Housing Supply Elasticity and Rent Extraction by
State and Local Governments

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Abstract

It is possible government workers can extract rent from private sector workers by charging high tax rates and paying themselves high wages. Using a spatial equilibrium model where private sector workers are free to migrate across government jurisdictions, I show that private sector workers’ migration elasticity with respect to local taxes determines the magnitude of rent extraction by rent seeking state and local governments. Since private sector workers “vote with their feet” by migrating out of rent extractive areas, governments trade off the benefits a higher tax rate with the cost of a smaller population to tax. Variation in areas’ housing supply elasticities differentially restrains governments’ abilities to extract rent from private sector workers. The incidence of a tax increase falls more on local housing prices in a less housing elastic area, leading to less out-migration. Thus, governments in less housing elastic areas can charge higher taxes without worry of shrinking their tax bases. I test the model’s predictions by using worker wage data from the CPS-MORG. I find the public-private sector wage gap is higher in areas with less elastic housing supplies. This fact holds both within state across metropolitan areas for local government workers and between states for state government workers.

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1 Introduction

Can government workers extract rent from private sector workers by charging high tax rates and paying themselves high wages? The determinants and justification of government workers’ compensation levels has taken on considerable heat in the past few years, as many states and localities face budgetary stress. Since state and local governments set taxes and government employee wages, government employees could earn rents by charging high taxes and receiving high wages. There has long been debate over whether the government acts as a benevolent social planner for its citizens or uses its market power to benefit its workers and political interest groups. (See Gregory and Borland (1999) for a review of this literature.)

In particular, the high unionization rate in the public sector may allow union bargaining to influence the political process and the decisions of elected officials (Freeman (1986)). In this paper, I analyze whether government workers receive higher wages than similar private sector workers in areas where state and local governments have stronger abilities to exercise market power.

This paper develops a model where state and local governments set taxes and the level of government services to maximize government "profits", which can then be paid to employees as excessive wages. I use a Rosen (1979) Roback (1982) spatial equilibrium model where workers maximize their utility by living in the city which offers them the most utility based on the city’s wage, rental rate of housing, tax rate, government services, and other amenities. Thus, governments must compete for residents to tax, and workers can "vote with their feet" by migrating away from excessively rent extractive governments.

I show that if state and local governments are using their market power to over pay their employees, their abilities to extract rents from their citizens is determined by the equilibrium migration elasticity of private sector residents with respect to local tax rates. Governments must trade off the benefits of a higher tax with the cost that a higher tax will cause workers to migrate away, leaving the government with a smaller population to tax. This is analogous to the standard result found in analysis of imperfect competition between product producers.
where a firm’s optimal price markup over cost is equal to the inverse elasticity of consumer demand with respect to price for the firm’s product.

Unlike firm competition for consumer demand, I show that a government’s market power to charge wasteful taxes remains even when there are a large number of governments competing for residents and every government is small. The spatial equilibrium model shows that when a government raises taxes, workers will migrate away to other jurisdictions. However, this out-migration decreases the level of labor supply and housing demand in the area. Assuming labor demand curves slope down and housing supply curves slope up, this decrease in population raises wages and decreases housing rents. Thus, some of the disutility of a tax increase will be offset by an increase in the desirability of local wages and rents, which limits the amount of out-migration caused by the tax increase. Since the local housing and labor markets will respond to government imposed taxes through migration, the government will always have market power.

An area’s elasticity of housing supply will determine how local housing rents respond to population changes in an area. Governments presiding over areas with inelastic housing supplies will have more market power than governments in housing elastic areas. A tax hike by a government in an area with inelastic housing supply leads to a small amount of out-migration because housing prices sharply fall due to the decrease in housing demand driven by the tax hike. The housing cost decline offsets the negative utility impact of a tax increase with a only small amount of out-migration in the housing inelastic area. Thus, governments in housing inelastic areas can charge higher taxes without shrinking their tax base since housing price changes limit the migration response.

If state and local governments exercise more market power in areas with inelastic housing supplies, the wage gap between public and private sectors workers should be larger in these areas. I test the model’s prediction by measuring variation in public-private sector wage gaps across areas with different housing supply elasticities. I measure workers’ wages using

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1 This result is closely related to Epple and Zelenitz (1981), which shows that worker migration between government jurisdictions is not enough to entirely compete away a government’s market power.
data from the 1995-2011 Current Population Survey Merged Outgoing Rotation Groups (CPS-MORG). I proxy for a metropolitan areas’s housing supply elasticity using data from Saiz (2010) on the share of land within 50km of a city’s center unavailable for real-estate development due to geographic constraints, such as the presence of swamps, steep grades, or bodies of water. With less available land around to build on, the city must expand farther away from the central business area to accommodate a given amount of population, driving up average housing costs.\textsuperscript{2} I also use the Wharton Land Use Regulation Index from Gyourko, Saiz, and Summers (2008) as component of housing supply elasticity. Since the decision to regulate real-estate development is endogenous and possibly correlated with unobserved characteristics which could impact government workers wages, I focus on the Saiz (2010) measure of geographic constraints on real-estate development as an exogenous source of variation in housing supply elasticity. These data are the metropolitan area level. To measure states’ housing supply elasticities I use an average of these measures across each state’s MSAs, weighted by the MSAs’ populations.

I find that the public-private sector wage gap is higher in states and metropolitan areas with less elastic housing supplies. This result holds when analyzing variation in state government-private sector wage gaps across states and in local government-private sector wage gaps across MSAs. This finding is robust to including a host of controls for workers’ demographics and characteristics, including dummies for three digit occupation codes. Additionally, the local government-private sector wage gap is found to be higher in housing inelastic MSAs, even when only comparing MSAs within the same state.

As falsification tests, I show that housing supply elasticity has no impact on the federal government worker-private sector wage gap. Since federal workers’ compensation is not

\footnotesize\textsuperscript{2}A full micro-foundation of this mechanism can be derived from the Alonso-Muth-Mills model (Brueckner (1987)) where housing expands around a city’s central business district and workers must commute from their house to the city center to work. Within-city house prices are set such that workers are indifferent between having a shorter versus longer commute to work. Average housing prices rise as the population grows since the houses on the edge of the city must offer the same utility as the houses closer in. As the city population expands, the edge of the city becomes farther away from the center, making the commuting costs of workers living on the edge higher than those in a smaller city. Since the edge of the city must offer the same utility value as the center of the city, housing prices rise in the interior parts of the city.
derived from government revenues of their place of residence, the market power of the state and local government should have no impact on their wages. Additionally, I show that variation in the state government worker-private sector wage gap does not vary across MSAs, within a state. The public-private wage gaps only vary with housing supply elasticities when the housing supply elasticity variation impacts the government’s market power. I also show that the effect is larger for government workers who are union members, suggesting unions allow government workers to bargain for a larger share of government rents.

The CPS-MORG only reports data on workers’ earnings, and does not include data on the value of workers’ benefits. Gittleman and Pierce (2012) show that government employees receive more generous benefits than similar private sector workers, on average. I use data from on average government pension payouts per beneficiary across states from the Census’ 2007-2010 Annual Surveys of Public Employee Retirement Systems as a measure of state government workers’ benefits. While I do not have a data source for similar private sector workers’ retirement benefits, I show that average annual state government pension payouts per beneficiary are higher in states with less elastic housing supplies. This suggests that the wage gap estimates from the CPS understate the full impact of housing supply elasticity on government worker compensation.

Previous work has also found evidence suggesting government jobs are more desirable than similar private sector jobs. Gittleman and Pierce (2012) show that public sector employees are more generously compensated than similarly qualified private sector employees. In particular, they find that government worker wages tend to be slightly lower than similar private sector workers. However, the value of government workers’ benefits strongly outweigh those of the private sector, leading to public sector employees to be better compensated overall. Krueger (1988) finds that there are more job applications for each government job than for each private sector job, suggesting that government jobs are more desirable to workers, on average. Additionally, average job quit rates reported from the 2002-2006 Job Openings and Labor Turnover Surveys show that average annual quit rate is 28% for private sector
workers, but only 8% for public sector employees. These fact taken together suggest that
government jobs are better compensated than private sector jobs, and that there appears to
be excess labor supply for these jobs, which is consistent with government workers receiving
rents. While this evidence shows that government jobs appear desirable to workers, it is not
clear that this desirability is due to rent-seeking behavior of governments exercising market
power. My paper shows that an increase in governments’ abilities to extract rent directly
leads to better paid government employees.

