State and Local Fiscal Conditions, Public Wealth and Local Land Values

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I. Introduction

Urban economists have long been interested in the role that equilibrium differences in spatial attributes play in influencing land values. Recent work has extended this literature to investigate the role of the local fiscal climate in determining local factor prices, with studies by Blomquist, *et. al.* (1988) and Gyourko & Tracy (1989, 1991) reporting that a vector of tax rates and locally-provided services are reflected in local land (and labor) markets.

This paper extends the literature on compensating differentials in local land markets in three ways. First, the vector of current taxes and services investigated is expanded to include those provided by the state. Previous work has focused primarily on equalizing differences associated with variation in the local tax/service climate. Our results document that the nature of state public finance also matters to local land owners, as land prices in central cities are higher the greater are state expenditures targeted towards cities (*cet. par.*).

The importance of the spatial distribution of spending and services is further highlighted by our second contribution which builds upon the work of Inman (1981, 1982) to extend the analysis of both state and local fiscal climates to include measures of public wealth. Local public infrastructures are very dense in America's larger cities, with Haughwout & Inman (1996) estimating that city infrastructure replacement values average over $13,000 per capita (in 1990 dollars) in our sample of 34 cities over the 1974-1991 period. State infrastructures have also become quite large, with the mean replacement value per state resident being nearly $4,500 on average (again in 1990 dollars). A particularly interesting result is the statistically and economically significant *negative* impact of a larger state infrastructure stock on city land prices (*cet. par.*). State infrastructure development appears to provide competitive advantages to parts of the state outside of the central cities we study, a result with important implications for the debate surrounding the productivity of infrastructure.

A third contribution arises from the time series cross section nature of the data. Most previous work on compensating differences across local land or labor markets uses a single cross section based on decennial census data (e.g., Gyourko & Tracy (1989, 1991) and Blomquist, *et. al.* (1988)). The data in this study cover 34 central cities, with twelve years of data available for most of the cities, beginning in 1974 and ending in 1991. The time series cross section variation permits estimation of models both in levels and short-horizon differences. This is potentially important because results from the levels regressions may be subject to spurious time series correlation problems. That the data shows an economically and statistically significant impact of current state taxes and services targeted toward cities and of the state infrastructure stock in both levels and differenced regressions strongly suggests the result is not due to spurious time series correlation.

II. The Local Fiscal Climate, Public Wealth, and Local Land Values

Rosen (1979) and Roback (1982) were the first to adapt a compensating differential model to illustrate how differences in amenities across sites could be capitalized in local factor markets. Gyourko & Tracy (1989b, 1991) expanded the Rosen/Roback framework to include taxes and locally provided services. Only the bare essentials of that work are reproduced here, followed by a discussion of how the model should be augmented to deal with a more complete description of the local climate that controls for public wealth differentials across jurisdictions.

Scarce sites across cities are competed for by workers and firms. The representative worker-resident consumes some composite traded good Y, land services N, and an exogenously given package of locally provided public services (G_j) and amenities (A_j) for each jurisdiction j. The service package G is financed using one or more taxes. These include a sales tax of rate s on the composite good (whose price is the numeraire), an income tax of rate z on gross wages W^g, and a property tax of rate t per local land rental n. Endowment income I to households is assumed. Firms use land services, labor, and intermediate goods in production. The latter are assumed subject to the sales tax.

Utility and profit maximization lead to indirect utility (V) and indirect profit (π) functions that reflect worker and firm evaluations of each jurisdiction. Assuming perfect mobility in the long run, worker utility and firm profitability must be equalized across cities such that equations (1) and (2) hold as follows:

(1) $V = V\{(1-z_j)W_j^g, (1+t_j)n_j, (1+s_j), I; A_j, G_j\}$ for all j,

(2) $\pi = \pi\{W_j^g, (1+t_j)n_j, (1+s_j), I; A_j, G_j\}$ for all j.

Equation (1) indicates that worker utility is a function of the net wage received $(1-z_j)W_j^g$, gross-of-tax land rentals, $(1+t_j)n_j$; the nonland cost of living $(1+s_j)$; and the amenity and publicly provided service packages, A_j and G_j. Firm profits are determined by many of the same factors, but firms care about the gross wage paid (W_j^g). Note that we assume that the amenity/service package enters the firm's indirect profit function via its underlying impact on the production function.

The equilibrium conditions in (1) and (2) can be solved implicitly for reduced-form wage and land rental equations (with R_j defined as the gross-of-tax land rent) to yield

(3) $W_j^g = W\{(1+s_j), z_j, I, G_j, A_j\}$,

(4) $R_j = (1+t_j)n_j = N\{(1+s_j), z_j, I, G_j, A_j\}$.

The intersection of these two level sets represents the equilibrium wage and land rental prices. Fiscal differentials can influence both land rentals and private wages as both factor prices could adjust to ration workers and firms across scarce sites, with the extent of the adjustment depending upon underlying production and demand conditions.[1]

While the role of visible differences in tax or service packages is relatively well understood, the

[1]The comparative statics of the reduced form equations are straightforward and are derived in Gyourko & Tracy (1989a,b).

model includes no explicit role for the stock of public wealth. If public wealth differentials across cities and states are as large as Haughwout's & Inman's (1996) evidence suggests they could be, then the reduced form factor price equations in (3) and (4) may be misspecified. Because data limitations presently restrict our empirical analysis to land value capitalization, we focus on how to specify the reduced form land rental equation in (4).

Empirical implementation of (4) typically involves estimating a specification such as equation (5)

(5) $n_j = n\{t_j, s_j, z_j, I, A_j, G_j\}$.

Equation (5) should be augmented with a vector of variables reflecting the public wealth (PW) of the community. Factors influencing the overall level of public wealth include measures of a locality's pension underfunding status (P) and its current dissavings behavior associated with spending the city's savings accounts on current consumption goods (D). Some measure of the publicly-provided capital stock also is needed (K). Existing work typically does not include a good measure of the public infrastructure and one is needed to have a more complete accounting of the state and local fiscal climates available to current and potential residents. This leads to the expanded reduced form land rent equation

(6) $n_j = n\{t_j, s_j, z_j, I, A_j, G_j, PW_j(P_j, K_j, D_j)\}$

which is estimated below.[2]

Section III. Data Description

A. City Sample and Housing Data

The data employed come from a variety of sources and reflect conditions in the 34 central cities

[2]Data limitations presently prevent us from further augmenting equation (6) with a control for the public union's ability to generate rents for its members. In Gyourko & Tracy (1989a), the percentage of local public employees belonging to a union served as a proxy for the union's rent-seeking potential.

listed in Table 1. It should be emphasized that all observations come from identifiable central cities, not from the suburbs of those cities, in order to properly match house price data with the appropriate fiscal conditions. The set of cities represents a fairly broad cross section of larger cities throughout the nation, with the set determined by the intersection of jurisdictions included both in Haughwout & Inman's (1996) public wealth data set and the *American Housing Survey* (AHS). The latter is the source for all house price and house quality data. We use data from 12 annual cross sections of the *AHS* (1974-1979, 1981, 1983, 1985, 1987, 1989, and 1991).[3] House prices are self-reported by the owners.[4] Table 2 provides a list of all home quality controls used in the regression analysis, with a brief description of whether the variables are dichotomous, polychotomous, or continuous in nature.

B. Local Amenities

A second set of variables captures local amenity conditions. These variables are weather related in our sample and are reported in Table 3. The set of unproduced amenities (A_j) includes the mean annual rainfall (RAIN) and the mean number of heating and cooling degree days (TEMP) in the relevant metropolitan area. Both come from 30-year averages reported in U.S. Department of Commerce's *Comparative Climatic Data*. Hence, these variables do not vary over time for any city.

C. Current Local and State Taxes and Services

The current tax-service climate is comprised of two vectors of variables reflecting local and state taxes and services ($LTS_{j,t}$ and $STS_{j,t}$, respectively) which vary over time by city. Local tax variables

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[3]Six cities are not continuously surveyed. Buffalo and Portland drop out of the sample after 1983. Memphis, Oakland, Omaha, and San Antonio first enter the AHS in 1985.

[4]There is an extensive literature on whether owner-reported values are systematically biased. Kain & Quigley's (1972) seminal investigation found no such bias in large samples, a conclusion also reached by Thibodeau (1992) in his study of AHS data. Our overall sample of prices is large (>20,000 observations), but some annual samples of specific cities are small.

include measures of the effective property tax rate (PTAXR) in addition to income (LINCTXR) and sales (LSALTXR) tax rates. Income (SINCTXR) and sales (SSALTXR) tax rates also are controlled for at the state level. The effective local property tax rate is computed as the ratio of property taxes paid to the home price, as reported in the *AHS*. Hence, this variable varies across households within any given city. In the analysis below, the average effective property tax rate for a city in any given year is computed by averaging rates across all households from that city in the sample for the relevant year. The income and sales tax data were gathered from various annual issues of the the Advisory Commission on Intergovernmental Affairs (ACIR) publication *Significant Features of Fiscal Federalism*. The income tax rate variables reflect the highest marginal rate applicable in the jurisdiction.[5] For the few cities in our sample that levy such a tax, it usually is at a flat rate. However, many state income tax schedules are progressive. Sales taxes typically are state levies and are always flat rates.

Effective service provision obviously is much more difficult to control for. At the local level, the mean number of serious crimes per 100,000 residents (LCRIME) as reported by the Federal Bureau of Investigation is used to proxy for police service quality. The pupil-teacher ratio (LEDUC) is included to control for local public school services provision. This variable is created from data provided in various issues of the *Digest of Education Statistics*.

At the state level, a series of per capita expenditures measures are employed to capture the service provision environment. These control for current services spending for a select group of functions and all other current spending. In addition, we include controls for the state's share of primary and secondary education spending and for direct state grants to the cities in our sample. These latter variables must be interpreted with care in the empirical work, as they capture the effects of composition

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[5]Local income and sales tax rates represent the sum of city and county levies, where applicable.

changes in state spending.[6]

The three specific functions controlled for in the specifications estimated below are public welfare, roads, and higher education. State government spending on welfare net of federal welfare aid is measured by the variable SNETWEL. Spending on this function is controlled for explicitly because most such payments probably go to residents of central cities during our 1974-1991 sample period. We expect that higher levels of such spending by the state leave cities better off in a variety of ways. A second function specifically controlled for is state spending on higher education (STHIED), which measures spending on colleges and universities.[7] The final specific function controlled for is current (i.e., non-capital) state government spending on highways (STHIWAY). This variable measures spending on what is considered typical maintenance, operation, and repair of roads (including bridges, tunnels, etc.). Replacement or major rehabilitations are considered capital spending, which is reflected in the infrastructure stock variables discussed below. All other current, non-capital spending is captured by the variable SOTHER. SOTHER is defined as total general expenditures (including intergovernmental aid) less welfare spending, current highway spending, current education spending (secondary + higher), and all capital spending.

