Institute for Federalism & Intergovernmental Relations

IFIR WORKING PAPER SERIES

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IFIR Working Paper No. 2009-03

November, 2008

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Abstract

Property tax limitations, as well as other tax and expenditure restrictions on state and local governments in the United States, date back to the late nineteenth century. A surge in property tax limitation legislation occurred in the late 1970s and early 1980s, and its effects on government revenue, school financing, and educational quality have been studied extensively. However, there is surprisingly little literature on how property tax limits affect housing markets. For the first time, we examine the impacts of property tax limitations on housing growth, in addition to their impacts on housing prices. Using state-level data over twenty-three years, we find that property tax limits increase housing prices (indexes) by approximately 1.6%. These limits appear to have little impact on the growth in the housing stock, as measured by the number of permits. Our evidence suggests that this is because while property tax limits reduce property taxes they also increase the price of housing. These two counteracting effects lead to ambiguous impacts on the gross price of housing.

JEL: H71, State and local government taxation
R31 Housing supply and markets

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1. *Introduction*

It has been thirty years since the passage of Proposition 13, California's voter-initiated limit on local property taxes. While this may be the most notable legislation imposed in the "taxpayer revolt" from 1978 to 1981, it was by no means the only property tax limit passed during this period – fifteen other states enacted similar limits. While voter-initiated tax and expenditure limits received a great deal of media attention during that time, constraints on local government tax rates and levies date back to the 1880's. After a lull in activity in the 1980's, the early 1990's brought another flurry of activity in limit legislation. And recently, after another lull of approximately fifteen years, there again seems to be renewed interest in limits.

These limits have been the subject of numerous academic studies since the imposition of Proposition 13. Not surprisingly, the vast majority of these studies focus on how these limits have affected local government fiscal conditions, including property and other tax revenues but especially expenditures on, as well as the quality of, primary and secondary education (Downes (1992), Figlio (1997, 1998), Downes et al. (1998), Downes and Figlio (1999)). In contrast to the vast majority of the literature on tax and expenditure limits, our interest is not on how these limits affect local government spending and revenue decisions but on how they affect housing markets. Given that property taxes are, in large part, a significant tax on the housing stock it is surprising to us that the impact of these limits on housing markets has received so little attention. While the direct effect of tax and expenditure limits on housing might be reductions in the property tax rate, the impacts of tax and expenditure limits on other local and state taxes and revenues services and the quality of local public services will also influence the price of and growth in housing.[1]

Other studies examine what brought about these limits, particularly the voter-initiated ones, seeking to understand why voters impose state-level constraints on their elected local officials.

[1]As this literature has been reviewed relatively recently in Shadbegian (1999), McGuire (1999), and Downes and Figlio (1999), we provide only a limited and general discussion of the findings of the numerous articles on this topic.

O'Sullivan et al. (1995) notes that between 1960 and 1975 the share of national income in property taxes was 4.1 – 4.3 percent in contrast to a level of 3.3 – 3.5 percent found from approximately 1945 to 1960. Fishel (1989) argues that the equalization of educational resources mandated by the California Supreme Court decision in *Serrano v. Priest* (1971) brought about Proposition 13 by severing the link between local tax efforts and local resources for education. Three studies (Citrin (1979), Courant et al. (1980), Ladd and Wilson (1982)) report the findings of surveys of voters for three different states: California (Proposition 13), Michigan (Headley and Tisch admendments), and Massachusetts (Proposition 2½). All three studies suggest that voters were seeking reductions in tax payments and neither reductions in government services nor tax reform, that is, increases in other taxes in place of the property tax.

While voters may have had reductions in overall tax burdens in mind when they approved limits on property taxation, we should expect some differences between the impacts of property tax limits and those of general revenue limits. Specifically, as a major source of property tax revenue is housing, we might expect to observe impacts in housing markets as a consequence of property tax limitations.

This paper adds to the nascent literature concerning the effect of property tax limits on housing markets and specifically on the growth in housing stocks. A large literature beginning with Oates (1969) examines how property taxes affect property values. Only one paper of which we are aware, Bradbury et al. (2001), examines how property tax limits affect housing prices. We are not aware of any studies examining how these limits might affect housing stocks. Moreover, most of these studies focus on a single housing market, generally a metropolitan area, and for a relatively short time period. That these studies generally examine the impacts of property taxation in a single metropolitan area is consistent with their theoretical underpinning of the Tiebout (1956) hypothesis. Capitalization of property taxes as well as other local taxes and expenditures requires mobility of

households among alternative jurisdictions. Household mobility, particularly in the short run, is more likely to occur within a small geographic area encompassing a single labor market rather than in a larger area such as a region or nation composed of many geographically distinct labor markets.

While numerous studies have examined how public policies influence housing prices, almost nothing has been published that considers how state and local policies might influence the housing stock, particularly the growth in it. The limited number of studies on housing growth might be best classified as "macroeconomic" studies of adjustments in a long-term investment, housing, in response to underlying macroeconomic factors including interest rates, population growth, and growth in the economy (Maisel (1963), Muth (1981), Toppel and Rosen (1988), Mankiw and Weil (1989)). In contrast to these studies but similar to our study, studies by McDonald and McMillen (2000) and Skidmore and Peddle (1998) focus on differences in growth rates across jurisdictions. Skidmore and Peddle (1998), similar to us, focus on the impact of policy differences on residential development. While their interest is primarily in development impact fees, they also estimate the relationship between property tax revenue (per household) and building permits, finding negative and at least marginally significant results. A study by Bates and Santerre (2003) examines how minimum educational requirements affect property values and has some similarities to this study. Perhaps most closely related to our study is Lutz (2008) which examines how "fiscal surpluses" created by educational funding affects residential development. The study uses data from both New Hampshire following a major educational reform there and for the entire United States based the impact of changes in educational reform in the 1980's on housing growth between 1980 and 1990.

Unlike most of these studies, we use data over a long span of time, twenty-five years. While it may be unreasonable to think that households respond to differences in state and local policies in the course of a few years, given that some of the most significant legislation occurred over twenty-five years ago, by now we should expect to see some evidence of its impacts on housing markets.

Our strategy is to examine the impact of tax and expenditure limits on housing prices and the growth in the housing stock both directly and indirectly. Our "direct" approach is to estimate reduced form equations for housing prices and the growth in the housing stock that include measures of tax and expenditure limits as explanatory variables but do not include any measures of government revenues and expenditures including the property tax. Using this approach we find that property tax limits have a positive impact on housing prices, increasing them by approximately 1.6 percent. Limits on educational spending decrease housing prices by about two percent and limits on general revenue increase housing prices by two percent.

In contrast to the result for housing prices, using our direct approach we find no evidence that either limits on property taxes or on educational spending have any statistically significant impact on growth in the housing stock. However, using this direct approach, we find that limits on general revenue increase the growth in housing by about 7.3 percent.

If tax limits do reduce government expenditures or the quality of government services, the positive relationship between educational expenditures or educational output and property values found in numerous studies would suggest that while a reduction in the property tax rate may directly increase property values, any associated reductions in services reduce property values. To determine how tax limits affect public services and other sources of revenue, we test the impacts of tax and expenditure limits on housing markets by estimating a system of equations that includes equations for property tax revenue, educational spending, other local revenue, state own-source revenue, and other state and local revenues in addition to equations for the price of and growth in the housing stock. In this system we include tax and expenditure limits as explanatory variables in our equations for government revenues and expenditures but not in the equations determining the price of housing and growth in the housing stock. Instead, we include our measures of government revenues and expenditures in these equations. In this case, the impact of tax limits on housing is

through their impacts on government revenues and expenditures.

Using this indirect approach, we again find that property tax limits, as well as general revenue limits, increase housing prices while limits on educational spending reduce them. We again find no evidence that property tax limits affect growth in the housing stock. While this conclusion is the same as we find with our direct test, these tests provide more insight into how these limits affect housing markets. Specifically, we find that while the reductions in property taxes that occur as a result of a limited increase in the housing stock, the increase in the price of housing that occurs as a result of a property tax limit acts to reduce growth. On net, these counteracting effects combine to result in no statistically significant impact on housing growth. Counter to what we found in our reduced-form estimation, we find that educational limits have a positive and significant impact on growth in the housing stock while general revenue limits were not found to have any statistical impacts.

In the next section, we briefly describe the history and measurement of tax limits. In *Section 3* we provide a simple heuristic model to highlight the expected impact of property tax limitations on both housing prices and the housing stock. *Section 4* has a discussion of our data and the empirical methodology while the empirical results are presented in *Section 5*. *Section 6* discusses directions for further research and concludes.

2. Tax Limits: Their History and Measurement

Table 1 gives a chronology of the tax and expenditure limits for each state.[2] While there is a long history among states of these limits, there is no question that the late 1970's and early 1980's was a period of increased activity and interest in tax and expenditure limits. From 1978 to 1982, sixteen states enacted some form of tax or expenditure limit. While the late 1980's saw little in the way of additional legislation, in the 1990's several states have passed or revised property tax rate or levy

[2]The discussion in this section draws heavily from ACIR (1995), and reflects updates reported in Mullins and Wallin (2004) and Anderson (2006).

limits.

