-occupied households facing the cost burdens in the home-owner sector, contrary to the rental market analysis. The results imply that there is a shift of households from the rental market to the owner-occupied market with the financial support of low-interest mortgages, but those new homeowners still face housing cost burdens.

Keywords: Affordable Housing, Municipal Bonds, Political Control of the State Legislature

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1. Introduction

"A decent home in a suitable living environment for every American family" was one of the goals set in the U.S. Housing Act of 1949, and the goal was revised by the National Affordable Housing Act of 1990 with an additional condition that the housing should be affordable. However, despite various efforts to increase housing affordability, the gap between the goal and the actual affordability has been one of the major social issues in the U.S. since the notion of affordable housing was proposed in the 1940s.

In this context, the purpose of the current study is to examine the effect of municipal housing bonds on the rental and owner-occupied housing affordability, separately, at the state level. Specifically, we assume that states experiencing a severe affordable housing crisis issue a larger volume of housing bonds to alleviate the problem, compared to states facing less severe affordability problems. In order to address this endogeneity, we use the political control of the state legislature as an instrument estimating the issuance volume of housing bonds.

According to a recent U.S. Census Bureau Survey, an estimated 18.5 million renter and homeowner households pay more than 50 percent of their annual incomes for housing, which accounts for 14.7 percent of the total U.S. households (18.3 out of 124.8 million) in 2015.[2] Based on the 30-percent-of-income affordability standard, the share of cost-burdened families, including both renters and owners, increases to 32.9 percent (38.9 million households).[3] Counting rental households only, the share becomes 48.3 percent of the total renter population nationwide.

As a response to the large share of cost-burdened households in the housing market, the Department of Housing and Urban Development (HUD) and the Department of Agriculture (USDA) support low-income families and private residential developers who are interested in creating affordable housing units, through many different kinds of assistance programs, such as Public Housing and Section 8 Housing Voucher, in an effort to increase housing affordability across the country. As of 2017, over 5 million low-income households have received some form

[2] In New York City, 30 percent of the City's rental households spend more than half their income in rent, according to the same data source.

[3] In general, families who pay more than 30 percent of their income for housing are considered cost burdened and may have difficulty affording necessities such as food, clothing, transportation and medical care. More detailed explanation on this threshold is discussed in the next section.

of rental assistance from the federal programs.[4] Furthermore, the Low-Income Housing Tax Credit (LIHTC) program provides tax credits for multifamily housing developers who commit to preserving affordable rental units for tenants making up to 40 or 50 percent of the metropolitan area's median family income (Schwartz, 2015). Municipal governments at the state, county, and city level, in association with local housing authorities, also provide various affordable housing assistance, mainly through a form of tax-exempt housing bonds.

However, millions of low-income households still lack decent and affordable housing. From small towns in rural regions to big expensive cities like San Francisco and New York City, an affordable and decent place to live is hard to find (Misra 2017). This phenomenon is called affordability crisis by a growing number of housing studies (e.g. Rohe, 2017; Albouy et al. 2016). The Secretary of Housing and Urban Development claims that "we are in the midst of the worst rental affordability crisis that this country has known." (HUD PD&R 2014).

As the crisis gains attention from the public and policymakers, there has been a demand for studies analyzing the effect of various government housing assistance programs designed to alleviate the affordability gap. In principle, those programs are supposed to achieve the affordable housing goals by two means. First, there are programs that support individual families facing housing cost burdens. For low-income families who want to buy a house, government programs provide help with a low-interest mortgage. For those who rent, Public Housing and Section 8 Housing Voucher program help low-income residents move to better and safer neighborhoods by offering a housing subsidy directly from Public Housing Agencies (PHAs) to the landlord. The recipient of this subsidy is only required to pay the difference between the actual market-based rent and the amount of the support. This type of assistance can be categorized as demand-side support. Sinai and Waldfogel (2005) show that Housing Voucher, which is one of the well-known demand-side assistance programs, is more cost-effective than project-based programs that subsidize the production of housing because it provides housing units to low-income households who otherwise would not have their own.

On the supply side, there are programs supporting multifamily housing private developers who create affordable rental units for medium- to low-income residents. Project-based Section 8 and LIHTC are two well-known supply-side approaches. In the 1980s, there was an emphasis on new housing construction supported by project-based assistance programs, such as Section 8

[4] Source: https://www.cbpp.org/sites/default/files/atoms/files/4-13-11hous-US.pdf

New Construction. However, this trend has been reversed by an increase in tenant-based demand-side programs since the 1990s (Quigley, 2000).

These two categories (demand- and supply-side housing assistance) are in line with the two types of tax-exempt municipal housing bonds issued by local housing authorities; both types of the bonds support housing affordability. They are commonly known as Multifamily Housing Bonds (MHB) and Mortgage Revenue Bonds (MRBs). MHBs support the production of privately-owned multifamily housing at rents affordable to low-income families to rent, while the proceeds of MRBs are used to finance low-cost (i.e. low-interest rates) mortgages for low-income, mostly first-time, homebuyers.

In this regard, we assess the effect of tax-exempt municipal bonds that are issued to support either housing developers (supply side) or home buyers (demand side), in the affordable housing market. The analysis is conducted at the state level as each state government issues housing bonds within its political and budget contexts. Although any state or locality can issue bonds to fund affordable housing projects, the ability to do so varies according to the jurisdiction's legal and political environments and its fiscal condition as well as a statewide volume cap. The cap is determined by the total number of the state population. Section 2 describes more details on the state-wide cap.

Furthermore, each state has the discretionary power in distributing billions of dollars of municipal bonds in different kinds of projects including housing, public schools, infrastructure, and hospital. Particularly in the housing sector, Gay (2013) shows political controls of state government and legislature influence the distribution of tax credits for affordable housing development. In this respect, this study finds that Democratic or divided-controlled state legislature issues a larger volume of per-capita housing bonds, compared to the Republican-controlled legislature.

Our findings also reveal that a 10 percent increase in per capita Multifamily Housing Bonds leads to a 0.7-0.8 percent decrease in the number of rental households having the cost burden (i.e. the supply-side analysis). On the other hand, the demand-side analysis shows that Mortgage Revenue Bonds increase the number of owner-occupied households facing the housing cost burden, contrary to the supply-side analysis. Based on our additional analysis, we find that there is a shift of households from the rental market to the owner-occupied market after receiving

the financial support of low-interest mortgages. However, those new homeowners still face housing cost burdens.

The rest of this paper is organized as follows. Section 2 describes the motivation for the study along with a review of related literature. Section 3 presents data and descriptive statistics. Section 4 discusses our regression models and outputs. Finally, Section 5 summarizes and concludes the study.

2. Motivation and Literature Review

2.1. Affordable Housing Crisis

According to the Bureau of Labor Statistics' Consumer Price Index (CPI), the housing price has increased by 120 percent since 1990, which is much higher compared to the price increase of other goods and services that are considered in the creation of CPI. This phenomenon of housing price is also verified by a follow-up study conducted by Crone, Nakamura, and Voith (2010) who analyzed the relative price of housing since 1970.

Over the same time period (since the 1970s), income inequality has risen across the country and resulted in lowered median household incomes relative to mean incomes, particularly among renters rather than homeowners. Moreover, Albouy et al. (2016) mention that falling household size may have increased demand for housing units over several decades.

Under these circumstances, the number of households facing a housing cost burden has increased, and the housing affordability crisis has caused associated-burdens not just on individual households but also on society as a whole. At the individual level, the housing burden is associated with a lack of foods, education, and other essential needs, housing instability, and poor housing conditions that could lead to health problems. The potential societal impacts include increases in public expenditure on public health and homelessness as well as a loss caused by less productivity of a less-educated workforce (Rohe, 2017).