Two additional variables round out the service side of the $STS_{j,t}$ vector. One is STAID which measures the per capita amount of grants-in-aid given by the relevant state to each of the 34 cities in our sample. This variable is included because it clearly represents very targeted spending towards cities and we are interested in the possibly differential effects of state spending that is targeted spatially versus that which is not. However, this variable's effect must be interpreted with care, as it captures the impact of a

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[6]These data come from the Government Finances series of the U.S. Census. Specifically, various issues of *State Government Finances* and *City Government Finances* are used.

[7]Not all spending in for public colleges and universities. For example, the Commonwealth of Pennsylvania provides annual allocations to a select group of private universities.

composition change. That is, this spending is captured in the SOTHER variable so that it represents a shift in state spending to cities, holding constant the total amount of state current services spending. The final variable is labelled STSECED which measures the state share of elementary and secondary spending statewide. More specifically, it is the state's intergovernmental aid for local education divided by total local spending on education.

D. Local and State Public Sector Wealth Variables

The third set of variables capture public wealth measures as reflected in pension (under)funding levels, infrastructure stocks, net cash holdings, and net debt outstanding. These variables comprise the local public wealth ($LPW_{j,t}$) and state public wealth ($SPW_{j,t}$) vectors, respectively. These data are described more fully in Haughwout & Inman (1996). For descriptive purposes, public sector wealth is divided into three categories, each of which represents a distinct type of net governmental asset. We begin with a description of the data in each category and then conclude with a summary of how the variables are combined to generate the regressors used in the empirical analysis.

The Cash Account

The cash account includes information about both the cash and security holdings owned by government and their short term debt liabilities. Cash and security holdings of state and local governments are reported annually in the Census Bureau's *Governmental Finances* series.

The financial assets data are categorized as held by either insurance trust, employee retirement, debt offset, bond, or other funds. Assets of insurance trust funds administered by state and local governments are excluded based on the assumption that the government's role as trustee for these accounts has no effect on its own real financial position.[8] An important exception to this rule is employee

[8]Trust fund balances differ from the other assets tabulated here in that they represent balances held purely in expectation of future liabilities. By excluding both the liabilities and the financial assets held in their anticipation, we treat such programs (which include unemployment and workmen's compensation at

retirement. Since the funding status of employee pensions is known to be a factor in the financial position of state and local governments (Inman 1985), a separate accounting is made for these funds (see below).

This leaves three components of cash and security holdings. The first, bond funds, are accounts established for the purpose of holding the proceeds of long-term debt issues. Since long term debt is issued primarily to finance capital investments, and since these investments are generally made over a period of several years, the proceeds of bond sales are often placed into interest-bearing accounts or securities prior to their disbursement. A second kind of account is the debt offset, or sinking, fund. These funds are held for the redemption of long term debt. It is from these accounts that funds are drawn when governments wish to buy back debt and from which they make all refunds to bondholders. Finally, the Census reports the assets of "Other" cash and securities accounts, which include the assets of governments held for all other purposes. These primarily represent unencumbered cash and liquid security assets.

State and local governments may issue short term debt (defined here as debt with a maturity of less than one year) for a variety of purposes, but do so primarily to smooth their cash flows during the fiscal year. Since the timing of revenue receipts may not match that of required expenditures, governments may borrow in anticipation of revenues yet to be received. While such borrowings may be classified as Revenue Anticipation Notes (RANs), Tax Anticipation Notes (TANs), or Bond Anticipation Notes (BANs), their defining characteristic is a maturity of less than one year. *Governmental Finances* annually reports the par value of short term debt outstanding for all states and a sample of local governments. Each of our cities is included in the annual sample. Given their short maturities, these obligations are valued at par in the cash account. All cash account assets and liabilities are deflated using the CPIU as described in Haughwout & Inman (1996).

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the state level) as if they are fully funded.

The Pension Account

As with the federal government and many private firms, state and local governments administer pension funds for many of their employees. When the present value of promised pensions benefits exceeds the present values of plan assets and future contributions, a pension plan is underfunded. Ultimately, since each government is required to live up to the pension bargain it has struck with employees, these unfunded liabilities are essentially debts owed by the government administering the plan. We follow the econometric method outlined by Inman (1985) for estimating the unfunded liabilities state and local government pension plans.[9]

The Capital Account

The functions of state and local governments often require the purchase, creation and maintenance of significant physical public assets. The roads, parks, sewer systems and public buildings that these governments construct or purchase are often paid for with the proceeds of long term debt issues. The Census Bureau reports, on an annual basis, the par value of long term debt outstanding as well as new issues and refundings that occurred during the fiscal year. The par value of long term debt outstanding is converted to a market value in order to make it comparable to the cash and pension account balances. This conversion exploits information on debt outstanding since 1949, and amortizes new obligations over

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[9]The method relates unfunded liabilities to plan parameters (benefit rates, cost-of-living adjustments, the rate at which benefits replace wages, the number of years of service required to receive benefits, and plan integration with the social security system), the plan's current asset and benefit levels, and growth in plan membership. Membership, assets and benefits are reported in the *Governmental Finance* volume *Finances of State and Local Employee Retirement Systems*, while plan parameters are found in state and city pension laws. For further details on the method as well as the equation solved to estimate the liability status of city and state employee pension systems, see Appendix A in Haughwout & Inman (1996) and Inman (1985). The pension account values are deflated by the CPIU as described in Haughwout & Inman (1996).

an 11 year period, which is the average length of time that these issues remain in public hands.[10]

The largest component of state and local government assets is the physical stock of land, structures, and durable equipment owned by these governments. The stock estimates reported below were constructed using the perpetual inventory technique, which has formed the basis of the most widely-cited estimates of capital stocks (see Boskin *et. al.* 1987, Hulten and Wykoff 1981, Munnell 1990). The technique requires the accumulation and depreciation of real investment outlays in each year, and provides estimates of the stock in place for each cross-sectional unit in each year. The application of the perpetual inventory technique to our investment data results in the following basic equation for public capital stocks:

$$(7) \quad K_t = (1 - \delta) K_{t-1} + I_t$$

where K and I are the real stocks and flows of investment, δ is the depreciation rate, and t indexes time.[11]

Coverage

The assets and liabilities included here are those that are controlled by the state or local government indicated. Control in this context has a fairly broad interpretation. Two potential sources of confusion are the treatment of assets and liabilities created with intergovernmental revenues and the treatment of assets owned by related but separate governmental units. Assets created using

[10]See Haughwout & Inman (1996) for more detail on the conversion of par to market values for long term debt. These market values are deflated by the CPIU as described in Haughwout & Inman (1996).

[11]Solution of this equation requires information on flows of capital spending over time, depreciation rates, and costs. Capital investments made by state and local governments are reported in the Census Bureau's Governmental Finances series. Depreciation rates are calculated from BEA (1987) and Hulten and Wykoff (1981). Cost data are calculated from *Engineering News Record's* Construction Cost series. Further detail on the construction of the capital stock series and the deflators used to put the values in real terms are described in Haughwout & Inman (1996).

intergovernmental funds are, for our purposes, the property of the receiving government. A shorthand way of thinking of the definition of ownership is that the government which controls the final disposition of the funds is the owner of the asset. Thus a roadway financed by a combination of state funds and federal matching grants is treated as the property of the state government.

Our treatment of quasi-independent governmental units mimics that of the Census Bureau. As part of the *Governmental Structure* component of the *Census of Governments* series, the Census Bureau classifies all governmental units as either independent or controlled by another government. The assets and liabilities of the latter group are here classified with the controlling government. Thus, our accounting of the assets of Philadelphia includes the assets and liabilities of the Philadelphia Housing Authority, which is controlled by the city, but excludes those of the Southeastern Pennsylvania Transportation Authority, which Census deems an independent agency. Assets and liabilities of county governments, where they exist, are excluded from the data presented here.[12]

Comparability of the Accounts

While the perpetual inventory technique is the most widely used method of estimating the value of government's physical capital, it does not provide a figure that is strictly comparable to the other asset and liability series described here. In effect, the cash, pension and long term debt estimates are designed to calculate the total market value of governmental assets and liabilities. They answer the question, "If government were to convert its financial assets to cash and pay off its liabilities, what amount (positive or negative) would be left over for each resident?" Since many of the services provided by public capital cannot be priced by markets, these physical assets may have no market value whatsoever. They do,

[12]In several of our cities, county boundaries are coterminous with those of the city. In these cases, county and city functions are combined and information on both is included. This introduces measurement error because the stocks of combined city-county governments are measured differently. Future work will include controls for such governments.

however, provide services that are potentially of value to residents. The physical capital stock estimates provided by the perpetual inventory technique utilized here measure the replacement value of government-owned physical assets. The capital stock estimates thus answer a somewhat different question, "If the public capital stock were to be destroyed, how much would it cost each resident to rebuild it to a level that would provide the same level of service?" In spite of these slight differences in the interpretation of the series, we believe that our methods result in the most consistent accounting of state and local assets and liabilities available.

Public Sector Wealth Controls Used in the Regression Analysis

The public sector wealth data are combined to generate the following set of ten regressors used in the empirical analysis. Because it generally is possible that city land owners would differentially value public assets or liabilities depending upon whether they were held by that city or state, separate measures are included for both governments. Local per capita figures use city residents in the denominator, while the state population serves as the denominator for state per capita variables.

a) Local or State Net Per Capita Short-Term Cash Position (LCASH and SCASH, respectively; 1990 dollars): these variables are defined as the unencumbered cash holdings of the relevant city or state government less its short-term debt outstanding; unencumbered cash holdings are defined as total cash and short term security holdings net of debt offset balances and unspent bond proceeds;

b) Local or State Net Per Capita Long-Term Debt Position (LNLTDBT and SNLTDBT, respectively; 1990 dollars): these variables are defined as the market value of long-term debt outstanding less any bond offset funds;

c) Local or State Per Capita Unfunded Pension Liabilities (LUFUND and SUFUND, respectively; 1990 dollars): these variable are computed as noted above and described in Inman (1985);

d) Local or State Per Capita Unspent Bond Proceeds (LBNDFND and SBNDFND, respectively; $1000s of 1990 dollars): these variables represent the unspent bond portions of the cash accounts for the city and the state;

e) Local and State Per Capita Infrastructure Amounts (LPUBSTOCK and SPUBSTOCK, respectively; $1000s of 1990 dollars): these variables are computed as described above and in Haughwout & Inman (1996).

