THE FISCAL IMPACTS ON CENTRAL AND SUBURBAN CITIES OF ALTERNATIVE LAND USES

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We theorize that the fiscal impacts of alternative land uses differ between central and suburban cities and before and after the housing market crash. Using a unique panel of Florida cities, we test our theory by estimating systems of revenue and expenditure equations for each type of city before and after the crash. Our results, which provide the first econometric evidence on fiscal impacts, are consistent with our expectations.

Keywords: Fiscal impact, Revenues, Expenditures

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I. INTRODUCTION

The worsening fiscal stress of many municipalities is well documented. Especially central cities are finding that shortfalls in revenues relative to expenditures necessitate increases in millage rates in order to balance their budgets (Ihlanfeldt and Willardsen, 2014). Higher millage rates induce capital flight and thereby loss in tax base, which further fiscally challenges these cities (Ladd and Bradbury, 1988). Unfortunately, the causes of municipal stress have not been clearly identified. One possible cause is that some land uses may not pay their own way, in the sense that they raise expenditures by more than revenues. According to conventional wisdom, residential land use falls into this category. However, this “wisdom” is largely based on Cost of Community Services (CCS) studies, which have been criticized on numerous accounts. Most importantly, these studies are subjective in nature, relying heavily on the best guesses of local officials regarding a land use’s effect on particular types of expenditures and revenues. Also at issue is that the CCS results are inconsistent with William Fischel’s Homevoter Hypothesis (1985, 2001), which maintains that suburban homeowners have control over land use within their communities and exercise this control to protect and enhance their property values. If deficit–producing properties are allowed into the community, taxes must rise to balance the budget and the capitalization of these higher taxes into land values would lower home values.

In this paper, in lieu of taking an accounting approach to evaluating the fiscal impacts of alternative land uses, we provide actual evidence on their budgetary impacts. Specifically, we estimate the change in expenditures and revenues from placing different types of buildings on a vacant lot. Based on the idea that residents control land use within their community, we posit that the expenditure and revenue effects of alternative land uses differ between central and suburban cities, with some land uses deficit producing in the former cities but not in the latter cities. To test our hypothesis we have assembled a unique panel of Florida cities covering the years 2000 to 2013. With our panel we estimate systems of revenue and expenditure equations which account for the endogeneity of land use, allow for the correlation of errors across equations and optimally weight our instrumental variables. Seven different land uses are analyzed and separate models are estimated before and after the housing market crash for central cities, large suburban cities, and small suburban cities.

Results obtained for the pre–crash period show important differences between the two types of cities in the fiscal impacts of alternative land uses, which are strongly consistent with our theoretical expectations. Three of the seven land uses are deficit producing within central cities, while one of the land uses is deficit producing within small suburban cities and none are deficit producing within large suburban cities. In the post–crash period none of the land uses are deficit producing within either small or large suburban cities. However, within central cities the post–crash results contrast sharply with those obtained in the pre–crash period, with land uses changing from deficit to surplus producing. These results are consistent with our hypothesis that the fiscal stress these cities were under from the crash and Great Recession caused them to place more weight on the budgetary impacts of proposed projects in making their approval decisions.

II. CONCEPTUAL FRAMEWORK

Our conceptual model has a singular, narrowly defined purpose, namely, to hypothesize where we might find a particular land use producing a fiscal deficit. We address this question assuming that the voters of a community have control over land use and they vote for or against a proposed project out of self–interest.[1] Expectations are derived from our framework by

[1] Cheung, Ihlanfeldt, and Mayock (2009) provide evidence in support of the assumption that residents control land use. In 2006 they surveyed the chief planners of 276 local governments in Florida and asked whether they thought that citizen input had a major impact on land use decisions made within their community. A majority of the respondents felt that this was the case. The survey results also make it clear that negotiations between the developer

recognizing there are stylized differences between central and suburban cities and among different types of land uses that affect their fiscal impacts. We assume that the suburban city is "Fischelian" in nature, where the jurisdiction's residents are largely homeowners.

Divide voters into the proportions who are renters (R) and homeowners (O). Assuming majority rule prevails within the community, approval of a proposed new development requires

(1) $$OP_O + RP_R > O(1 - P_O) + R(1 - P_R)\ ,$$

where P_O and P_R are the probabilities that homeowners and renters vote yes, respectively.

What factors influence these probabilities? Given the significant resources that cities allocate to economic development, the jobs generation potential of the project is likely a citizen concern (ΔJ). Both renters and homeowners are expected to be more favorably disposed toward a project if it brings permanent jobs into the community. Fischel's (2001) Homevoter Hypothesis argues that the more dominant concern for homeowners is the impact the project is expected to have on their property values (ΔV). Hence, we include this as a second factor affecting P_O. Renters, on the other hand, are expected to be concerned about the impact the project will have on their housing costs (ΔH). Hence, we include this as a second factor affecting P_R. Assume for simplicity that probabilities are linearly related to their determinants,

(2a) $$P_O = a\Delta J + b\Delta V$$

(2b) $$P_R = c\Delta J - d\Delta H,$$

then the project approval condition becomes

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and the planner play a major role in whether a project receives approval. Planners have discretionary power and this power is responsive to the will of the citizens. Lens and Monkkonen (2016) find that the complexity of the municipal review process is strongly related to the segregation of low income households, which provides further evidence of the importance of project approval in affecting land use within a community.

(3) $(Oa\Delta J + Ob\Delta V + Rc\Delta J - Rd\Delta H) > 0.5.$[2]

It should be emphasized that it is not a land use that may be rejected by a city, but rather a property within a land use category. Within each land use category properties display a quality distribution. Those of low quality are more likely to be deficit producing, while those of high quality are more likely to be surplus producing. Whether the mean level of quality is deficit or surplus producing will vary across land uses. If there is no offsetting advantage (e.g., job creation or an amenity effect), low quality, deficit–producing properties will be rejected by the city, while high quality, surplus–producing properties will be approved. Cities may require through negotiation with developers that properties that fall within the middle quality range be elevated to a higher quality level before approval is awarded. Because projects within a land use category where the mean quality level is deficit producing are less likely to be approved, we would expect to see fewer of these projects built within a city.

Assume there are two types of cities: central cities and suburban cities, and that there are three types of land uses: single–family housing, multi–family housing, and commercial buildings.[3] This yields six cases to consider. Expectations regarding whether a project will be deficit producing can be generated by considering the likely importance of each of the four components of the project approval condition, before and after the housing market crash. We first consider the components of (3) for each of the six cases in the period before the crash.

1. Single–Family Housing Projects, Suburban City

[2] We are assuming that the parameters "a" and "c" reflect the weights voters place on job opportunities and possible community–wide amenity effects from commercial development. While voters may also weigh the effects of jobs on the tax base, we view this as a tertiary concern.

[3] In our empirical estimation we add condominiums as a housing type and break commercial properties down into different types. What we conclude for single–family housing from our conceptual framework also applies to condominiums. Commercial buildings are broken down into office, retail, industrial, and other commercial buildings. What we conclude for commercial properties from our conceptual framework applies equally to these four types.