The public sector workforce is also highly unionized, enabling government employees to
bargain for government rents. Gyourko and Tracy (1991) use a spatial equilibrium model to
show that if the cost of government taxes to citizens are not completely offset by benefits
of government services, they will be capitalized into housing prices. Similarly, if high levels
of public sector unionization lead to more government rent extraction, the public sector
unionization rate will proxy for government waste and also be capitalized into housing prices.
While Gyourko and Tracy (1991) find evidence for both of these effects, it is unclear what
drives the variation in taxes and unionization rates across localities. This paper uses housing
supply elasticity as a source of exogenous variation in government market power to assess
whether government take advantage of their power to over pay employees.

Brueckner and Neumark (2011) considers whether government can extract more rent from
local residents if the government presides over an area with more desirable amenities. They
use a similar setup to this paper where profit maximizing governments compete for residents
by setting local tax rates. They allow local governments to play a game in tax-competition
where the number of competing governments is small. My model differs from theirs by
allowing each government to be small when deriving tax rates chosen by governments. They
find evidence that amenity differences are positively associated with public-private wage
gaps. However, it is possible that some of the amenity measures, such as coastal proximity
and population density, are correlated with housing supply elasticity differences.

The paper proceeds as follows. Section 2 layouts of the model. Section 3 presents
empirical evidence, and Section 4 concludes.

2 Model

The model detailed below uses a Rosen (1979) Roback (1982) spatial equilibrium to analyzes how local governments set taxes and compete for residents. In the model, I assume that governments use a head tax to collect revenue, however in reality, most state and local governments use property and income tax instruments. In Appendix A I derive results for the case of a government income or property tax and show the same results. I also abstract away from the political election process in each area. While politics could surely influence the extent of government rent seeking, my goal is to analyze contributors to governments’ abilities to exercise market power if they had a rent seeking motivation.

The nationwide economy is made up of many cities. There are \( N \) cities, where \( N \) is large. Cities are differentiated by their endowed amenity levels \( A_j \), which impact how desirable workers find the city, and their endowed productivity levels \( \theta_j \), which impact how productive firms are in the city. Workers are free to migrate to any city within the country. Each city has a local labor and housing market, which determine local wages and rents. The local government provides government services and collects taxes.

2.1 Government

The local government of city \( j \) charges a head tax \( \tau_j \) to workers who choose to reside within the city. The local government also produces government services, which cost \( s_j \) for each worker in the city. The government revenue and cost are

\[
\text{Revenue}_j = \tau_j N_j \\
\text{Cost}_j = s_j N_j.
\]
\( N_j \) measure the population of city \( j \). The local government is not benevolent and maximizes profits. These profits could be spent on inefficient production of \( s_j \) (thus, making the government benevolent, but naive). They could also be directly pocketed by government workers, such as through union negotiations. The local government maximizes:

\[
\max_{\tau_j, s_j} \tau_j N_j - s_j N_j
\]

### 2.2 Workers

All workers are homogeneous. Workers living in city \( j \) inelastically supply one unit of labor, and earn wage \( w_j \). Each worker must rent a house to live in the city at rental rate \( r_j \) and pay the local tax \( \tau_j \). Workers value the local amenities as measure by \( A_j \). The desirability of government services \( s_j \) is represented by \( g(s_j) \). Thus, workers’ utility from living in city \( j \) is:

\[
U_j = w_j - r_j + A_j + g(s_j) - \tau_j.
\]

Workers maximize their utility by living in the city which they find the most desirable.

### 2.3 Firms

All firms are homogenous and produce a tradeable output \( Y \). Cities exogenously differ in their productivity as measured by \( \theta_j \). Local government services impact firms productivity, as measured by \( b(s_j) \). The production function is:

\[
Y_j = \theta_j N_j + b(s_j) N_j + F(N_j),
\]

where \( F'(N_j) > 0 \) and \( F''(N_j) < 0 \) in labor.

The labor market is perfectly competitive, so wages equal the marginal product of labor:

\[
w_j = \theta_j + b(s_j) + F'(N_j).
\]
2.4 Housing

Housing is produced using construction materials and land. All houses are identical. Houses are sold at the marginal cost of production to absentee landlords, who rents housing to the residents. The asset market is in long-run steady state equilibrium, making housing price equal the present discounted value of rents. Housing supply elasticities differ across cities. Differences in housing supply elasticity are due to topography and land use regulation, which makes the marginal cost of building an additional house more responsive to population changes (Saiz (2010)). The housing supply curve is:

\[ r_j = a_j + \gamma_j \log (N_j), \]
\[ \gamma_j = \gamma x_j^{\text{house}} \]

where \( x_j^{\text{house}} \) is a vector of city characteristics which impact the elasticity of housing supply.

2.5 Equilibrium in Labor and Housing

Since all workers are identical, all cities with positive population must offer equal utility to workers. In equilibrium, all workers must be indifferent between all cities. Thus:

\[ U_j = w_j - r_j + A_j + g(s_j) - \tau_j = U. \]

Plugging in labor demand and housing supply gives:

\[ \theta_j + b(s_j) + F'(N_j) - a_j - \gamma_j \log N_j + A_j + g(s_j) - \tau_j = U. \]

Equation (7) determines the equilibrium distribution of workers across cities.
2.6 Government Tax Competition

Local governments set city tax rates and the level of government services to maximize profits, taking into account the endogenous response of workers and firms in equilibrium, equation (7). Each city is assumed to be small, meaning out-migration of workers to other cities does not impact other cities’ equilibrium wages and rents. If there were a small number of cities, each city would have even more market power than in this limiting case. The results below can be thought of as a lower bound on the market power of local governments competing for residents. They maximize:

$$\max_{s_j, \tau_j} \tau_j N_j - s_j N_j.$$ 

The first order conditions are:

$$0 = \tau_j \frac{\partial N_j}{\partial s_j} - N_j - s_j \frac{\partial N_j}{\partial s_j}$$  \hspace{1cm} (2)

$$0 = \frac{\partial N_j}{\partial \tau_j} + N_j - s_j \frac{\partial N_j}{\partial \tau_j}.$$ 

Differentiating equation (7) to solve for $\frac{\partial N_j}{\partial s_j}$ and $\frac{\partial N_j}{\partial \tau_j}$ gives:

$$\frac{\partial N_j}{\partial s_j} = \frac{b'(s_j) + g'(s_j)}{\left( \frac{\gamma_j}{N_j} - F''(N_j) \right)} > 0$$

$$\frac{\partial N_j}{\partial \tau_j} = - \frac{1}{\left( \frac{\gamma_j}{N_j} - F''(N_j) \right)} < 0.$$  \hspace{1cm} (3)

Population increases with government services and decreases in taxes. Plugging these into (8) gives:

$$0 = (\tau_j - s_j) \left( \frac{b'(s_j) + g'(s_j)}{\left( \frac{\gamma_j}{N_j} - F''(N_j) \right)} \right) - N_j$$

$$\tau_j = N_j \left( \frac{\gamma_j}{N_j} - F''(N_j) \right) + s_j.$$
Combining the first order conditions shows that government services are provided such that the marginal benefit \( b'(s_j) + g'(s_j) \) equals marginal cost (1):

\[
b'(s_j^*) + g'(s_j^*) = 1.
\]

This is the socially optimal level of government service.

The equilibrium tax rate is:

\[
\tau_j^* = \gamma - N_j F''(N_j) + s_j^*.
\] (4)

The elasticity of city population with respect to the tax rate \( \varepsilon_j^{\text{migrate}} \) can be written as:

\[
\varepsilon_j^{\text{migrate}} = \frac{\partial N_j}{\partial \tau_j} \frac{\tau_j}{N_j}.
\]

Plugging in equation (9) for \( \frac{\partial N_j}{\partial \tau_j} \) and rearranging gives:

\[
\left( \frac{\gamma - F''(N_j)}{N_j} \right) N_j = \frac{-\tau_j}{\varepsilon_j^{\text{migrate}}}.
\]

Substituting this expression into the equation (10) shows that the tax markup can be written as:

\[
\frac{\tau_j^* - s_j^*}{\tau_j^*} = \frac{-1}{\varepsilon_j^{\text{migrate}}}.
\]

The tax markup above cost is equal to the inverse elasticity of city population with respect to the tax rate. While workers are perfectly mobile between cities, worker migration causes shifts along the local labor demand and housing supply curves. An increase in local taxes would cause workers to migrate to other cities. A decrease in population will increase local wages, since I have assumed a downward sloping labor demand curve. The decrease in population will also cause rents to fall, by moving along the housing supply curve. This increase in wages and decrease in rents will increase the desirability of the city to workers,
limiting the migration response to the tax increase. The government takes into account the equilibrium wage and rent response to a tax hike when setting taxes to profit maximize. Thus, if migration leads to large changes in local wages and rent, a tax increase will not lead to large amounts of out-migration, since workers will be compensated for the tax with more desirable wages and rents.