Section IV. Econometric Methodology & Summary Statistics

A two-stage estimation is performed to determine whether the city- or state- level variables can account for the variance in house prices across cities over time. In the first stage, city-specific effects in land prices over time are computed. Determining them involves the following OLS estimation of the log of individual house prices ($HV_{i,j,t}$)[13] on a vector of house quality controls ($HQ_{i,j,t}$) and another vector (which is denoted as $CSE_{j,t}$ for city-specific effects) of city indicator variables (C_j) that are interacted with year dummies (T_t),

$$(8)\ \text{Log } HV_{i,j,t} = \beta_1 HQ_{i,j,t} + \beta_2 CSE_{j,t} + \epsilon_{i,j,t},$$

where house prices (HV) and house quality (HQ) vary by the i^{th} individual home across each city j and each cross section year t, city-specific effects in land prices by year (CSE) vary by city and cross section year, and ϵ is the standard iid error term. This regression is performed using 20,083 observations on homes in all 34 cities across the 12 cross sections. Summary statistics on house prices and the HQ vector are reported in Table 4.

By sweeping out structure quality effects in house prices across cities and over time in equation

[13]House price is measured in 1990 dollars, as is the case for all financial variables used in the paper.

(8), we isolate city-specific effects in (presumably) land prices over time.[14] The appropriate F-tests showed that the city effects represented by β_2 do vary across city and over time by city.[15] The mean value of those effects is $31,574, which is approximately 41% of mean overall house price. Variance in the house quality attributes over time account for the remainder of the explained variance in house prices over time.

The second stage of the estimation strategy involves examining whether variance in local amenities (A_j), local or state current tax/service conditions ($LTS_{j,t}$ and $STS_{j,t}$), and public wealth conditions ($LPW_{j,t}$ and $SPW_{j,t}$) can account for the variance in the estimated city-specific effects over time in prices. For each time period the mean value of each variable in these vectors is computed[16], with the estimated β_2 vector (a 368x1 column vector) from equation (8) then regressed on the means of the city-specific variables as follows,

$$(9)\ \beta_{2,j,t} = \beta_3 A_j + \beta_4 LTS_{j,t} + \beta_5 STS_{j,t} + \beta_6 LPW_{j,t} + \beta_7 SPW_{j,t} + \eta_{j,t}$$

where $\eta_{j,t}$ is the standard error term, β_3-β_7 are regression coefficient vectors, and all other terms are as described above.[17]

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[14]There are 368 city- and time-specific estimates generated which are available upon request. This is less than 34x12 because for some cities there are not observations in each cross section.

[15]That is, we can reject with very high confidence (99%+) the following nulls: (1) that the effects do not vary across cities; (2) that the effects do not vary over time; (3) that the effects do not vary by city over time.

[16]For every city-specific variable except the effective local property tax rate, there is no variation in the city-specific variables across households within a given city. That is, the annual rainfall amount is the same for all households in (say) Atlanta. In addition, there is no time series variation in the pure amenities.

[17]In lieu of this two-stage approach, a GLS-based random effects model could be estimated on the micro data. Gyourko & Tracy (1991) estimate such a model on 1980 Census data and report statistically and economically significant city-specific random effects in both land price and wage data. Estimating a GLS model on unbalanced time series, cross section data such as ours is difficult, but not impossible

Table 5 reports summary statistics on the city-specific variables used in equation (9). The first column reports means and standard deviations over time across all cities in the sample. The remaining columns report the same statistics by year to help illustrate the time series and cross section variance in the data. The means by year represent the mean of the city means, with the standard deviation in any given year representing the cross sectional variation in the city means for the given year.

Table 5 also includes data on two variables used in the regression beyond those discussed above. One is the land area of the central city in square miles (City Land Area), which is included for a couple of reasons. One is that the larger the city land area, the higher is the probability of drawing a house observation far away from the central business district (CBD). Given the strong results from the urban economics literature on the slope of bid-rent functions, land prices should be lower the more often our observations are for units far away from the CBD. This is what the regression results show.[18] The second added variable is an interaction term of the State Net Long-Term Debt Position (SNLTDBT) with lagged state employment growth. The use and influence of this interaction term is discussed more fully below.

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with modern software packages. Econometric theory suggests that our two-stage results are a weighted average of the OLS and random effects estimates, with the weights depending upon factors such as the amount of within-city variance over time in the city-specific variables. Hence, any significant results from our approach are highly likely to be robust with respect to a GLS model. Moreover, because the city level variables are essentially choices of the city, the estimated group effect is likely to be correlated with the included variables, possibly requiring a difficult instrumental variables estimation. That said, it should also be noted that the robustness of fixed effects-based results also may be suspect because of possible specification bias. Unless the number of cities or cross sections is large, the number of degrees of freedom is limited, which itself may force excessive parsimony in modeling. If important variables are omitted because of this limitation, the standard biases result. In our case, we have included as many types of city-specific attributes as possible (consistent with having 368 total observations) to minimize this potential problem.

[18]Another reason for including this variable is to control for a potential density of infrastructure impact--particularly in the case of city infrastructure. That is, it may be that a given per capita amount of city infrastructure is more valuable in a smaller city. However, that impact was not statistically or economically important.

Section V. Results and Analysis: Regressions in Levels

A. Regression Summary Statistics

Table 6 reports regression summary statistics from estimating equation (9), with Table 7 providing the results for individual variables. The first row of Table 6 documents that the specification does well in accounting for the variance in city-specific land prices across cities over time, with an adjusted-R^2=80%. The remaining rows of that table summarize the relative importance of the amenity, current tax and service, and public wealth variables in accounting for that variance. Relative importance is measured in two ways. One, termed the maximum partial R^2 for the vector(s) of traits in each row, is defined to be the adjusted-R^2 from the regression of city-specific effects in prices over time on the traits listed in each row. The other, the minimum partial R^2 for the vector(s) of traits in each row, is defined to be the difference between the adjusted-R^2 obtained when including all traits (row 1) and the adjusted-R^2 from the regression omitting the traits listed in the relevant row. This measures the marginal increase in explanatory power from adding the given vector to all others.

There are a number of interesting results in Table 6. First, the variance in just the two local amenity variables (RAIN and TEMP) can account for 36% of all variance in city-specific land prices over time. This is a major reason such amenities have been the focus of much of the early work in the empirical compensating differences literature (e.g., see Rosen (1979) and Roback (1980, 1982)).. However, pure local amenities add relatively little in terms of explanatory power to a specification that includes current state and local tax/service variables and measures of public wealth, as indicated by the minimum partial R^2 of 0.02 for the A_j vector. Much of the reduction in R^2 occurs when the state-level variables are added.

Table 6 also documents that the explanatory power of the current tax/service environment generally is greater than that of public wealth conditions. This is true in terms of maximum and minimum partial R^2's and at both local and state levels. However, controlling for state and local public wealth is beneficial, as adding the $LPW_{j,t}$ and $SPW_{j,t}$ vectors to a specification including all other variables still is found to increase the adjusted-R^2 by 6% (from 0.75 to 0.80, row 10).

While local tax/service and public wealth conditions are very influential in explaining variation in quality-adjusted house prices across cities over time (maximum partial R^2=0.41, minimum partial R^2=0.16; row 7), the independent role of the analogous state variables is far from insignificant. Row 8 of Table 6 illustrates that the combined $STS_{j,t}$ and $SPW_{j,t}$ vectors can themselves explain 54% of the total variance in the quality-adjusted price series. When added to a specification that includes all other vectors, the adjusted-R^2 increases by 11 percentage points from 0.69 to 0.80 (or by 14%), suggesting that what goes on in state capitals to affect the structure of state public finance has meaningful impact on the value of central city homes in their states.

B. Individual Variable Results and Standardized Marginal Effects

Table 7 reports individual coefficient results and standardized marginal effects for each variable. Standardized marginal effects are for a standard deviation increase in each variable. Because the dependent variable city fixed effect reflects a log price, marginal effects are calculated using the exponential transformation suggested by Halverson and Palmquist (1980). Column 4 reproduces the mean and standard deviation for each variable from Table 5.

Amenities (A_j)

Both the temperature (TEMP) and rainfall (RAIN) variables are statistically significant. Cities with more extreme climates have more heating and cooling degree days, which translates into higher living costs in terms of air conditioning or heating. A one standard deviation higher number of heating and cooling degree days (TEMP) about its mean is associated with a 8.5% lower city-specific effect in land prices over time. As noted above, the mean city-specific effect over time (from equation (8)) is

$31,574. Given that figure, the -8.5% impact translates in $2696 in lower value (=-.085*31,574). The positive coefficient on RAIN implies that a city receiving 11.6 more inches of rain per year on average has a 6.7% higher city-specific effect, or prices that are $2129 higher. This seems anomalous as more rain generally is not viewed as a positive amenity. Experimentation with alternative specifications that include region controls did not change this particular finding.[19]

Current Local Taxes and Services ($LTS_{j,t}$)

The three local tax variables each have the anticipated sign, with the effective property tax rate (PTAXR) and city income tax rate (LINCTXR) being both statistically and economically significant. The coefficient on the local sales tax rate (LSALTXR) not only is imprecisely estimated, it is small in magnitude.

The results for the effective property tax are consistent with it being fully capitalized. Table 7 illustrates that a city with a one standard deviation higher value of PTAXR (i.e., of 0.72%, or 2.10% versus the sample mean of 1.38%) is estimated to have quality-adjusted house prices that are 17.8% lower, all else constant. In price terms, this translates into $5610 (=.178*31,574). Higher taxes of 0.72% on the sample mean house price of approximately $75,000 implies higher annual payments of $540 (=.0072*$75,000). Treating this stream as a perpetuity and capping it at 7% yields a value of over $7700, indicating that approximately 73% of the property tax is capitalized. Given the difficulty of fully controlling for the level of effective service provision and that the supply of housing in many of our cities may well be fairly elastic (e.g., Houston), a finding of less than full capitalization is not unexpected.[20]

The local income tax also is significantly negatively capitalized into city land prices. A one

[19]It could be that capitalization of this variable occurs primarily in the labor market. If so, the full price of rain still could be negative.