$Rd\Delta H$ is unimportant because 1) in comparison to homeowners, renters (R) are a small percentage of voters within a suburban city, and 2) an increase in single–family housing has little effect on ΔH.[4] $Rc\Delta J$ is unimportant because both R and ΔJ are small. The latter is small because single–family housing creates few permanent jobs within the community. This also suggests that $Oa\Delta J \approx 0$. Hence, a single–family housing project in the suburbs will only be approved if $Ob\Delta V > 0.5$. A deficit–producing project will raise the property tax rate and after capitalization will lower aggregate property value. Hence, unless this loss in value is offset by the project producing an amenity effect that after capitalization raises value, the approval condition will not be satisfied. Because there is no evidence that an additional single–family housing project produces an amenity effect that raises community housing values, we conclude that single–family housing projects in suburban cities are not deficit producing.[5]

2. Single–Family Housing Projects, Central City

Because single–family housing is not a permanent jobs generator, $Oa\Delta J$ and $Rc\Delta J$ are unimportant. $Rd\Delta H$ is unimportant because a single–family project has little effect on ΔH. Approval therefore requires that $Ob\Delta \mathrm{V} > 0.5$. As in a suburban city, we do not expect a single–family housing project to produce a community wide amenity effect. Hence, a deficit–producing project that raises the tax rate and lowers property value will not satisfy the approval condition. We conclude that deficit–producing single–family housing projects will not obtain project approval within central cities.

3. Multi–Family Housing, Suburban City

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[4] Renters are a relatively unimportant voting bloc in the suburbs because exclusionary zoning restricts their numbers and, in comparison to central city renters, they are less likely to vote (Bollens, 1961).

[5] To be clear, we are not predicting that single–family housing will not be built in the city, but rather that what is allowed to get built will be of sufficient value to generate enough property taxes to cover the costs of providing public services.

Like single–family housing, multi–family housing creates few permanent jobs. This factor, combined with the relative unimportance of renter voters in the suburbs, suggests that $Oa\Delta J$, $Rc\Delta J$, and $Rd\Delta H$ are all small, resulting in project approval only if $Ob\Delta V > 0.5$. A deficit–producing multi–family housing project will raise the tax rate which will lower property value. Because there is no evidence that this value loss will be offset by multi–family housing producing an amenity effect, we conclude that deficit–producing multi–family housing projects will not obtain project approval within suburban cities.

4. Multi–Family Housing Projects, Central City

Because multi–family housing is not a permanent job generator, $Oa\Delta J$ and $Rc\Delta J$ are small. For approval the project therefore must satisfy the condition that $Ob\Delta V - Rd\Delta H > 0.5$. Because renters as voters are important within central cities and additional multi–family housing is expected to reduce H, this housing may obtain approval even if tax capitalization lowers homeowners' property values. Hence, we conclude that *multi–family housing projects may be deficit producing within central cities.*

5. Commercial Projects, Suburban City

Because R is small and commercial properties have little effect on ΔH, approval requires that $Oa\Delta J + Ob\Delta V > 0.5$. If suburban residents weigh job growth (a) heavily in their decision, then commercial properties may receive approval even if these projects cause property values to fall. However, a is unlikely to be large for homeowners in a suburban city because 1) for them unemployment is low and 2) they are more able to commute to jobs throughout the entire metropolitan area than renters.[6] Hence, approval will hinge on whether the commercial project

[6] The number of permanent jobs created by a project may actually reduce the probability of approval in a suburban city because residents wish to maintain the residential character of their community and they fear that jobs may produce negative externalities.

raises property value. Since a deficit–producing commercial project will lower value from tax capitalization, the issue is whether this value loss will be offset by an amenity effect. A commercial project may produce an amenity effect by offering residents easier access to goods and services they wish to consume. On the other hand, these projects generally face NIMBY opposition from homeowners because of the negative externalities they are expected to generate. Because we could find no evidence that commercial projects produce an amenity effect that offsets the NIMBY effect, we conclude that deficit–producing commercial projects will not obtain approval within suburban cities.

6. *Commercial Properties, Central City*

Because commercial buildings have little effect on ΔH, $Rd\Delta H$ is unimportant. Of the four components, this is the only one that can be ruled out. Hence, project approval requires that $Oa\Delta J + Ob\Delta V + Rc\Delta J > 0.5$. Both R and c are large. The latter is large because unemployment among central city renters tends to be high and these renters are less able to commute to jobs outside the central city.[7] It is therefore possible for $Rc\Delta J > (Oa\Delta J + Ob\Delta V)$, even if the commercial project lowers homeowners' property values. Hence, we conclude that *commercial properties in the central city may obtain approval even if they are deficit producing.*[8]

In summary, we expect that projects within all three land uses in the suburbs and single–family housing projects in central cities are not deficit producing. Multi–family housing and commercial properties may be deficit producing within central cities.

How might the housing market crash and accompanying recession alter our pre–crash fiscal impact predictions? The budgets of cities were hit hard by these events, with the impact

[7] In comparison to other groups, central city renters are more dependent on public transportation, which makes it difficult to commute to suburban jobs (Ihlanfeldt and Sjoquist, 1998).
[8] In those areas of the central city where renters are concentrated residents sometime complain about the absence of commercial activity (e.g., food deserts). Hence, this may be an additional factor causing central city renters to vote in favor of a commercial project.

especially severe within central cities. On average, these cities in Florida experienced a 33 percent decline in their real property tax base per capita and a 21 percent decline in their real intergovernmental transfers per capita over the post–crash period.[9] These are the two most important revenue sources of Florida cities (Cromwell and Ihlanfeldt, 2015). The dire financial situations of cities after the crash caused many of them to threaten raising millage rates and others to actually follow through on their threats (Cromwell and Ihlanfeldt, 2015), which not surprisingly raised the ire of property owners. Facing the prospect of tax capitalization further reducing their housing values which had already fallen from the crash, the expected response of homeowners is that they placed more importance on the fiscal impacts of proposed projects, raising the value of *b* in (2a). For cases 1, 2, and 3, this reinforces our pre–crash predictions that deficit–producing single–family housing projects in central cities and both single–family and multi–family housing projects in suburban cities will not obtain project approval.

The importance of an increase in *b* for case 4 (multi–family housing projects in central cities) is that post–crash there is less likelihood that a deficit–producing project will obtain project approval. If *b* is sufficiently large relative to *d* (the weight attached to a reduction in the price of rental housing), multi–family housing projects that are deficit producing will not obtain project approval.

In addition to an increase in *b*, the loss in jobs caused by the recession likely increased the weight attached by voters to a project's job creation, resulting in an increase in *a* and *c* in (2a) and (2b), respectively. While the increase in *b* lessens the likelihood that suburban voters approve deficit–producing commercial projects, the increase in *a* has the opposite effect. Hence,

[9] Resource declines were only moderately less severe for Florida's suburban cities. For small cities (population less than 10,000) the base and transfers declined by 28 percent and 18 percent, respectively. For large suburban cities (population greater than 10,000) the declines were 32 and 16 percent.

in the post–crash period no clear prediction can be made on whether suburban cities will approve these projects. Similarly, while a larger *b* reduces the likelihood that a deficit–producing commercial project will obtain approval within central cities, both the increase in *a* and in *c* work to counter this result by heightening the possibility of approval.

To review, the crash fails to alter our pre–crash predictions for cases 1, 2, and 3. For case 4, the likelihood that multi–family housing projects are deficit producing declines within central cities. In the case of deficit–producing commercial projects, within both central and suburban cities, it is not clear whether they are more or less likely to obtain approval after the crash in comparison to before the crash. Outcomes depend on the increased importance voters place on the jobs created by a project in comparison to a greater concern over its fiscal impact.