To analyze the effect of housing supply elasticity on governments’ ability to extract rent from taxes, I differentiate the tax markup with respect to the slope of the inverse housing supply curve, $\gamma_j$.

$$
\frac{\partial}{\partial \gamma_j} (\tau_j^* - s_j^*) = 1 - \frac{\partial}{\partial N_j} (N_j F''(N_j)) \frac{\partial N_j}{\partial \gamma_j}. \tag{5}
$$

The first term (1) in equation (11) represents the increased rent response to migration induced by a tax hike in a city with an inelastic housing supply. The equilibrium condition, equation (7), shows that out-migration will continue until the negative utility impact of the tax hike has been completely offset by changes in the city’s wage and rent. In a city with a less elastic housing supply, a smaller amount of migration is needed to push housing rents down to offset the negative utility impact of the tax hike. The second term in equation (11) represents the change in the elasticity of labor demand due to being at a different point on the labor demand curve $\left(\frac{\partial}{\partial N_j} (N_j F''(N_j))\right)$. Since a city with a less elastic housing supply has a smaller equilibrium population, the slope of the labor demand curve in a smaller city could differ from the slope of the labor demand curve in a larger city. I will assume $\frac{\partial}{\partial N_j} (N_j F''(N_j)) = 0$, which is equivalent to assuming $\exp(F'(N_j))$ has a constant elasticity with respect to $N_j$. Under this assumption, the derivative of the tax markup with respect to the slope of the inverse housing curve is:

$$
\frac{\partial}{\partial \gamma_j} (\tau_j^* - s_j^*) = 1 > 0.
$$

The government can extract more rent through higher taxes in a city with a less elastic
housing supply.

Note that this result assumes there are a large number of cities. When there are a small number of cities, the incentives for rent extraction will be even higher. Outward migration from a city in response to a tax increase will lead to increases in other cities’ rents and decreases in their wages, leading to less outward migration in response to tax increases. I have assumed this effect away by not allowing the equilibrium utility level across all cities to fall in response to a given city’s tax increase. Cities can extract rent even in an environment where there are a large number of competitors because household demand for city residence can never be infinite in equilibrium.

Additionally, this model assumes cities charge a head tax, while in reality most cities and states tax their population through income taxes and property taxes. The amount of rent extraction depends on the elasticity of tax revenue with respect to the tax rate. Thus, an income tax will depend both on the wage response to the tax rate, as well as the migration response. Appendix A shows that when using an income tax, governments can still exercise more market power in housing inelastic areas.

In the case of a property tax, government revenue will depend on local the rental rate and the size of the tax base. An increase in the property tax rate can decrease government revenue both by incentivizing workers to migrate away, shrinking the tax base, and decreasing housing rents, lowering tax revenue from each household. However, I show in appendix A that if local labor demand is perfectly elastic, the housing supply elasticity will not impact the size of the rental rate decrease in response to a given tax hike. To see this, recall the equilibrium condition, equation (7). For workers to derive utility \( \bar{U} \) from a local area, the utility impact of a tax increase must be perfectly offset by a rent decrease, if labor demand is perfectly elastic. Thus, the equilibrium rental rate response to a given tax increase does not depend on the local housing supply elasticity. Indeed, the housing supply elasticity determines the migration response required to change housing rents in order to offset the utility impact of the tax increase. Thus, a less elastic housing supply decreases the elasticity
of government revenue with respect to the tax rate, giving the government more market power when using a property tax instrument. See Appendix A for the full derivation of this result.

Regardless of the tax instrument, governments of cities with less elastic housing supplies are able to extract more rent from their residents. In the next section, I empirically test this prediction.

3 Empirical Evidence

The model predicts that local governments in areas with less elastic housing supplies will be able to extract more rent from their residents. While this extra money could be spent in a number of ways, it is likely that some of it gets absorbed into public sector workers’ wages. Since most public sector workers are unionized, they will be able to bargain to gain some of these rents as wages. Thus, the wage gap between government employees and similarly qualified private sector workers should be higher in areas with less elastic housing supplies. The effect should hold across metropolitan areas for local government-private sector wage gaps and across states for state government-private sector wage gaps.

To test this, I estimate how states’ and MSAs’ public/private sector wage gaps vary with characteristics which impact local housing supply elasticities. Saiz (2010) shows that the topological characteristics of land around an MSA’s center impact whether the land can be used for real-estate development. Cities located next to wetlands, bodies of waters, swamps, or extreme hilliness have limits on how many building can be built close to the city center, which impacts the elasticity of housing supply to the area. Saiz (2010) uses satellite data to measure the share of land within 50km of an MSA’s center which cannot be developed due to these topological constraints. A rent-seeking government is able to charge higher taxes in areas with less land available for development. Thus, the public-private sector wage gap should be higher in these areas.
A city’s housing supply elasticity is also influenced by the amount of land-use regulation in the area. The 2005 Wharton Land Use Regulation Survey Gyourko, Saiz, and Summers (2008) collected survey data on a number of land-use regulations and practices, which were aggregated into the Wharton Land Use Regulation Index (WLURI). Saiz (2010) aggregates this municipality measure into a MSA-level index.

I z-score the MSA level data from the WLURI and the land unavailability measure and will use both as measures of cities’ housing supply elasticities. I also aggregate these measures to a state-level index, where I weight each MSA measure by the state population in each MSA. The state-level housing supply elasticity measure is a noisy measure of the overall housing supply elasticity for the state, since the data is only based off of the MSAs covered by Saiz’s sample. Table 1 reports summary statistics on these measures. The data covers 48 states (there is no data for Hawaii or Alaska) and 228 MSAs.

3.1 Wage Gap Regressions

To measure public-private sector wage gaps across MSAs and states, I use data from the Current Population Survey Merged Outing Rotation groups from 1995-2011. The CPS-MORG is a household survey which collects data on a large number of outcomes including workers’ weekly earnings, hours worked, public/private sector of employment, union status, and a host of demographics. I restrict the sample to 25 to 55 year old workers with positive labor income, working at least 35 hours per week, to have a standardized measure of weekly earnings. The CPS’s usual weekly earnings question does not include the self-employment income so all analysis excludes the self-employed. I also restrict analysis to workers whose wages are not imputed to avoid any bias due to the CPS’s wage imputation algorithm (Bollinger and Hirsch (2006)). I measure earnings using workers’ log usual weekly earnings,

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3 Since there was a significant change in the CPS’s earnings questions in 1994, I restrict analysis to 1994-2011. I also focus my analysis on workers whose wages are not imputed in the CPS. Since sector, occupation, and union status and not used in the CPS’s imputation algorithm, analyzing government wage gaps and union wage gaps using imputed wages can be problematic (Bollinger and Hirsch (2006)). Thus, I focus only on the non-imputed wage sample. The data flagging which wages were imputed are missing in the 1994 data, so I drop this year, leaving me with a 1995-2011 sample.
deflated by the CPI-U and measured in real 2011 dollars. Top coded weekly earnings are multiplied by 1.5 and weekly earnings below $128 are dropped from the analysis. All analysis is weighted by the CPS earnings weights.

Table 1 reports summary statistics of workers’ log weekly earnings each for workers employed in the private sector, local government, state government, and federal government. Consistent with previous works, such as Gittleman and Pierce (2012), the raw earnings are higher for all three classes of government workers than for private sector workers. However, these raw earnings differences do not account for differences in the characteristics of workers between the public and private sector. To test the model’s predictions, I will control for worker characteristics when evaluating differences in the public-private sector wage gap. Additionally, the CPS only collects data on workers’ earnings, but not compensation paid to workers in the form of benefits. Gittleman and Pierce (2012) show using the BLS’ restricted-use Employer Cost of Employee Compensation microdata that government employees receive significantly more generous benefits than similar workers in the private sector. I will return to the question of benefits compensation, but first focus on public-private sector wage gaps.

To test the model’s predictions, I estimate the following regression:

$$\ln w_{ijt} = \delta_j + \alpha_t + \beta^{gov}gov_{it} + \beta^{elast}z_{elast}^{j}*gov_{it} + \beta X_{it} + \varepsilon_{ijt}. \quad (6)$$

As controls, I include location fixed-effects $\delta_j$, year fixed effects, $\alpha_t$, and a set of worker demographics which include 15 dummies for education categories, gender, race, Hispanic origin, a quartic in age, and a rural dummy. $gov_i$ is a dummy for whether the worker is government worker, $z_{elast}^j$ measures land use regulation and topography. Standard errors are clustered by state when using state-level measures of housing supply elasticity and clustered by MSA when using MSA variation in housing supply elasticity.