[20]Eighty-three percent capitalization is indicated using a coefficient two standard errors above the point estimate for PTAXR.

standard deviation higher rate of 1.06% about the sample mean is associated with an 8.8% lower city-specific effect in prices. In terms of land prices, their level is $2780 lower (-.088*$31,574). Assuming a $40,000 income for home owners as the base for the tax, a 1.06% higher rate translates into $424 in higher taxes on an annual basis ($424=.0106*$40,000). Using the same 7% cap rate for the perpetuity yields a value of $6057. This suggests that a reasonably large fraction of the capitalization of this variable does not occur in the labor market. Given Inman's (1992) findings on the large negative impacts of higher local income taxes on local job growth and Stull & Stull's (1991) direct evidence on land market capitalization of the Philadelphia wage tax, it is not surprising that such effects are at least partially reflected in the levels of land prices over time.

Both proxies for public safety and education services have the anticipated signs, but only the crime variable is significant at standard confidence levels (and at the 10% level only). A one standard deviation higher number of serious crimes per 100,000 people (CRIME) is associated with a 1.9% lower city-specific effect in land prices. Stated differently, 650 more serious crimes per 100,000 city residents is associated with a $615 lower property value. The estimated impact of a higher student-teacher ratio is economically small, in addition to being statistically insignificant. A one standard deviation higher ratio (of 2.7 pupils per teacher) is associated with only a $289 lower level of land prices. One would expect education service quality differentials to be capitalized into local land prices. The fact that we do not find a larger and more significant effect probably reflects the difficulty of accurately measuring school quality over time.

Current State Taxes and Services ($STS_{j,t}$)

Our expectations regarding the impact of state services in particular depend crucially on whether the spending varies within state and the extent of intra- versus inter-state household mobility. For example, if all household moves were within state and state spending on a given service function did not vary spatially (i.e., per capita spending was equal across all jurisdictions in the state), then we would expect no capitalization of that spending into land prices. If the marginal bidder for city homes is a home state resident (approximately 80% of during our sample period are intrastate), we would expect capitalization to result primarily for functions whose spending is targeted towards specific jurisdictions.

Because the poor are overrepresented in large cities and became increasingly concentrated in large cities during our sample period, added spending by the state on welfare probably has a high likelihood of benefitting city land markets in one way or another. That this is the case is suggested by the result for net state welfare spending (SNETWEL) which has the strongest individual impact of the state spending variables. A one standard deviation higher level of such spending (which is equal to $79 per state resident) is associated with a 14.3% higher city specific effect, or $4531 higher property values. The plausibility of this effect depends upon whether $79 per state resident in perpetuity could benefit middle class city homes by approximately $320 per year (assuming a 7% cap rate). Back-of-the envelope calculations we have done suggest that city homeowners benefit in the amount of approximately $200 per year. Thus, it appears that this variable may also proxy for other uncontrolled for services and benefits provided to cities by the state.

Another spatially targeted spending variable is state grants to the cities in our sample. This variable (STAID) also has a statistically significant positive impact on city land prices. However, the impact is small economically. The results imply that a one standard deviation higher amount of such aid (equal to $452 per city resident) is associated with land prices that are $759 higher, or a 2.4% greater city-specific effect. Assuming the typical city owner-occupier is a three person household, the individual household's share of this aid flow amounts to $1356 on an annual basis (=$452*3). Treated as a perpetuity with a 7% cap rate implies a present value of over $19,000 to such a difference in aid levels.

Thus, relatively little of the value is capitalized into home values.[21]

Given that cities tend to have many fiscal responsibilities beyond education, we expected that situations in which states fund a greater share of education spending would be associated with higher city values. The coefficient on STSECED is consistent with this prior, as a value of STSECED that is one standard deviation above its mean (i.e., 65% versus 53%) is associated with a 2.7% greater city-specific effect, or higher prices in the city of $868.

More spending by the state on higher education (STHIED) is also associated with higher city prices, although this variable just misses being statistically significant at the 10% level. A one standard deviation increase of $57 per state resident about the sample mean of $199 per state resident is associated with city values that are 2% (or $638) higher. It may be that this spending also is targeted more towards larger cities, which may contain more of their states' institutions of higher learning.

A higher level of current highway spending (STHIWAY) also is associated with increased city home prices. Our regression results indicate that a one standard deviation increase of $17 per state resident in such spending is associated with a 6% higher city-specific effect in prices. Recall that current highway spending involves expenditures on normal maintenance such as filling potholes, cutting the grass along the medians, and performing normal upkeep on existing roads. As such, a large fraction of these expenditures probably occur in jurisdictions such as central cities that have large existing road infrastructures, and it appears that city home owners benefit via capitalization into their land prices.

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[21]One reason may be the argument made by Linneman (1980). Linneman noted that in a perfectly specified model of local taxes and services that capitalization effects could not be identified as the balanced budget constraint meant that taxes could not vary independently of services. The fact that such effects were routinely estimated meant that some factor such as intergovernmental aid was not being controlled for (or that there were different levels of government efficiency). Thus, it could be that the impact of state aid already is reflected in the local tax variable (i.e., local taxes are lower than they would be otherwise in the absence of state aid). We included intergovernmental controls because we are confident our vector of taxes and services does not perfectly control for the local fiscal climate. Dropping this variable does change the local property and income tax coefficients marginally.

The impact of other state current services spending (SOTHER) is positive, but the variable's coefficient is not statistically significantly different from zero. Since most mobility is within state, it may be that this result reflects the fact that SOTHER spending is fairly uniform across jurisdictions within a given state.

With respect to the two state tax controls (SINCTXR and SSALTXR), we do not find any material capitalization into city property values. These rates clearly do not vary within state and the implied impacts based on their point estimates are small in any event. Again, relatively little capitalization would be expected in a world in which the marginal bidder was from within the state.

Local Public Wealth: Asset and Liabilities ($LPW_{j,t}$)

While city assets and liabilities are highly statistically significant as a group, the influence of individual variables varies widely. For example, higher levels of unencumbered cash holdings by the local government (LCASH) are associated with lower city quality-adjusted house prices, all else constant. However, the coefficient is not precisely estimated, and the implied effect a one standard deviation higher amount of these cash reserves is fairly small. It is as if property owners prefer their city government not maintain cash reserves. Perhaps there is some underlying belief that tax revenues be refunded if they are not going to be spent relatively quickly.

The coefficient on the city infrastructure stock per capita (LPUBSTOCK) is positive as expected. However, the variable is only significant at the 13% level with a t-statistic of 1.5. A one standard deviation greater local infrastructure stock, which amounts to $6143 per capita, is associated with higher property prices of only $657 (or 2.1% in terms of the city-specific effect). On its face, this *ceteris paribus* result implies a very low rate of return on city infrastructure *on the margin*. A three-person household's share of such an increase in local infrastructure amounts to $18,429 (=$6143*3), yet their home prices go up by less than $700 in the face of such a large increase in this asset. However, this interpretation may not be correct. One reason is that whether this effect is sufficient to offset the cost of the investment depends upon the method of finance. That is, if federal and state matching rates are very high, then the net cost to the city owner may itself be low--and the private return may not be so low in fact.[22]

The impact of a higher level of unspent bond proceeds by the city (LBNDFND) is much greater, in addition to being statistically significant at conventional levels. A one standard deviation greater amount of such funds (which equals $272 per capita) is associated with property prices that are $717 higher. The impact of this variable can be interpreted in a couple of ways. These particular bond proceeds are not free cash flow in a legal sense. They essentially reflect promises of future infrastructure per the bond agreements under which they were generated. However, for most of our sample period, state and local governments could play an arbitrage game with these proceeds.[23] Essentially, they were able to raise funds at low cost using their tax exempt status and then invest those proceeds at a market rate. All else constant, that spread should be capitalized into local house prices--to the extent owners trust the government to do something productive with the funds. Our result is consistent with a fairly high arbitrage return as the following calculations suggest. Over our sample period, the average rate at which municipalities could borrow was about 7%. If they were able to invest the funds in the stock market, they were able to earn a return that was about 350 basis points higher than their borrowing rate. Multiplying this by the $272 figure yields $9.52 (=$272*.035), which represents the annual arbitrage gain from

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[22]In addition, it could be that total social returns are higher. The Rosen/Roback model assumes away complexities of residential versus nonresidential zoning issues that may prevent households and firms from competing for the same plot on the margin. If those complexities are in fact relevant, then our residential land price estimation would not capture all benefits accruing to firms.

[23]The 1986 Tax Reform Act put stringent limits on the ability to engage in this arbitrarge. We have experimented with specifications that include interaction terms with pre- and post-1986 dummies. Those results do show no significant impact of this variable in the post-1986 period. However, including that interaction does not change the basic tenor of this (or any other) result.

borrowing at the low tax-exempt rate and investing in stocks. Treating this as a perpetuity and capping the stream at the tax-exempt borrowing rate of 7% yields a present value of approximately $136 (=$9.52/.07). For a three-person owner-occupied household, this translates into $408 of value. This is less than the amount we estimate is capitalized into house value, but it not off by an order of magnitude, suggesting that an arbitrage story could largely account for this impact on local land markets.

The net long-term debt position of the city (LNLTDBT) has a negative impact on city values, as expected, and is marginally significant at the 10% level. A one standard deviation increase in the amount of such debt is associated with a 2.2% lower city-specific effect in prices (or -$710). A three-person household's share of this net debt amounts to $2010, implying much less than full capitalization for this variable.

Finally, higher levels of unfunded pension liabilities (LUFUND) are found to positively capitalized into local land markets. The mean amount of such liabilities is large ($1989) and the variation in this variable also is large (standard deviation=$2468). A one standard deviation increase in the amount of such liabilities is associated with a 8.3% higher city-specific effect in quality-adjusted housing prices (which translates into $2617). A three-person household's share of this liability amounts to $7404, so much less than full capitalization into the local land market occurs. This finding is consistent with a couple of hypotheses. One is that unfunded pensions represent 'invisible' deficits being run by the city, with the marginal bidder for homes being oblivious to such things. Less than full capitalization would result in such a situation if the city was spending part of the 'invisible' deficit on (uncontrolled for) worthwhile services while spending the other part on unjustified wage premia or overstaffing. The same would result if at least some tax relief was being provided in addition to transfers to local public unions. However, our result also is consistent with such deficits being fully visible, and the local land owners viewing them as the equivalent of positive present value loans. In this case, the government could be fully using the funds to provide (uncontrolled for) desired services or temporary tax relief, with the local owners equally fully aware that the implied loan must be paid back. If the interest rate on the implied loan is low enough, positive capitalization into land prices could ensue.

State Public Wealth: Assets and Liabilities ($SPW_{j,t}$)

Individually, the state asset and liability variables often do not mimic the effects of their local counterparts. As discussed above, this is not unexpected as the impacts of state-level variables depends at least partially on the extent of inter-state versus intra-state household mobility and the extent to which the variables are spatially targeted within the state.