In particular, concerns about the effect of housing conditions on children's life chances have been studied since the 1890s (Riis 1890). Those concerns helped motivate the federal government to provide low-income housing programs such as housing vouchers (Jacob, Kapustin, and Ludwig, 2015). Since then, government programs, from the federal to the municipal level,

have been required to address the affordability crisis and its associated social costs in both owner-occupied and rental housing markets.

A recent study from the Urban Institute (2017) reveals that federal rental assistance plays a significant role in providing affordable housing, in general, with low-income households nationwide. As of 2014, the U.S. housing market provided 21 affordable units for every 100 renter households with income at or below 30 percent the area median income (AMI) (often called extremely low-income, or ELI renters) (Leopold, et al. 2015). However, federal assistance from HUD and the U.S. Department of Agriculture (USDA) added another 24 affordable units per 100 households in 2014. The Urban Institute study also shows that, without the support of federal programs, not one county in the U.S. has enough affordable housing for its ELI renters (See Figure 1 for detailed geographic distribution of affordable rental units.)

[Figure 1 Here]

As for the definition of housing affordability, the precise definition is still ambiguous. However, one of the conventional ways of defining affordability is to use the share of income spending on housing expenditures. Specifically, housing costs exceeding 30 percent of household annual or monthly income have been considered as a general indicator of housing unaffordability. The 30 percent threshold originally appeared in the U.S. National Housing Act of 1937. Although the definition once reduced to 20 or 25 percent throughout the Housing Act amendment history, it raised to 30 percent again in 1981, and this threshold remains today as the standard for most government housing assistance programs (Schwartz and Wilson 2008). This study uses both 30 and 35 percent thresholds to define housing affordability.

2.2. Tax-exempt Bonds for Housing Affordability

According to the Federal Reserve Bank data released in 2014, the cumulative size of U.S. municipal bond market reached $3.63 trillion with more than 80,000 issuers of municipal bonds nationwide. Those issuers include states, cities, towns, counties, school districts, hospitals, transportation authorities, universities and colleges, housing, road and highway authorities, water and power districts. The Internal Revenue Service (IRS) reports that these government or government-associated agencies issued $337.5 billion in the form of municipal bonds in 2014.

Tax-exempt bonds issued by federal, state or municipal governments are generally sold at a rate of interest less than that of taxable corporate bonds because the interest earned by investors are exempt from taxation (Lee 2008).[5] In terms of default risk, municipal bonds historically showed an extremely low default rate of around 0.08% between 1970 and 2014 (Schwert 2017). For these reasons, individual holdings of municipal bonds have dominated the holdings of other corporate bonds; individuals directly hold municipal bonds at the market or indirectly hold those securities through mutual funds or other forms of intermediaries (Ang, Bhansali and Xing 2010).

Over the last decade, tax-exempt municipal bonds have been used to finance critical infrastructure including the construction of schools, hospitals, airports, affordable housing, water and sewer facilities, public power and gas utilities, roads and public transit. According to the United States Conference of Mayors (USCM), local and state governments financed nearly $1.7 trillion in infrastructure projects through tax-exempt municipal bonds from 2003 to 2012. In the absence of such financing, it would have cost cities up to $500 billion more—dramatically increasing the costs borne by taxpayers for critical infrastructure projects (Durr 2017).

As part of the municipal bonds, state and local governments sell two types of tax-exempt housing bonds, Multifamily Housing Bonds and Mortgage Revenue Bonds, and use the proceeds to finance the production of apartments at rents affordable to lower income families, and low-cost mortgages for lower income first-time homebuyers, respectively. Multifamily Housing Bonds have provided financing to produce nearly 1 million apartments affordable to lower-income families. Mortgage Revenue Bonds have made first-time homeownership possible for almost 3 million lower-income families, approximately 100,000 families every year.

Specifically, home mortgages supported by Mortgage Revenue Bonds are restricted to first-time homebuyers who earn no more than the area median income (AMI), although larger families can earn up to 115 percent of AMI.[6] In 2015, State Housing Finance Agencies (HFAs) provided MRB mortgages to families with an average income of $48,571. The price of a home

[5] Despite the tax-exempt feature of these bonds, the profits from trading tax-exempt municipal bonds in secondary markets are taxable.

[6] In this regards, the Mortgage Revenue Bond program is different from the Home Affordable Refinance Program (HARP) that offers refinancing options to current borrowers of Freddie Mac or Fannie Mae-guaranteed loans who may otherwise be unable to get conventional refinancing options due to a decline in their property values (Zhu, et al. 2015). In the same way, the Mortgage Revenue Bond financing is different from other types of policy intervention in mortgage renegotiation such as the Home Affordable Modification Program (HAMP). See Agarwal et al. (2017) for details about the HAMP. (Agarwal, et al. 2017)

purchased with an MRB-supported mortgage was limited to 90 percent of the average area purchase price.

As for Multifamily Housing Bonds, private rental housing developers are required to set aside at least 40 percent of their rental units for families with incomes of 60 percent of AMI or less, or 20 percent for families with incomes of 50 percent of AMI or less. In 2015 alone, HFAs financed the development of over 38,000 affordable apartments through this type of housing bonds. Eriksen (2009) shows that developers using tax-exempt bonds to finance their residential development projects receive subsidies equal to, on average, about 30 percent of construction costs, although the percentage varies across the property's location and the type of construction.

Each state's annual issuance of tax-exempt bonds, including both Multifamily Housing Bonds and Mortgage Revenue Bonds, is capped. As of 2017, the volume cap for each state is $100 multiplied by the state population, with a state minimum of $302.9 million (Fisher and Mathews 2017). The volume cap that is not used in a given year can be carried forward for use in one of the next three years. In other words, a state's volume cap is more specifically defined as the sum of its new allocation and the total amount of unused volumes in the last three years. This is called the total annual issuing capacity.

On average, each state has consistently used only 25 percent or less of its total annual issuing capacity every year. This implies that individual states have the discretionary power in distributing billions of dollars of tax-exempt bonds in various sub-sectors. Particularly in the housing sector, Gay (2013) examines a relationship between political party controls and the distribution of tax credits for affordable housing development and reveals the partisan influences on states' administration on the Low Income Housing Tax Credit (LIHTC) program.

3. Data and Descriptive Statistics

3.1. Affordable Housing Datasets

As described above, housing expenditures that exceed 30 percent of household income have historically been viewed as an indicator of a housing unaffordability. Following this HUD's definition, we measure the unaffordability by the number of households paying 30 percent or more of their monthly income on monthly housing costs. For additional analysis, the number of households paying 35 percent or more of income is also calculated.

The affordable housing data was downloaded from the American Community Survey (ACS) of the US Census.[7] The specific ACS data set used in this study tracks the number of households by the percentage of income for housing expenditure from 2005 to 2016. The number of households paying "30 percent or more" and "35 percent or more" of their income on housing costs are counted separately to see if there is any difference in the effect of tax-exempt bond financing on those two groups. Those families in the "30 percent or more" group are considered to have a moderate cost burden, while those in the "35 percent or more" group to have the more serious burden.

Panel 1 in Figure 2 plots the average share of housing units facing cost burden. In the graphs, the unaffordability of rental housing is measured by the percentage of rental households facing housing cost burdens, divided by the total number of rental households of the corresponding state in each year. The unaffordability of owner-occupied housing with a mortgage is measured by the percentage of those units facing cost burdens, divided by the total number of owner-occupied households in each state in each year. In the empirical models shown below, we use the log-transformed number of households in each group.

The monthly housing cost of a rental household includes both monthly rent and utility expenses such as electricity, gas, water and sewer, and others if a tenant pays these costs separately from the base rent. The housing cost of an owner household includes mortgage payment (plus second mortgage and/or home equity loans if applicable), real estate taxes, homeowner insurance, and utilities.