There are seven standard classifications for tax and expenditure limits with four classifications specific to property taxes: an overall tax rate limit, a specific tax rate limit, a revenue (levy) limit, and limit on increases in assessments. In addition to limits on property taxes some states have enacted general revenue limits, general expenditure limits, or "Full Disclosure" legislation that are not reported in *Table 1*. Overall property tax rate limits set a ceiling on property tax rates for all local governments (generally the combined county, municipal, school district tax rate) that can only be exceeded by popular vote, while specific tax rate limits, the most common form of tax and expenditure limits, set ceilings on the tax rates of specific types of local governments (either county, municipal, or school district). Property tax levy limits constrain the amount of revenue collected from the property tax though they are often designed to allow for an annual percentage increase in the levy (as in Massachusett's *Proposition 2½)* and frequently adjusted for the impacts of growth and additional development on levies. Finally, assessment increase limits constrain how much local governments can increase revenues by increasing assessments. Similar to revenue limits, these limits also are frequently on the growth of assessments and adjusted for development. Currently thirty-six states have some combination of these limits with twelve states limiting overall tax limits; thirty states limit specific local governments' tax rates; twenty-seven states limit local tax levies; and fifteen states limit the growth in assessments.

Most recent studies (for example, Preston and Ichniowski (1991), Joyce and Mullins (1991), Shadbegian (1998) and Figlio (1997)) make a distinction between binding and non-binding (or sometimes potentially binding) limitations. Generally, the rule followed in classifying property tax limits is that rate or assessment limits are only binding in combination while levy limits are binding alone. Following many of these studies on the impacts of property tax limits on local government finances, in our examination of their impacts on housing markets, we focus on *binding* limits. However, in

addition we examine the impact of the each of the three distinct forms of property tax limits as well[3].

Of course, while levy limits or the combinations of rate and assessment limits may constrain property tax revenues, they may not constrain other sources of local revenues. If the objective of the legislation is to limit local expenditures or revenues rather than alter the source of revenues, states may resort to general revenue or expenditure limits. These are generally specific to the level of government and are often indexed. These are also more commonly imposed on state governments; currently, only two states impose revenue limits and eight states impose expenditure limits. While these types of limits are less frequently used than tax limitations, in our empirical work we also consider their impacts on government revenues and expenditures and housing markets.

3. What Impact Might Property Tax Limitations have on Housing Prices and Construction?

At first glance, a reduction in the property tax rate should reduce the gross price of housing to households and therefore increase their demand for it. However the assumption of an elastic supply of housing is at odds with the voluminous literature on capitalization suggesting that property tax increases reduce housing prices. In the case of full capitalization, the gross price of housing is unaffected by the reduction (or increase) in the property tax. To more thoroughly examine the expected impacts of property tax limits on housing markets we consider a simple static model. As our empirical work examines the impacts of limits on building permits, the more appropriate model would be dynamic with the equilibrium characterized by a steady-state growth rate. After our analysis of the static model, we briefly address the implications of limits on growth rates in the housing stock.

3.1 A Simple Model of Capitalization and Residential Development

Assuming that households are mobile among markets (states), in equilibrium they choose the state that maximizes their utility. For simplicity, we assume households are identical, meaning that in

[3]Another potentially complicating factor, which we do not consider here, is when a state limits assessments on residential property but not commercial property. This has the effect over time of shifting the tax base away from homeowners towards business owners.

equilibrium they should be indifferent between living in any state. Then let the indirect utility function be expressed by

$$V\left(p_i(1+\tau_i), t_i, g_i, a_i\right) = \overline{U} \qquad (3.1)$$

where τ is the property tax rate, *g* is a measure of public services, *t* is an alternative tax (possibly state income), and *a* represents amenities in state *i*. The term $\overline{U}$ is the level of utility obtainable to residents in any of the regions. Then *(3.1)* implicitly defines the housing price function $p(\tau_i, t_i, g_i, a_i)$ with $p_\tau \equiv \frac{\partial p}{\partial \tau} > 0,\ p_t \equiv \frac{\partial p}{\partial t_i} < 0,$ and $p_g \equiv \frac{\partial p}{\partial g} > 0$. If, through the government budget constraint, we have changes in the property tax rate affecting the level of public services or level of other taxes then we have a total impact on the price of housing of

$$\frac{dp_i}{d\tau_i} = \frac{\partial p_i}{\partial \tau_i} + p_t \frac{dt_i}{d\tau_i} + p_g \frac{dg_i}{d\tau_i} \qquad (3.2)$$

where we assume that $\frac{dg_i}{d\tau_i} \geq 0$ and $\frac{dt_i}{d\tau_i} \leq 0$.[4] The sign of *(3.2)* is ambiguous. If public services are efficiently provided then *(3.2)* will equal zero; underprovision of public services results in *(3.2)* being positive and overprovision means that it is negative.[5] Thus when we consider the impact of changes in property tax limitations, not only do we need to consider how these how tax limits affect property taxes but also how they affect public services and other taxes.

In addition, the land market in each state must be in equilibrium. With an elastic housing stock this equilibrium condition is

$$L_i(r_i) = n_i l(r_i) h\left(p_i(1+\tau_i)\right) \qquad (3.3)$$

where r_i is the land rent, $L_i(r_i)$ is the amount of land available for residential development; $l(r_i)$ is land per unit of housing; and n_i is the number of housing units in state *i*. Equation *(3.3)* presumes an elas-

[4]Given that our data is at the state rather than the local level , wages as well as housing prices could be considered endogenous and influenced by property tax limits. A model with endogenous wages would require equilibrium conditions characterizing labor market clearing such as found in Harden and Hoyt (2003). While the impacts on wages would need to be considered when evaluating the welfare impacts of tax limits, we believe that the indirect effect of tax limits through wages is likely to have little impact on growth in the housing stock.

[5]See Sonstelie and Portney (1978) for a formal proof of the relationship between property value maximization and efficiency in the provision of local public services. Of course, this result assumes that the price of housing is the only price influenced by changes in government policy, that is, changes in policies are not capitalized into wages as well.

tic supply of existing housing. While this assumption may be rather tenuous for a static model of housing, as our interest is in the growth of the housing stock, an elastic supply seems much more plausible. If we slightly modify *(3.3)* so that we can relate the growth of housing *(⊿n)* in the state to the growth in land available for residential development there *(⊿L)*, we have the relationship

$$\Delta L_i(r_i) = \Delta n_i l(r_i) h\left(p_i(1+\tau_i)\right) \qquad (3.3')$$

Then differentiating *(3.3')* gives

$$\frac{d\Delta n_{it}}{d\tau_{it}} = \frac{\Delta n_{it}}{p_{it}}\left[\underbrace{\left(\frac{(\theta-\eta)}{\lambda}-\varepsilon\right)}_{(a)}\frac{dp_{it}}{d\tau_{it}} - \varepsilon\underbrace{\frac{p_{it}}{(1+\tau)}}_{(b)}\right]^{6} \qquad (3.4)$$

where $\Delta n_{it} = n_t - n_{t-1}$ is the growth in the housing stock from year *t-1* to year *t* in state *i*. The term θ is the price elasticity of supply for land for residential housing; η is the price elasticity of demand for land per unit of housing; λ is the share of land in housing; and ε is the price elasticity of demand for housing.[7] Then the impact of changes in the property tax rate on the number of households depends on the responsiveness of residential land development *(θ)* to changes in rent, the substitutability in capital and land in housing production, the price elasticity of demand for housing and, of course, the impact a change in the property tax rate has on the price of housing.

While the growth rate depends on the responsiveness of both the production of housing *(θ* and *η)* and demand *(ε)* to changes in the price of housing, of most interest to us is how factors that affect the price of housing, specifically tax and expenditure limits, will influence the growth in the housing stock. Note that the impact of a change in the property tax rate on the growth in the housing stock depends on the impact of the tax on the price of housing (term (a)) and the direct effect of the tax on the growth in housing (term (*b*)). Increases in the price of housing will increase housing growth by increasing residential development and housing density (term (a)). The direct

[6]A derivation of *(3.4)* is found in the appendix.

[7]Formally we have $\theta = \frac{\partial L}{\partial r}\frac{r}{L} \geq 0$; $\eta = \frac{\partial l}{\partial r}\frac{r}{l} \leq 0$; $\lambda = \frac{rl}{p}$; and $\varepsilon = \frac{\partial h}{\partial\left[p(1+\tau)\right]}\frac{p(1+\tau)}{h} \leq 0$.

impact of a tax increase is to increase housing growth by reducing housing per resident, thereby reducing land per household and increasing density (term (b)). Of course, if zoning restricts growth in development or variation in lot or house sizes then population growth will not be responsive to changes in housing prices or property taxes.

Thus the impact of a tax or expenditure limit has on housing growth is ambiguous. It depends on the degree to which changes in the property tax rate and other taxes or public services are capitalized into property values and the impact the limit has on the tax rates and the provision of public services. Reductions in property tax rates through limits, in the absence of resulting increases in other taxes and reductions in public services, should increase the supply of housing, that is, stimulate development. If, as a response, other taxes are increased and public services are decreased, the state becomes less attractive, reducing the demand for housing and reducing the growth in the housing stock.

4. Data and Empirical Methodology

4.1 Data

In this study, we use state-level data from 1980 to 2003. Data on housing, including building permits and the housing stock by state, are available from the U.S. Census Bureau on an annual basis.[8] Housing permits are categorized by the number of units per building. In our analysis, we focus on the growth in total housing units. These data are available from 1980 to 2003.