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4I follow Autor, Katz, and Kearney (2008)’s top and bottom coding procedures. Autor, Katz, and Kearney (2008) drops all reported hourly wages below $2.80 in real 2000 dollars. This translates to $128 per week in real 2011 dollars, assuming a 35 hour work week. They also scale top coded wages by 1.5.

5A worker’s sector is measured by the CPS variable reporting a worker’s class.
The nationwide average public-private wage gap is measured by $\beta^{gov}$. The model predicts that public-private wage gap should be higher in areas with less elastic housing supplies:

$$\beta^{elast} > 0.$$ 

The prediction should hold both for areas with less land available for development and for areas with stricter land-use regulations. Since land-use regulations are chosen by local municipalities, it is possible that the decision to regulate land-use could be correlated with other characteristics of the area which could impact workers’ wages. Since the topological constraints around a city are pre-determined, they are likely a measure of exogenous differences in housing supply elasticities across areas. I perform all analysis using both measures, but I also drop the regulation index to focus directly on the impact of land availability, which is likely a cleaner estimate of the impact of housing supply elasticity on public-private sector wage gaps.

I test this prediction first using a sample including private sector workers and state government workers. Column 1 of Table 2 shows that the nationwide average wage gap between state government employees and private sector workers is -0.112 log points. Consistent with Gittleman and Pierce (2012), after controlling for worker demographics, government workers’ earnings are lower than similar private sector workers, on average. However, the state worker-private sector wage gap increases by 0.017 log points in states with a 1 standard deviation increase in land unavailability. This effect is significant at the 10% level. The wage gap is 0.026 log points higher in states with a 1 standard deviation increase in land availability, which is likely a cleaner estimate of the impact of housing supply elasticity on public-private sector wage gaps.

Figure 1 plots states’ land unavailability against states’ state government worker-private sector wage gaps, after wages have been residualized against the set of controls included in equation (6). Figure 1 shows
the state government-private sector wage gaps are higher in states including California, Vermont, Florida, and Connecticut, but must lower in states such as Iowa, Texas, Montana, and Kentucky which lines up with these states’ land unavailability. Note that states such as Utah are significant outliers. However, Utah’s land availability was measured only based on Salt Lake City, which has a large share of land unavailable for development due proximity to the Great Salt Lake. This is likely a poor measure of the overall state housing supply elasticity. Despite the short comings of the state-level data, I find that states with less elastic housing supplies have significantly better paid state government employees, as compared to the private sector employees residing in the state.

Performing the same analysis on local government employees, I compare the wage gaps between local government workers and private sector workers across 229 MSAs. The controls in this setup now include MSA fixed effects and the housing supply measures are now at the MSA level. Column 3 of Table 2 shows that the nationwide local government worker-private sector wage gap is -0.080 log points. A 1 standard deviation increase in land unavailability increases the wage gap by 0.029 log points and a 1 standard deviation increase in land-use regulation increases the wage gap by 0.0348 log points. Both of these effects are significant at the 1% level. Dropping the land-use regulation, I find the coefficient on land unavailability increases to 0.037 log points, and is significant at the 1% level. Figure 2 plots MSAs’ land unavailability against MSAs’ local government worker-private sector wage gaps, after wages have been residualized against the set of controls included in equation (6). The plot shows high local government wages gaps in land unavailable cities including Los Angeles, New York, Cleveland, Chicago, and Portland and low government wage gaps in cities with lots of land to develop including Atlanta, Houston, Minneapolis, and Phoenix. Housing supply elasticity explains a significant amount of the cross-section variation in public-private wage gaps.

To test whether the local housing supply elasticity measures impact local government worker-private sector wage gaps within states, across MSAs, I add controls for state differ-
ences in the local government worker-private sector wage gaps. I now estimate:

\[ \ln w_{ijkt} = \delta_j + \alpha_t + \beta^\text{gov}_{k} \text{gov}_{kt} + \beta^\text{elast}_{j} \text{elast}_{jt} \times \text{gov}_{kt} + \beta X_{it} + \varepsilon_{ijt}, \]

where \( j \) represents an MSA and \( k \) represents a state. Columns 5 and 6 of Table 2 show that the impact of land unavailability on the local government-private sector wage gap falls slightly, but remains statistically significant when land-use regulations are not included in the regression. Land unavailability consistently has a positive impact the public-private sector wage gap both for local and state government workers, as predicted by the model.

Table 3 repeats the analysis adding in dummies for each three-digit occupation code to attempt to further control for differences in workers' skills in the public and private sectors. The point estimate measuring the impact of land unavailability of the state government-private sector wage gap remains positive, but the standard errors increase, making the effect only statistically significant when land-use regulations are dropped from the regression. However, the large standard errors shows that one cannot rule out a point estimate equal to the magnitude found when 3-digit occupation code dummies were not included in the regression.

The estimates for local-government worker wage gaps are positive and statistically significant at the 1% level. Column 4 of Table 3 shows that even when including the full set of 3 digit occupation dummies, a 1 standard deviation increase in land unavailability increases the local public-private sector wage gap by 0.028 log points. Note that with the inclusion of occupation dummies, the nationwide local government worker-private sector wage gap is now positive and equal to 0.028 log points.

One possible way government workers are able to raise their wages is through union wage bargaining. I repeat the analysis adding in additional housing supply elasticity interactions terms for whether the government worker is part of a labor union. I control for the direct effect of being in a union, and its interaction with the housing supply elasticity characteristics. This controls for differences in union bargaining power across states and MSAs for all unions,
public and private. Table 4 shows that a standard deviation increase in land unavailability raises state government-private sector wage gaps by 0.0127 log points for non-union members and an addition 0.0214 log points for unionized government workers. State government worker unions appear to be able to bargain for better wages in housing inelastic areas, relative to non-unionized government workers. The point estimates in Columns 3 and 4 of Table 4 are similar for local government-private sector wage gaps. However, the additional impact of government labor unions is positive, but not statistically significant. These point estimates suggest government workers part of a labor union might be able to use their market power to negotiate for a larger amount of excess wages beyond the offerings of the private sector.

Table 5 repeats the analysis separately for workers with and without a 4 year college education. I find a positive and statistically significant effect both for college and non-college educated workers. The impact of land unavailability is stronger for low skill workers than for those with a college education. Overall, housing supply elasticity appears to impact the public-private wage gap.

3.2 Falsification Tests

The evidence presented thus far suggests that governments are exercising their market power by extracting rents and paying government employees higher wages than are paid by local private sector employers. Variation in housing supply elasticities across areas impacts the extent to which governments can exercise market power. A falsification test of these predictions is to analyze whether the federal government-private sector wage gaps across cities and states exhibit similar properties. Since federal workers are not paid by the state or local government which presides over their location of residence, housing supply elasticity should have no impact on federal workers’ wages.

Columns 1 through 4 of Table 6 estimate the same state and local wage gap regressions, but use federal workers instead of state and local workers. The point estimate of the impact
of land unavailability of the federal worker-private sector wage gap is consistently negative. As predicted by the model, the federal worker-private sector wage gaps are not inflated by the housing supply elasticity of these workers’ cities or states of residence.

As an additional falsification test, I compare the wage gaps between state government and private sector workers across MSAs within states. Since the revenues used to pay state government workers are collected from all areas within a state, the MSA of residence of a state governments should not impact their pay, relative to private sector workers living in the same MSA. I add state fixed effects interacted with whether the worker is employed by the state government as controls:

\[
\ln w_{ijkt} = \delta_j + \alpha_t + \beta_{gov}^{gov} g_{it} + \beta_{k}^{gov} g_{it} + \beta^{elast} z_{j}^{elast} * g_{it} + \beta X_{it} + \varepsilon_{ijt}.
\]

This setup estimates the relation between state government-private sector wage gaps and local housing supply elasticities within states, across MSAs. Columns 5 and 6 of Table 6 show that the impact of land unavailability on state government-private sector wages gaps is not statically significant and that the point estimates are negative.

While state level variation in housing supply elasticity impacts state worker-private sector wage gaps, variation across MSAs within a state have no impact on the state worker-private sector wage gap, exactly as predicted by the model. Further, federal worker-private sector wages gaps are unaffected by state level or MSA level variation in housing supply elasticities, as also predicted by the model. However, local government worker-private sector wage gaps vary across MSAs both within and across states. Additionally, the impact of housing supply elasticities of these the public-private sector wage gaps is larger for unionized government workers. This evidence suggests that governments are exercising market power and over paying their employees, relative to the private sector.