While we are able to make predictions regarding the difference between a land use's revenues and expenditures, we are unable to predict how an individual land use may separately affect revenues and expenditures. The effect of a new land use on revenues and expenditures may be either positive or negative. In the case of expenditures a new building may increase the demand for city services, due to accompanying increases in the residential or workforce populations. On the other hand, if the new land use is part of a private government, the private provision of services may enable cities to reduce their expenditures (Cheung, 2008). In Florida almost all new owner–occupied housing (single–family housing and condominiums) is part of a homeowners association and these associations frequently provide services that the city would otherwise have to provide, such as sanitation, police, and recreation. In the case of commercial buildings, project approval is frequently conditional on developer exactions that may enable cities to also cut some of their expenditures.[10]

In the case of revenues, a new building adds value to a vacant lot, causing an increase in the property tax base and property tax revenues. Revenues may also rise because the building generates increases in non–ad valorem revenues, such as sales taxes and user fees. For example, to the extent that an additional retail establishment causes greater spending within the city, there will be more sales tax revenues. On the other hand, a new building may also emit negative externalities, such as congestion and pollution, which act to lower nearby property values and thereby the property tax base and property tax revenues.

In summary, we cannot predict a priori how revenues and expenditures might be affected by placing a new building on a vacant lot. However, we assume that cities are aware of the likely changes in expenditures and revenues that would be generated by a proposed new building in making their project approval decisions. In our modeling of the approval decision it is the difference between revenues and expenditures that affect this decision.

III. LITERATURE REVIEW

To our knowledge, there is no econometric evidence that relates actual changes in cities' budgets to changes in land use.[11] What evidence that does exist on the fiscal impacts of alternative land uses comes from Cost of Community Services (CCS) studies.[12] The

[10] For example, commercial properties are frequently required to provide additional road services in order to satisfy Florida's transportation concurrency laws. Under state law transportation concurrency was mandatory for all cities in Florida. In 2011 the law was changed to make concurrency voluntary. Under concurrency cities assess developers the costs of maintaining specific levels of road services when the projected impacts of their development would adversely affect the road system. Exactions can also take the form of parks, libraries, and off–site sewer and water system improvements.

[11] We found only one econometric study of fiscal impacts. Coupal, McLeod, and Taylor (2002) estimated the changes in revenues and expenditures from building homes on previously agricultural land within rural Wyoming counties.

[12] CCS studies should not be confused with fiscal impact analyses (FIAs). Unlike CSS studies, FIAs do not focus on the fiscal impacts of general categories of land use but rather on the fiscal impact of a proposed new development,

methodology of a CCS study is uncomplicated. The revenues and expenditures of a local government (city or county) are grouped and then allocated to three alternative land uses: residential, commercial/industrial, and agricultural/open space. The allocations are based on an examination of records, interviews with financial officers and public administrators, and default percentages. The default percentage is the aggregate value of properties within the land use category divided by the total value of all property on the property tax roll. Where recorded data and interviews fail to indicate where expenditures should be allocated, they are allocated across the three land uses based on their default percentages. Kotchen and Schulte (2009) list 125 CCS studies by their location. With few exceptions they report that these studies have all reached the same conclusions — commercial/industrial and agricultural/open space are surplus producing and residential is deficit producing.

Kotchen and Schulte (2009) criticize the use of only three land use categories in the CCS methodology and the use of the ratio of expenditures to revenues as the fiscal impact measure instead of the difference between the two. The problem with the ratio is that it does not reflect the magnitude of the deficit or surplus generated by the land use. However, their most damaging criticism of the CCS methodology is that it yields the average rather than the marginal fiscal impact of each of the three land uses. From a planning perspective, a forecast of the change in the budget from a shift in the composition of land use in favor of a particular category is needed.

Others have also criticized CCS studies. Kotval and Mullin (2006) argue that CCS studies are biased in favor of producing an expenditure/revenue ratio for agricultural/open space that is less than one because the assumption is made that there are no service costs, such as street

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for example, a new shopping center. However, the results of FIAs are generally consistent with the conventional wisdom that residential land use is deficit producing. FIAs have their own significant limitations, as outlined by Edwards and Huddleston (2009).

maintenance, garbage collection, or fire protection, associated with agricultural use.[13] Paulsen (2014) emphasizes that CCS studies (and FIAs) ignore indirect effects, arising from the externalities that some land uses emit and from multiplier effects. An example of the latter would be an increase in commercial land use that expands the community's workforce, which in turn creates more housing construction.

Our approach to measuring the fiscal impacts of alternative land uses is a radical departure from CCS methodology. In lieu of taking an accounting approach, we estimate the percentage changes in expenditures and revenues from converting a vacant lot into one of seven alternative types of buildings. In the next two sections we describe our panel of Florida cities and our estimating equations.

IV. PANEL OF FLORIDA CITIES

Our panel of Florida cities, which covers the years 2000 to 2013, is constructed from multiple sources. Expenditures and revenues come from the audited Annual Financial Reports that each city must submit to the Florida Department of Financial Services. Expenditures are broken down into current and capital accounts. Revenues are broken down into subcategories including property taxes and intergovernmental transfers.[14]

We conduct separate analyses for central and suburban cities. Suburban cities are divided into small and large, based upon whether the city's population was below or above the median population (10,000) of all suburban cities in the final year of our panel (2013). In Florida there are 47 central cities, as defined by the U.S. Census Bureau. Florida has close to 300 incorporated places within the suburban rings of its 20 metropolitan areas. Because some of these cities are

[13] This bias is attributed to the fact that the CCS methodology was first developed by the American Farmland Trust, which has as its goal the preservation of farmland on the fringe of urban areas.

[14] Revenues and expenditures do not include those related to schools because schools are not a municipal function in Florida. School board boundaries are coterminous with county boundaries and these boards are a third local governmental unit, having their own budgets separate from those of cities and counties.

small, we include in our panel only those with populations exceeding 1000, which left roughly 100 small and 100 large cities.[15]

The number of properties in each land use category found in each city for each year of our panel is obtained from the standardized property tax rolls that counties must submit annually to the Florida Department of Revenue. We divide land uses into seven types: single–family housing, multi–family housing, condominiums, office buildings, retail buildings, industrial properties, and other commercial properties.[16] Other variables included in our panel are median income, population, the Zillow Home Value Index, and the tax price facing the median homeowner. City incomes come from the American Community Survey (ACS). Because the ACS does not report income for all years of our panel, for those years where it is not available its value was predicted based on a regression model.[17] Population data come from the Florida Statistical Abstracts, published by the Bureau of Business and Economic Research at the University of Florida. Zillow publishes a value index for single–family housing for almost all cities in Florida. It is constructed from their estimates of home market values.[18] Our tax price variable is common in the literature and represents the price of public goods faced by the median homeowner, namely

(4) $$T = (r/R) * (R/B),$$

where r is the median assessed value of owner–occupied homes, R is the sum of the assessed values of all of these homes, and B is the sum of the assessed values of all properties on the tax

[15] Florida is well known for some of its incorporated places having very few residents. For example, the cities of Indian Creek, Belleair Shores, Lazy Lake, Bay Lake, Lake Buena Vista, and Marineland all have fewer than 75 residents.

[16] Other commercial properties include a wide range of establishments, with the largest components being wholesale outlets, produce houses, manufacturing outlets, and transportation terminals.

[17] Annual income data are available for every city post 2008. Income was regressed on city population, county per capita income, the county unemployment rate, a linear time trend, and city fixed effects. The R–squared equaled 0.95. Results were used to predict city income for the length of our panel.

[18] A description of the methodology used to construct the Zillow Home Value Index can be obtained at http://www.zillow.com/research/zhvi-methology-6032/.

roll. *T* is attractive intuitively, because it is higher where the median property's assessed value is a larger fraction of the aggregate value of all residential properties and is lower where the latter value is a smaller percentage of the total tax base.

V. SYSTEMS OF EQUATIONS

In Section A. we provide an overview of our empirical methodology. Sections B. and C. describe our expenditures (*E*) and revenues (*R*) equations, respectively.