Other measures directly related to housing include the vacancy rates and average age of the housing stock. As the data on the age of housing are obtained from the decennial censuses we use the 1980 values for the years 1980 - 1985; the 1990 value for 1986-1995; and the 2000 value for 1996 to 2003. The vacancy rate is also available for 1980 and 1986 - 2003. Both of these variables are

[8]Data on housing permits are available at http://www.census.gov/const/www/permitsindex.html while data on the housing stock are available at http://www.census.gov/popest/housing/HU-EST2004.html for years 2000 to 2004 and at the Census archives for 1980 to 1998 (http://www.census.gov/popest/archives/1990s/).

treated as proxies for the rate of depreciation in the existing housing stock, a factor influencing the supply of housing. As one measure of the cost of housing we have the average annual mortgage interest rate for the U.S.[9] In addition, we have the state-level housing price index *(HPI)* constructed by the Office of Federal Housing Enterprise Oversight (OFHEO) using a modified version of the Case-Shiller geometric weighted repeat sales procedure (Case and Shiller, 1989).[10] Following Shadbegian (1999) and others, we include the homeownership rate in the state in some of our estimation as a measure of how "transparent" property taxes might be to the population of the state.

The Census of Governments provides detailed data on both state and local government expenditures and revenues aggregated to the state level for the period 1980 to 2003. From these data we constructed a measure of per capita state own-source revenue, per capita local property tax revenue, and per capita other local own-source revenue, all measures in 2003 dollars. We have measures of government services that include highway expenditures, spending on higher education, and primary and secondary education spending as well as the totals for state and local government spending. However, we separate state and local expenditures into primary and secondary educational spending (per student) and all other state and local spending per capita. This, we feel, is consistent with the focus of earlier work on how limits affected primary and secondary education.

The government policies in which we are most interested, property tax limits were the most difficult to obtain, particularly for recent years. Limitations imposed prior to 1992 are documented in a report of the Advisory Commission on Intergovernmental Relations (ACIR, 1995). Mullins and Cox (1995), Mikhailov (1998), and Moak et al. (2004) have some additional information on the timing and nature of limits. As discussed in *Section 2,* there are different forms of limits currently being used by states. We follow a number of studies including Preston and Ichniowski (1991), Joyce

[9]We use the rate on a 30-year fixed interest mortgage available at http://www.freddiemac.com/pmms/pmms30.htm.
[10] Data on the housing price indexes and an explanation of their construction are available at http://www.ofheo.gov/HPIOverview.asp.

and Mullins (1991), Shadbegian (1998) and Figlio (1997) and classify the limits as binding, potentially binding or not binding, depending upon the legislated rate, levy, and assessment restrictions. The combination of a rate and assessment limit is treated as being binding, while the existence of either an assessment or rate limit as only potentially binding. While our primary focis is on the impact of binding property tax limits, we also consider the separate impacts of limits on property tax revenue, rates, and assessments. See *Table 1* for details on these limits.

Demographic and economic measures, used sparingly in our estimation, include population and the population growth rate, measures of racial and ethnic composition of the population, per capita real income, employment and growth in employment, earnings, and the state unemployment rate. In addition, we also have a measure of property income as a fraction of total income in the state. The demographic variables are from the Census Bureau while the economic measures are from the Bureau of Economic Analysis or the Bureau of Labor Statistics.

4.2 Empirical Models of the Impacts of Tax and Expenditure Limits on Housing Markets

We are interested in the impact of tax and expenditure limits on both the price and growth of the housing stock. Following the literature on the impacts of state taxes on employment, we assume that the steady state growth in housing stock nor the equilibrium price of housing are not obtained instantaneously.[11] This being the case, we estimate equations of the form

$$P_{it} = (1-\delta)P_{it-1} + \delta\left(\beta_1 L_{it-1} + \beta_2 W_{it} + \beta_3 D_{it} + \beta_4 H_{it}\right) + \lambda^p + \gamma_{it}^P + \varepsilon_{it}^P \qquad (4.1a)$$

and

$$\Delta n_{it} = (1-\sigma)\Delta n_{it-1} + \sigma\left(\chi_1 P_{it-1} + \chi_2 L_{it-1} + \chi_3 W_{it} + \chi_4 D_{it} + \chi_5 H_{it}\right) + \lambda^n + \gamma_{it}^n + \varepsilon_{it}^n \qquad (4.1b)$$

where δ and σ are the costs of adjustment for the price and growth in the housing stock and lagged dependent variables are included in our estimating equations. Explanatory variables include measures of property tax, expenditure, and revenue limits denoted by *L*; *W* refers to variables measuring relevant economic factors in the state (unemployment rate, wages); *D* contains relative socio-demo-

[11]See, for example, Helms (1985), and Carroll and Wasylenko (1994), and Harden and Hoyt (2003).

graphic factors (population growth, growth in population under 19 and growth in population over 65); and *H* denotes characteristics of the housing market including the homeownership rate. Following Preston and Ichniowski (1991) we include a regional dummy variable rather than a state-fixed effect to reflect regional trends in housing markets.

Again following earlier studies (Rueben (1996), Figlio (1997), Shadbegian (1998)) in some of our estimation we treat the tax and spending limits as endogenous, requiring instruments for the limits. For instruments, we use categorical variables indicating whether the state had a limit the previous year, whether the state has voter-initiatives, the party affiliation of its governor and the political composition of its state legislature. In all equations, with or without the use of instruments, we use lagged values for the tax and spending limits, somewhat reducing endogeneity concerns. In addition, overidentification tests do not indicate endogeneity of our instruments.[12]

The use of lagged dependent variables in a panel will lead to inconsistent estimates of coefficients (Nickell, 1981; Hsiao, 1986). Hsiao (1986) shows that the bias associated with the use of a lagged dependent variable in a panel is on the order of 1/T, with T being the number of years in the panel. Hsiao (1986) also shows the closer the coefficient on the lagged dependent variable is to unity, the greater the bias. However, given the length of our panel (23 years), we believe that concerns about the endogeneity of the tax and expenditure limits are more pressing. For this reason we instrument for tax limits. In addition, following a substantial literature on employment and taxes, we use lagged values of our fiscal measures to reduce concerns regarding endogeneity. While we do not estimate *(4.1)* using an Arellano-Bond estimator (Arellano and Bond (1991)) in which we would take the first difference of *(4.1)* and instrument it using $P_{it-2} - P_{it-3}$ for *(4.1a)* and $\Delta n_{it-2} - \Delta n_{it-3}$ for *(4.1b),* we do a modification of this procedure in which we use P_{it-2} and Δn_{it-2} as an instrument for

[12]When we included per capita federal and state aid as instruments, overidentification tests failed, suggesting endogeneity of some of the instruments.

estimating *(4.1)*.[13]

4.2A. An Indirect Test of the Impact of Tax and Expenditure Limits on Housing Markets

Our second approach to estimating the impact of tax and expenditure limits on housing markets is to estimate their impacts indirectly – first by estimating the impacts of tax and expenditure limits on government services and revenues and then estimating how changes in these services and revenues affect the housing market. It seems reasonable that both our fiscal variables and housing market measures may be affected by common "shocks", meaning that their error terms are likely to be correlated. This being the case, we estimate a seemingly unrelated system of equations *(SUR)* that includes equations for estimating our fiscal measures and housing measures to exploit this possible correlation to increase efficiency as well as to provide a framework for testing nonlinear combinations of coefficients across these equations.

More formally, let the equations determining the state fiscal policies be given by

$$y_{it}^{j} = \alpha_{o}^{j} + \alpha_{1}^{j} L_{it-1} + \alpha_{2}^{j} W_{it} + \alpha_{3}^{j} D_{it} + \alpha_{4}^{j} H_{it} + \lambda_{j}^{j} + \gamma_{t}^{j} + \varepsilon_{it}^{j},\ j = T,\ E,\ O,\ R,\ S \qquad (4.2a)$$

where the superscript T refers to per capita property taxation; E is educational spending per student; O denotes local own-source revenues (taxes and charges) other than property taxes; R refers to per capita state own-source revenues; and S is all state and local services except primary and secondary education. Then this system the equations determining the price and growth of the housing stock can be expressed as

$$P_{it} = (1-\delta)P_{it-1} + \delta\left(\beta_1 G_{it} + \beta_2 W_{it} + \beta_3 D_{it} + \beta_4 H_{it}\right) + \lambda^{p} + \gamma_{it}^{P} + \varepsilon_{it}^{P} \qquad (4.2b)$$

and

$$\Delta n_{it} = (1-\sigma)\Delta n_{it-1} + \sigma\left(\chi_1 P_{it-1} + \chi_2 T_{it} + \chi_3 W_{it} + \chi_4 D_{it} + \chi_5 H_{it}\right) + \lambda^{n} + \gamma_{it}^{n} + \varepsilon_{it}^{n} \qquad (4.2c)$$

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[13]If we have an underlying model of $N_t = N_{t-1} + \beta \sum_{j=t_o}^{t} X_{ij} + \lambda_i + \gamma_t + \varepsilon_{it}$ then our IV estimation procedure of *(4.1)* using Δn_{it-2} as an instrument is essentially the Arellano-Bond estimator.

where G_{it} is a vector of our fiscal measures. Note that in the housing growth equation, the only fiscal measure we include is the property tax rate as the other measures should only affect housing growth through their impact on the price of housing.

Then by estimating this system we can test for the impacts of our limits on both the price and growth in the housing market by testing for the significance of the combined effects of the limits on the government services and revenues and the impacts of these services and revenues on the housing markets. By "indirectly" testing the impact of these tax and expenditure limits on housing markets, we get a better understanding of how and why they might influence or not influence housing markets. That is, we can examine the separate impact of reductions in taxes and expenditures that occur as a result of tax and expenditure limits on housing markets.