The empirical evidence shows that housing supply elasticity impacts the average wage gap between public and private sector workers. A possible alternative explanation for this result
other than rent-seeking and market power is that housing supply elasticity influences the type of workers state and local governments choose to employ. The wage gap between public and private sector workers could represent unobserved skill differences between workers employed in the public and private sectors. If this were true, the regressions previously presented which controlled for 3-digit occupation codes should have had much smaller point estimates than those which did not control for occupation, since there is likely less variation in worker skill within occupation than between.

As an additional test of this alternative hypothesis, I assess whether public-private sector workers years of education gaps vary with state and local housing supply elasticities. Table 7 preforms the standard analysis used to analyze state and local wage gaps, but replaces the left hand side variable with a worker’s years of education. If government workers are higher skilled than private sector workers in housing inelastic areas, then this should hold both for observed skills (education) and unobserved skills (which cannot be tested). Table 7 shows that impact of land unavailability on public-private sector education gaps is not statistically significant. This holds in the state government workers sample and local government workers sample. This result is also robust to dropping worker demographics as controls in the regressions. Overall, differences in public and private sector workers’ years of schooling to not appear to relate to state and local housing supply elasticities. Columns 5 through 8 of Table 7 reports additional robustness by re-doing the same analysis with the left-hand side variable equal to a dummy of whether the worker has a four year college degree. These results further show housing supply elasticity does not positively impact public-private sector worker skill differences. Government workers’ wages appear to reflect the market power of state and local governments.

### 3.3 Benefits

Gittleman and Pierce (2012) show that government workers’ benefits are more generous than private sector workers’ benefits. If the market power of state and local governments allows
government workers to earn more desirable wages than similar private sector workers, this
should also be true for public-private differences in the generosity of benefits.

As a measure of government workers’ pension benefits, I use data from the Census’ 2007-
2010 Annual Surveys of Public Employee Retirement Systems. This data is collected annually
from states governments’ pension plans on the aggregate amount of retirement benefits paid
out during the year, as well as the total number of beneficiaries who received a transfer that
year. Taking the ratio of these, gives the average pension payout per beneficiary. Table 1
reports summary statistics on this data. Unfortunately, there is not a similar data set for
retirement payouts to private sector workers.

An indirect test of whether benefits augment or offset wage gap differences is to assess
whether the state worker-private sector wage gap negatively varies with pension payouts per
retiree. If the public-private wage gap is high when public pension benefits are low, than
changes in wage gaps across states might be offset by changes in benefits across states. How-
ever, Table 9 shows a regression of state government pensions payouts per retiree is strongly
positively correlated with the public-private sector wage gap. This suggests that increases
in the public-private wage gap are positively associated with increases in the public-private
benefits gap. The wage gap estimates are likely a lower bound of impact of government mar-
ket power of government employees compensation since they do not account for the impacts
on benefits.

If private sector benefits do not vary with states’ housing supply elasticities, than a
regression of state pension payouts per beneficiary on states’ housing supply elasticities
measures the impact of housing supply elasticity on government retirement benefits. Table
9 reports these regressions. I find a 1 standard deviation increases in a states’ land unavail-
ability increases annual retirement payouts per retired state government employee by 0.0674
log points. Government workers appear to receive better compensation in both wages and
retirement benefits in areas where the government can exercise more market power.
4 Conclusion

By using housing supply elasticity as exogenous variation in governments’ abilities to exercise market power, I show that the public-private sector wage gap is higher in areas where the government can extract more rent from residents. Further, this effect is stronger for unionized government workers, suggesting that public sector unions might influence governments to engage in rent seeking behavior. While I cannot gauge to what extent government workers are overcompensated overall, government market power appears to play a role in government worker compensation.

The spatial equilibrium model shows that the scope of governments’ market power does not disappear when there is competition between a large number of governments or when each government is small. The local labor and housing market will respond to the tax policy choices of the state and local government, mitigating the disciplining effects of workers’ voting with their feet through migration.

It is possible that the unmodeled political system where multiple candidates run for election and campaign for less wasteful government policies could compete away some of this government market power. However, the empirical evidence of this paper suggests that these rents have not been fully competed away.

These results also speak to the welfare effects of land-use regulation policy. While the decision to regulate real-estate development and population expansion has many costs and benefits not studied in this paper, my results show that decreasing a city’s housing supply elasticity through regulation gives the local government more market power. Thus, the rise in land-use regulations since the 1970s may have had an unintended consequence of increasing rent seeking by governments and leading to overpaid government workers. State and local governments appear to take advantage of their market power and some of these rents are shared with government employees.
References


A Government Taxation under Income and Property Taxes

A.1 Income Tax

A.1.1 Government

The local government of city $j$ charges an income tax $\tau_j$ to workers who choose to reside within the city. The local government also produces government services, which cost $s_j$ for each worker in the city. $N_j$ measure the population of city $j$. The local rent seeking government maximizes:

$$\max_{\tau_j, s_j} \tau_j w_j N_j - s_j N_j$$

A.1.2 Workers

All workers are homogeneous. Workers living in city $j$ inelastically supply one unit of labor, and earn wage $w_j$. Each worker must rent a house to live in the city at rental rate $r_j$ and pay the local income tax $\tau_j$. Workers value the local amenities as measure by $A_j$. The desirability of government services $s_j$ is represented by $g(s_j)$. Thus, workers’ utility from living in city $j$ is:

$$U_j = w_j (1 - \tau_j) - r_j + A_j + g(s_j).$$

Workers maximize their utility by living in the city which they find the most desirable.

A.1.3 Firms

All firms are homogenous and produce a tradeable output $Y$. Cities exogenously differ in their productivity as measured by $\theta_j$. Local government services impact firms productivity, as measured by $b(s_j)$. The production function is:

$$Y_j = \theta_j N_j + b(s_j) N_j + F(N_j),$$

where $F'(N_j) > 0$ and $F''(N_j) = 0$ in labor. I assume a completely elastic labor demand curve to focus on the role of housing supply elasticity in setting tax rates.

The labor market is perfectly competitive, so wages equal the marginal product of labor:

$$w_j = \theta_j + b(s_j) + F'(N_j).$$

A.1.4 Housing

The housing market is identical to the setting described in the main text in Section ##. The housing supply curve is:

$$r_j = a_j + \gamma_j \log(N_j),$$

$$\gamma_j = \gamma x_j^{\text{house}}$$

where $x_j^{\text{house}}$ is a vector of city characteristics which impact the elasticity of housing supply.
A.1.5 Equilibrium in Labor and Housing

Since all workers are identical, all cities with positive population must offer equal utility to workers. In equilibrium, all workers must be indifferent between all cities. Thus:

\[ U_j = w_j (1 - \tau_j) - r_j + A_j + g(s_j) = \bar{U}. \]

Plugging in labor demand and housing supply gives:

\[ (\theta_j + b(s_j) + F'(N_j)) (1 - \tau_j) - a_j - \gamma_j \log N_j + A_j + g(s_j) = \bar{U}. \]

Equation (7) determines the equilibrium distribution of workers across cities.

A.1.6 Government Tax Competition

The government maximizes:

\[ \max_{\tau_j, s_j} \tau_j w_j N_j - s_j N_j. \]

The first order conditions are:

\[ 0 = w_j \tau_j \frac{\partial N_j}{\partial s_j} + \tau_j N_j \frac{\partial w_j}{\partial N_j} \frac{\partial N_j}{\partial s_j} - N_j - s_j \frac{\partial N_j}{\partial s_j} \]
\[ 0 = \tau_j \left( \frac{\partial w_j}{\partial N_j} \frac{\partial N_j}{\partial \tau_j} \right) + w_j \frac{\partial N_j}{\partial \tau_j} + w_j N_j - s_j \frac{\partial N_j}{\partial \tau_j}. \]

Differentiating equation (7) to solve for \( \frac{\partial N_j}{\partial s_j} \) and \( \frac{\partial N_j}{\partial \tau_j} \) gives:

\[ \frac{\partial N_j}{\partial s_j} = N_j \left( \frac{(1 - \tau_j)b'(s_j) + g'(s_j)}{\gamma_j} \right) > 0 \]
\[ \frac{\partial N_j}{\partial \tau_j} = -N_j \left( \frac{\theta_j + b(s_j) + F'(N_j)}{\gamma_j} \right) < 0. \]

Population increases with government services and decreases in taxes. Plugging these into (8) and combining the first order conditions shows that government services are provided such that the marginal benefit \( ((1 - \tau_j)b'(s_j) + g'(s_j)) \) equals marginal cost (1):

\[ (1 - \tau_j^*)b'(s_j^*) + g'(s_j^*) = 1. \]

This is the socially optimal level of government service, given the tax rate.