A. Overview

Land development is a two stage process. First, unimproved land, such as farmland or timber land is converted into improved land or buildable lots. On these lots different types of buildings are built. We want to know how expenditures and revenues are affected if one of seven different types of buildings is built on the lot: single–family home, apartment building, condominium, office building, retail establishment, industrial building, or other commercial type of building.[19]

A land use is surplus producing if for an additional unit $\%\Delta R > \%\Delta E$, and is deficit producing if for an additional unit $\%\Delta R < \%\Delta E$, where the $\%\Delta R$ is obtained holding the millage rate constant. Cities balance their budgets (a statutory requirement) by changing their millage rates. We want to know the change in revenues that would have occurred from changes in the property tax base and non–ad valorem revenues as the result of adding a building, leaving the millage rate unchanged.

The data are first–differenced to control for unobservable heterogeneity across cities that affects their expenditures and revenues. Wooldridge (2002) recommends a first–differences (FD) over a fixed effects (FE) estimator if one or more of the regressors are not strictly exogenous.

[19] The condominium property we analyze is not the entire building but an individual unit within the building.

Strict exogeneity is required for consistent estimation. A strictly exogenous variable does not react to past changes in expenditures, displays no traditional simultaneity, and is not correlated with time–varying omitted variables. Hence, it is a much stronger condition than contemporaneous exogeneity. The advantage of FD over FE is that it allows an endogenous change in an explanatory variable to be instrumented using lagged levels of the variable as instruments.

Our methodology consists of the following steps: 1) estimate the revenues and expenditures equations using OLS testing each land use change for strict exogeneity, 2) instrument each change not satisfying strict exogeneity checking on first–stage diagnostics, and 3) estimate both equations simultaneously using a general method of moments (GMM) estimator. GMM provides three benefits. First, it optimally weights the instruments set to maximize efficiency. Second, it allows correlation in errors across equations, further increasing efficiency. Third, it enables us to conduct significance tests on differences in estimated coefficients across equations. We repeat the above steps for the three types of cities and two time periods (pre– and post–crash) yielding six cases: central cities 2000–2007, central cities 2008–2013, small and large suburban cities 2000–2007, and small and large suburban cities 2008–2013.

B. The Expenditures Equation

To isolate the impact on expenditures from placing one of our seven types of buildings on a vacant lot, we regress the percentage change in current expenditures on changes in the number of buildings of each type and changes in variables that theory and prior evidence suggest should be included as controls.

Note that our dependent variable equals current and not total expenditures. We wish to relate a city's spending on public services to changes in land use, where spending is defined as the sum of spending on current operations and the current cost of using public capital. This suggests that our dependent variable should equal the sum of current and capital account expenditures. In our data, however, capital expenditures equal capital outlays and not the annual capital cost. If we sum current and capital expenditures, we would be adding a flow and a stock variable together, which would make the results difficult to interpret. Fortunately, current expenditures include debt service, which captures, albeit imperfectly, the current cost of capital, because almost all large capital projects are debt financed by Florida cities.

There are two theories of city expenditures that help define our set of control variables. The median voter model suggests that the demand for public services varies directly with the median voter's income and wealth, and inversely with the tax price she faces. The budget maximizer model suggests that expenditures may exceed those predicted by the median voter model, but only to the extent that officials can draw down available fiscal resources. Cromwell and Ihlanfeldt (2015) have found that the two most important exogenous fiscal resources affecting the expenditures of Florida cities are the property tax base and intergovernmental transfers. Pulling the above factors together, our expenditures equation can be expressed as

(5)
$$E_{jt} = \alpha_0^E + \sum_{\ell=1}^{8}\sum_{m=0}^{2} \beta_{\ell m}^E X_{j\ell(t-m)} + \alpha_1^E TP_{jt-1} + \alpha_2^E IT_{jt} + \alpha_3^E TB_{jt-1} + \alpha_4^E Z_{jt-1} + \alpha_5^E I_{jt-1} + \alpha_6^E POP_{jt-1} + f_t^E + \epsilon_{jt}^E ,$$

where j = city

ℓ = land use type

t = year

E = the natural log of current expenditures

X = land use count in 100s[20]

TP = log tax price

IT = natural log of intergovernmental transfers

TB = natural log of the tax base

Z = natural log of the Zillow Home Value Index

I = median income

POP = population

f = year fixed effects.[21]

Recall that the data are first–differenced so that (5) states that the percentage change in *E* in year *t* is affected by the change in land use in years *t*, *t–1*, and *t–2*.[22] The correct number of lags was determined by comparing Akaike's information criterion (AIC) among models with zero to four lags. The AIC declined through the second lag and then jumped strongly upward for the third and fourth lags; hence, there is little ambiguity in our chosen lag structure. The differences in the timing of the variables entering (5) reflect the fact that expenditures and revenues are measured for the fiscal year, while the other variables are measured for the calendar year. The fiscal year is identified as the year in which the fiscal period ends. To illustrate, year 2000 expenditures are for expenditures beginning on July 1, 1999 and ending on June 30, 2000. These expenditures (*t*) are related to the number of properties on the January 1, 2000 (*t*) tax roll; the January 1, 1999 (*t–1*) tax roll; and the January 1, 1998 (*t–2*) tax roll. The January 1, 1999 tax roll is used to measure

[20] We use an increment of 100 units to avoid reporting very small percentage changes that would result if a single unit change was used.

[21] Both logged and unlogged versions of each control variable were tried and the version with the greatest explanatory power was retained.

[22] With the inclusion of the lagged changes in *X*, the estimated total effect of the change in *X* is computed as the long run propensity (LRP), which is obtained by summing the estimated coefficients on the *t*, *t–1*, and *t–2* changes in *X*. The LRP reflects the long–run change in expenditures after a permanent change in land use.

the property tax base and the tax price. Also measured for 1999, the year in which expenditures commence, are the Zillow Home Value Index, city median income and city population.

Note that eight different land uses enter (5). Although our interest is only in the fiscal impacts of the seven land uses listed in V.A, we include an eighth composite land use category to ensure that the reference (i.e., omitted) land use category is indeed a vacant lot. The composite land use category includes government, institutional, and agricultural uses.

A novel attribute of (5) is that it relates the percentage change in expenditures to the percentage change in the Zillow index. The latter variable is included to capture changes in housing wealth, which may affect the demand for public services. A number of studies have shown that as housing values fall the loss in property wealth reduces the demand for private goods.[23] The desire to cut back on consumption as wealth declines may also carry over into the public sector.

C. The Revenues Equation

In addition to altering the property tax base and thereby property tax revenues, a new building can change the revenues received from non–ad valorem revenue sources, the largest being sales taxes and user fees. Our revenues equation accounts for both sources of change and can be expressed as

(6) $$R_{jt} = \alpha_0^R + \sum_{\ell=1}^{8}\sum_{m=0}^{1} \beta_{\ell m}^R X_{j\ell(t-m)} + \alpha_1^R Z_{jt-1} + \alpha_2^R I_{jt-1} + \alpha_3^R POP_{jt-1} + \alpha_4^R M_{jt-1} + f_t^R + \epsilon_{jt}^R ,$$

where R = the natural log of revenues[24] and

[23] For a review of the housing wealth and consumption literature see Iacoviello (2011).

[24] To accurately estimate the long–run fiscal impact of a land use, *R* should include only recurring revenue sources. We therefore excluded impact fees from *R*. These fees are one–time levies, predetermined by a city, that are assessed on a property developer during the construction project process to cover the city's costs of providing public infrastructure to the project. In the early years of our panel one–third of the cities used impact fees. By the end of our panel, half of the cities had these fees. Fees equal one to two percent of total revenues for those cities that use them.

M = millage rate.