5. Results

Before examining the results of our estimation, it is useful to briefly inspect the summary statistics reported in *Table 2*. In addition to reporting the summary statistics for the entire sample, we also provide summary statistics for the sample of state-years in which there was any limit on property taxes and for the sample in which there were no property tax limits. Note that this split on the sample is based on the existence of any limit; in our estimation we divide the sample based on whether it is a *binding* limit. This will create a much more balanced division in the data. From *Table 2* we can see that per capita real state and local property tax revenues are almost twice as high in those state-years in which there is no property tax limit. Interestingly, state income taxes are also almost twice as high in these state-years and the state sales tax and other local taxes are higher as well. While this division is based on states with and without a property tax limit, it almost appears to be a split between "high" tax and "low" tax states. Not surprisingly, expenditures are higher in the states without limits. Somewhat surprisingly, states that do not impose limits also receive greater federal intergovernmental revenue and provide more state intergovernmental aid to their local governments.

The growth in housing stock, measured as a percentage, is higher in states without a limit, though the difference seems relatively small. The housing price index is growing faster in the states without limits as well.

5.1 The Determinants of Tax and Expenditure Limits

Our interest is not in the determinants of tax and expenditure limits but on their impacts on housing markets. However, because of concerns about the endogeneity of these limits, we employ instrumental variable techniques in some of our estimation. As mentioned, as instruments for these limits we use measures of the political climate, specifically the political party of the governor, and upper and lower chambers of the legislature. In addition, we also use a dummy variable indicating whether the state allows voter initiatives or not. Given the history of some tax limits as arising from "taxpayer revolt" and being the result of voter initiatives, as in the case of *Proposition 13,* we expect whether a state has voter initiatives to be important in determining whether the state has tax and expenditure limits. Measures of the political structure and climate in the state are likely to be correlated with laws limiting property tax rates and receipts, limits on educational spending, and general revenue limits. Such measures are good candidates for instruments since the political structure is not likely to be directly related to the process driving home construction or home prices.

In *Table 3* we report the results of *OLS* (linear probability) estimates of the impacts of these political measures as well as other economic and demographic variables on the probability that a state has these limits. This is essentially the first stage of our instrumental variable estimation. Columns (1) and (2) report the results for whether the state has a property tax limit; columns (3) and (4) report the results for whether the state has limits on educational spending; and columns (5) and (6) report them for whether the state has a limit on general revenue.

As can be seen in the table, voter initiatives have a significant impact on the likelihood of having a tax or expenditure limit, with initiatives making tax or revenue limits more likely and limits

on education spending less likely. The party of the governor only seems to matter in the determination of educational spending limits --having a democratic governor makes them less likely. A democratic upper house makes property tax less likely but educational spending limits more likely. When we include the demographic and economic variables, the party composition of the lower chamber only affects the likelihood of having a general revenue limit in the state.

In addition to reporting the coefficients from these first stage estimates, *Table 3* also reports partial correlation coefficients for each of our four instruments and the F-Statistic for the joint test of significance of the coefficients for the instruments. Not surprisingly, the partial correlation coefficients mirror the coefficients in sign and significance with only a few exceptions. As with the regression coefficients, the partial correlation coefficients for initiative with the measures of limits are all statistically significant.

The F-Statistics for the set of instruments are all significantly different from zero with each of the alternative measures of limits. Based on Bound et al. (1995), the magnitude of our F-Statistics, given the four instruments we use, suggests that the bias of our IV estimates relative to the OLS estimates should be quite small – on the order of three percent or less.[14]

5.2 The Impact of Tax and Expenditure Limits on Housing Markets

While we are interested in the impacts of tax and expenditure limits on the housing market through their impacts on state and local expenditures and revenues, we first focus on the direct impacts of limits on housing markets. To do this we estimate reduced form equations for both the price of housing and growth in the housing stock that include our measures of tax and expenditures limits as explanatory variables and exclude any measures of public expenditures and revenues from these equations while including our measures of the limits.

5.2.A The Impact of Tax and Expenditure Limits on the Price of Housing

[14]The relative bias for IV and OLS estimates can be found in Bound et al. (1995), Table A.1 (page 450).

Table 4 reports the results of our reduced form estimates for the price of housing *(HPI)*. As is apparent from the examination of both the OLS results (columns (1) – (3)) and the *IV* results (columns (4) – (5)) the coefficients on all three tax and expenditure limits are remarkably stable and all highly significant.

Our results suggest that a property tax limit increases *HPI* by 2.11 to 2.84 points, which with a mean of 162.0 for the *HPI*, is about a 1.6% increase. The impact of a limit on general revenue is somewhat greater, increasing the *HPI* by 3.43 points in the *OLS* estimate and 3.94 in the *IV* estimate, about a two percent increase. In contrast, the coefficients on the educational spending limit are negative and approximately equal to -3.24, a decrease in the *HPI* of about two percent. In column (3), we find that the property tax limit only has a significant impact on housing prices three or more years after it has been instituted.

As can be seen in *Table 4*, a number of other variables have statistically-significant impacts on *HPI* including the income per capita, the poverty rate, the homeownership rate, the mortgage interest rate, the unemployment rate, and the proportion of young people in the population.[15]

5.2.B The Impact of Limits on Housing Permits

As with the price of housing, we estimate reduced form equations for housing permits *(Permits)* with the tax and expenditures limits included as explanatory variables. The results of this estimation, both with OLS and IV, are reported in *Table 5*. In contrast to our results for *HPI*, neither a limit on property tax nor educational spending have any statistically significant impact on the number of housing permits applied for in a state. The point estimates for the coefficient on the property tax limit ranges from -0.064 to .1804. Then, as the mean number of permits per 1,000 is 13.66, the point estimate suggests a very small impact even if significant, on the order of a 1.4% increase in

[15]In the results reported in *Table 5* for the *HPI* and *Table 6* for permits we do not include any measures of population or population growth since growth in the housing stock and population growth are driven by similar underlying factors. However, when these variables are included in our estimation the results are quite similar with all coefficients of interest having the same sign and levels of significance.

permits based on the coefficient of .1804. However, general revenue limits are associated with a statistically-significant increase of .94 to 1.05 permits per 1,000 existing homes, an increase of about 7.3 percent.

As can be seen in *Table 5*, only a few other variables, the unemployment rate, the age of the housing stock, and the percentage of the population that is African-American, have statistically significant impacts on the growth in the housing stock.

5.2.C The Impact of Different Types of Property Tax Limits on Housing Markets

As discussed in *Section 2,* there are three distinct types of property tax limits: limits on revenues, limits on tax rates, and limits on assessments. In *Tables 4* and *5* we examined the impact of binding limits, limits on revenue or on both tax rates and assessments, on the price and growth in the housing stock. In *Table 6* we examine the distinct impact of each of the three types of property tax limits on housing markets. In the first four columns, we examine the impacts of the revenue, rate, and assessment limits on housing prices. The OLS and IV results with all three limits included in the regression, reported in columns (1) and (3), indicate a positive and significant impact of the revenue limit on *HPI*. In columns (2) and (4) we include the binding limit with the rate and assessment limits as explanatory variables. Inclusion of the revenue limit is not necessary as it is, by definition, binding. When including the binding limit, while it is positive and statistically significant, neither the rate nor the assessment limit are significant suggesting it is whether the limit is binding that does, in fact, matter.

Results for the impact of the three types of limits on housing permits are reported in columns (5) – (8). Given that we found that binding limits had no impact on the number of housing permits, it is not surprising that none of the three types of limits has any impact either.

5.3 The Indirect Impact of Tax and Expenditure Limits on Housing Markets

As discussed in *Section 3*, we expect tax and expenditure limits to affect the price of housing

through their impacts on taxes and government expenditures, particularly the property tax rate and the level of educational spending. Housing construction should be influenced indirectly through the impacts of limits on housing prices and more directly through the limit on the property tax rate as this will affect the gross price of housing and therefore construction.

In *Table 7* we report the results of regressions with our fiscal measures - local property taxes, primary and secondary educational spending, local own-source revenue less property taxes, state own-source revenue, and state and local expenditures other than education – as the dependent variables. All these fiscal measures, with the exception of primary and secondary educational spending, are per capita in 2003 dollars; primary and secondary education is in 2003 dollars per student. In addition to including the tax limits as explanatory variables, the regressions include income per capita, the poverty rate, population, population growth rate, homeownership rate, earnings per work, the unemployment rate, percent African-American, percent Hispanic, percent under the age of 19, percent over the age of 65, and regional and time dummies.

The results for local property taxes are reported in columns (1) – (4). Not surprisingly, the property tax limit has a negative and statistically significant impact on property taxes though when estimated with the IV, the coefficient is much smaller (-$155 to -$157) than when estimated with OLS (-$222 to -$241). The education limit has an even greater impact, reducing property taxes by $155 to $161 per capita. While the coefficient on the general revenue limit is negative and statistically significant in OLS, it is not statistically significant in the IV results.

As can be seen in columns (5) – (8) both the property tax and educational spending limits have large negative impacts on educational spending per student though the coefficients on the property tax limit are smaller for the IV results.

From inspection of the remainder of *Table 7*, we see that educational spending limits are associated with higher local revenues other than property taxes and lower state own-source revenue.

Property tax limits are associated with significant increases in state own-source revenue while limits on general revenue are associated with decreases in both state own-source revenue and state and local expenditures other than primary and secondary education.