The equilibrium tax revenue per capita is:

\[ w_j \tau_j^* = \gamma_j + s_j^*. \]

To analyze the effect of housing supply elasticity on governments’ ability to extract rent from taxes, I differentiate the tax markup with respect to the slope of the inverse housing
supply curve, $\gamma_j$.

$$\frac{\partial}{\partial \gamma_j} \left( w_j \tau_j^* - s_j^* \right) = 1 > 0. \quad (11)$$

The government can extract more rent through higher taxes in a city with a less elastic housing supply with a income tax instrument.

**A.2 Property Tax**

**A.2.1 Government**

The local government of city $j$ charges a property tax $\tau_j$ to workers who choose to reside within the city. The local rent seeking government maximizes:

$$\max_{\tau_j, s_j} \tau_j r_j N_j - s_j N_j$$

**A.2.2 Workers**

Workers’ utility from living in city $j$ facing a property tax $\tau_j$ is:

$$U_j = w_j - r_j (1 + \tau_j) + A_j + g(s_j).$$

**A.2.3 Firms**

The production function is:

$$Y_j = \theta_j N_j + b(s_j) N_j + F(N_j),$$

where $F'(N_j) > 0$ and $F''(N_j) = 0$ in labor. I assume a completely elastic labor demand curve to focus on the role of housing supply elasticity in setting tax rates.

The labor market is perfectly competitive, so wages equal the marginal product of labor:

$$w_j = \theta_j + b(s_j) + F'(N_j).$$

**A.2.4 Housing**

The housing market is identical to the setting described in the main text in Section ##. The housing supply curve is:

$$r_j = a_j + \gamma_j \log(N_j),$$

$$\gamma_j = \gamma x_{j, \text{house}}$$

where $x_{j, \text{house}}$ is a vector of city characteristics which impact the elasticity of housing supply.
A.2.5 Equilibrium in Labor and Housing

Since all workers are identical, all cities with positive population must offer equal utility to workers. In equilibrium, all workers must be indifferent between all cities. Thus:

\[ U_j = w_j - r_j (1 + \tau_j) + A_j + g(s_j) = \bar{U}. \]

Plugging in labor demand and housing supply gives:

\[
(\theta_j + b(s_j) + F'(N_j)) - (a_j + \gamma_j \log N_j) (1 + \tau_j) + A_j + g(s_j) = \bar{U}.
\]

Equation (7) determines the equilibrium distribution of workers across cities.

A.2.6 Government Tax Competition

The government maximizes:

\[
\max_{s_j, \tau_j} \tau_j r_j N_j - s_j N_j.
\]

The first order conditions are:

\[
0 = r_j \tau_j \frac{\partial N_j}{\partial s_j} + \tau_j N_j \frac{\partial r_j}{\partial N_j} \frac{\partial N_j}{\partial s_j} - N_j - s_j \frac{\partial N_j}{\partial s_j},
\]

\[
0 = \tau_j \left( \frac{\partial r_j}{\partial N_j} \frac{\partial N_j}{\partial \tau_j} N_j + r_j \frac{\partial N_j}{\partial \tau_j} \right) + r_j N_j - s_j \frac{\partial N_j}{\partial \tau_j}.
\]

Differentiating equation (7) to solve for \( \frac{\partial N_j}{\partial s_j} \) and \( \frac{\partial N_j}{\partial \tau_j} \) gives:

\[
\frac{\partial N_j}{\partial s_j} = N_j \frac{b'(s_j) + g'(s_j)}{\gamma_j (1 + \tau_j)} > 0,
\]

\[
\frac{\partial N_j}{\partial \tau_j} = -N_j \frac{r_j}{\gamma_j (1 + \tau_j)} < 0.
\]

Combining the first order conditions shows that government services are provided such that the marginal benefit \( (b'(s_j) + g'(s_j)) \) equals marginal cost \( (1) \), which is the same finding for an income tax and head tax:

\[ b'(s_j^*) + g'(s_j^*) = 1. \]

Plugging (15) into (14) and rearranging shows the equilibrium tax revenue per capita is:

\[ r_j \tau_j^* = g_j + s_j^*. \]

Differentiating the tax markup with respect to the slope of the inverse housing supply curve, \( \gamma_j \):

\[ \frac{\partial}{\partial \gamma_j} (w_j \tau_j^* - s_j^*) = 1 > 0. \]

The government can extract more rent through higher taxes in a city with a less elastic
housing supply using a property tax instrument. In the case of a property tax, as opposed to a head tax, there are four mechanisms through which a tax rate change impacts government revenue. To break these down, I rewrite the tax rate first order condition:

\[ 0 = \tau_j \frac{\partial N_j}{\partial \tau_j} + \tau_j \frac{\partial r_j}{\partial N_j} \frac{\partial N_j}{\partial \tau_j} \]

Decline in revenue due to population decrease  
Decline in revenue due to rent decrease  
Additional tax revenue from each resident  
Government services cost savings

(18)

First, the amount of out-migration driven by a tax hike is influenced by the local housing supply elasticity. This is the first term of equation (18). Second, the out-migration lowers rents and directly impacts tax revenues since the tax revenue is a percentage of housing rents. This is the second term of equation (18). However, the housing supply elasticity will not impact the size of the rental rate decrease in response to a tax hike. To see this, recall the equilibrium condition, equation (12a). For workers to derive utility \( \bar{U} \) from this local area, the utility impact of a tax increase must be perfectly offset by a rent decrease.\(^6\) Thus, the equilibrium rental rate response to a given tax increase does not depend on the local housing supply elasticity. Indeed, the housing supply elasticity determines the migration response required to change housing rents in order to offset the utility impact of the tax increase. Thus, a more inelastic housing supply decreases the elasticity of government revenue with respect to the tax rate, giving the government more market power when using a property tax instrument.

The third and forth terms of equation (18) show a tax increase raises government revenues from each household and lowers the cost of government services due to out-migration. These channels also appear in the case of a head tax instrument.

---

\(^6\)Since I have assumed a perfectly elastic labor demand curve, the rental rate response to a tax increase would be the same in any city. However, if labor demand was not perfectly elastic, then the rental rate response to a tax increase could differ with housing supply elasticity, since housing supply elasticity would influence the relative incidence of the tax rate on wages versus rents.
## Table 1: Summary Statistics

### A. CPS Data 1995-2011

<table>
<thead>
<tr>
<th>Sector</th>
<th>Mean</th>
<th>Standard Dev.</th>
<th>Min</th>
<th>Max</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local Government Worker Ln Weekly Earnings</td>
<td>6.723</td>
<td>0.519</td>
<td>4.854</td>
<td>8.695</td>
<td>112639</td>
</tr>
<tr>
<td>State Government Worker Ln Weekly Earnings</td>
<td>6.725</td>
<td>0.509</td>
<td>4.857</td>
<td>8.695</td>
<td>62994</td>
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<tr>
<td>Federal Government Worker Ln Weekly Earnings</td>
<td>6.964</td>
<td>0.496</td>
<td>4.855</td>
<td>8.695</td>
<td>37008</td>
</tr>
<tr>
<td>Private Sector Worker Ln Weekly Earnings</td>
<td>6.686</td>
<td>0.613</td>
<td>4.852</td>
<td>8.695</td>
<td>968349</td>
</tr>
</tbody>
</table>

### B. Housing Supply Elasticity Measures

<table>
<thead>
<tr>
<th>Measure</th>
<th>Mean</th>
<th>Standard Dev.</th>
<th>Min</th>
<th>Max</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>State Aggregated Land Unavailability: Z-Score</td>
<td>0.000</td>
<td>1.000</td>
<td>-1.427</td>
<td>2.982</td>
<td>48</td>
</tr>
<tr>
<td>State Aggregated Wharton Land Use Regulation Index: Z-Score</td>
<td>0.000</td>
<td>1.000</td>
<td>-1.640</td>
<td>2.348</td>
<td>48</td>
</tr>
<tr>
<td>MSA Land Unavailability: Z-Score</td>
<td>0.000</td>
<td>1.000</td>
<td>-1.205</td>
<td>2.824</td>
<td>228</td>
</tr>
<tr>
<td>MSA Wharton Land Use Regulation Index: Z-Score</td>
<td>0.000</td>
<td>1.000</td>
<td>-1.746</td>
<td>3.938</td>
<td>228</td>
</tr>
</tbody>
</table>

### C. State Government Pension Payouts: 2007-2010

<table>
<thead>
<tr>
<th>Measure</th>
<th>Mean</th>
<th>Standard Dev.</th>
<th>Min</th>
<th>Max</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log Thousand Dollars of Annual Payout per beneficiary from State Pension</td>
<td>2.9897</td>
<td>0.24996</td>
<td>2.5289</td>
<td>3.629</td>
<td>192</td>
</tr>
</tbody>
</table>