All other variables in (6) are defined as in (5). Equation (6) recognizes that non–ad valorem revenues will largely be driven by changes in spending and therefore includes as control variables income, population and the Zillow measure of property wealth. Also note that, as for (5), the AIC indicated that two lags of the *X* variables be included. We control for changes in the millage rate for the reasons given in V.A.

VI. RESULTS

In part A of this section we deal with the possible endogeneity of land uses in our *E* and *R* models. In part B we report the results obtained for central cities for the years before and after the housing market crash. Parts C and D contain the results for small and large suburban cities, respectively. The section concludes with a discussion of the results obtained with the control variables.

A. Strict Exogeneity Test Results

Strict exogeneity is violated if current changes in *R* or *E* feedback and affect future land uses. Unfortunately, to our knowledge, there is neither theory nor empirical evidence identifying the land uses that are susceptible to these effects. Hence, we chose to test each *X* for strict exogeneity in each of our *R* and *E* equations using Wooldridge's (2002) suggested test. This test involves adding the undifferenced value of $X_{j\ell t}$ to our *E* and *R* differenced equations and testing for its statistical significance. For each model there are 42 tests (seven land use types times the six cases). For the *E* models we could not reject strict exogeneity at the 5 percent level in 35 of the 42 cases using a test statistic robust to serial correlation and heteroscedasticity.[25] For the *R* models the number of failed rejections equaled 30. In the cases where strict exogeneity is rejected the contemporaneous change in *X* requires instrumentation. There are three potential sets of instrumental variables. Wooldridge (2002) suggests using lagged levels of *X* as instrumental variables. Because the first and second lagged changes in *X* are included in our models, the first lagged level of *X* available as an instrument is *t–3*. Our first set of instruments included the *t–3* and *t–4* levels of *X*. Other possible instruments are lagged levels of the exogenous *X* change variables, again beginning with *t–3*. We used *t–3* and *t–4* lagged levels as our second set of instruments. Finally, our third set of instruments included the percentage change in the average market value of *X*, measured for *t–3* and *t–4*.[26] Variable combinations from these sets were selected that yielded reasonable first–stage results in separate 2SLS models estimated for *E* and *R*. First–stage results showed that our instruments are strongly correlated with the endogenous *X* change variables in our *E* and *R* models.[27,28]

B. Results for Central Cities

[25] We also used a 10 percent level test which resulted in additional *X* and control variables requiring instrumentation. Expanding the instrumentation set to include these variables generally had little effect on our results and did not alter our main conclusions.

[26] The market values come from the property tax rolls and equal the assessor's estimate of the fair market value of the property on January 1 of the tax roll year.

[27] In all cases the first–stage *F*–statistic, which is robust to serial correlation and heteroskedasticity, is significant at the 1 percent level or better. The average first–stage *F*–statistic equaled 10 and 4, for the *R* and *E* models, respectively. Based on Stock, Wright, and Yogo (2002), it is common to use an *F*–statistic of 10 as the rule of thumb to rule out weak instruments bias. However, this assumes a single endogenous variable and iid errors, neither of which obtains in our models. In addition, the first–stage results obtained from our 2SLS models understate the strength of the correlations between our instruments and endogenous variables, because we estimate GMM models that optimally weight the instruments. For each of our GMM models we tested the validity of our overidentifying restrictions by computing Hansen's *J* statistic. These statistics are reported in the appendix tables and show that in all cases restrictions are valid, which is not surprising given that all of our instruments are lagged three and four years. The credibility of an identification strategy is enhanced if the instruments are intuitive. In our case, past levels of land uses and percentage changes in values may signal to developers the need for more buildings of a given type.

[28] The strict exogeneity of the control variables was also tested. We rejected strict exogeneity in only a few cases. In those cases, we instrumented the change in the variable using lag levels of the variable.

Table 1 reports estimates of the land use coefficients from the *E* and *R* GMM systems of equations for central cities.[29] Results for all variables are reported in Appendix Table A1. In Table 1 the first entry under each land use reports the land use's estimated effect on a city's budget. A positive (negative) sign indicates that the land use is surplus (deficit) producing. The next two entries under each land use report the estimated effect of the land use on *R* and *E*, respectively. The estimates equal the percentage change in the dependent variable from an increase in *X* of 100 units.

The impacts of changes in *X* on *E* and *R* may come from the effects that *X* has on city income and population. For example, *R* may increase from an additional single–family home because homeowners raise income and thereby consumption in the community, which results in more sales tax and user fee revenues. As another example, the effect of another multi–family housing property on *E* may come from the increase in population accompanying this addition. We therefore report in Table 1 the results obtained with income and population excluded and included in our *E* and *R* models.

[Table 1 about here.]

A comparison of the second and fourth columns of Table 1 reveals that in the post–crash period there is little difference in the results between the models excluding and including income and population. Hence, the fiscal effects of the land uses do not appear to be registered through their impact on income and population. However, a comparison of the first and third columns of Table 1 shows that in the pre–crash period the results for one of the land uses (single-family homes) vary between the models excluding and including income and population. In the model excluding income and population single–family housing has a positive and significant effect on

[29] We use the iterative GMM estimator, which may produce gains to finite–sample efficiency (Hall, 2005), and a heteroskedasticity—and autocorrelation—consistent weight matrix.

the difference between revenues and expenditures (DIFF). After adding income and population to the model, the effect of single–family housing on DIFF is negative and insignificant. Adding the income and population variables one at a time revealed that the positive effect that single–family housing has on DIFF can be attributed to its positive correlation with city income. Henceforth, our discussion will focus on the results obtained without these variables.

In the pre–crash period our theory suggests that single–family housing and condominium properties are not deficit producing within central cities. The results show that DIFF is positive and significant and negative and insignificant for single–family and condominium properties, respectively. Hence, our expectations are confirmed. A second prediction is that multi–family housing may be deficit producing. The results also confirm this expectation — DIFF is negative and significant at better than the one percent level. Finally, there is the prediction that commercial properties may be deficit producing. This is true for office (*p*–value = 0.00) and retail (*p*–value = 0.00) properties.

Standing in sharp contrast to the pre–crash results are those obtained for the post–crash period (2008–2013). While DIFF for single–family homes remains positive and significant, the DIFF for condominium homes changes from small and insignificant in the pre–crash period to a relatively large positive number that is highly significant (*p*–value = 0.00) in the post–crash period. The DIFF for multi–family housing changes from negative and significant in the pre–crash period to positive and significant in the post–crash period. Office and retail buildings change from being significant deficit producers to significant surplus producers in the post–crash period. Our theory suggests that the losses in fiscal resources that central cities experienced after the crash may have increased the weight attached to the budgetary impact of a proposed project in making the approval decision. This expectation is strongly supported by our findings in that single–family, condominium, multi–family, office, and retail land uses are all surplus producing in the post–crash period.

However, two of the land uses, industrial and other commercial properties, are not deficit producing in the pre–crash period but are deficit producing in the post–crash period. DIFF is marginally insignificant for industrial properties (*p*–value = 0.14) and highly significant for other commercial properties (*p*–value = 0.00). Our theory suggests that in the post–crash period, in addition to placing more weight on the budgetary impacts of a land use, more weight would be placed on the job creation potential of a land use in making the project approval decision. The recession caused unemployment to rise within central cities and there was a clear need for more employment opportunities. Both industrial and other commercial land uses generate blue–collar jobs that are often sought after by local governments. Hence, the jobs created by these land uses may explain their approval in the post–crash period despite them being deficit producing.