In *Table 8* we report the results of three alternative specifications of a system of equations that includes equations for the *HPI* and *Permits*. Models (1) to (3) provide seemingly unrelated regression results *(SUR)* and models (4) to (6) provide the results of a *SUR* model in which we instrument for the tax and expenditure limits and the lagged *HPI*. Our first specification is a model that includes an equation for *Property Tax* and one for *HPI* that includes the property tax limit as an explanatory variable. Of course, the system also includes an equation for *Permits*. The second specification is similar to the first except that we include all three limits as independent variables in the equations for *Property Tax* and *HPI*. Our third specification includes equations for all of the fiscal measures and measures of all three limits in these equations but not in the equations for *HPI* and *Permits*.

In *Table 8* we report the coefficients on the limits and fiscal measures for *HPI* as well as the lagged value of *HPI*; for the *Permits* equation we report the coefficient on the lagged value of permits, *HPI*, and the property tax rate. We do not report the estimates for our fiscal measures as they are generally very similar to single equation estimates. Not surprisingly in the models in which the limits are included in the equation for *HPI* (models (1), (2), (4), and (5)) we find very similar results to those for the single equation model of *HPI*. Across all models, with and without the use of instrument variables, the coefficients on *Property Tax* in the *Permits* equation are statistically significant and negative. The same is true for the coefficient on *HPI* in the *Permits* equation. In the *HPI* equations that include the fiscal measures (models (3) and (6)) we find that the coefficient on *Property Tax* is negative and statistically significant while the coefficient on *Education* is positive and statistically significant. The coefficient on *State Revenue* is positive and significant while the coefficients on *Other*

Local Revenue and *Other Expenditures* are negative and generally significant.

Our primary reason for estimating these systems of equations was to test for the impact of tax and expenditure limits through their impacts on state and local expenditures and taxes. While the results of our reduced-form estimates for *HPI* and *Permits* suggest that limits affect housing prices but not construction, they do not give us an indication of why we have or do not have any effects from limits. Further, in the case of the impact on permits, is the statistical insignificance due to imprecision in measurement or because of counteracting impacts of the limits on property taxes and public services, particularly educational spending? By estimating a system of equations, we can get a better understanding of how tax and expenditure limits influence housing prices.

In *Table 9*, we present a detailed list of tests on nonlinear combinations of coefficients for each of our six specifications. The first row of the table reports the results of a test of significance of the product of the coefficient on the property tax limit from the property tax equation and the coefficient on the property tax in the permits equation. Our results generally suggest that the property tax limit, through its impacts on the property tax rate, increases the number of permits though the results are not always statistically significant. For our specifications in which *Property Tax* is included as an explanatory variable in the equation for *HPI* (columns (1)-(2), (5)-(6)) we also need to consider how the property tax limit, through its impacts on the *HPI*, affects *Permits*. This effect, reported in row (2), is negative and statistically significant in all four specifications. Then for these four cases, the total impact of property tax limits on permits is the sum of its impact through the property tax (row (1)) and through its impact on the *HPI* (row (2)). The sum of these two effects are reported in row (3). As can be seen there, this sum is very small and not statistically different from zero – the same result we find when we directly include the property tax limit in the reduced form equation for *Permits* reported in *Table 5*.

A similar test of the significance of the limit on educational spending is performed based on

the coefficient of the educational limit in the equations for *Property Tax* and *HPI*, and the coefficients for the *Property Tax* and *HPI* in the equation for *Permits*. As the education limit reduces both the property tax rate and the price of housing, it will increase permits both through its impact on the property tax (row (4)) and through its impact on the *HPI* (row (5)). As both impacts are positive, then the total impact (row (6)), is positive as well and statistically significant. This is in contrast to what we found when the limit was directly included in the permits equation where the impact was negative though statistically insignificant.

The last system we estimate includes equations for all the fiscal variables as well as for *HPI* and *Permits* and includes measures of all three limits (columns (3) and (6)). Again, the effect of the limits on *HPI* and *Permits* are through their impacts on government services and revenues. For the property tax limit, while we find a positive impact on permits through the property tax rate, the effect is not statistically significant (column (1)). Its impact on the price of housing is again positive, statistically significant and quite large, 1.35 to 1.43 points in the index for the *SUR* with and without *IV* (column (3), (6) of row (10)). This results in a statistically significant reduction in the number of permits (row (11)) and, combined, with the smaller positive impact of the property tax limit through the property tax, a positive but statistically-insignificant combined impact on *Permits* (row 12).

In contrast, we find a positive and statistically-significant total effect of the educational limits on *Permits* (row (16)) for both estimates of the model. The impact of educational limits on *Property Tax* leads to increases in the number of permits (row (13)). Educational limits also reduce the price of housing, with this effect being much larger and statistically significant for the *IV* estimates (column (6), row (14)). Then since the reduction in the price of housing increases the number of permits (row (15)), the combined effect of an educational limit is to increase the number of permits (row (16)).

Rows (17) – (20) summarize the results of our tests of the impacts of general revenue limits.

While the coefficients are of a much greater magnitude and statistical significance when we employ *IV* techniques, the net impact of the limits on permits is still insignificant.

6. Conclusions and Further Work

While the findings of this study are by no means conclusive and much work remains to be done, we believe that our results suggest more work is merited. Our work, like that of other researchers, suggests that both property tax and expenditures limits have had substantial impacts on property taxes, educational spending, and state spending. The effects of these limits should not be expected to end with their impacts on local budgets as these changes in taxes and services will presumably impact the behavior of households in the market. Specifically the substantial changes occurring in local taxes and services should have impacts in housing markets.

We consistently find, in both our direct and indirect tests, that property tax and general revenue limits increase housing prices *(HPI)* while limits on educational spending decrease them. This suggests, along the lines of Brueckner (1979, 1982), that tax and revenue limits increase efficiency in the public sector while limits on educational spending decrease it, though these conclusions are subject to these limits not affecting other prices, specifically earnings of workers. Further it is the reduction in property taxes as a result of these limits that increase housing prices while the decreases in educational spending act to reduce them. It is primarily the relative impact on property taxes and educational spending that explains how the three types of limits differ in their impact on housing prices.

While property tax limits appear to reduce the price of housing, there is mixed evidence on whether they have any impact on growth in the housing stock. This result, or perhaps more accurately, non-result, is not because property tax limits have no impacts on the growth in the housing stock. Instead, it is that it has two counteracting impacts – a reduction in the property tax rate and an increase in the net price of housing. This being the case, the impact of the limit on the gross

price of housing is ambiguous and the effect on growth in the housing stock is uncertain. The impacts of the expenditure and revenue limits on housing permits are more ambiguous. While we find no evidence of any impact of the educational limit in our reduced-form estimate for permits, we do find evidence of a positive impact from estimating our system of equations. The reverse is true for general revenue limits where we find a positive and significant impact in our reduced-form estimates but no impact when estimating a system of equations.

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Appendix: Derivation of (3.4)

The relationship between the price of housing and rent is given by

$$\frac{dp}{dr} = l \quad \text{or} \quad \frac{dr}{dp} = \frac{1}{l} \quad . \tag{A.1}$$

where *l* is land per unit of housing. For notational simplicity we derive a static-model version of *(3.4)* where rather than referring to ΔL and Δn we simply refer to *L and n.* We also omit the subscripts referring to state and year. Totally differentiating *(3.3)* with respect to τ gives

$$\frac{\partial L}{\partial r}\frac{dr}{dp}\frac{dp}{d\tau} = \frac{dn}{d\tau}lh + nh\frac{\partial l}{\partial r}\frac{dr}{dp}\frac{dp}{d\tau} + nl\frac{\partial h}{\partial\left[p(1+\tau)\right]}\left((1+\tau)\frac{dp}{d\tau} + p\right) \tag{A.2}$$

Then using the fact that $\frac{dr}{dp} = \frac{1}{l}$ from *(A.1)* we can rewrite *(A.2)* as

$$\left(\frac{\partial L}{\partial r}\frac{r}{L}\right)\left(\frac{L}{rl}\right)\frac{dp}{d\tau} = \frac{dn}{d\tau}lh + nh\left(\frac{\partial l}{\partial r}\frac{r}{l}\right)\frac{1}{r}\frac{dp}{d\tau} + nlh\left(\frac{\partial h}{\partial\left[p(1+\tau)\right]}\frac{p(1+\tau)}{h}\right)\left(\frac{1}{p}\frac{dp}{d\tau} + \frac{1}{(1+\tau)}\right) \tag{A.3}$$

Let $\theta = \frac{\partial L}{\partial r}\frac{r}{L} > 0,\ \eta = \frac{\partial l}{\partial r}\frac{r}{l} < 0,\ and\ \varepsilon = \frac{\partial h}{\partial\left[p(1+\tau)\right]}\frac{p(1+\tau)}{h} < 0$

Then we can express *(A.3)* as

$$\theta\left(\frac{L}{rl}\right)\frac{dp}{d\tau} = \frac{dn}{d\tau}lh + \eta\left(nh\frac{1}{r}\right)\frac{dp}{d\tau} + nlh\varepsilon\left(\frac{1}{p}\frac{dp}{d\tau} + \frac{1}{(1+\tau)}\right) \tag{A.3}$$

which can further be rewritten as

$$\theta\left(\frac{p}{rl}\right)L\frac{1}{p}\frac{dp}{d\tau} = \frac{1}{n}\frac{dn}{d\tau}nlh + \eta\left(nhl\frac{p}{rl}\right)\frac{1}{p}\frac{dp}{d\tau} + nlh\varepsilon\left(\frac{1}{p}\frac{dp}{d\tau} + \frac{1}{(1+\tau)}\right) \tag{A.4}$$