Notes: Wages are measured as weekly wages deflated by the CPI-U and reported in constant 2011 dollars for 25-55 year old workers working at least 35 hours per week. Workers with imputed weekly earnings are dropped from the analysis. Top coded weekly earnings as set to 1.5 times the top coded value and weekly earnings below $128 (in real 2011 dollars) are dropped from the analysis. Sector of worker (local/state/federal/private) is measured by reported class of worker. MSA land unavailability measures the share of land within 50km of an MSA’s center which cannot be developed due to these topological constraints from Saiz (2010). This measure is then Z-scored. The Wharton Land Use Regulation index aggregates survey data on a large set of local land use practices by local municipalities. This is aggregated to the MSA level and then Z-scored. State aggregated housing supply elasticity measures use a population weighted average of MSA level data. State and MSA level housing supply elasticity measures are z-scored. Government pension data come from 2007-2010 Annual Surveys of Public-Employee Retirement Systems.
Table 2: Ln Wage vs. State & Local Public Sector-Housing Supply Elasticity Interactions

<table>
<thead>
<tr>
<th></th>
<th>State Gov-Private Sector Wage Gaps</th>
<th>Local Gov-Private Sector Wage Gaps</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Government Worker</td>
<td>-0.112***</td>
<td>-0.113***</td>
</tr>
<tr>
<td>Gov* Land Unavailability</td>
<td>0.0170*</td>
<td>0.0262***</td>
</tr>
<tr>
<td>Gov* Land Use Regulation</td>
<td>0.0263**</td>
<td>0.0348***</td>
</tr>
<tr>
<td>Constant</td>
<td>2.493***</td>
<td>2.487***</td>
</tr>
<tr>
<td>State x Gov Worker FE:</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>State Elasticity Measures:</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>MSA Elasticity Measures:</td>
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<tr>
<td>State Gov Workers Sample:</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Local Gov Workers Sample:</td>
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</tr>
<tr>
<td>Observations</td>
<td>973,792</td>
<td>973,792</td>
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<tr>
<td>R-squared</td>
<td>0.384</td>
<td>0.384</td>
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</tbody>
</table>

Note: Standard errors clustered by state for state worker regressions. Standard errors clustered by MSA for local government worker regressions. Weekly wage data from 1995-2011 CPS MORG. Wage data is restricted to 25-55 year old workers working at least 35 hours per week. State government worker sample includes private sector and state government workers. Local government worker sample includes private sector and local government workers living in MSAs. Land unavailability measures a z-score of the share of land within 50km of an MSA’s center which cannot be developed due to topological constraints. Land use regulation is an index of aggregated survey data on a large set of local land use practices by local municipalities. This is aggregated to the MSA level and then Z-scored. State level measures are z-scores of average MSA-level measures within the state, weighted by MSA population. Controls include 15 dummies for education categories, gender, race and hispanic origin, a quartic in age, a rural dummy, and year dummies. All regressions weighted using CPS MORG earnings weights.
Table 3: Ln Wage vs. State & Local Public Sector-Housing Supply Elasticity Interactions with 3 Digit Occupation Dummy controls

<table>
<thead>
<tr>
<th></th>
<th>State Gov-Private Sector Wage Gaps</th>
<th>Local Gov-Private Sector Wage Gaps</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Government Worker</td>
<td>-0.0320***</td>
<td>-0.0331***</td>
</tr>
<tr>
<td></td>
<td>[0.00830]</td>
<td>[0.00837]</td>
</tr>
<tr>
<td>Gov* Land Unavailability</td>
<td>0.0107</td>
<td>0.0188*</td>
</tr>
<tr>
<td></td>
<td>[0.0111]</td>
<td>[0.0109]</td>
</tr>
<tr>
<td>Gov* Land Use Regulation</td>
<td>0.0234**</td>
<td>0.0350***</td>
</tr>
<tr>
<td></td>
<td>[0.0112]</td>
<td>[0.00716]</td>
</tr>
<tr>
<td>Constant</td>
<td>4.263***</td>
<td>4.258***</td>
</tr>
<tr>
<td></td>
<td>[0.274]</td>
<td>[0.274]</td>
</tr>
</tbody>
</table>

State Elasticity Measures: X X
MSA Elasticity Measures: X X
State Gov Workers Sample: X X
Local Gov Workers Sample: X X
Observations: 973,792 973,792 586,696 586,696
R-squared: 0.524 0.524 0.526 0.526

Note: Standard errors clustered by state for state worker regressions. Standard errors clustered by MSA for local government worker regressions. Weekly wage data from 1995-2011 CPS MORG. Wage data is restricted to 25-55 year old workers working at least 35 hours per week. State government worker sample includes private sector and state government workers. Local government workers sample includes private sector and local government workers living in MSAs. Land unavailability measures a z-score of the share of land within 50km of an MSA’s center which cannot be developed due to topological constraints. Land use regulation is an index of aggregated survey data on a large set of local land use practices by local municipalities. This is aggregated to the MSA level and then Z-scored. State level measures are z-scores of average MSA-level measures within the state, weighted by MSA population. Controls include 1057 occupation dummies, 15 dummies for education categories, gender, race, hispanic origin, a quartic in age, a rural dummy, and year dummies. Three digit occupation code definitions change in 2000, so I include the full set of combined 3 digit occupation dummies. I treat occupation codes used in years 2000-2011 as distinct occupations from those in previous years, giving a total of 1057 occupation codes. All regressions weighted using CPS earnings weights. *** p<0.01, ** p<0.05, * p<0.1
<table>
<thead>
<tr>
<th></th>
<th>State Gov-Private Sector Wage Gaps</th>
<th>Local Gov-Private Sector Wage Gaps</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Government Worker</td>
<td>-0.140***</td>
<td>-0.142***</td>
</tr>
<tr>
<td></td>
<td>[0.00613]</td>
<td>[0.00575]</td>
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<tr>
<td>Gov* Land Unavailability</td>
<td>0.0101</td>
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</tr>
<tr>
<td></td>
<td>[0.00705]</td>
<td>[0.00624]</td>
</tr>
<tr>
<td>Gov* Land Use Regulation</td>
<td>0.00782</td>
<td>0.0238***</td>
</tr>
<tr>
<td></td>
<td>[0.00889]</td>
<td>[0.00801]</td>
</tr>
<tr>
<td>Gov* Land Unavailability*Union</td>
<td>0.00372</td>
<td>0.0214*</td>
</tr>
<tr>
<td></td>
<td>[0.0120]</td>
<td>[0.0128]</td>
</tr>
<tr>
<td>Gov* Land Use Regulation*Union</td>
<td>0.0492**</td>
<td>0.0356***</td>
</tr>
<tr>
<td></td>
<td>[0.0191]</td>
<td>[0.0106]</td>
</tr>
<tr>
<td>Constant</td>
<td>2.532***</td>
<td>2.540***</td>
</tr>
<tr>
<td></td>
<td>[0.289]</td>
<td>[0.288]</td>
</tr>
</tbody>
</table>

State Elasticity Measures:  
MSA Elasticity Measures:  
State Gov Workers Sample:  
Local Gov Workers Sample:  

| 973,792 | 973,792 | 586,696 | 586,696 |
| 0.39    | 0.389   | 0.395   | 0.394   |

Note: Standard errors clustered by state for state worker regressions. Standard errors clustered by MSA for local government worker regressions. Weekly wage data from 1995-2011 CPS MORG. Wage data is restricted to 25-55 year old workers working at least 35 hours per week. State government worker sample includes private sector and state government workers. Local government work sample includes private sector and local government workers living in MSAs. Land unavailability measures a z-score of the share of land within 50km of an MSA's center which cannot be developed due to topological constraints. Land use regulation is an index of aggregated survey data on a large set of local land use practices by local municipalities. This is aggregated to the MSA level and then Z-scored. State level measures are z-scores of average MSA-level measures within the state, weighted by MSA population. Controls include 15 dummies for education categories, gender, race and hispanic origin, a quartic in age, a rural dummy, and year dummies. Controls also include a labor union dummy, labor union dummy interacted with government dummy, and the labor union dummy interacted with the housing supply elasticity measures. Union is defined as a member of a labor union. All regressions weighted using CPS earnings weights. *** p<0.01, ** p<0.05, * p<0.1
Table 5: Ln Wage vs. State & Local Public Sector-Housing Supply Elasticity Interactions: Subsamples by College Education of Workers