State unencumbered cash holdings (SCASH) is a variable that clearly is the same for any resident regardless of where they live within the state. As long as the marginal bidder for a home is not from another state, we would not expect much capitalization into land prices in our model. This is what the results show, with the point estimate for SCASH being negative, but small in magnitude and imprecisely measured.

The impact of the state infrastructure stock (SPUBSTOCK) is dramatically different. A higher state infrastructure stock is associated with *lower* city values, and the impact is very precisely estimated (t=-4.9). Specifically, the results imply that a one standard deviation higher state stock of $1069 per state resident is associated with city land prices that are $2865 lower. This represents a 9.1% lower city-specific effect in prices. A three-person city household's share of the increase in this stock amounts to $3207 (=$1069*3), so this effect is nearly fully negatively capitalized.

In the time period examined here, net growth in state infrastructure stocks occurred mostly outside of the central city.[24] Hence, increasing its amount represents a transfer from city owners and generally helps make competing suburban and rural jurisdictions more attractive places in which to live

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[24]State infrastructure stocks are largely composed of roadways, the net growth of which certainly is concentrated outside of central cities. For our sample period, road stocks were on average 65% of total state infrastructure stocks.

and work. This transfer of resources appears to have very negative consequences for city land owners. For any given amount of taxes paid, city owners would prefer to have the funds spent on virtually anything but state infrastructure.

This finding has potentially important implications for the so-called infrastructure productivity puzzle. Following Aschauer's (1989) claim of very high productivity for infrastructure investments, Holtz-Eakin (1994) and Garcia-Mila, McGuire & Porter (1996) analyze aggregate state-level output and infrastructure data with more sophisticated econometric techniques and conclude that the contribution of infrastructure to overall state productivity is very low.[25] While our analysis is of land value, the relation between land values and output in a fixed geographic area (such as our central cities) may be summarized by noting that higher land prices generally will be associated with higher output.[26] Our results are consistent with a negative relation between state infrastructure and city output, while growth in city-owned infrastructure stocks is associated with higher city output. While this is fully consistent with recent findings that the *net* effect of infrastructure at the state level is negligible, our result adds a cautionary note to this line of research. The conditional correlation between state output and state infrastructure stocks probably cannot reveal the productivity of infrastructure. It would thus be incorrect to infer from aggregate state production function studies that infrastructure is not productive on the margin: aggregated models can capture only net effects, which will mask the kinds of intra-state impacts uncovered here. Indeed, our results suggest that infrastructure growth is valuable, but that its benefits are

[25]They find that controlling for unobserved state characteristics reduces the estimated productivity effect to zero.

[26]Haughwout (1996) shows that this result holds when the following conditions obtain: (1) there is free mobility of productive inputs; (2) land and labor are substitutable in production; and (3) households and firms compete freely for land.

spatially concentrated in areas smaller than states.[27]

The coefficient on the level of state unspent bond proceeds (SBNDFND) also implies negative capitalization into city land markets, but the variable is not statistically significant at conventional levels (t-statistic of only -1.2). Again, we would not expect the arbitrage story used for LBNDFND to generate the same capitalization if the marginal bidder for a city home is from another part of the state, as in that case, there would be no variation in SBNDFND for that bidder.

The impact of the net long-term debt position of the state (SNLTDBT) is complex. When entered linearly, the variable has a significantly positive coefficient, suggesting that higher levels of debt are associated with higher city land prices (all else constant). This anomalous finding appears to be due to state debt levels being correlated with past state growth, which itself is positively associated with land prices. This is suggested by the fact that the coefficient on the level of SNLTDBT changes sign and becomes insignificant only when an interaction of the state's net long-term debt position is interacted with lagged state population growth. The interaction term is strongly positive, as expected, indicating that high state debt levels accumulated in the wake of high growth are not negatively capitalized into local land prices (see the Other Variables group at the bottom of the table).[28]

Finally, higher levels of state unfunded pension liabilities (SUFUND) are negatively capitalized into city land prices. This is the opposite effect found for local unfunded pension liabilities and it was unexpected given that its amount does not vary spatially within the state (per the arguments made above with respect to other state-level variables that are not spatially targeted). A one standard deviation higher

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[27]Another possible source of our findings is that firms are indifferent to marginal infrastructure investments and that the land price effects are completely attributable to household valuations of infrastructure. Nonetheless, Haughwout (1996) shows that the positive association between output and land values obtains, regardless of whether firms directly benefit from infrastructure.

[28]Whether or not this interaction term is included materially affects no other variable besides the state net long-term debt coefficient.

level of SUFUND (which equals $688 per state resident) is associated with city land prices being lower by $1549 on average.

VI. Results and Analysis: Extensions to Short-Horizon Changes

One critique of regressions in levels with data such as ours is that they may simply uncover spurious correlations if the time series being analyzed are non-stationary. Our use of cross sectional and time series information should diminish this problem, but may not allow to avoid it entirely. Because we have at most twelve observations on any variable per city, it is virtually impossible to reject the null that the price series or any of our explanatory variable have unit roots for any city. The potential problem this poses for the findings above is well illustrated by considering the house price and state infrastructure series which are plotted in Figures 1 and 2. The figures show that both series evolve slowly over time. Per capita state infrastructure has two changes in trend, one right after 1974 and another following 1983. The log price series has a clear upward trend until 1979, followed by a flat to declining trend thereafter. For these series in particular, it could be argued that some of the repeated cross sections contain much the same information, and that our identification of the negative relation between state infrastructure investments and city housing prices in Table 7 is not based on nearly as powerful a test as our 368 observations would suggest.

The strategy to deal with this potential problem generally involves differencing the data. The limited extent of our time series cross section prevents us from examining long horizon differences, as differencing the earliest and latest cross sections (i.e., 1991-1974) leaves us with 28 observations and over 20 possible independent variables, making estimation infeasible. Consequently, we examine shorter-horizon differences, and do so over seven two-year periods. For the two year horizons, changes are computed over the following years: 1975-1977, 1977-1979, 1979-1981, 1981-1983, 1983-1985, 1987-1989, and 1989-1991. Given the entry and exit of cities from the *American Housing Survey*, we are left with 244 observations.

The results of reestimating equation (9) by regressing two-year changes on changes are reported in Tables 8 and 9.[29] Table 8 reports regression summary statistics analogous to those in Table 7, while Table 9 presents individual variable coefficients and the implied percentage changes in city prices associated with changes in the regressors. The adjusted-R^2 of the regression of two-year changes on changes is 0.32. The results in Table 8 suggest that it is changes in the local tax/service environment that accounts for most of the explained variance in these short horizon changes in quality-adjusted house prices. The maximum and minimum partial R^2's for the $LTS_{j,t}$ vector are 0.21 and 0.13, respectively (row 2). Short-horizon changes in the public wealth variables ($LPW_{j,t}$) add virtually nothing to the explanatory power of the vector of current local taxes and services. Current state taxes and services ($STS_{j,t}$) do contribute to explanatory power, with both maximum and minimum partial R^2's for this vector being 0.05 (row 4). The minimum partial R^2 for the state public wealth vector ($SPW_{j,t}$) is 0.04 (row 5). Thus, even for short-horizon changes, decisions made in state capitals regarding the structure of public finance do have a measurable impact the local land market.[30]

Table 9 reports individual coefficients, along with the percentage changes in quality-adjusted house prices implied by the mean change in each independent variable. Because the mean change in some of the independent variables is very small and in order to provide some insight into the range of possible effects, percentage changes in prices implied by the 25th and 75th percentile changes of the independent variables also are reported. For example, the change in unencumbered city cash holdings (LCASH) is

[29] The first-stage regression to estimate the city-specific effects in house prices over time is unchanged. Those quality-adjusted housing prices by city over time are themselves differenced and used as the dependent variable in the regression reported in Tables 8 and 9.

[30] The same conclusion holds for the differences over four-year horizons. For the four year horizon results, differences were created over 1975-1979, 1979-1983, 1983-1987, and 1987-1991, yielding 120 observations. Those results are not reported for space reasons, but are available upon request.

found to be statistically significant at the 10% level (t-stat=-1.7). However, the mean change in such cash holdings in our sample is a minuscule -\$1 per capita. Naturally, the mean implied percentage change in home prices associated with such a small change is zero. The 25th percentile two-year change in LCASH is -\$78 per capita, and the implied percentage change in quality-adjusted house prices is 0.8% (i.e., .008). The 75th percentile two-year change in LCASH is \$62 per capita, and this increase in cash reserves is associated with a -0.7% lower appreciation in quality-adjusted prices over the typical two year period. For comparison purposes, the sample mean two-year appreciation rate is 1.8%.

Among the current local tax/service variables, changes in the crime rate and the effective property tax rate are significant at least at the 10% level, and changes in the pupil-teacher ratio are close to being significant at the 10% level. Short-horizon changes in the effective property tax rate are very important. The mean change of -0.04 (4/10ths of one percent) in this variable is associated with a 1% higher home price appreciation rate. This is a fairly large effect given the 1.8% average appreciation rate over all two year periods. The mean two-year increase in the local crime rate of 96 serious crimes per 100,000 residents is associated with a 0.6% lower price growth rate.

Other variables statistically significant at the 5% level that also have economically important impacts on appreciation of city homes include changes in net state welfare spending (SNETWEL) and state infrastructure (SPUBSTOCK). The mean two year increase in net state welfare spending is \$8 per state resident and is associated with a 1.1% higher city home price appreciation rate. The impact of short-run increases in state infrastructure per state resident are especially large. The mean two-year increase in this variable is \$42 per capita, which is associated with a 1.4% lower city property appreciation rate. Thus, the strong negative partial correlation between city prices and state infrastructure exists both in the levels and short-horizon changes.

IV. Conclusions

Two new results are borne out in both the levels and differenced regressions. First, controlling for current state tax and service provision conditions improves the explanatory power of land price specifications. City land owners appear to benefit from added state spending that is targeted towards cities in one way or another. Second, state public wealth in the form of the state infrastructure stock has a major effect on city land markets. That effect is strongly negative, suggesting that most of that infrastructure ends up benefitting competitive locations outside the central cities in our sample. This latter result has potentially important implications for the debate regarding the productivity of infrastructure. While the most recent research finds little or no productivity effect for infrastructure (at the state or national level), our findings suggest that infrastructure investments are affecting the relative attractiveness of locations and influencing the location of factors of production. Hence, more care is needed to control for these effects before a convincing conclusion can be made with respect to the productivity of infrastructure.