Then letting $\hat{x} = \frac{dx}{x}$ and using the fact that $L = nlh$ gives

$$\theta\left(\frac{p}{rl}\right)\hat{p}_\tau = \hat{n}_\tau + \eta\left(\frac{p}{rl}\right)\hat{p}_\tau + \varepsilon\left(\hat{p}_\tau + \frac{1}{(1+\tau)}\right) \tag{A.5}$$

Let $\lambda = \frac{rl}{p}$ then solving *(A.5)* for $\hat{n}_\tau$ gives

$$\hat{n}_\tau = \left(\frac{\theta - \eta}{\lambda} - \varepsilon \right) \hat{p}_\tau - \frac{\varepsilon}{(1+\tau)} \qquad (A.6)$$

or, to be consistent with *(3.3')* we can express as:

$$\frac{dn}{d\tau} = \frac{n}{p} \left[\left(\frac{\theta - \eta}{\lambda} - \varepsilon \right) dp - \frac{\varepsilon}{(1+\tau)} \right]. \qquad (A.6')$$

*Table 1: Property Tax Limits, by Year of Passage, Type, and Level of Government**

	Rate Restrictions				Revenue (Levy) Restrictions			Assessment Restrictions
State	Overall	School District	Municipal	County	Municipal, Revenue	School District, Revenue	County, Revenue	Overall
Alabama	1972, 1978							
Alaska		1972			1972			
Arizona	1980				1913, 1980	1913, 1980	1913, 1980	1980
Arkansas					1981	1981	1981	2001
California	1978, 1986							1978
Colorado		1992	1992	1992	1913, 1992	1992	1913, 1992	1982
Connecticut								
Delaware							1972	
DC								
Florida			1922, 1968, 1973	1968				1995
Georgia			1945	1800s, 1981				
Hawaii								
Idaho	1978	1967	1963	1913	1979, 1992**	1979, 1992**	1979, 1992**	
Illinois		1961	1961	1939	1991	1991	1991	
Indiana					1973, 1977, 1980	1973, 1977, 1980	1973, 1977, 1980	
Iowa		1972, 1974	1989	1983				1978, 1980
Kansas		1933, 1989	1933, 1989	1933, 1989	1970, 1989		1970, 1989	
Kentucky		1908	1908	1908	1979	1979	1979	
Louisiana		1974	1974	1974	1978	1978	1978	
Maine								
Maryland								1957, 1991
Massachusetts		1980, 1991			1980, 1983			
Michigan	1933	1949			1978	1978	1978	1994
Minnesota		1992						1993

*Limits are missing from this table where the level of government is unclear.
**Reflects a change in the tax limits imposed earlier.

Table 1 (continued)

	Rate Restrictions				Revenue (Levy) Restrictions			Assessment Restrictions
State	Overall	Municipal	School District	County	Municipal	School District	County	Overall
Mississippi					1980	1983, 1990	1980	
Missouri		1875	1875	1875	1980	1980	1980	
Montana		1965	1971	1931, 1987	1987		1987	
Nebraska		1957	1921	1920	1987	1997	1987	
Nevada	1936, 1979	1929	1956		1983, 1987		1983, 1987	
New Hampshire								
New Jersey							1980	
New Mexico	1914	1973, 1987	1973, 1987	1973, 1987	1979	1979	1979	1979, 2001
New York		1953	1953	1953				1981, 1986
North Carolina		1973		1973				
North Dakota		1929	1929	1929	1981		1981	
Ohio	1929, 1934, 1953				1976	1976	1976	
Oklahoma	1933							1996
Oregon	1991		1991		1916	1916	1916	1997
Pennsylvania		1959	1959	1959				
Rhode Island					1985			
South Carolina								
South Dakota		1915	1915	1915				
Tennessee								
Texas		1876	1883	1876	1982	1982	1982	1997
Utah		1929	1929, 1988	1961	1969, 1986**	1969, 1986**	1969, 1986**	
Vermont								
Virginia								
Washington	1944, 1972, 1973	1973		1973	1971, 1979	1971, 1979	1971, 1979	1997, 2000
West Virginia	1939	1939	1939	1939	1990	1990	1990	
Wisconsin				1993				
Wyoming		1890	1911	1890				

*Limits are missing from this table where the level of government is unclear.

**Reflects a change in the tax limits imposed earlier.

Table 2: Summary Statistics

	Entire Sample		Without Property Tax Limit		With Property Tax Limit	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Housing Permits per 1000 Existing Houses	13.7	08.6	12.8	6.7	13.9	09.1
House Price Index (nominal)	162.0	66.8	172.2	73.1	158.9	64.6
House Price Index Growth	5.2%	5.3%	6.2%	6.3%	4.9%	4.9%
State Property Tax*	40.0	84.0	17.4	51.2	46.4	90.2
Local Property Tax*	960.0	1,195.0	1,565.2	2,273.8	785.6	467.0
State & Local Property Tax*	999.6	1,203.0	1,579.9	2,287.1	832.4	486.4
State Total Income Tax*	782.4	1,295.6	1,233.3	2,518.8	654.2	531.7
State Total General Sales Tax*	590.3	549.0	767.7	976.8	539.9	324.2
State Total Sales & Gross Receipts Tax*	932.1	926.7	1,290.9	1,772.5	830.1	406.4
State Total Select Sales Tax*	341.8	415.6	523.2	827.7	290.2	125.0
State Total License Taxes*	139.1	151.6	150.1	228.6	135.9	121.1
State Other Taxes*	1,994.3	2,351.2	2,746.4	4,609.4	1,780.5	932.3
Local Other Taxes*	327.7	679.0	671.3	1,340.5	228.7	183.6
State Total Intergovernmental Revenue*	987.9	922.7	1,190.8	1,759.2	930.2	448.2
Local Total Intergovernmental Revenue*	1,242.8	1,352.0	1,674.5	2,587.9	1,118.4	601.1
State Total Federal Intergovernmental Revenue*	948.1	878.5	1,142.4	1,680.2	892.8	420.6
Local Total Federal Intergovernmental Revenue*	215.7	549.3	512.2	1,107.5	130.2	59.7
Local Total State Intergovernmental Revenue*	1,027.1	1,177.8	1,162.3	2,248.9	988.2	572.2
State & Local Total Highway Expenditures*	496.1	591.8	648.5	1,151.0	452.2	248.9
State Total Highway Expenditures*	387.1	525.2	521.9	1,041.0	348.8	200.9
Local Total Highway Expenditures*	170.9	152.3	183.8	239.5	167.2	115.5
State Total Higher Education Expenditures*	523.9	671.9	777.5	1,406.5	458.2	190.9
State & Local Educational Expenditures, per student	8,167.9	9,788.9	12,234.1	19,608.9	7,023.7	2,999.5
1 if a property tax limit in effect the previous year	77.4%	41.9%				
Houses 40 years old or older	28.9%	12.8%	32.8%	13.2%	27.8%	12.4%
Homeownership Rate	66.7	6.7	64.8	10.0	67.2	5.3
Vacancy Rate	1.7	0.6	1.6	0.7	1.7	0.6
Population	4,948,082	5,439,537	3,204,798	2,593,535	5,475,850	5,943,327
Population Growth	1.10%	1.67%	0.94%	2.13%	1.15%	1.51%
Employment	2,697,332	2,945,043	1,805,434	1,381,843	2,967,348	3,226,560
Employment Growth	1.9%	2.0%	1.8%	1.9%	1.9%	2.0%
Annual Wage*	31769.3	5294.6	32984.5	6935.7	31401.5	4627.4
Annual Wage Growth	0.3%	1.8%	0.6%	1.9%	0.2%	1.8%
Income*	25,939.7	5,004.0	27,407.1	6,343.1	25,495.5	4,429.8
Per Capita Income Growth	1.4%	2.5%	1.6%	2.4%	1.3%	2.6%
Unemployment Rate	6.0	2.0	5.9	2.1	6.0	2.0
Percent African American	10.6%	11.9%	14.1%	18.1%	9.6%	9.2%
Percent White	79.2%	15.5%	75.5%	23.8%	80.3%	12.0%
Total Observations with a Property Tax Limit:	953					
Total Observations without a Property Tax Limit:	271					
* per capita in 2003 dollars						