<table>
<thead>
<tr>
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<th>College Sample</th>
<th>Non-College Sample</th>
</tr>
</thead>
<tbody>
<tr>
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<td>2</td>
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<tr>
<td>Government Worker</td>
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<td>-0.182***</td>
</tr>
<tr>
<td></td>
<td>[0.00837]</td>
<td>[0.00832]</td>
</tr>
<tr>
<td>Gov* Land Unavailability</td>
<td>0.0113*</td>
<td>0.00889*</td>
</tr>
<tr>
<td></td>
<td>[0.00644]</td>
<td>[0.00518]</td>
</tr>
<tr>
<td>Gov* Land Use Regulation</td>
<td>-0.00686</td>
<td>0.0169*</td>
</tr>
<tr>
<td></td>
<td>[0.00981]</td>
<td>[0.00994]</td>
</tr>
<tr>
<td>Constant</td>
<td>2.767***</td>
<td>2.773***</td>
</tr>
<tr>
<td></td>
<td>[0.768]</td>
<td>[0.769]</td>
</tr>
<tr>
<td>State Elasticity Measures:</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>MSA Elasticity Measures:</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>State Gov Workers Sample:</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Local Gov Workers Sample:</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Observations</td>
<td>307,951</td>
<td>307,951</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.227</td>
<td>0.227</td>
</tr>
</tbody>
</table>

Note: Standard errors clustered by state for state worker regressions. Standard errors clustered by MSA for local government worker regressions. Weekly wage data from 1995-2011 CPS MORG. Wage data is restricted to 25-55 year old workers working at least 35 hours per week. State government worker sample includes private sector and state government workers. Local government worker sample includes private sector and local government workers living in MSAs. Land unavailability measures a z-score of the share of land within 50km of an MSA’s center which cannot be developed due to topological constraints. Land use regulation is an index of aggregated survey data on a large set of local land use practices by local municipalities. This is aggregated to the MSA level and then Z-scored. State level measures are z-scores of average MSA-level measures within the state, weighted by MSA population. Controls include 15 dummies for education categories, gender, race and hispanic origin, a quartic in age, a rural dummy, and year dummies. All regressions weighted using CPS MORG earnings weights. *** p<0.01, ** p<0.05, * p<0.1
## Table 6: State & Federal Government Workers Falsification Tests

<table>
<thead>
<tr>
<th></th>
<th>Federal Gov-Private Sector Wage Gaps</th>
<th>State Gov-Private Sector Wage Gaps</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Government Worker</td>
<td>0.162***</td>
<td>0.161***</td>
</tr>
<tr>
<td></td>
<td>[0.0130]</td>
<td>[0.0130]</td>
</tr>
<tr>
<td>Gov* Land Unavailability</td>
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<td>-0.0216***</td>
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<tr>
<td></td>
<td>[0.0112]</td>
<td>[0.0103]</td>
</tr>
<tr>
<td>Gov* Land Use Regulation</td>
<td>-0.0151</td>
<td>-0.0158</td>
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<tr>
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<td>[0.0122]</td>
<td>[0.0114]</td>
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<td>2.337***</td>
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<td>[0.291]</td>
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<tr>
<td>State FE</td>
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</tr>
<tr>
<td>MSA FE</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>State x Gov Worker FE:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>State Elasticity Measures:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSA Elasticity Measures:</td>
<td></td>
<td></td>
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<tr>
<td>Federal Gov Worker Sample:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>State Gov Workers Sample:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Standard errors clustered by state for state worker regressions. Standard errors clustered by MSA for local government worker regressions. Weekly wage data from 1995-2011 CPS MORG. Wage data is restricted to 25-55 year old workers working at least 35 hours per week. State government worker sample includes private sector and state government workers. Federal government work sample includes private sector and federal government workers. Land unavailability measures a z-score of the share of land within 50km of an MSA’s center which cannot be developed due to topological constraints. Land use regulation is an index of aggregated survey data on a large set of local land use practices by local municipalities. This is aggregated to the MSA level and then z-scored. State level measures are z-scores of average MSA-level measures within the state, weighted by MSA population. Controls include 15 dummies for education categories, gender, race, hispanic origin, a quartic in age, a rural dummy, and year dummies. All regressions weighted using CPS earnings weights. *** p<0.01, ** p<0.05, * p<0.1
<table>
<thead>
<tr>
<th>Education Measure: Years of Schooling</th>
<th>Government Worker</th>
<th>Gov* Land Unavailability</th>
<th>Gov* Land Use Regulation</th>
<th>Constant</th>
<th>Demographic Controls:</th>
<th>MSA FE</th>
<th>State FE</th>
<th>State Gov Workers Sample:</th>
<th>Local Gov Workers Sample:</th>
<th>Observations</th>
<th>R-Squared</th>
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<tbody>
<tr>
<td>State Gov-Private Sector Wage Gaps</td>
<td>1.719***</td>
<td>0.0383</td>
<td>-0.235***</td>
<td>13.52***</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>973,792</td>
<td>0.181</td>
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<tr>
<td>Local Gov-Private Sector Wage Gaps</td>
<td>1.836***</td>
<td>0.124</td>
<td>-0.249***</td>
<td>12.94***</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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</tr>
<tr>
<td>(0/1)</td>
<td>1.390***</td>
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<td>13.91***</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>586,696</td>
<td>0.186</td>
</tr>
<tr>
<td></td>
<td>1.463***</td>
<td>0.0794</td>
<td>0.0259</td>
<td>13.44***</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>586,696</td>
<td>0.042</td>
</tr>
<tr>
<td></td>
<td>0.266***</td>
<td>-0.00263</td>
<td>-0.0535***</td>
<td>0.354***</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>973,792</td>
<td>0.091</td>
</tr>
<tr>
<td></td>
<td>0.264***</td>
<td>0.0048</td>
<td>-0.0530***</td>
<td>0.178***</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td>0.03</td>
</tr>
<tr>
<td></td>
<td>0.238***</td>
<td>-0.0095</td>
<td>-0.0191*</td>
<td>0.424***</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>586,696</td>
<td>0.00288</td>
</tr>
<tr>
<td></td>
<td>0.230***</td>
<td>-0.00127</td>
<td>-0.00755</td>
<td>0.269***</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>586,696</td>
<td>0.00585</td>
</tr>
</tbody>
</table>

Note: Standard errors clustered by state for state worker regressions. Standard errors clustered by MSA for local government worker regressions. Sample is from 1995-2011 CPS MORG. Sample is restricted to 25-55 year old workers working at least 35 hours per week. State government worker sample includes private sector and state government workers. Local government worker sample includes private sector and local government workers living in MSAs. Land unavailability measures a z-score of the share of land within 50km of an MSA's center which cannot be developed due to topological constraints. Land use regulation is an index of aggregated survey data on a large set of local land use practices by local municipalities. This is aggregated to the MSA level and then Z-scored. State level measures are z-scores of average MSA-level measures within the state, weighted by MSA population. Controls include gender, race and hispanic origin, a quartic in age, a rural dummy, and year dummies. All regressions weighted using CPS MORG earnings weights. *** p<0.01, ** p<0.05, * p<0.1
Table 8: State Housing Supply Elasticity, State Pension Payout per State beneficiary & State Public-Private Government Wage Gaps

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Unavailability</td>
<td>0.0317</td>
<td>0.0674**</td>
<td></td>
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<tr>
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<td>[0.0311]</td>
<td>[0.0329]</td>
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<tr>
<td>Land Use Regulation</td>
<td>0.0925**</td>
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<tr>
<td></td>
<td>[0.0366]</td>
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</tr>
<tr>
<td>Public-Private State Wage Gap</td>
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<tr>
<td></td>
<td></td>
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<td>2.931***</td>
<td>3.130***</td>
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<td>[0.0342]</td>
<td>[0.0534]</td>
</tr>
<tr>
<td>Observations</td>
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<td>192</td>
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</tr>
<tr>
<td>R-squared</td>
<td>0.219</td>
<td>0.099</td>
<td>0.287</td>
</tr>
</tbody>
</table>

Figure 1: State Government-Private Sector Wages Gaps vs. State Land Unavailability Z-Score

Notes: State wage gaps calculated after residualizing wages against 15 dummies for education categories, gender, race, hispanic origin, a quartic in age, a rural dummy, and year dummies. Regression weighted using CPS earnings weights.
Figure 2: Local Government-Private Sector Wages Gaps vs. MSA Land Unavailability Z-Score

Notes: MSA wage gaps calculated after residualizing wages against 15 dummies for education categories, gender, race, Hispanic origin, a quartic in age, a rural dummy, and year dummies. Regression weighted using CPS earnings weights.