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Table 1: Sample of Central Cities

1. Atlanta
2. Baltimore
3. Boston
4. Buffalo
5. Chicago
6. Cincinnati
7. Cleveland
8. Columbus (OH)
9. Dallas
10. Denver
11. Detroit
12. Fort Worth
13. Houston
14. Indianapolis
15. Kansas City
16. Los Angeles
17. Memphis
18. Milwaukee
19. Minneapolis
20. New Orleans
21. Newark
22. Oakland
23. Oklahoma City
24. Omaha
25. Philadelphia
26. Phoenix
27. Pittsburgh
28. Portland (OR)
29. San Antonio
30. San Diego
31. San Francisco
32. Seattle
33. St. Louis
34. Toledo

Table 2: House Quality Controls
Source: American Housing Surveys, 1974-1991

1. # of Bathrooms: 1, 1.5, 2, 2.5+

2. # of Bedrooms: 1, 2, 3, 4, 5, 6+

3. Basement: Dichotomous, 0-1

4. Condominium: Dichotomous, 0-1

5. Central Air Conditioning: Dichotomous, 0-1

6. Detached Unit: Dichotomous, 0-1

7. Garage Present: Dichotomous, 0-1

8. Age of House: continuous[31]

9. # of Other Rooms: continuous (=Total Rooms-Bedrooms-Bathrooms)

10. Public Sewerage Hookup: Dichotomous, 0-1

11. Full Kitchen Facilities: Dichotomous, 0-1

12. Heating Equipment: Polychotomous (Warm Air, Electric, Steam, Other)

13. House Quality Rating: Polychotomous (Excellent, Good, Fair, Poor)

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[31]Age of the house is computed as a function of when the house is reported to have been built. That data is reported in interval form. We also the structure was constructed at the midpoint of the interval. When bottom coding is relevant (for old homes), we assume the house is built during the bottom code year.

Table 3: Variable List

1. Unproduced Amenities (A_j)

   a. Mean Annual Rainfall
   b. Mean Annual Heating and Cooling Degree Days

2. Current Local Taxes and Services ($LTS_{j,t}$)

   a. Effective Property Tax Rate
   b. Local Income Tax Rate
   c. Local Sales Tax Rate:(includes city and county taxes)
   d. Serious Crimes per 100,000 People
   e. Pupil-Teacher Ratio

3. Current State Taxes and Services ($STS_{j,t}$)

   a. Per Capita Welfare Spending Net of Federal Spending
   b. Per Capita Higher Education Spending
   c. Per Capita Highways/Roads Spending
   d. Per Capita All Other Spending
   e. Per Capita State Grants-in-Aid
   f. State Share of Primary and Secondary Education Spending
   g. State Income Tax Rate
   h. State Sales Tax Rate

4. Local Public Wealth ($LPW_{j,t}$)

   a. Per Capita Unencumbered Cash Holdings
   b. Per Capita Long-Term Debt Outstanding
   c. Per Capita Unfunded Pensions
   d. Per Capita Unspent Bond Proceeds
   e. Per Capita Public Capital Stock

5. State Public Wealth ($SPW_{j,t}$)

   a. Per Capita Unencumbered Cash Holdings
   b. Per Capita Long-Term Debt Outstanding
   c. Per Capita Unfunded Pensions
   d. Per Capita Unspent Bond Proceeds
   e. Per Capita Public Capital Stock

Table 4: Summary Statistics on House Prices and House Quality Controls

Number of Observations, 34 cities, 12 cross section: 20,083

Mean House Price (1990 dollars): $75,267

House Quality Variables:

a. Bathrooms:
   1. % with 1 bathroom: 44.8
   2. % with 1.5 bathrooms: 21.3
   3. % with 2 bathrooms: 22.1
   4. % with 2.5+ bathrooms: 11.6

b. Bedrooms
   1. % with 1 bedroom: 2.9
   2. % with 2 bedrooms: 27.6
   3. % with 3 bedrooms: 51.4
   4. % with 4 bedrooms: 14.6
   5. % with 5 bedrooms: 2.7
   6. % with 6+ bedrooms: 0.6

c. Cellar: % with basement=54.6

d. Condominium Status: % condo=2.2

e. Central Air Conditioning: % with central air=31.1

f. Detached Unit Status: % detached units=81.9

g. Garage Dummy: % with garage=77.1

h. Public Sewerage Hookup: % with public sewer=97.2

I. Ful Kitchen Facilities Dummy: % with full kitchen facilities=99.6

j. Heating System
   1. % with warm air system: 68.3
   2. % with electric system: 5.2
   3. % with steam system: 15.0
   4. % with any other system: 11.3

k. Overall Structure Quality Rating
   1. % with excellent rating: 42.1
   2. % with good rating: 47.2
   3. % with fair rating: 9.8
   4. % with poor rating: 0.9

l. Mean Age of House: 30.8 years

m. Mean Number of Other Rooms: 1.7

Table 5: Summary Statistics, City- and State-Level Variables
Full Sample and By Year

	Time Period												
Variable	Full Sample, 1974-1999	1974 n=30	1975 n=30	1976 n=30	1977 n=30	1978 n=30	1979 n=30	1981 n=30	1983 n=30	1985 n=32	1987 n=32	1989 n=32	1991 n=32
CCASH (per cap)	$344 (276)	$397 (299)	$374 (308)	$300 (270)	$266 (202)	$294 (196)	$326 (200)	$291 (217)	$301 (262)	$335 (242)	$465 (349)	$404 (358)	$363 (304)
MCASH (per cap)	$405 (233)	$413 (204)	$385 (246)	$380 (249)	$397 (239)	$442 (233)	$436 (199)	$322 (222)	$292 (221)	$416 (216)	$469 (202)	$470 (256)	$424 (270)
CNLTDBT (per cap)	$717 (670)	$349 (161)	$321 (162)	$345 (184)	$430 (217)	$500 (317)	$526 (297)	$451 (285)	$630 (467)	$846 (652)	$1399 (1018)	$1142 (664)	$1528 (899)
SNLTDBT (per cap)	$760 (554)	$554 (316)	$542 (334)	$605 (412)	$688 (490)	$730 (543)	$670 (526)	$585 (500)	$728 (601)	$771 (478)	$1063 (677)	$1024 (644)	$1095 (637)
CUFUND (per cap)	$1989 (2468)	$1844 (2051)	$1929 (2132)	$2052 (2295)	$2021 (2292)	$2192 (2530)	$2331 (2754)	$2297 (3026)	$1930 (2710)	$1737 (2360)	$1777 (2451)	$1963 (2685)	$1840 (2518)
SUFUND (per cap)	$579 (688)	$225 (189)	$292 (253)	$363 (286)	$432 (313)	$427 (327)	$486 (347)	$703 (515)	$741 (615)	$751 (751)	$740 (913)	$810 (1155)	$917 (1111)
RAIN (inches/year)	34.6 (11.6)	34.7 (11.7)	34.7 (11.7)	34.7 (11.7)	34.7 (11.7)	34.7 (11.7)	34.7 (11.7)	34.7 (11.7)	34.7 (11.7)	34.5 (11.9)	34.5 (11.9)	34.5 (11.9)	34.5 (11.9)
TEMP (heating and cooling degree days)	5702 (1509)	5738 (1518)	5738 (1518)	5738 (1518)	5738 (1518)	5738 (1518)	5738 (1518)	5738 (1518)	5738 (1518)	5634 (1556)	5634 (1556)	5634 (1556)	5634 (1556)
CRIME (per 100,000 residents)	1318 (650)	1079 (507)	1130 (514)	1049 (503)	1073 (453)	1141 (505)	1279 (585)	1447 (696)	1291 (555)	1379 (630)	1455 (636)	1582 (800)	1851 (828)
EDUC (pupil/teacher)	20.2 (2.7)	22.3 (2.4)	22.0 (2.0)	21.6 (2.3)	21.0 (2.0)	20.4 (2.1)	19.9 (2.2)	20.0 (2.3)	19.2 (2.0)	19.2 (1.9)	19.0 (2.4)	18.1 (3.0)	18.0 (2.7)
PTAXR (% rate)	1.38 (0.72)	1.70 (0.61)	1.68 (0.68)	1.68 (0.82)	1.56 (0.72)	1.43 (0.78)	1.28 (0.77)	1.20 (0.79)	1.21 (0.74)	1.18 (0.62)	1.23 (0.59)	1.18 (0.62)	1.25 (0.65)