While our primary interest is in the DIFF estimates, a number of the results obtained from the individual *R* and *E* models are also of interest. In the pre–crash period, office and retail buildings are found to have a negative and significant effect on revenues. As suggested above, a possible explanation for this result is that these buildings create negative externalities, such as noise and automobile congestion that reduce the taxable values of nearby properties, bringing down the property tax base and property tax revenues. Also of some interest is that in the pre–crash period industrial properties are found to reduce expenditures. As noted above, this likely reflects developer exactions that enable cities to cut some of their expenditures.[30]

C. Results for Small Suburban Cities

[30] It is also possible that these properties produce positive spillover benefits to their neighborhoods. For example, on–site security may deter criminal activity off site, saving cities on police expenditures.

The *X* results for small suburban cities are reported in Table 2. Appendix Table A2 contains the results for all variables.[31] The pre– and post–crash models, with and without the inclusion of income and population, all yield the same results: with but one exception, no land use is deficit producing for small suburban cities. The exception is condominium properties in the pre–crash period in the model excluding income and population (DIFF = –0.02, *p*–value = 0.08). While this result is inconsistent with our theoretical predictions, it may reflect the fact that we are underestimating the property tax revenues generated by a condominium because our revenues exclude property taxes on the condominium's common areas. Our data provide no way to measure these revenues. While a number of the land uses yield positive and statistically significant DIFF estimates, generally the DIFF estimates are not significantly different from zero. There are two possible explanations that may account for these results. First, the estimated coefficients of the land use in the *R* and *E* equations may be similar in value, resulting in a small DIFF estimate. This is true in 8 of the 28 cases, where the absolute value of the DIFF estimate is less than 0.10. Most of these cases are for the residential land uses. Second, the estimated coefficient of the land use in one or both of the equations may have a large confidence interval, resulting in a corresponding large confidence interval on DIFF. This is true in 20 of the 28 cases. As noted above, if the properties within a land use are mostly deficit producing and they yield no offsetting advantage to the community, few will be allowed to be built in the community. Within small suburban cities, both the average annual change and its standard deviation are small for all

[31] Although small and large suburban cities are defined as those below and above the median city population in 2013, note that the number of observations differs between the two types of cities. This results from differences in the variables used to instrument those *X* for which strict exogeneity is rejected and differences in the number of *X* requiring instrumentation.

of the commercial land uses; hence, it is not surprising that many of the DIFF estimates for these properties are not statistically significant.[32]

[Table 2 about here.]

D. Results for Large Suburban Cities

The DIFF results for large suburban cities are in Table 3 and complete results are in Appendix Table A3. A comparison of the results obtained without and with the income and population variables shows that the results differ for only one of the land uses. The DIFF for multi–family housing changes from positive and significant to positive and insignificant after adding income and population. Adding these variables one at a time revealed that both variables contribute equally to the positive effect that multi–family housing has on DIFF.

Overall, the results for large suburban cities mirror those obtained for small suburban cities. Most importantly, regardless of time period or the inclusion/exclusion of income and population, none of the land uses are found to be deficit producing. However, in contrast to the small suburban city results, more of the land uses yield DIFF estimates that are statistically significant. In the pre–crash period, single–family, multi–family, office, and industrial properties are surplus producing, while in the post–crash period retail and other commercial properties are surplus producing.

[Table 3 about here.]

To summarize the results for suburban cities, our theory suggests that deficit–producing properties are unlikely to be found within these cities. Only after the crash and accompanying recession are deficit–producing properties expected and only if suburban residents placed more importance on the jobs created by the property than on its fiscal impact. Our results suggest that

[32] For example, the average annual change in single–family homes is 16 with a standard deviation of 47. In comparison, the average annual change in office buildings is 0.5 with a standard deviation of 3.

this is not the case. The key conclusion that can be drawn from both our small and large suburban city findings is that they support William Fischel's Homevoter Hypothesis, which maintains that suburban homeowners control land use within their communities and use this control to protect and enhance their property values.

E. Addition of County Level Variables

First–differencing the data controls for time–invariant unobservables across cities that may be correlated with our land use variables. To control for time–variant variables that may be correlated with changes in land uses we included in (5) and (6) an extensive set of variables measured at the city level (reviewed below). To further mitigate the possibility of omitted variables biases we added to our models variables that change over time that are available at the county but not the city level.[33] We added to the expenditure equations changes in the number of business establishments from County Business Patterns, the number of registered Democrats and Republicans from the Florida Division of Elections, and the dollar amount of property damage due to storms from the National Climatic Data Center. The number of establishments is included to capture the size of the business sector in recognition that businesses, as well as households, demand public services. The party affiliations of registered voters are included to capture voter preferences for city services. Storm damage is included because cities are responsive to the needs of their citizens in times of crisis. To the revenue equations we added changes in the number of unemployed workers from the Bureau of Business and Economic Research at the University of Florida, the number of business establishments, storm damage, and total employment from County Business Patterns. A reasonable case can be made that each of these variables may affect city revenues.

[33] A drawback of adding the county level variables is that they introduce measurement error into our models which increases the likelihood of committing type 2 errors.

The addition of these variables to our models has little effect on our major results. The dramatic changes for central cities showing deficit‒producing land uses before the crash and surplus‒producing land uses after the crash are still apparent. For small suburban cities the only noteworthy change is that multi‒family housing is deficit producing in the post‒crash period. The results for large suburban cities are nearly identical, at least qualitatively. Overall, the results from adding the county level variables to our models failed to change the conclusions that can be drawn from Tables 1‒3.

F. Results for City Control Variables

The city control variables entering the expenditures equations are intergovernmental transfers, the property tax base, the tax price, the Zillow Home Value Index, and in the models including population and median income the values of these two variables. As expected, transfers and the tax base are generally positive and statistically significant across all twelve models (three city types times two time periods times two specifications (with and without income and population)). Also as expected, a higher tax price generally lowers expenditures, with the exceptions being in the models estimated for central cities before the crash, but the effect is also generally not significant. Surprisingly, an increase in property wealth, as measured by the Zillow index, is found to reduce expenditures in eleven of the twelve models, and the effect is significant in seven cases. These results suggest that an increase in property wealth reduces the demand for city services. This may be caused by property owners substituting private for public goods consumption as their wealth increases.[34]

The control variables entering the revenues equations are the Zillow Home Value Index and the millage rate and in the models including population and income the values of these two

[34] For example, homeowner associations may provide their own security or their own parks and recreation facilities.

variables. The estimated effect of the Zillow index depends on whether income and population are included in the models, but in the majority of cases it is positive, as expected. In four of the latter cases, the effect is significant. An increase in the millage rate raises expenditures in all twelve models, but the effect is significant in only one–third of the cases.

An increase in the city's population has mixed effects across the twelve models; however, where it is significant, it has a negative effect on expenditures. If the increase in population comes from more households moving into the city the expectation is that expenditures should rise. However, if the population increase is from existing households becoming larger these households may reduce their demand for city services in order to spend more on private goods.

An increase in the city's median income raises expenditures and the effect is significant in three of the six cases. An income increase has mixed effects on revenues, but where it is significant the effect is more often negative. To the extent that an increase in income causes households to buy less locally (and perhaps more online), a decline in sales tax revenues may account for these results.

VII. CONCLUSIONS

To our knowledge, the estimates produced by our *R* and *E* systems of equations provide the first evidence on what happens to city budgets as a result of building different types of properties on a vacant lot. We posited that these impacts would vary between central and suburban cities and the results are strongly consistent with our expectations. Before the housing market crash, three of the seven types of properties we investigated are found to produce a difference between revenues and expenditures that is negative and statistically significant within central cities, while this is true for only condominiums within small suburban cities. However, for the latter properties revenues are underestimated because property taxes on the common areas could not be counted. Given the small size of the estimated DIFF coefficient, including these taxes may have changed this result. While the crash had little impact on the fiscal impacts of alternative land uses within suburban cities, it dramatically changed fiscal impacts within central cities, with five of the seven property types generating a positive and significant difference between revenues and expenditures. We speculated that the changes in fiscal impacts within central cities from negative to positive may have been the result of central cities' fiscal stress emanating from the crash and Great Recession. There is also evidence that central cities paid more attention to the jobs created by properties within selective land use categories. Industrial and other commercial land uses change from not being deficit producing in the pre–crash period to being significantly deficit producing in the post–crash period. These properties may have been approved in the post–crash period, despite being deficit producing, because of the loss in jobs central cities experienced as the result of the Great Recession. These uses are sources of the blue–collar jobs that these cities often covet.