[Figure 2 Here]

3.2. Tax-exempt Bonds

Data on tax-exempt municipal housing bonds come from the Municipal Securities Rulemaking Board (MSRB) that tracks all municipal bond transactions for not only housing but also education, health, and other public sectors. More specifically, the Electronic Municipal Market Access (EMMA), an online data tool managed by MSRB provides the bonds data by state, year,

[7] Source: https://www.cbpp.org/research/housing/national-and-state-housing-fact-sheets-data. Details about the Census data methodology available at: https://www.cbpp.org/research/2017-federal-rental-assistance-factsheets-sources-and-methodology?fa=view&id=3464

and sector. In the U.S., about 6 percent of all bonds issued each year are municipal bonds and most of the municipal bonds are tax-exempt. The main purpose of this bond is to raise funds for public projects, including schools, roads, sewers, and many other kinds of community needs (MSRB, 2017).

The issuance of the total housing bonds (including both Mortgage Revenue Bonds and Multifamily Housing Bonds) grew from $10.91 billion in 2015 to $18.47 billion in 2016. Over our sample periods from January 2015 to December 2016, 27,795 tax-exempt bonds were issued particularly for affordable housing across the U.S. The average principle value of those bonds in 50 states and D.C. (Total N=51) was 262 million dollars in 2016, which is the highest since the Subprime Mortgage Crisis between 2007 and 2008. Panel 2 in Figure 2 describes the trends in the issuance of tax-exempt housing bonds in top five states and the U.S. average. California was one of the top states by the issuance amount of housing bonds until 2008 but rapidly reduced the issuance after the recession. The state of New York has issued the largest volume of housing bonds in 2016 ($2.3 billion), followed by Connecticut ($898 million), Minnesota ($859 million), Michigan ($750 million), Pennsylvania ($695 million), and Massachusetts ($549 million).

When it comes to the per-capita volume of housing bonds in 2016, North Dakota ranked first with $361 per capita, followed by Rhode Island ($275), South Dakota ($254), and Connecticut ($251). New York ranked 11th with a per capita housing bond of $119. In Table 1, we describe in detail the summary statistics of housing affordability, tax-exempt bonds, and other variables controlled.

[Table 1 Here]

3.3. Political Party Control of State Legislatures and Governors

The main purpose of this study is to investigate whether the tax-exempt municipal bonds have any effect on housing affordability. More specifically, we hypothesize that there would be a positive effect of bond financing on housing affordability, and thus the higher issuance volume of municipal housing bonds is expected to reduce the number of households facing housing cost burdens. However, it is plausible that states experiencing a severe affordable housing crisis

allocate a larger amount of housing bonds to alleviate the problem, compared to states facing less severe affordability issues. Therefore, the direction of causality is unclear.

To address this endogeneity issue, we employ two-stage least squares (2SLS) regression models. In the first stage, we use instrumental variables that are correlated with the issuance volume of tax-exempt housing bonds, but that is not correlated with the residuals in the second stage equation. The instrument variables are correlated with housing unaffordability, which is the outcome of interest, only through the tax-exempt bonds.

The instrument used in this study is the political control of state legislatures. The relationship between fiscal policy and the political party in power has long been studied in the political economy literature. Many of those studies reveal a positive association between the Democratic-controlled government and state tax spending (e.g. Besley and Case, 1995). Based on the findings from political literature, this study uses three dummy variables indicating the party control of state legislatures as the instruments: Democratic, Republican, and divided control.

The National Conference of State Legislatures (NCSL) tracks historic party control of state legislatures every year for all states.[8] Table 2 shows the political party control of state legislatures for each state and D.C. by the issuance volume of Multifamily Housing Bonds in 2016. Two of the five states (Vermont and Rhode Island) had the Democratic-controlled state legislatures and Democratic governors. Other two states (New York and Minnesota) had the split-control of the state legislatures but Democratic governors. For details, Figure 3 presents a modest and positive relationship between the percentage of Democratic Senate and House seats and Multifamily Housing Bonds per capita in 2016.

From a different angle, Table 3 compares the mean of the per-capita municipal housing bonds (all tax-exempt) among three groups of states by the political control of state legislatures: Democratic, Divided, and Republican-controlled. Consistent with a general assumption, Democratic-controlled states have the highest mean of per-capital housing bonds ($90.13), followed by divided-controlled states ($76.69) and Republican-controlled ($72.12) in 2016.

[Table 2 Here]

[8] Data source: http://www.ncsl.org/research/about-state-legislatures/partisan-composition.aspx

As for the instrumental dummy variables used in this study, a state is classified as Democratic-controlled when both the state Senate and House representatives are controlled by the Democratic Party. The Republican-controlled state dummy is created in the same way. When the state Senate is controlled by the Democratic Party, while the House is dominated by the Republican Party or vice versa, the state is coded as divided-controlled. For example, Minnesota had 37 Democratic and 27 Republican Senators, and 61 Democratic and 75 Republican House representatives in 2016, and thus the state was categorized as divided controlled as the state Senate had a larger number of Democratic seats than Republican, while the House was represented by a larger number of Democratic seats.

[Table 3 Here]

3.4. Controls for Other Affordable Housing Assistance Programs

Since the passage of the U.S. Housing Act of 1937, the federal, state, and municipal governments have provided housing assistance to low-income families in various forms. Most of these housing subsidies were provided under programs administered by the U.S. Department of Housing and Urban Development (HUD) or predecessor agencies. This study controls for those government housing assistance programs to estimate the effect of tax-exempt bond financing on affordable housing, holding other factors constant.

a. LIHTC

The Low-Income Housing Tax Credit (LIHTC) has been one of the most important resources for creating affordable housing in the U.S. since 1986. Created by the Tax Reform Act of 1986, the LIHTC program gives state and local LIHTC-allocating agencies the equivalent of nearly $8 billion in annual budget authority to issue tax credits for the acquisition, rehabilitation, or new construction of rental housing targeted to lower-income households. HUD's LIHTC database provides complete nationwide datasets on the size ($) of the tax credit, the number of units placed in service annually, and the location of individual projects.

b. Public Housing and Housing Choice Voucher Program

HUD's Public Housing program was established to provide decent and safe rental housing for eligible low-income families, the elderly, and persons with disabilities. As of 2017, there are 1.2 million households living in units supported by Public Housing programs managed by local housing authorities in each state. The eligibility of the program is determined by several criteria such as annual gross income and immigration status. HUD sets the lower income limits at 80 percent and very low-income limits at 50 percent of the median income for the country or metropolitan area in which an applicant wants to live, although the income limits vary from area to area across the country. A local housing authority plays a role as a landlord in terms of the lease. The rents paid by Public Housing tenants are set by a formula using each tenant family's monthly income (e.g. 30 percent of the monthly adjusted income).

HUD also provides Housing Choice Vouchers to very low-income families. The eligible family's income may not exceed 50% of the median income for the county or metropolitan area in which the family chooses to live. By law, a local public housing agency (PHA) must provide 75 percent of its voucher to applicants whose incomes do not exceed 30 percent of the area median income. Once a household is selected as a recipient of the housing voucher, the PHA pays a housing subsidy directly to the landlord and the household is supposed to pay the difference between the actual rent and the amount subsidized by the program.

c. Section 8 Project-Based Programs

Finally, there is a project-based rental assistance program under Section 8, which is labeled as the "Section 8 New Construction and Substantial Rehabilitation (NC/SR)." As can be seen from the name of the title, this program provides rental assistance in connection with the development of newly constructed or substantially rehabilitated privately owned rental housing financed with any type of construction or permanent financing. Like the housing voucher program, it is a direct rental subsidy for the tenants. However, the subsidy stays with the rental housing property; when the tenant moves out, they no longer have their rental assistance because the subsidy is attached to the property. In this study, we include two different types of project-based Section 8 programs as a control: new construction and substantial rehabilitation (NC/SR), and moderate rehabilitation (MR). Specifically, the total housing units placed in service by these two programs each year is calculated for each state.