Variable	Full Sample, 1974-1999	1974 n=30	1975 n=30	1976 n=30	1977 n=30	1978 n=30	1979 n=30	1981 n=30	1983 n=30	1985 n=32	1987 n=32	1989 n=32	1991 n=32
LINCTXR (% rate)	0.71 (1.06)	0.63 (0.91)	0.63 (0.91)	0.66 (1.02)	0.66 (1.02)	0.66 (1.02)	0.66 (1.02)	0.67 (1.03)	0.71 (1.09)	0.74 (1.15)	0.81 (1.22)	0.83 (1.20)	0.81 (1.20)
LSALTXR (% rate)	1.11 (1.10)	0.91 (1.02)	0.91 (1.02)	0.91 (1.02)	0.91 (1.02)	0.91 (1.02)	0.91 (0.92)	1.10 (1.17)	1.09 (1.19)	1.36 (1.25)	1.32 (1.22)	1.46 (1.31)	1.45 (1.24)
SNETWEL ($1000 per cap)	$0.148 (0.079)	$0.117 (0.062)	$0.130 (0.071)	$0.137 (0.066)	$0.137 (0.076)	$0.143 (0.086)	$0.133 (0.081)	$0.146 (0.080)	$0.145 (0.072)	$0.150 (0.074)	$0.163 (0.078)	$0.175 (0.083)	$0.192 (0.094)
STHIED ($1000 per cap)	$0.199 (0.057)	$0.171 (0.058)	$0.180 (0.058)	$0.191 (0.062)	$0.193 (0.061)	$0.198 (0.061)	$0.185 (0.057)	$0.184 (0.053)	$0.194 (0.051)	$0.213 (0.049)	$0.224 (0.048)	$0.218 (0.045)	$0.229 (0.050)
STSECED (share)	0.53 (0.12)	0.50 (0.08)	0.49 (0.08)	0.49 (0.10)	0.51 (0.10)	0.52 (0.09)	0.55 (0.11)	0.56 (0.12)	0.54 (0.15)	0.57 (0.13)	0.56 (0.14)	0.56 (0.16)	0.53 (0.11)
STHIWAY ($1000 per cap)	$0.042 (0.017)	$0.037 (0.012)	$0.041 (0.019)	$0.039 (0.015)	$0.038 (0.012)	$0.053 (0.033)	$0.037 (0.013)	$0.038 (0.012)	$0.044 (0.015)	$0.045 (0.015)	$0.046 (0.016)	$0.040 (0.014)	$0.041 (0.013)
SOTHER ($1000 per cap)	$0.596 (0.244)	$0.457 (0.148)	$0.485 (0.145)	$0.505 (0.160)	$0.512 (0.158)	$0.512 (0.162)	$0.536 (0.156)	$0.527 (0.179)	$0.549 (0.192)	$0.572 (0.168)	$0.621 (0.198)	$0.885 (0.271)	$0.951 (0.286)
STAID ($1000 per cap)	$0.267 (0.452)	$0.246 (0.312)	$0.264 (0.357)	$0.277 (0.364)	$0.267 (0.333)	$0.246 (0.300)	$0.258 (0.307)	$0.252 (0.308)	$0.240 (0.296)	$0.220 (0.260)	$0.440 (1.165)	$0.233 (0.283)	$0.253 (0.311)
SINCTXR (% rate)	5.23 (3.91)	5.45 (4.40)	5.46 (4.40)	5.53 (4.33)	5.53 (4.33)	5.50 (4.26)	5.54 (4.33)	5.48 (4.26)	5.61 (4.20)	5.21 (3.80)	4.56 (3.06)	4.53 (2.98)	4.50 2.67)
SSALTXR (% rate)	4.35 (1.18)	3.83 (1.13)	3.86 (1.12)	3.93 (1.13)	3.93 (1.13)	3.97 (1.14)	3.97 (1.14)	3.97 (1.14)	4.40 (1.29)	4.71 (0.87)	4.99 (0.88)	5.04 (0.82)	5.34 (0.95)
LBNDFND ($ per cap)	$272 (272)	$316 (249)	$293 (272)	$267 (260)	$218 (230)	$275 (334)	$271 (302)	$192 (158)	$211 (215)	$235 (193)	$331 (255)	$323 (245)	$325 (435)
SBNDFND ($ per cap)	$304 (394)	$97 (249)	$109 (228)	$141 (301)	$168 (343)	$211 (402)	$210 (408)	$292 (509)	$355 (537)	$381 (251)	$434 (273)	$587 (364)	$616 (353)
LPUBSTOCK ($1000 per cap)	$13.037 (6.143)	$12.152 (6.087)	$12.403 (6.208)	$12.518 (6.245)	$12.704 (6.329)	$12.932 (6.424)	$12.915 (6.339)	$13.068 (6.291)	$13.196 (6.316)	$13.162 (6.218)	$13.327 (6.069)	$13.727 (5.998)	$14.189 (6.043)
CLAND (sq. miles)	186 (154)	177 (152)	178 (153)	180 (154)	180 (154)	182 (156)	183 (157)	185 (158)	186 (159)	192 (156)	195 (161)	198 (157)	199 (158)

Variable	Full Sample, 1974-1999	1974 n=30	1975 n=30	1976 n=30	1977 n=30	1978 n=30	1979 n=30	1981 n=30	1983 n=30	1985 n=32	1987 n=32	1989 n=32	1991 n=32
SPUBSTOCK ($1000 per cap)	$4.448 (1.069)	$4.379 (0.997)	$4.386 (0.993)	$4.406 (0.998)	$4.390 (0.984)	$4.375 (0.983)	$4.342 (0.965)	$4.354 (0.964)	$4.343 (0.975)	$4.427 (1.122)	$4.532 (1.202)	$4.653 (1.279)	$4.755 (1.334)
SNLTDBT* SPOPGROW	$12,705 (9961)	$11,712 (8798)	$11,302 (8697)	$12,300 (9489)	$13,804 (10,575)	$14,384 (11,156)	$13,077 (10,218)	$8401 (9059)	$10,455 (10,201)	$10,955 (8104)	$15,233 (11,011)	$14,601 (9978)	$15,854 (10,684

Note: Standard Deviations in parentheses.

Table 6: Regression Summary Statistics Amenity, Current Tax and Service, and Public Wealth Impacts on Intercity Housing Price Levels Over Time		
Variable Set	Maximum Partial R^2	Minimum Partial R^2
1. All Traits	0.80	--
2. Amenities (A_j) (RAIN, TEMP)	0.36	0.02
3. Current Local Taxes & Services ($LTS_{j,t}$) (CRIME, EDUC, PTAXR, LINCTXR, LSALTXR)	0.23	0.12
4. Local Public Wealth ($LPW_{j,t}$) (LCASH, LNLTDBT, LUFUND, LBNDFND, LPUBSTOCK)	0.22	0.02
5. Current State Taxes & Services ($STS_{j,t}$) (SNETWEL, STHIED, STSECED, STHIWAY, SOTHER, SINCTXR, SSALTXR)	0.50	0.06
6. State Public Wealth ($SPW_{j,t}$) (SCASH, SNLTDBT, SUFUND, SBNDFND, SPUBSTOCK)	0.09	0.03
7. Current Local Taxes & Services and Local Public Wealth (rows 3 +4)	0.41	0.16
8. Current State Taxes & Services and State Public Wealth (rows 5 + 6)	0.54	0.11
9. Current Local and State Taxes & Services (rows 3 + 5)	0.67	0.24
10. Local and State Public Wealth (rows 4 + 6)	0.28	0.05

Notes:

1. The maximum partial R^2 for the vector(s) of traits in each row is defined to be the second-stage adjusted-R^2 from the regression containing only the traits listed in each row.

2. The minimum partial R^2 for the vector(s) of traits in each row is defined to be the difference between the adjusted-R^2 obtained when including all traits (row 1) and the adjusted-R^2 from the regression omitting the traits listed in the relevant row.

Table 7: Second-Stage Regression Output and Standardized Marginal Effects Based on Equation (9)
[from Fixrg12d.lst; levels; all years)

Independent Variables	Coefficient	Std. Error	t-stat	n=368 Variable Mean	n=368 Variable Std.Dev	Implied % Change in City-Specific Land Prices	Implied Change in Level of City-Specific Land Prices
Dependent Mean:	10.3601	$31,574					
Intercept	10.6941	0.20722	51.7				
Amenities (A)							
RAIN-Average Annual Rainfall (inches)	**0.005625**	**0.00167097**	**3.4**	**34.7**	**11.6**	**6.7**	**$2,129**
TEMP-Average Heat+Cool Degree Days	**-0.000059155**	**0.00001212**	**-4.9**	**5702**	**1509**	**-8.5**	**-$2,696**
Current Local Taxes and Services (LTS)							
PTAXR1-Effective Property Tax Rate	**-0.271678**	**0.02123484**	**-12.8**	**1.38**	**0.72**	**-17.8**	**-$5,610**
LINCTXR-City Income Tax Rate	**-0.08695**	**0.01228424**	**-7.1**	**0.71**	**1.06**	**-8.8**	**-$2,780**
LSALTXR-City Sales Tax Rate	-0.001479	0.01382701	-0.1	1.11	1.1	-0.2	-$51
CRIME-Serious Crimes per 100,000 City Pop	**-0.000030245**	**0.00001872**	**-1.6**	**1318**	**650**	**-1.9**	**-$615**
EDUC-Pupil-Teacher Ratio	-0.003411	0.00451692	-0.8	20	2.7	-0.9	-$289
Current State Taxes and Services (STS)							
SNETWEL-Net State Welfare Spend per State Cap $1000s	**1.69731**	**0.25989031**	**6.5**	**0.148**	**0.079**	**14.3**	**$4,531**
STHIED-State Higher Educ Spend per State Cap $1000s	0.350884	0.23514043	1.5	0.199	0.057	2.0	$638
STSECED-State Secondary Ed Share	***0.225871***	***0.13071429***	***1.7***	***0.53***	***0.12***	**2.7**	**$868**
STHIWAY-State Current Hiway Spend per State Cap $1000s	***3.442985***	***0.6323407***	***5.4***	***0.042***	***0.017***	**6.0**	**$1,903**
SOTHER-State Other Spend per State Cap $1000s	0.099764	0.07910946	1.3	0.596	0.244	2.5	$778
STAID-State Grants to City per City cap $1000s	**0.052583**	**0.02611901**	**2**	**0.267**	**0.452**	**2.4**	**$759**
SINCTXR-State Income Tax Rate	0.002328	0.0039274	0.6	5.23	3.91	0.9	$289
SSALTXR-State Sales Tax Rate	0.003633	0.01472736	0.2	4.35	1.18	0.4	$136
Local Public Wealth (LPW)							
LCASH-City Unencumbered Cash Per City Cap	-0.000057987	0.00004386	-1.3	344	276	-1.6	-$501
LNLTDBT-City Net LT Debt per City Cap	**-0.000033946**	**0.0000209**	**-1.6**	**717**	**670**	**-2.2**	**-$710**
LUFUND-City Unfunded Pensions per City Cap	**0.000032268**	**0.0000055**	**5.9**	**1989**	**2468**	**8.3**	**$2,617**
LBNDFND-City Unspent Bond Funds per City Cap	**0.0000825**	**0.00004531**	**1.8**	**272**	**272**	**2.3**	**$717**
LPUBSTOCK-City Infrastructure Stock per City Cap $1000s	0.003352	0.00223523	1.5	13.037	6.143	2.1	$657
State Public Wealth (SPW)							
SCASH-State Unencumbered Cash per State Cap	-0.00000272	0.000055	-0.1	405	233	-0.1	-$20
SNLTDBT-State Net LT Debt per State Cap	-0.00005359	0.00006076	-0.9	760	554	-2.9	-$924
SUFUND-State Unfunded Pensions per State Cap	**-0.000073095**	**0.00001934**	**-3.8**	**579**	**688**	**-4.9**	**-$1,549**
SBNDFND-State Unspent Bond Funds per State Cap	-0.000070821	0.00005911	-1.2	304	394	-2.8	-$869
SPUBSTOCK-State Infrastructure Stock per State Cap $1000s	**-0.08899**	**0.0183037**	**-4.9**	**4.448**	**1.069**	**-9.1**	**-$2,865**
Other Variables							
SNLTDBT*SPOPGROW-State Debt*Lagged State Popgrow	**0.000012201**	**0.00000204**	**6**	**12705**	**9961**	**12.9**	**$4,080**
CLAND-City Land Area (sq. miles)	**-0.000382**	**0.00008904**	**-4.3**	**186**	**154**	**-5.7**	**-$1,804**

Note: Boldface means that variable has t of at least 1.6 (in absolute value) and that variable is signficicant at 10% level.