Table 3: The Determinants of Tax and Expenditure Limits

Dependent Variable	Limit, Property Tax		Limit, Educational Spending		Limit, General Revenue	
	(1)	(2)	(3)	(4)	(5)	(6)
Initiative	0.175***	0.206***	-0.205***	-0.236***	0.187***	0.209***
	(5.39)	(6.57)	(-6.40)	(-7.39)	(8.53)	(9.48)
Democratic Governor	-0.019	0.028	-0.090***	-0.079***	0.038**	0.012
	(-0.70)	(1.06)	(-3.27)	(-2.98)	(2.00)	(0.64)
Democratic Lower House	0.792***	0.079	-0.220	-0.156	0.264***	0.179*
	(5.69)	(0.56)	(-1.61)	(-1.08)	(2.82)	(1.80)
Democratic Upper House	-0.655***	-0.337**	0.471***	0.343**	0.165*	0.272***
	(-4.68)	(-2.53)	(3.41)	(2.53)	(1.75)	(2.91)
Income per Capita ($2003)	0.423***	0.482***		0.000***		-0.000
	(9.93)	(11.2)		(3.38)		(-0.48)
Poverty	0.177***	0.111**		0.011*		-0.007*
	(4.50)	(2.06)		(1.89)		(-1.82)
Population (1000's)	0.371***	0.105*		0.000*		-0.000**
	(8.25)	(1.91)		(1.87)		(-2.50)
Population Growth (%)		-0.000***		0.018*		0.037***
		(-10.5)		(1.71)		(4.94)
Homeownership Rate (%)		-0.010*		-0.015***		0.007***
		(-1.90)		(-4.70)		(2.95)
Earnings per Worker ($2003)		-0.000***		-0.000		0.000***
		(-6.23)		(-0.88)		(2.78)
Unemployment Rate (%)		-0.011		-0.004		0.003
		(-1.07)		(-0.39)		(0.43)
African-American (%)		-0.030***		-0.017***		0.002
		(-9.35)		(-7.12)		(1.27)
Hispanic (%)		0.000***		-0.006**		0.004***
		(9.36)		(-2.24)		(2.62)
Age > 65 (%)		0.009		0.059***		-0.039***
		(0.78)		(5.20)		(-4.96)
Age < 19 (%)		0.003		0.014		-0.020**
		(1.49)		(1.10)		(-2.33)
Midwest		0.019***	0.074*	0.149***	0.203***	0.290***
		(8.05)	(1.75)	(3.42)	(7.02)	(9.63)
South		-0.025**	-0.076*	0.255***	-0.089***	-0.051
		(-2.19)	(-1.96)	(4.68)	(-3.31)	(-1.35)
West		0.032***	0.564***	0.476***	-0.069**	-0.041
		(2.59)	(12.7)	(8.50)	(-2.26)	(-1.05)
Partial Correlation Coefficients						
Initiative	.1455***	0.1912***	-0.1969***	-0.2037***	0.2319***	0.2639***
Democratic Governor	-0.0465	0.0150	-0.1173***	-0.1080***	0.026	0.0347
Democratic Lower House	0.1579***	0.0461	-0.052*	-0.044	0.0736**	0.0598**
Democratic Upper House	-0.1518***	-0.1106***	0.0873***	0.0854***	0.0334	0.0842***
F-Test of Instruments	15.26***	15.81***	17.90***	18.85***	26.88***	29.18***
Observations	1176	1127	1127	1127	1127	1127
R-squared	0.20	0.37	0.22	0.32	0.20	0.29
Robust t statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1						

Table 4: The Impact of Limits on the Housing Price Index (HPI)

Dependent Variable	Housing Price Index (*HPI*)				
	(1)	(2)	(3)	(4)	(5)
	OLS			IV	
HPI_{t-1}	0.97347*** (81.2)	0.96558*** (82.4)	0.97480*** (80.9)	0.96932*** (78.0)	0.95967*** (79.2)
Limit, Property Tax_{t-1}	2.84295*** (3.57)	2.71412*** (3.47)		2.46190*** (2.90)	2.11414** (2.54)
Limit, Educational $Spending_{t-1}$		-3.23762*** (-4.39)			-3.22175*** (-4.21)
Limit, General $Revenue_{t-1}$		3.43348*** (3.34)			3.94151*** (3.69)
Limit enacted in past 2 years			-1.62787 (-0.71)		
Limit enacted 3-5 years'			3.34837*** (2.63)		
Limit enacted 6 or more years			1.14904 (1.62)		
Income per Capita ($2003)	0.00088*** (3.70)	0.00103*** (4.32)	0.00074*** (3.06)	0.00096*** (3.83)	0.00106*** (4.20)
Poverty Rate	0.67282*** (5.12)	0.72146*** (5.54)	0.64807*** (4.86)	0.72431*** (5.12)	0.76334*** (5.47)
Housing older than 40 years (%)	0.11599 (1.48)	0.04758 (0.62)	0.06669 (0.83)	-0.03971 (-0.46)	-0.12804 (-1.50)
Homeownership Rate (%)	0.13145*** (2.72)	0.15107*** (2.89)	0.13100*** (2.73)	0.22856*** (4.15)	0.26538*** (4.42)
Mortgage Interest Rate	3.50715*** (3.55)	4.17529*** (4.20)	3.44803*** (3.44)	4.46049*** (4.16)	5.15065*** (4.76)
Earnings per Worker ($2003)	0.00021 (1.02)	0.00013 (0.63)	0.00029 (1.41)	0.00003 (0.15)	-0.00002 (-0.079)
Unemployment Rate (%)	-3.13617*** (-8.37)	-3.18077*** (-8.60)	-3.12035*** (-8.53)	-3.44616*** (-8.37)	-3.49310*** (-8.57)
African-American (%)	0.06477 (1.36)	0.01233 (0.25)	0.03284 (0.68)	0.16323*** (3.11)	0.12411** (2.31)
Hispanic (%)	-0.09601 (-1.61)	-0.09032 (-1.54)	-0.07133 (-1.18)	-0.09408* (-1.69)	-0.08808 (-1.61)
Age < 19 (%)	1.54605*** (5.92)	1.79738*** (6.69)	1.53453*** (5.77)	1.46633*** (5.29)	1.71532*** (6.02)
Age > 65 (%)	0.40678 (1.48)	0.41747 (1.57)	0.47520* (1.72)	0.29147 (1.06)	0.30425 (1.15)
Observations	1173	1173	1173	1078	1078
R-squared	0.97	0.97	0.97	0.97	0.97
Robust t statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1					

Table 5: The Impact of Limits on the Housing Permits

Dependent Variable	Housing Permits per 1000 Existing Homes				
	(1)	(2)	(3)	(4)	(5)
	OLS			IV	
$Permits_{t-1}$	0.86983***	0.86219***	0.86952***	0.86671***	0.86286***
	(31.7)	(30.7)	(31.7)	(31.6)	(30.4)
Limit, Property Tax_{t-1}	0.18045	0.10209		0.06588	-0.06420
	(0.97)	(0.53)		(0.32)	(-0.29)
Limit, Educational $Spending_{t-1}$		-0.16265			-0.16195
		(-0.78)			(-0.70)
Limit, General $Revenue_{t-1}$		0.93614**			1.05288**
		(2.10)			(2.16)
Limit enacted in past 2 years			0.93976		
			(1.30)		
Limit enacted 3-5 years'			0.09219		
			(0.18)		
Limit enacted 6 or more years			0.11373		
			(0.66)		
Income per Capita ($2003)	0.00003	0.00004	0.00003	0.00001	0.00004
	(0.42)	(0.60)	(0.41)	(0.18)	(0.61)
Poverty Rate	-0.02167	-0.02074	-0.02017	-0.03469	-0.02769
	(-0.46)	(-0.43)	(-0.42)	(-0.69)	(-0.49)
Homeownership Rate (%)	0.01199	0.00573	0.01229	0.00321	-0.00812
	(0.51)	(0.24)	(0.51)	(0.12)	(-0.30)
Housing older than 40 years (%)	-0.05778***	-0.05218***	-0.05742***	-0.06466***	-0.05217**
	(-3.06)	(-2.62)	(-3.01)	(-3.11)	(-2.48)
Mortgage Interest Rate	0.15840	0.26410	0.14055	0.36564	0.73564*
	(0.47)	(0.80)	(0.41)	(1.05)	(1.96)
Earnings per Worker ($2003)	0.00001	-0.00001	0.00001	0.00001	-0.00005
	(0.070)	(-0.14)	(0.086)	(0.077)	(-0.49)
Unemployment Rate (%)	-0.39067***	-0.40109***	-0.38461***	-0.40664***	-0.43123***
	(-4.34)	(-4.47)	(-4.27)	(-4.32)	(-4.33)
African-American (%)	0.03117*	0.02882	0.03035*	0.03609*	0.04056*
	(1.69)	(1.47)	(1.65)	(1.79)	(1.76)
Hispanic (%)	0.01528	0.01906	0.01624	0.01702	0.02459
	(0.57)	(0.68)	(0.61)	(0.62)	(0.84)
Age < 19 (%)	0.13705	0.17237**	0.13350	0.19677**	0.21032**
	(1.61)	(2.07)	(1.55)	(2.22)	(2.39)
Age > 65 (%)	0.07857	0.08201	0.07642	0.12777	0.10561
	(0.75)	(0.78)	(0.72)	(1.18)	(0.99)
Observations	1173	1173	1173	1127	1078
R-squared	0.89	0.89	0.89	0.89	0.89
Robust t statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1					

Table 6: The Impacts of Alternative Types of Property Tax Limits on Housing Markets

Dependent Variable	Housing Price Index (HPI)			
	(1)	(2)	(3)	(4)
	OLS		IV	
HPI_{t-1}	0.973296***	0.968092***	0.968886***	0.967954***
	(79.9)	(77.9)	(76.2)	(76.5)
Binding $Limit_{t-1}$		2.8659***		2.502677***
		(3.61)		(3.09)
Rate $Limit_{t-1}$	0.06283	-0.31204	0.043810	-0.258432
	(0.084)	(-0.44)	(0.057)	(-0.35)
Revenue $Limit_{t-1}$	2.0398***		1.827733**	
	(2.66)		(2.32)	
Assessment $Limit_{t-1}$	1.3750	0.09875	0.484981	-0.590408
	(1.59)	(0.11)	(0.56)	(-0.65)
Observations	1173	1127	1127	1127
R-squared	0.97	0.97	0.97	0.97
Dependent Variable	Housing Permits per 1,000 Existing Homes			
	(5)	(6)	(7)	(8)
	OLS		IV	
$Permits_{t-1}$	0.86845708***	0.86889447***	0.86505087***	0.88669522***
	(31.7)	(31.6)	(31.5)	(28.6)
Binding $Limit_{t-1}$		0.17290642		0.20351096
		(0.90)		(1.01)
Rate $Limit_{t-1}$	0.1724	0.15095921	0.00000000	0.00000000
	(0.86)	(0.76)	()	()
Revenue $Limit_{t-1}$	0.05624		0.06404407	
	(0.32)		(0.35)	
Assessment $Limit_{t-1}$	-0.01166	-0.07138845	0.00000000	0.00000000
	(-0.04)	(-0.27)	()	()
Observations	1173	1173	1127	1127
R-squared	0.89	0.89	0.89	0.89

Robust t statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1
All regressions include income per capita, the poverty rate, population, population growth rate, homeownership rate, earnings per work, the unemployment rate, percent African-American, percent Hispanic, percent under the age of 19, percent over the age of 65, and regional and time dummies.