4. Model Specification and Analysis

4.1. Models

As mentioned above, this study applies two-stage least square (2SLS) models to estimate the effects of municipal bonds on housing affordability, controlling for other housing assistance programs as well as endogeneity. We run three sets of regression models separately: the first set examines the marginal effect of Multifamily Housing Bonds on rental housing affordability (supply-side analysis), while the models in the second set examine the effect of Mortgage Revenue Bonds on owner-occupied housing affordability (demand-side analysis). The third set of models examines the effect of Multifamily Revenue Bonds on rental housing affordability. We call the final models "cross-checking" analysis because they are designed to check the effect of mortgage assistance on the rental housing market. A generic model is represented as follows:

[First Stage]

$$ln\_Tax\_exempt\_bonds_{it} = \partial_0 + \partial_1 Political\ Control\ of\ State\ Legislatures_{it} + \sum_k \partial_k P_{it} + \vartheta_{it} \quad (1)$$

[Second Stage]

$$Housing\ Unaffordability_{it} = \theta_0 + \theta_1 \ln\_Tax\_exempt\_bonds_{it} + \sum_k \theta_k P_{it} + \varepsilon_{it} \quad (2)$$

where *i* stands for state *i*, and *t* stands for year *t*. *Tax-exempt bonds* refer to the log-transformed per-capita issuance volume of Multifamily Housing Bonds or Mortgage Review Bonds (all tax-exempt). *Political Control of State Legislature* is a set of dummy variables indicating the political control of state legislatures for state *i* at time *t*. *Housing Unaffordability* is measured by the log-transformed number of rental or owner-occupied households facing housing cost burden. *P* is a vector of other affordable housing assistance programs as controls, including the log-transformed number of units placed in service by LIHTC, Public Housing, Housing Voucher, and Project-based Section 8. ϑ_{it} and ε_{it} are the residuals in the first and second stage, respectively.

4.2. The First Stage Model Outputs: Political Control and Tax-exempt Bonds

As described above, we control for the endogenous issue between the allocation of tax-exempt bonds on affordable housing and the number of rental or owner-occupied households facing housing cost burdens, by using instrumental variables categorizing states into three groups: Democratic, Divided, and Republican-controlled. In the first stage of our 2SLS models, the first two dummy variables are included, while the Republican dummy is excluded as a reference group.

[Table 4 Here]

In Table 4, the first stage outputs show that the per-capita volume of tax-exempt Multifamily Housing Bond is approximately 9 to 10 percent higher in the Democratic-controlled states than the Republican-controlled states, while the coefficients are not statistically significant. When it comes to the divided-controlled states, the per-capita size of Multifamily Housing Bond is 30 to 38 percent higher than in the Republican states, holding other factors constant. These results are somewhat consistent with general arguments from political science literature showing that affordable housing may not be the type of targeted good that Republicans choose to distribute for political advantage (Gay 2013).

As for Mortgage Revenue Bonds, the per-capita volume of the bond issued in the Democratic-controlled states is 104 to 116 percent higher than the volume of Republican states. Furthermore, the size of the bond is 84 to 87 percent higher in the divided-controlled states, compared to Republican counterparts. All the coefficients from the Mortgage Revenue Models are statistically significant at the 99 percent confidence level. This implies that the impact of political control on the allocation of housing bonds in the owner-occupied market is much stronger than the political influent in the rental housing market at least for affordable housing matters.

4.3. The Effect of Multifamily Housing Bonds on Rental Housing Affordability

Table 5 reports the second stage outputs of the 2SLS regression models on Multifamily Housing Bonds. This set of models is named as “supply-side” analysis because the purpose of Multifamily Housing Bonds is to provide financial assistance with private rental housing

developers who commit to creating affordable housing units up to a certain percentage, depending on target income-level thresholds.

The second-stage outputs for the effect of Multifamily Housing Bonds on rental housing affordability estimate that a 10 percent increase in the per-capita volume of the bond reduces the number of rental households experiencing housing cost burdens by 0.7 to 0.8 percent. Models in Columns (3) and (4) are labeled as "lagged models" because these models assume that the actual effect of bond financing issued in time *t* is reflected in the housing market in the following year (*t+1*). Columns (1) and (3) estimate the effect of bond financing on rental housing affordability, specifically on the households spending 30 percent or more of household income on housing costs. On the other hand, Columns (2) and (4) show regression outputs from models using the "35 or more of income" threshold.

[Table 5 Here]

When it comes to the control variables included in the model, the results reveal a modest impact of LIHTC on housing affordability, estimating that a 10 percent increase in the number of housing units supported by LIHTC reduces the number of rental households experiencing housing cost burdens by 0.1 percent. This finding is consistent with literature that shows tenants barely capture benefits from the LIHTC program, while developers and investors capture a relatively large fraction of the program's benefits (Burge 2011).

Furthermore, the finding on the effect of the LIHTC program presented in this paper is similar to the Malpezzi and Vandell (2002) study that reveals no significant relationship between LIHTC and the size of housing stock. However, unlike those previous studies, the outputs from the current study suggest that the LIHTC program provides a synergy effect when it is used along with Multifamily Housing Bonds. It is practically and legally available for most affordable housing developers to finance their projects using both LIHTC and Multifamily Housing Bond programs.

4.4. The Effect of Mortgage Revenue on Owner-occupied Housing Affordability

Table 6 presents the second-stage outputs from the supply-side models. The models in this category are called "demand-side" analysis because the purpose of Mortgage Revenue Bonds is

to provide financial support to low-income households who want to become a homeowner by using a low-interest mortgage. Contrary to the results from the previous set of models on rental households, we find that Mortgage Revenue Bonds increase the number of homeowner households experiencing housing cost burdens; a 10 percent increase in the per-capita mortgage bond leads to a 0.4-0.6 percent increase in the number of homeowner households facing housing cost burdens.

[Table 6 Here]

A possible explanation for this result is that there might be a movement, or shift, of households from the rental market to owner-occupied market with the financial support of low-interest mortgages. This implies that Mortgage Revenue Bonds help rental households become homeowners by offering demand-side housing assistance, but those new homeowners still face a housing cost burden, at least in the short term period. This phenomenon can be called a "horizontal shift" of housing unaffordability from the rental to owner-occupied market. To better understand this, we additionally run cross-checking models and the outputs are shown in Table 7 below.

As for control variables, the Housing Voucher program is included in the analysis because housing vouchers can be used by low-income households to buy a home and receive monthly assistance in meeting homeownership expenses. Other housing assistance programs controlled in the rental market are only applicable to renters, and thus they are excluded in this set of models.

[Table 7 Here]

In the cross-check models, we add the log-transformed per-capita size of Mortgage Revenue Bonds on the right-hand side of the original regression equation. By doing so, we test if there is any significant effect of the low-interest mortgage assistance on the rental housing market. The results reveal that a 10 percent increase in the issuance volume of Mortgage Revenue Bonds leads to a 0.3 percent decrease in the number of rental households currently facing housing cost burdens, after controlling for the effect of Multifamily Housing Bonds and

other housing programs. From a different angle, we also find that the higher volume of Mortgage Review Bonds is associated with the greater homeownership rates. Specifically, a 10 percent increase in per-capita Mortgage Revenue Bonds leads to a 0.01 percentage point increase in the homeownership rate, holding other factors constant. Although the size of the impact is still minimum, the association is statistically significant ($p<0.05$).[9]

4.5. Exclusion Restriction

The validity of the identification used in this study is based on the assumption that the political control of state legislatures is a legitimate instrument for the issuance volume of housing bonds in the second stage equation. The first stage estimates, computed by Equation (1) above, show that the instrument is correlated with the issuance volume of housing bonds, which is the regressor of interest in Equation (2).