Overall, our results are inconsistent with the conventional wisdom that residential land use is deficit producing. There is little evidence that this is true within suburban cities and the evidence for central cities suggests that it is not true for owner–occupied housing. Our results, however, are consistent with Fischel's (2001) argument that residents have the final authority over what gets built within their communities and it is illogical to believe that they would approve land uses inimical to their interests. The results also suggest that approval decisions are affected by the fiscal stress that cities are under at the time the decisions are made. Attention to the other benefits that a land use may provide (such as bringing permanent jobs into the community) may receive less weight in making approval decisions when cities are struggling to balance their budgets.

We acknowledge that econometric evidence from states other than Florida is needed to reach a full understanding of the fiscal impacts generated from converting a vacant lot into buildings of different types. Complicating these efforts, however, is the need to construct comprehensive panel data bases, akin to the one we built for Florida cities, including expenditure, revenue, and land use variables. However, in comparison to conducting additional CCS studies, these efforts promise to yield more credible and therefore useful evidence on this important topic.

Table 1
Results for Central Cities

	Without Income and Population		With Income and Population	
	Before Crash	After Crash	Before Crash	After Crash
Single–family homes				
Surplus/deficit [1]				
β	0.00487	0.02582	–0.00021	0.02758
p–value	0.0321	0.0000	0.9323	0.0007
Revenues				
β	0.00461	0.03010	0.00012	0.04346
p–value	0.0234	0.0000	0.7401	0.0000
Expenditures				
β	–0.00026	0.00427	0.00093	0.01587
p–value	0.5914	0.2724	0.1021	0.0257
Multi–family housing				
Surplus/deficit				
β	–0.16565	0.01406	–0.14603	0.01976
p–value	0.0012	0.0451	0.0129	0.0080
Revenues				
β	–0.13229	0.02208	–0.11358	0.03870
p–value	0.0074	0.0074	0.0391	0.0000
Expenditures				
β	0.03337	0.00802	0.03305	0.01894
p–value	0.0000	0.2398	0.0000	0.0470
Condominiums				
Surplus/deficit				
β	–0.00123	0.01187	–0.00142	0.01066
p–value	0.4494	0.0010	0.3519	0.0003
Revenues				
β	–0.00101	0.01550	–0.00124	0.02399
p–value	0.5407	0.0008	0.4633	0.0001
Expenditures				
β	0.00022	0.00362	0.00018	0.01333
p–value	0.6292	0.0266	0.7163	0.0003
Offices				
Surplus/deficit				
β	–.015926	0.04640	–0.12640	0.04915
p–value	0.0013	0.0151	0.0033	0.0343
Revenues				
β	–0.12557	0.04488	–0.10631	0.04715
p–value	0.0051	0.0333	0.0050	0.01302
Expenditures				
β	0.03370	–0.00152	0.02010	–0.00206
p–value	0.0022	0.8459	0.0667	0.8708
Retail				

Surplus/deficit				
β	–0.02983	0.03875	–0.02901	0.03023
p–value	0.0010	0.0007	0.0041	0.0721
Revenues				
β	–0.02381	0.04425	–0.02186	0.06467
p–value	0.0131	0.0000	0.0529	0.0000
Expenditures				
β	0.00602	0.00550	0.00714	0.03444
p–value	0.0122	0.5332	0.0265	0.0519
Industrial				
Surplus/deficit				
β	0.15819	–0.10495	0.14775	–0.16168
p–value	0.1441	0.1422	0.1365	0.1675
Revenues				
β	0.13406	–0.11970	0.08904	–0.17537
p–value	0.2283	0.0019	0.3806	0.0365
Expenditures				
β	–0.02413	–0.01475	–0.05871	–0.01369
p–value	0.0871	0.7516	0.0004	0.7726
Other commercial				
Surplus/deficit				
β	0.21323	–0.21389	0.22079	–0.28135
p–value	0.1263	0.0000	0.1062	0.0000
Revenues				
β	0.20682	0.09052	0.23654	0.12526
p–value	0.1480	0.0047	0.1066	0.0017
Expenditures				
β	–0.00641	0.30440	0.01575	0.40662
p–value	0.7716	0.0000	0.6140	0.0000
Observations	370	283	370	283

Note: Estimated *β* coefficients are percentage changes in *R–E*, *R*, and *E* from a 100 unit increase in the land use. As described in the text the *β* coefficients are Long Run Propensities obtained from summing the estimated coefficients on the current and lagged values of the number of properties within a land use category.

[1] Surplus/deficit equals *R–E*.

Table 2
Results for Small Suburban Cities

	Without Income and Population		With Income and Population	
	Before Crash	After Crash	Before Crash	After Crash
Single–family homes				
Surplus/deficit [1]				
β	–0.01285	–0.21637	0.06012	–0.20237
p–value	0.3787	0.1541	0.0483	0.1853
Revenues				
β	0.04129	–0.18632	0.09603	–0.14805
p–value	0.0330	0.2263	0.0000	0.3316
Expenditures				
β	0.05414	0.03005	0.03591	0.05432
p–value	0.0000	0.1208	0.0130	0.0262
Multi–family housing				
Surplus/deficit				
β	0.14462	–0.71627	0.08009	–0.70991
p–value	0.5565	0.1070	0.8026	0.1105
Revenues				
β	0.19035	–0.66808	0.20219	–0.58924
p–value	0.3468	0.1403	0.3798	0.1811
Expenditures				
β	0.04574	0.04819	0.12210	0.12068
p–value	0.4744	0.3484	0.2680	0.0588
Condominiums				
Surplus/deficit				
β	–0.02185	–0.13570	0.01358	–0.11520
p–value	0.0804	0.3280	0.4879	0.4018
Revenues				
β	–0.00183	–0.15276	0.02161	–0.10724
p–value	0.8955	0.2745	0.1813	0.4306
Expenditures				
β	0.02002	–0.01706	0.00803	0.00797
p–value	0.0015	0.3956	0.3764	0.7367
Offices				
Surplus/deficit				
β	–0.62033	2.40425	–0.99682	2.30239
p–value	0.2420	0.2534	0.1442	0.3269
Revenues				
β	–0.57519	2.35316	–0.78644	2.16231
p–value	0.2276	0.2641	0.1456	0.3530
Expenditures				
β	0.04514	–0.05110	0.21038	–0.14007
p–value	0.8605	0.8036	0.5206	0.4951
Retail				

Surplus/deficit				
β	–0.25507	–0.31185	–0.28981	–0.37096
p–value	0.5870	0.1466	0.5454	0.1441
Revenues				
β	–0.67078	–0.26336	–0.58969	–0.28264
p–value	0.1471	0.2379	0.2065	0.2970
Expenditures				
β	–0.41571	0.04849	–0.29987	0.08832
p–value	0.0126	0.4599	0.0826	0.2322
Industrial				
Surplus/deficit				
β	–0.03012	0.05018	0.16977	0.03441
p–value	0.7489	0.7709	0.1881	0.8601
Revenues				
β	–0.07695	0.08723	0.06108	0.03370
p–value	0.3890	0.5858	0.5183	0.8549
Expenditures				
β	–0.04683	0.03705	–0.10869	–0.00071
p–value	0.4486	0.3367	0.1337	0.9884
Other commercial				
Surplus/deficit				
β	1.20303	36.75448	5.13334	44.76653
p–value	0.7795	0.0266	0.3270	0.0066
Revenues				
β	0.77678	35.75810	4.79970	44.15462
p–value	0.8550	0.0364	0.3472	0.0098
Expenditures				
β	–0.42625	0.99637	–0.33364	–0.61191
p–value	0.4679	0.6609	0.6560	0.7936
Observations	673	591	673	591

Note: Estimated β coefficients are percentage changes in *R–E*, *R*, and *E* from a 100 unit increase in the land use. As described in the text the β coefficients are Long Run Propensities obtained from summing the estimated coefficients on the current and lagged values of the number of properties within a land use category

[1] Surplus/deficit equals *R–E*.