*Table 7: A Summary of the Impact of Tax and Expenditure Limits on State and Local Government Expenditures and Revenue**

	Local Property Taxes				Primary and Secondary Educational Spending			
	OLS		IV		OLS		IV	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Limit Property Tax_{t-1}	-240.501*** (-4.06)	-221.921*** (-3.85)	-157.325*** (-2.79)	-154.931*** (-2.64)	-1,297.408*** (-2.60)	-1,176.722** (-2.42)	-839.000* (-1.82)	-819.174* (-1.80)
Limit, Educational $Spending_{t-1}$		-154.646*** (-3.18)		-161.333*** (-3.16)		-1,739.457*** (-4.30)		-1,844.349*** (-4.33)
Limit, General $Revenue_{t-1}$		-139.180** (-2.45)		-86.526 (-1.43)		-519.202 (-1.19)		-281.252 (-0.60)
Observations	1071	1071	1029	980	1020	1020	980	980
R-squared	0.29	0.29	0.31	0.31	0.22	0.22	0.23	0.24
	Local Own Revenue Less Property Taxes				State Own Revenue			
	OLS		IV		OLS		IV	
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Limit Property Tax_{t-1}	-41.185 (-0.59)	-39.981 (-0.58)	73.654 (1.15)	79.148 (1.19)	592.582*** (6.39)	660.690*** (6.65)	263.569*** (3.29)	366.692*** (4.38)
Limit, Educational $Spending_{t-1}$		211.700*** (3.85)		230.042*** (3.99)		-273.642** (-2.53)		-300.307*** (-2.84)
Limit, General $Revenue_{t-1}$		-99.240* (-1.77)		42.792 (0.76)		-598.239*** (-4.46)		-773.721*** (-5.28)
Observations	1071	1071	1029	980	1173	1173	1127	1078
R-squared	0.50	0.50	0.38	0.39	0.47	0.47	0.51	0.53
	State & Local Expenditures Less Education							
	OLS		IV					
	(17)	(18)	(19)	(20)				
Limit Property Tax_{t-1}	28.835 (0.55)	72.931 (1.36)	121.177** (2.27)	173.040*** (3.05)				
Limit, Educational $Spending_{t-1}$		-48.632 (-1.03)		-53.098 (-1.03)				
Limit, General $Revenue_{t-1}$		-459.875*** (-5.11)		-385.497*** (-4.23)				
Observations	1071	1071	1029	980				
R-squared	0.74	0.75	0.68	0.68				
Robust t statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1								

*The dependent variables are real (2003) dollars per capita with the exception of primary and secondary education which is per student. All regressions include income per capita, the poverty rate, population, population growth rate, homeownership rate, earnings per work, the unemployment rate, percent African-American, percent Hispanic, percent under the age of 19, percent over the age of 65, and regional and time dummies.

Table 8: The Impacts of Limits on Housing Prices and Permits using Seemingly Unrelated Regressions (SUR)

SUR Results						
	(1)		(2)		(3)	
Dependent Variable	*HPI*	Permits	*HPI*	Permits	*HPI*	Permits
HPI_{t-1}	0.96204***	-0.01215***	.95561***	-.01211***	0.9351***	-0.009786***
	(106.51)	(-4.41)	(106.06)	(-4.39)	(99.66)	(-3.48)
$Permits_{t-1}$		0.8212***		.8216***		0.8162***
		(50.73)		(50.64)		(49.24)
Limit, Property Tax_{t-1}	2.1409***		2.0331***			
	(3.11)		(2.95)			
Limit, $Education_{t-1}$			-2.556***			
			(-3.53)			
Limit, General $Revenues_{t-1}$			1.647			
			(1.53)			
Property Tax_{t-1}		-0.0002158***		-.00021**	-0.00971***	-0.000233**
		(-2.59)		(2.49)	(-6.62)	(-3.48)
$Education_{t-1}$					0.000922***	
					(5.55)	
State $Revenue_{t-1}$					0.001158**	
					(2.88)	
Other Local $Revenue_{t-1}$					-0.001449*	
					(-1.80)	
Other $Expenditures_{t-1}$					-0.00265***	
					(-3.46)	
"R-Squared"	0.9662	0.8916	.9667	.8916	0.9700	0.8927
SUR with IV						
	(4)		(5)		(6)	
	HPI	Permits	*HPI*	Permits	*HPI*	Permits
HPI_{t-1}	.9585***	-.01052***	.9532***	-.01054***	.9350***	-.00978***
	(105.82)	(-3.74)	(105.28)	(-3.74)	(99.65)	(-3.48)
$Permits_{t-1}$		.8254***		.8261***		.8161***
		(49.86)		(49.80)		(49.24)
Limit, Property Tax_{t-1}	2.192***		1.816**			
	(3.01)		(2.58)			
Limit, $Education_{t-1}$			-2.484***			
			(-3.36)			
Limit, General $Revenues_{t-1}$			2.2067**			
			(2.03)			
Property Tax_{t-1}		-.0002351**		-.000234**	-.009688***	-.0002337**
		(-2.77)		(-2.75)	(6.61)	(-2.71)
$Education_{t-1}$					.0009171***	
					(5.52)	
State $Revenue_{t-1}$					.00116***	
					(2.89)	
Other Local $Revenue_{t-1}$					-.00147***	
					(-1.83)	
Other $Expenditures_{t-1}$					-.002646***	
					(-3.45)	
"R-Squared"	.9683	.8928	.9688	.8928	.9700	.8927
Limits included	Property Tax		All		All	
Equations included	Property Tax		Property Tax		All	
Robust t statistics in parentheses *** p<0.01, ** p<0.05, * p<0.1						

*All regressions include income per capita, the poverty rate, population, population growth rate, homeownership rate, earnings per work, the unemployment rate, percent African-American, percent Hispanic, percent under the age of 19, percent over the age of 65, and regional and time dummies.

Table 9: Tests of the Impacts of Tax and Expenditure Limits on Housing Prices and Growth

	Limit		SUR			SUR with IV		
			(1)	(2)	(3)	(4)	(5)	(6)
1	Property Tax	On Permits through Property Tax	0.03873* (1.77)	.0336 (1.63)	0.0460* (1.85)	.05447* (1.99)	.04566* (1.85)	1.0851 (1.11)
2		On Permits through *HPI*	-0.2600** (-2.55)	-.02463** (-2.45)		-.02341** (-2.49)	-.01915** (-2.13)	
3		On Permits through Property Tax and *HPI*	0.01273 (0.55)	.00899 (0.41)		.0314 (1.13)	.0265 (1.05)	
4	Education	On Permits through Property Tax		.04787* (1.92)			.0424* (1.76)	
5		On Permits through *HPI*		.03107** (2.76)			.02618** (2.51)	
6		On Permits through Property Tax and *HPI*		.07884** (2.86)			.0686** (2.60)	
7	Revenue	On Permits through Property Tax		.01649 (0.69)			.0286 (0.99)	
8		On Permits through *HPI*		-.01996 (-1.44)			-.02325* (-1.78)	
9		On Permits through Property Tax and *HPI*		-.00346 (-0.13)			.005341 (0.18)	
10	Property Tax	On *HPI* through all Government Services/Taxes			1.352*** (4.62)			1.433*** (3.53)
11		On Permits through Government Services via *HPI*			-.01389** (-2.86)			-.0140** (-2.49)
12		On Permits through Property Tax and *HPI*			.03215 (1.33)			.0121 (0.49)
13	Education	On Permits through Property Tax			.05699** (2.05)			.3476** (2.46)
14		On *HPI* through all Government Services/Taxes			-.1496 (-0.62)			-3.8915*** (-3.69)
15		On Permits through Government Services via *HPI*			.001539 (0.54)			.0381** (2.56)
16		On Permits through Property Tax and *HPI*			.05854** (2.15)			.3856** (2.71)
17	Revenue	On Permits through Property Tax			.01946 (0.68)			.2458* (2.01)
18		On *HPI* through Government Services/Taxes			.6008 (1.63)			5.829*** (3.27)
19		On Permits through Government Services via *HPI*			-.006181 (-1.49)			-.05704** (-2.37)
20		On Permits through Property Tax and *HPI*			.0133 (0.49)			.1887 (1.57)

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