To test if the instrument is uncorrelated with the residual (ε) in the housing affordability equation (Eq. 2), and if the IV is correlated with the number of households facing housing cost burden only through the issuance of housing bonds, we compute OLS estimates as shown in Equation (3). This form captures the impact of an instrument on an outcome, and has the same structure and regressors as Equation (2) above, but replacing $ln\_Tax\_exempt\_bonds_{it}$ with Y_{it} for the dependent variable and including the housing bonds on the right-hand side of the equation (Angrist, Pathak, and Walters, 2011; Angrist and Krueger, 1991). When the instrument Z is associated with Y only through housing bonds, the coefficients of Z should be insignificant in the housing affordability equation below. As shown in Figure 8, none of the instruments are significant.[10] Column (2) and (4) represent models with a 1-year time lag (*t-1*) for the political control variables.

$$Y_{it} = \partial_0 + \partial_1 Z_{it} + \partial_1 X_{it} + \sum_k \theta_k P_{it} + \varepsilon_{it} \qquad (3)$$

where Y_{it} is the log-transformed number of rental or owner-occupied households facing housing cost burden for state i and year t. Z_{it} is a vector of dummy variables indicating the political control of state legislatures as an instrument, and X_{it} refers to the log-transformed per-capita

[9] Both year-fixed and state-fixed effects are applied to the model.
[10] Pearson's correlation coefficients between the instruments (z) and the housing affordability (y) are also insignificant.

issuance volume of Multifamily Housing Bonds or Mortgage Review Bonds. P_{it} is a vector of other affordable housing assistance programs as covariates. ε_{it} is the residual.

[Table 8 Here]

Finally, we report falsification test outputs in Table 9. For this test, we use tax-exempt education municipal bonds with an assumption that there should be no direct effect on housing affordability. The main purpose of the education bonds issued by local governments or school districts is to finance buildings and projects promoting primary and secondary education. For higher education, these bonds are also used to provide financial supports with public universities and libraries. The results from the falsification test confirm that the non-housing securities (i.e. education bonds) have no significant effects on the number of households paying 30 percent or more of income on housing while showing consistent outputs for the control variables included in the original models.

In addition, there has been a general argument that minimum wage is one of the critical factors that affect housing affordability. For example, data published by the National Low Income Housing Coalition shows that a renter household who receives the federal-level minimum wage needs three full-time jobs in order to afford a two-bedroom rental unit at fair market rents (Aurand et al., 2018). As a response to this assumption regarding the impact of minimum wage on housing affordability, we estimate 2sls models including the state-level minimum wage as a control variable, but find no significant impact on the affordability in both MHB and MRB models.

[Table 9 Here]

5. Conclusions

Despite the government response to housing affordability, millions of residents in the U.S. are still living in neighborhoods without a sufficient supply of affordable and decent housing. The shortage of affordable housing has reached a crisis point, and the gap is continuously widening. In this context, we test whether the tax-exempt municipal housing bonds have any

effect on housing affordability using the state level data sets, controlling for other affordable housing programs.

Specifically, this study is in line with those studies comparing the project-based affordable housing programs (i.e. supplied-side assistance) with the tenant-based (i.e. demand-side) approach (e.g. Sinai and Waldfogel, 2005; Quigley, 2000; Burge, 2011). However, we expand the affordable housing literature in two ways. First, considering that most studies have focused on LIHTC, Project-based Section-8, Housing Voucher, and Public Housing programs thus far, this study is differentiated by quantifying the effect of municipal bond financing on housing affordability. Second, we compare the effect of affordable housing programs between the rental and the owner-occupied sector. As already described, housing municipal bonds are categorized into the two types (MHBs and MRBs), and it makes the comparison possible in this study.

Using 2SLS regression models, we find that a 10 percent increase in per-capita Multifamily Housing Bonds leads to a 0.7-0.8 percent decrease in the number of rental households facing housing cost burdens. On the other hand, the demand-side analysis shows that Mortgage Revenue Bonds increase the number of owner-occupied households facing the housing cost burden. The results from the demand-side models are contrary to the outputs from the supply-side analysis. This implies a possibility of a "horizontal shift" from renters to homeowners. Our cross-check models partially support the idea of this possibility by identifying that an increase in the low-interest mortgage assistance leads to a decrease in the number of households in the rental market while leading to an increase in the number of cost-burdened households in the owner-occupied market. It can be interpreted as a positive policy effect at least in terms of homeownership rates. However, our analysis reveals that those new homeowners are still facing housing cost burdens.

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Table 1. Summary Statistics

	Year	Mean	SD	Min	Max		Year	Mean	SD	Min	Max
Housing (un)Affordability: Share of Rental Units facing Housing Cost Burden	2005	0.43	0.04	0.31	0.52	LIHTC (Units)	2005	2,482	3,203	84	16,077
	2006	0.43	0.04	0.30	0.52		2006	2,364	2,963	20	16,457
	2007	0.43	0.04	0.29	0.52		2007	2,212	2,925	0	16,734
	2008	0.47	0.04	0.34	0.57		2008	2,049	3,072	0	17,982
	2009	0.48	0.04	0.36	0.58		2009	2,004	2,803	0	12,962
	2010	0.49	0.04	0.36	0.58		2010	2,147	3,928	0	26,374
	2011	0.49	0.04	0.37	0.59		2011	1,886	3,281	0	17,103
	2012	0.50	0.04	0.39	0.60		2012	1,747	2,642	0	15,711
	2013	0.50	0.04	0.40	0.60		2013	1,845	3,037	0	15,757
	2014	0.50	0.04	0.40	0.59		2014	557	875	0	4,042
	2015	0.50	0.04	0.39	0.58		2015	406	1,646	0	11,321
	2016	0.48	0.04	0.40	0.56		2016	N/A	N/A	N/A	N/A
	Year	Mean	SD	Min	Max		Year	Mean	SD	Min	Max
Housing (un)Affordability: Share of Owner-occupied Units facing Housing Cost Burden	2005	0.32	0.05	0.22	0.48	Public Housing (Units)	2005	21,773	29,782	789	194,554
	2006	0.34	0.06	0.23	0.52		2006	21,553	29,713	716	194,224
	2007	0.34	0.06	0.22	0.51		2007	22,215	30,131	715	195,285
	2008	0.35	0.07	0.23	0.53		2008	21,537	31,594	716	212,739
	2009	0.35	0.07	0.22	0.53		2009	22,002	32,092	716	214,962
	2010	0.35	0.07	0.22	0.52		2010	21,211	29,694	716	196,006
	2011	0.35	0.07	0.21	0.52		2011	21,585	31,620	716	212,869
	2012	0.34	0.07	0.20	0.50		2012	21,523	31,595	716	212,969
	2013	0.33	0.06	0.19	0.48		2013	21,406	31,343	716	211,201
	2014	0.32	0.06	0.18	0.47		2014	21,236	31,268	716	210,780
	2015	0.31	0.06	0.18	0.45		2015	20,816	31,014	716	209,976
	2016	0.27	0.05	0.18	0.39		2016	19,945	30,535	715	208,811
	Year	Mean	SD	Min	Max		Year	Mean	SD	Min	Max
Tax-exempt Municipal Housing Bonds ($ in millions)	2005	$505	$1,054	$24	$7,158	Section 8 (Units)	2005	18,300	18,318	757	94,200
	2006	$485	$462	$0	$2,550		2006	17,774	17,666	749	90,976
	2007	$526	$546	$48	$3,452		2007	17,976	17,836	796	92,687
	2008	$284	$362	$20	$1,788		2008	22,039	20,807	1,365	92,326
	2009	$194	$270	$0	$1,816		2009	16,427	16,012	749	78,693
	2010	$155	$231	$0	$1,429		2010	16,614	16,100	748	79,436
	2011	$174	$236	$0	$1,329		2011	16,562	16,070	749	79,344
	2012	$147	$281	$0	$1,712		2012	16,561	16,248	729	80,547
	2013	$139	$344	$0	$2,483		2013	16,617	15,843	824	68,870
	2014	$148	$348	$0	$2,443		2014	24,092	24,069	1,350	104,587
	2015	$199	$357	$0	$2,453		2015	24,178	24,137	1,275	104,603
	2016	$262	$369	$0	$2,353		2016	24,404	24,358	1,274	105,969

Note.—This table presents summary statistics of key variables from 2005 to 2016. All the statistics include 50 states and Washington D.C (N=51). The rental housing (un)affordability is the percentage of renter households paying 30 percent or higher of monthly income on monthly housing costs. In the same way, the housing (un)affordability in the owner-occupied sector is the percentage of homeowners paying 30 percent or higher of their income on housing costs, including mortgage payments and property taxes. All the values for the Low Income Housing Tax Credit (LIHTC), Public Housing, and Section 8 programs are the numbers of housing units placed in service supported by each of the programs in a corresponding year.