Table 8: Regression Summary Statistics Impacts of Changes in Current Tax and Service and Public Wealth Variables on Two-Year Changes in Intercity Housing Prices		
Variable Set	Maximum Partial R^2	Minimum Partial R^2
1. All Traits	.32	--
2. Current Local Taxes & Services ($LTS_{j,t}$) (CRIME, EDUC, PTAXR, LINCTXR, LSALTXR)	0.21	0.13
3. Local Public Wealth ($LPW_{j,t}$) (LCASH, LNLTDBT, LUFUND, LBNDFND, LPUBSTOCK)	0.03	0.00
4. Current State Taxes & Services ($STS_{j,t}$) (SNETWEL, STHIED, STSECED, STHIWAY, SOTHER, SINCTXR, SSALTXR)	0.05	0.05
5. State Public Wealth ($SPW_{j,t}$) (SCASH, SNLTDBT, SUFUND, SBNDFND; SPUBSTOCK)	0.12	0.04
6. Current Local Taxes & Services and Local Public Wealth (rows 3 +4)	0.23	0.14
7. Current State Taxes & Services and State Public Wealth (rows 5 + 6)	0.19	0.09
8. Current Local and State Taxes & Services (rows 3 + 5)	0.27	0.06
9. Local and State Public Wealth (rows 4 + 6)	0.13	0.06

Notes:

1. The maximum partial R^2 for the vector(s) of traits in each row is defined to be the second-stage adjusted-R^2 from the regression containing only the traits listed in each row.

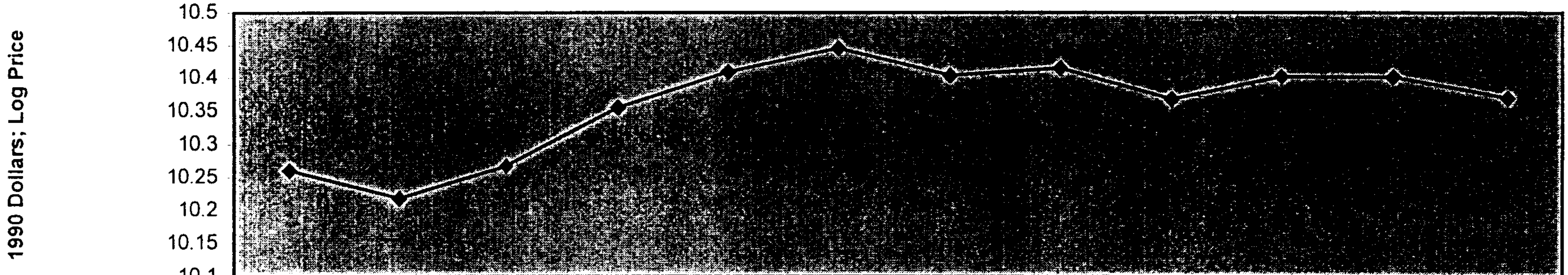
2. The minimum partial R^2 for the vector(s) of traits in each row is defined to be the difference between the adjusted-R^2 obtained when including all traits (row 1) and the adjusted-R^2 from the regression omitting the traits listed in the relevant row.

Table 9: Second-Stage Regression Output and Marginal Effects
[from Fixrg12g.lst; two year changes on changes; n=244

Independent Variables	Coefficient	Std. Error	t-stat	n=244 Variable Mean	n=244 25th %tile	n=244 75th %tile	Implied % Change in City Land Prices Based on Mean Change in Independent Variable	Implied % Change in City Land Prices Based on 25th %tile Change in Independent Variable	Implied % Change in City Land Prices Based on 75th %tile Change in Independent Variable
Dependent Mean:	0.01766	1.77							
Intercept	0.002625	0.01565	0.2						
Current Local Taxes and Services (LTS)									
PTAXR-Effective Property Tax Rate	**-0.250499**	**0.0401752**	**-6.2**	**-0.04**	**-0.16**	**0.09**	**1.0**	**4.0**	**-2.3**
LINCTXR-City Income Tax Rate	-0.060584	0.0544632	-1.1	0.03	0	0	*-0.2*	*0.0*	*0.0*
LSALTXR-City Sales Tax Rate	-0.021728	0.02224801	-1	0.06	0	0	*-0.1*	*0.0*	*0.0*
CRIME-Serious Crimes per 100,000 City Pop	**-0.000058508**	**0.00003619**	**-1.6**	**96**	**-59**	**236**	**-0.6**	**0.3**	**-1.4**
EDUC-Pupil-Teacher Ratio	-0.008952	0.006111	-1.5	-0.5	-1.4	0.2	*0.4*	*1.3*	*-0.2*
Current State Taxes and Services									
SPUBWEL-Net State Welfare Spend per State Cap $1000s	**1.175789**	**0.37615949**	**3.1**	**0.008**	**-0.004**	**0.022**	**0.9**	**-0.5**	**2.6**
STHIED-State Higher Educ Spend per State Cap $1000s	0.585147	0.574505	-1	0.006	-0.005	0.016	*0.4*	*-0.3*	*0.9*
STSECED-State Secondary Ed Share	0.167401	0.13878363	1.2	0.003	-0.023	0.033	*0.1*	*-0.4*	*0.6*
STHIWAY-State Current Hiway Spend per State Cap $1000s	**2.514517**	**1.11625**	**2.3**	**-0.0001**	**-0.003**	**0.004**	**0.0**	**-0.8**	**1.0**
SOTHER-State Other Spend per State Cap $1000s	**0.165107**	**0.0946548**	**1.7**	**0.064**	**0.005**	**0.1**	**1.1**	**0.1**	**1.7**
STAID-State Grants to City per City cap $1000s	0.006384	0.0164979	0.4	0.002	-0.01	0.022	*0.0*	*0.0*	*0.0*
SINCTXR-State Income Tax Rate	**0.022119**	**0.01295032**	**1.7**	**-0.05**	**0**	**0**	**-0.1**	**0.0**	**0.0**
SSALTXR-State Sales Tax Rate	0.004447	0.02326279	0.2	0.17	0	0	*0.1*	*0.0*	*0.0*
Local Public Wealth (LPW)									
LCASH-City Unencumbered Cash Per City Cap	**-0.000105**	**0.0000602**	**-1.7**	**-1**	**-78**	**62**	**0.0**	**0.8**	**-0.7**
LNLTDBT-City Net LT Debt per City Cap	-0.00001504	0.00002415	-0.6	150	1	278	*-0.2*	*0.0*	*-0.4*
LUFUND-City Unfunded Pensions per City Cap	-0.000009438	0.00001689	-0.6	2	-124	162	*0.0*	*0.1*	*-0.2*
LBNDFND-City Unspent Bond Funds per City Cap	0.000018935	0.00005139	0.4	4	-77	66	*0.0*	*-0.1*	*0.1*
LPUBSTOCK-City Infrastructure Stock per City Cap $1000s	-0.01578	0.02117976	-0.7	0.246	-0.016	0.512	*-0.4*	*0.0*	*-0.8*
State Public Wealth (SPW)									
SCASH-State Unencumbered Cash per State Cap	-0.000014496	0.00009496	-0.2	2	-71	63	*0.0*	*0.1*	*-0.1*
SNLTDBT-State Net LT Debt per State Cap	0.000098138	0.00009038	1.1	89	-20	165	*0.9*	*-0.2*	*1.6*
SUFUND-State Unfunded Pensions per State Cap	-0.000038453	0.0000315	-1.2	87	-77	176	*-0.3*	*0.3*	*-0.7*
SBNDFND-State Unspent Bond Funds per State Cap	-0.000039037	0.00009288	-0.4	77	6	112	*-0.3*	*0.0*	*-0.4*
SPUBSTOCK-State Infrastructure Stock per State Cap $1000s	**-0.34162**	**0.0866529**	**-3.9**	**0.042**	**-0.045**	**0.113**	**-1.4**	**1.5**	**-3.9**
Other Variables									
SNLTDBT*SPOPGRO-State Debt*Lagged State Popgrow	0.000002166	0.000004	0.5	851	-382	2409	*0.2*	*-0.1*	*0.5*
CLAND-City Land Area (sq. miles)	0.000286	0.00102885	0.3	2	0	0.3	*0.1*	*0.0*	*0.0*

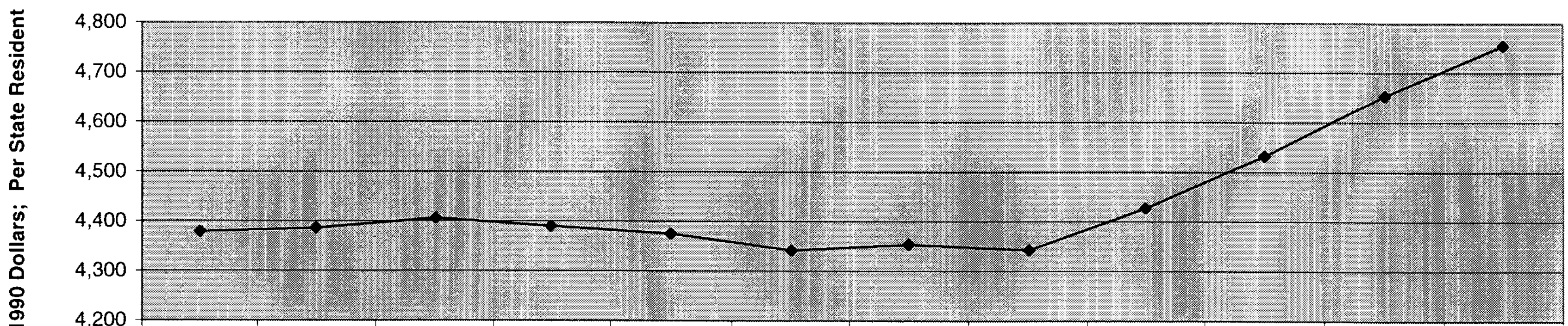
Note: Boldface means that variable has t of at least 1.6 (in absolute value) and that variable is signficicant at 10% level.

Figure 1: Log City Land Prices: 1974-1991



	74	75	76	77	78	79	81	83	85	87	89	91
Log City Land Price	10.2603	10.218	10.2675	10.3551	10.4091	10.4456	10.4036	10.4146	10.3675	10.4018	10.4016	10.3697

Figure 2: State Infrastructure Replacement Value



	74	75	76	77	78	79	81	83	85	87	89	91
State	4379	4386	4406	4390	4375	4342	4354	4343	4427	4532	4653	4755

Year