Table 2. The Political Control of State Legislature and Per-capita Housing Bonds in 2016

State	MHB per capita	Total Senate	Senate Dem.	Senate Rep.	Total House	House Dem.	House Rep.	Legis. Control	Gov. Party	State Control
Vermont	$ 94.87	30	21	9	150	85	53	Dem	Dem	Dem
District of Columbia	$ 56.29									
New York	$ 51.78	63	31	32	150	104	44	Split	Dem	Divided
Rhode Island	$ 46.62	38	32	5	75	63	11	Dem	Dem	Dem
Minnesota	$ 38.60	67	39	27	134	61	72	Split	Dem	Divided
Michigan	$ 28.30	38	11	27	110	46	61	Rep	Rep	Rep
Wisconsin	$ 27.44	33	14	19	99	36	63	Rep	Rep	Rep
New Jersey	$ 21.72	40	24	16	80	51	29	Dem	Rep	Divided
Maryland	$ 17.82	47	33	14	141	91	50	Dem	Rep	Divided
Indiana	$ 14.28	50	10	40	100	30	70	Rep	Rep	Rep
Virginia	$ 12.74	40	19	21	100	34	66	Rep	Dem	Divided
Oklahoma	$ 12.42	48	9	39	101	30	71	Rep	Rep	Rep
Connecticut	$ 10.95	36	20	15	151	87	64	Dem	Dem	Dem
California	$ 10.58	40	25	14	80	52	28	Dem	Dem	Dem
South Carolina	$ 10.37	46	17	28	124	46	78	Rep	Rep	Rep
Colorado	$ 10.26	35	17	18	65	34	31	Split	Dem	Divided
Arizona	$ 10.13	30	13	17	60	24	36	Rep	Rep	Rep
Tennessee	$ 9.90	33	5	28	99	26	73	Rep	Rep	Rep
Illinois	$ 9.30	59	39	20	118	71	47	Dem	Rep	Divided
Missouri	$ 8.98	34	9	25	163	45	117	Rep	Dem	Divided
Georgia	$ 8.19	56	17	39	180	61	118	Rep	Rep	Rep
Louisiana	$ 7.86	39	14	25	105	42	61	Rep	Rep	Rep
Montana	$ 7.19	50	21	29	100	41	59	Rep	Dem	Divided
Texas	$ 6.29	31	11	20	150	51	99	Rep	Rep	Rep
Iowa	$ 5.69	50	26	24	100	43	57	Split	Rep	Divided
Florida	$ 5.65	40	14	26	120	39	81	Rep	Rep	Rep
Massachusetts	$ 5.47	40	33	5	160	123	34	Dem	Rep	Divided
Nebraska	$ 5.24	49	0	0		Unicameral		N/A	Rep	N/A
Ohio	$ 4.46	33	10	23	99	34	65	Rep	Rep	Rep
North Carolina	$ 4.17	50	16	34	120	45	74	Rep	Rep	Rep
Pennsylvania	$ 3.11	50	19	30	203	82	118	Rep	Dem	Divided
Oregon	$ 2.24	30	18	12	60	35	25	Dem	Dem	Dem
Alabama	$ 2.06	35	8	26	105	33	72	Rep	Rep	Rep
Washington	$ 1.95	49	24	25	98	50	48	Split	Dem	Divided
Kentucky	$ 1.92	38	11	27	100	52	44	Split	Rep	Divided
Mississippi	$ 1.42	52	20	32	122	49	73	Rep	Rep	Rep

Data source: The National Conference of State Legislatures (NCSL), Municipal Securities Ruling Board (MSRB).

Note.—This table shows the breakdown of the state Senators and House Representatives by political party, and is sorted by per-capita issuance volume of the Multifamily Housing Bonds. Column “Legis. Control” categorizes each state into three groups: Democratic, Republican, and divided control. A state is classified as Democratic-controlled when both the state Senate and House representatives are controlled by the Democratic Party. When the state Senate is dominated by the Democratic Party, while the House is dominated by the Republican Party or vice versa, the state is labeled as divided-controlled. These three categories are used in this study as the instrument. Finally, when the state legislature is controlled by the Democratic Party, while the state governor’s political party affiliation is the Republic, the last column (State Control) is labeled as divided.

Table 3. Comparison of Per-capita Housing Bonds by Political Control of State Legislature in 2016.

Category	Mean (Per-capita Housing Bonds*)	N (States)
Democratic-controlled	$ 90.13	9
Divided-controlled	$ 76.69	10
Republican-controlled	$ 72.12	26
States with zero issuance		6
Total		51

Note.—This table compares the average of per-capita housing bonds among three groups: Democratic, Republican, and divided controlled. The per-capital housing bonds is the total issuance volume in each state in 2016 divided by a corresponding state's total population in the same year. In 2016, **Democratic-controlled states** are California, Connecticut, Illinois, Maryland, Massachusetts, New Jersey, Oregon, Rhode Island, and Vermont. **Republic-controlled states** are Alabama, Alaska, Arizona, Florida, Georgia, Idaho, Indiana, Kansas, Louisiana, Michigan, Mississippi, Missouri, Montana, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Utah, Virginia, Wisconsin, and Wyoming. **Divided-controlled states** are Colorado, D.C., Iowa, Kentucky, Maine, Minnesota, Nebraska, New Mexico, New York, and Washington. Washington D.C. is included in the divided-controlled group.

Table 4. First-stage Outputs

VARIABLES	(1) lnMHB	(2) lnMHB_Lagged	(3) lnMRB	(4) lnMRB_Lagged
IV Democratic	0.09	0.10	1.04***	1.16***
	(0.18)	(0.20)	(0.24)	(0.25)
IV Divided-control	0.30*	0.38**	0.84***	0.87***
	(0.17)	(0.17)	(0.22)	(0.23)
LIHTC units (log)	0.04	0.05*		
	(0.03)	(0.03)		
Public Housing units (log)	0.17	1.83		
	(1.24)	(1.30)		
Housing Voucher units (log)	-2.81***	-3.50***	-5.56***	-6.32***
	(0.74)	(0.77)	(0.89)	(0.94)
Section8 NC/SR/MR units (log)	0.47*	0.73***		
	(0.28)	(0.28)		
Constant	23.62	12.69	58.55***	66.18***
	(15.79)	(16.25)	(9.03)	(9.56)
Observations	561	510	612	561
R-squared	0.06	0.11	0.13	0.15
Number of state code	51	51	51	51
State FE	Yes	Yes	Yes	Yes

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Note.—This table presents OLS estimates from the first-stage regression models that examines the associations between the political party control of the state legislature and the issuance volume of Multifamily Housing Bonds (Columns 1 and 2) and Mortgage Revenue Bonds (Columns 3 and 4). Specifically, the dependent variable takes the log-transformed values of the per-capita issuance volume in each state in each year. In Columns 2 and 4, the two political dummy variables (IV Democratic, and IV Divided-control) at time *t-1* are used in order to see the lagged effect of the political party controls on the issuance volume of housing bonds at time *t*. Section 8 NC, SR, and MR refer to the new construction, substantial rehabilitation, and moderate rehabilitation projects, respectively.

Table 5. The Effect of Multifamily Housing Bonds on Rental Housing Affordability

VARIABLES	(1) lnRenters Pay>30%	(2) lnRenters Pay>35%	(3) lnRenters Pay>30%_Lagged	(4) lnRenters Pay>35%_Lagged
MHB per cap (log)	-0.08*	-0.08*	-0.07**	-0.07**
	(0.05)	(0.05)	(0.03)	(0.04)
LIHTC units (log)	-0.01**	-0.01**	-0.01**	-0.01**
	(0.00)	(0.00)	(0.00)	(0.00)
Public Housing units (log)	-0.31***	-0.33***	-0.20*	-0.22*
	(0.11)	(0.11)	(0.12)	(0.12)
Housing Voucher units (log)	0.35**	0.37**	0.34**	0.36**
	(0.15)	(0.16)	(0.14)	(0.14)
Section8_NC/SR units (log)	0.01	0.01	0.03	0.02
	(0.03)	(0.04)	(0.03)	(0.03)
Constant	11.56***	11.41***	10.45***	10.34***
	(1.79)	(1.89)	(1.32)	(1.39)
Observations	561	561	510	510
Number of state code	51	51	51	51
State FE	Yes	Yes	Yes	Yes

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Note.—This table presents the regression estimates from the second-stage models of the rental housing sector. In Columns 1 and 3, the dependent variable is the log-transformed number of renter households spending 30 percent or higher of income on housing. In Columns 2 and 4, the 35 percent or higher of income threshold is used as a measure of housing (un)affordability. In Columns 3 and 4, the political party control variables (i.e. the instruments of this study) at time *t-1* are used in the first-stage.

Table 6. The Effect of Mortgage Revenue on Owner-occupied Housing Affordability

VARIABLES	(1) lnOwner Pay>30%	(2) lnOwner Pay>35%	(3) lnOwner Pay>30%_Lagged	(4) lnOwner Pay>35%_Lagged
MRB per cap (log)	0.06***	0.05***	0.05***	0.04***
	(0.02)	(0.02)	(0.02)	(0.02)
Housing Voucher units (log)	-0.32**	-0.31**	-0.49***	-0.51***
	(0.15)	(0.15)	(0.14)	(0.14)
Constant	15.25***	14.92***	17.04***	16.98***
	(1.59)	(1.59)	(1.43)	(1.42)
Observations	612	612	561	561
Number of state code	51	51	51	51
State FE	YES	YES	YES	YES

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Note.—This table presents the regression estimates from the second-stage models of the home-owner housing sector. In Columns 1 and 3, the dependent variable is the log-transformed number of home-owner households spending 30 percent or higher of income on housing, including mortgage payments and property taxes. In Columns 2 and 4, the 35 percent or higher of income threshold is used as a measure of housing (un)affordability. In Columns 3 and 4, the political party control variables (i.e. the instruments of this study) at time *t-1* are used in the first-stage. LIHTC, Public Housing, and Section 8 variables are excluded from this model because these programs are designed to support the rental housing affordability.

Table 7. Cross Check: The Effect of Housing Revenue Bonds on Rental Housing Affordability

VARIABLES	(1) lnRenters Pay>30%	(2) lnRenters Pay>35%	(3) lnRenters Pay>30%_Lagged	(4) lnRenters_ Pay>35%_Lagged
MRB per cap (log)	-0.03**	-0.03**	-0.03**	-0.03*
	(0.01)	(0.01)	(0.01)	(0.01)
MHB per cap (log)	-0.03	-0.03	-0.04	-0.05
	(0.04)	(0.04)	(0.03)	(0.03)
LIHTC units (log)	-0.01**	-0.01**	-0.00*	-0.00*
	(0.00)	(0.00)	(0.00)	(0.00)
Public Housing units (log)	-0.14	-0.16	-0.13	-0.15
	(0.11)	(0.12)	(0.10)	(0.11)
Housing Voucher units (log)	0.37***	0.38***	0.32***	0.34***
	(0.11)	(0.11)	(0.11)	(0.12)
Section8_NC/SR units (log)	-0.00	-0.01	0.02	0.02
	(0.02)	(0.03)	(0.03)	(0.03)
Constant	9.99***	9.80***	10.11***	10.01***
	(1.46)	(1.54)	(1.11)	(1.17)
Observations	561	561	510	510
Number of state code	51	51	51	51
State FE	Yes	Yes	Yes	Yes

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Note.—This table presents the second-stage estimates testing if there is any significant effect of the low-interest mortgage assistance on the rental housing market. Therefore, in Columns 1 and 3, the dependent variable is the log-transformed number of the renter households spending 30 percent or higher of income on housing, while in Columns 2 and 4, the dependent variable is the log-transformed number of the renter households spending 35 percent or higher of income on housing. In Columns 3 and 4, the political party control variables (i.e. the instruments of this study) at time *t-1* are used in the first-stage.

Table 8. Exclusion Restriction

VARIABLES	(1) Renters affordability	(2) Renters Affordability with lag	(3) Home-owners Affordability	(4) Home-owners Affordability with lag
IV-Democratic	0.01	-0.00	0.00	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)
IV-Divided	0.00	-0.00	0.00	-0.00
	(0.00)	(0.00)	(0.01)	(0.01)
MRB per cap (log)	-0.00	-0.00		
	(0.00)	(0.00)		
MHB per cap (log)			-0.00	-0.00
			(0.00)	(0.00)
Covariates (control variables)	Yes	Yes	Yes	Yes
Constant	12.88***	12.33***	12.71***	12.85***
	(0.49)	(0.48)	(0.42)	(0.43)
Observations	561	510	612	561
Number of state code	51	51	51	51
State FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Note.—This table presents OLS estimates from regressions testing the exclusion restriction of the instruments used in this study. In Columns 1 and 2, the dependent variable is the log-transformed number of the renter households spending 30 percent or higher of income on housing, while in Columns 3 and 4, the dependent variable is the log-transformed number of the home-owner households spending 30 percent or higher of income on housing.

Table 9. Falsification Tests with Education Bonds

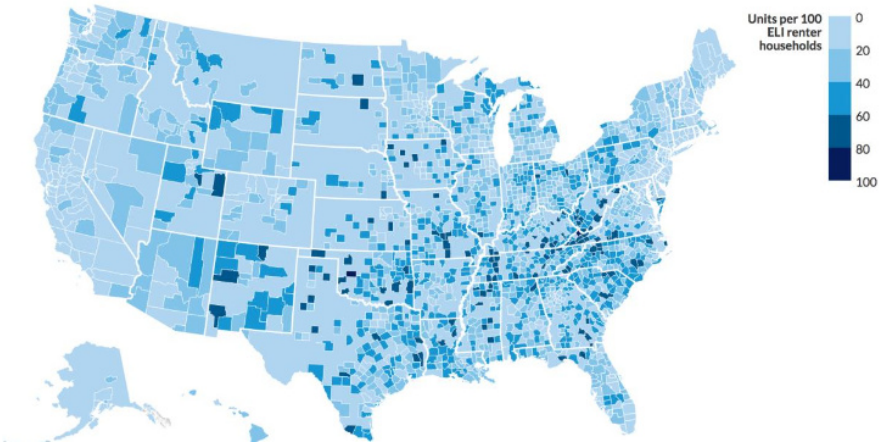
VARIABLES	(1) Pay>30%	(2) Pay>35%	(3) Pay>30%_Lagged	(4) Pay>35%_Lagged
Edu. Bonds per cap (log)	0.05	0.05	0.00	-0.01
	(0.04)	(0.05)	(0.02)	(0.02)
LIHTC units (log)	-0.01***	-0.01***	-0.01***	-0.01***
	(0.00)	(0.00)	(0.00)	(0.00)
Public housing unit (log)	-0.42***	-0.44***	-0.27***	-0.29***
	(0.13)	(0.14)	(0.09)	(0.10)
Housing Voucher unit (log)	0.61***	0.63***	0.44***	0.44***
	(0.08)	(0.08)	(0.07)	(0.07)
Section8_combine unit (log)	-0.03	-0.04	0.04	0.05
	(0.03)	(0.03)	(0.03)	(0.04)
Constant	10.03***	9.85***	9.96***	9.84***
	(1.26)	(1.30)	(0.97)	(1.01)
Observations	510	510	408	408
Number of state code	51	51	51	51
State FE	Yes	Yes	Yes	Yes

Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

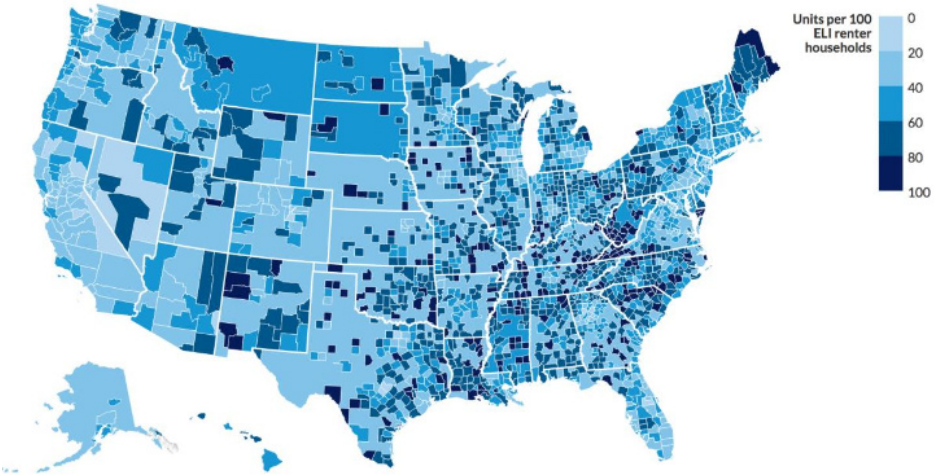
Note.—This table presents the second-stage estimates from the 2SLS models using the education municipal bonds instead of the housing bonds. The dependent variable is the log-transformed number of households spending 30 percent or higher of income on housing in Columns 1 and 3, and the households pending 35 percent or higher of income in Columns 2 and 4.

Fig. 1.— The Number of Affordable Rental Units per 100 Extreme Low-Income Households, 2014.

(Panel 1. Without federal assistance)



(Panel 2. With federal assistance)

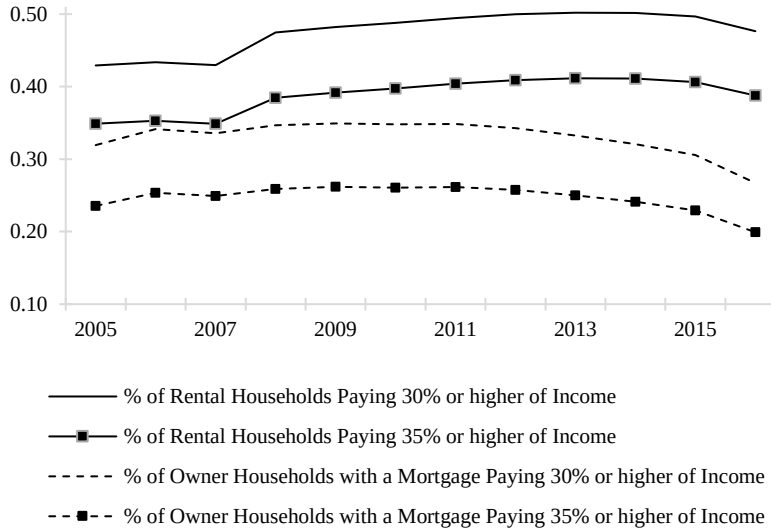


Note.—This figure shows the geographic distribution of affordable rental units for extreme low-income (ELI) households with and without federal housing assistance, including the HUD and USDA programs, in 2014. The lightest areas have the least available and affordable housing for ELI renters, and the darkest areas have the most. Hildalgo County, Texas, ranks first with the smallest affordable rental housing gap (71 affordable rental units per 100 ELI renters).

Source: Urban Institute, 2017

Fig. 2.—Housing Unaffordability and Municipal Bonds, 2005-2016.

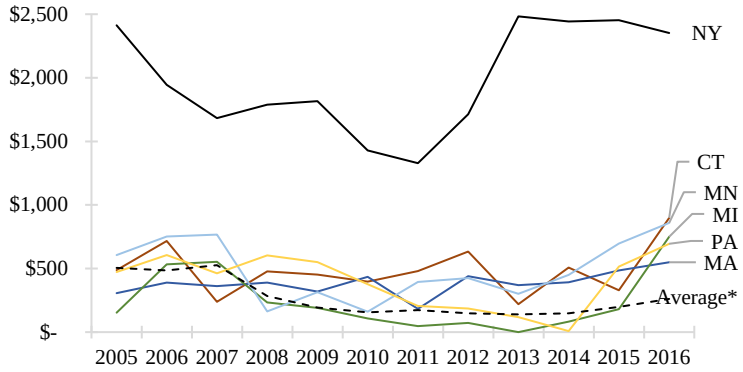
(Panel 1) Average Share of Housing Units Facing Housing Cost Burdens



Note.—This figure presents the average share of rental or owner-occupied households paying 30 or 35 percent of the household's income in 50 states and D.C (Total N=51), from 2005 to 2016. The renter household is represented by the solid line, and the owner household is represented by the dashed line. The lines with the square market show the average share of households spending 35 percent or higher of income on housing.

Data Source: American Community Survey (ACS).

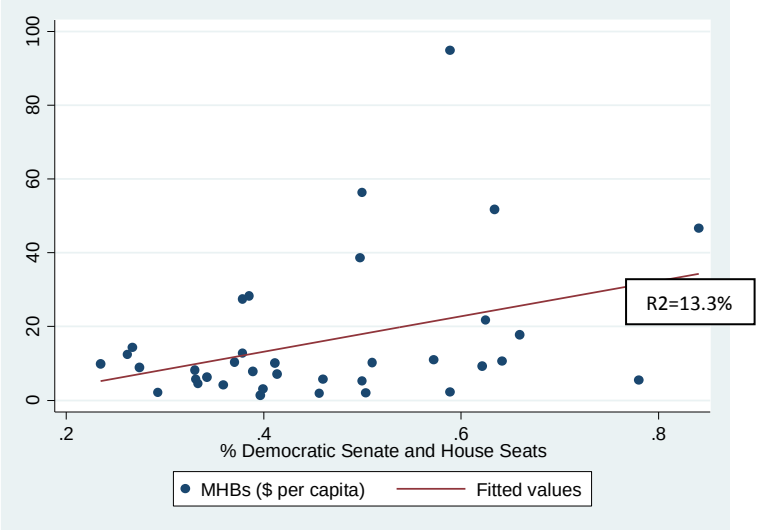
(Panel 2) Issuance Volume of Municipal Housing Bonds: Top Six States and Average*



Note.—This figure shows the issuance volume of tax-exempt municipal housing bonds, including both Multifamily Housing Bonds and Mortgage Revenue Bonds for the top six states by the issuance amount (dollars in millions) in 2016, which is the most recent data point of this study. The dashed line represents the average of fifty states and D.C.

Source: Municipal Securities Ruling Board (MSRB).

Fig. 3.—The Share of the Democratic Senate and House Seats and Per-capita Multifamily Housing Bonds



Note.—This figure presents a relationship between the share of the Democratic Senate and House seats and Multifamily Housing Bonds per capita for each state in 2016. The share of the Democratic seat is the total number of Democratic Senators and Housing Representatives divided by the total number of the state legislature. Per-capita housing bonds are the volume of municipal housing bonds divide by the total number of the state population in 2016. The fitted line represents a linear relationship between these two variables.

Data source: The National Conference of State Legislatures (NCSL),
Municipal Securities Ruling Board (MSRB).