Table 3
Results for Large Suburban Cities

	Without Income and Population		With Income and Population	
	Before Crash	After Crash	Before Crash	After Crash
Single–family homes				
Surplus/deficit [1]				
β	0.00607	–0.00884	0.01046	–0.00805
p–value	0.0038	0.4126	0.0008	0.4300
Revenues				
β	0.00654	–0.00338	0.01098	–0.00207
p–value	0.0005	0.7562	0.0001	0.8392
Expenditures				
β	0.00048	0.00546	0.00052	0.00598
p–value	0.6382	0.0077	0.6217	0.0074
Multi–family housing				
Surplus/deficit				
β	0.03799	0.00305	0.02115	0.00837
p–value	0.0857	0.8699	0.3494	0.6373
Revenues				
β	0.03071	0.00951	0.01337	0.01536
p–value	0.2182	0.6094	0.5979	0.3847
Expenditures				
β	–0.00727	0.00646	–0.00778	0.00699
p–value	0.3616	0.0075	0.3707	0.0078
Condominiums				
Surplus/deficit				
β	–0.00148	–0.00989	0.00092	–0.00924
p–value	0.6821	0.3461	0.7974	0.3491
Revenues				
β	–0.00225	–0.00562	0.00029	–0.00450
p–value	0.4959	0.5960	0.9284	0.6492
Expenditures				
β	–0.00077	0.00427	–0.00063	0.00473
p–value	0.5816	0.0225	0.6581	0.0178
Offices				
Surplus/deficit				
β	0.27590	–0.03692	0.29533	–0.01757
p–value	0.0466	0.1506	0.0398	0.4757
Revenues				
β	0.41865	–0.04067	0.44618	–0.02175
p–value	0.0004	0.1683	0.0003	0.4278
Expenditures				
β	0.14275	–0.00374	0.15086	–0.00418
p–value	0.0007	0.8496	0.0006	0.8192
Retail				

Surplus/deficit				
β	0.06527	0.02269	0.06955	0.02386
p–value	0.7051	0.0375	0.6823	0.0264
Revenues				
β	0.07401	0.03955	0.07215	0.04073
p–value	0.6578	0.0000	0.6605	0.0000
Expenditures				
β	0.00873	0.01686	0.00260	0.01686
p–value	0.8098	0.0008	0.9420	0.0007
Industrial				
Surplus/deficit				
β	0.08468	–0.01975	0.08039	–0.01979
p–value	0.0784	0.1801	0.1056	0.1743
Revenues				
β	0.05122	–0.02584	0.03546	–0.02565
p–value	0.2163	0.0803	0.4081	0.0735
Expenditures				
β	–0.03346	–0.00608	–0.04493	–0.00587
p–value	0.1273	0.2823	0.0664	0.3065
Other commercial				
Surplus/deficit				
β	–0.20104	0.03613	–0.22907	0.03364
p–value	0.2104	0.0010	0.1494	0.0031
Revenues				
β	–0.04786	0.06014	–0.07610	0.05888
p–value	0.6178	0.0000	0.4028	0.0000
Expenditures				
β	0.15317	0.02400	0.15296	0.02623
p–value	0.1115	0.0000	0.1288	0.0000
Observations	745	568	745	568

Note: Estimated β coefficients are percentage changes in $R–E$, R, and E from a 100 unit increase in the land use. As described in the text the β coefficients are Long Run Propensities obtained from summing the estimated coefficients on the current and lagged values of the number of properties within a land use category

[1] Surplus/deficit equals $R–E$.

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Appendix Table A1

Complete Results for Central Cities

	Without Income and Population		With Income and Population	
	Before Crash	After Crash	Before Crash	After Crash
Expenditures				
Counts (*t*) [1]				
Single–family	0.00183	0.00560	0.00165	0.02265
	(0.00049) [2]	(0.00425)	(0.00055)	(0.00770)
Multi–family	–0.01751	–0.00080	–0.01200	0.01942
	(0.00431)	(0.00655)	(0.00425)	(0.01107)
Condominium	0.00015	0.00480	–0.00023	0.01992
	(0.00035)	(0.00236)	(0.00042)	(0.00537)
Office	0.01215	–0.00347	0.01135	0.01298
	(0.00645)	(0.00661)	(0.00708)	(0.00863)
Retail	0.03422	0.00409	0.02872	0.04505
	(0.00604)	(0.01285)	(0.00869)	(0.02304)
Industrial	–0.06187	–0.00256	–0.07334	–0.00724
	(0.01329)	(0.04079)	(0.01460)	(0.04269)
Other commercial	–0.00555	0.27606	–0.00084	0.47101
	(0.01392)	(0.05962)	(0.01267)	(0.08426)
Composite	0.00390	0.00130	0.00584	0.00039
	(0.00317)	(0.00217)	(0.00355)	(0.00407)
Counts (*t–1*)				
Single–family	–0.00057	–0.00019	–0.00008	–0.00494
	(0.00062)	(0.00108)	(0.00062)	(0.00161)
Multi–family	0.04177	0.00399	0.03800	–0.00344
	(0.00599)	(0.00280)	(0.00663)	(0.00417)
Condominium	–0.00145	–0.00109	–0.00062	–0.00647
	(0.00041)	(0.00109)	(0.00034)	(0.00199)
Office	0.00985	–0.00246	0.01016	–0.01849
	(0.00871)	(0.00504)	(0.01031)	0(.00789)
Retail	–0.03508	–0.00095	–0.02704	–0.01013
	(0.00917)	(0.00293)	(0.01191)	(0.00410)
Industrial	0.00844	–0.00998	0.00557	–0.01588
	(0.02023)	(0.00415)	(0.02035)	(0.00968)
Other commercial	–0.01264	0.00283	–0.00493	–0.10221
	(0.00981)	(0.02628)	(0.00861)	(0.05467)
Composite	–0.00017	–0.00012	–0.00174	–0.00372
	(0.00202)	(0.00302)	(0.00205)	(0.00536)
Counts (*t–2*)				
Single–family	–0.00151	–0.00113	–0.00064	–0.00183
	(0.00068)	(0.00065)	(0.00077)	(0.00068)
Multi–family	0.00911	0.00483	0.00705	0.00296
	(0.00508)	(0.00369)	(0.00447)	(0.00469)
Condominium	0.00152	–0.00009	0.00103	–0.00012
	(0.00063)	(0.00046)	(0.00068)	(0.00046)

Office	0.01169	0.00441	–0.00142	0.00351
	(0.01169)	(0.00179)	(0.01148)	(0.00451)
Retail	0.00688	0.00236	0.00547	–0.00047
	(0.00426)	(0.00198)	(0.00573)	(0.00219)
Industrial	0.02929	–0.00220	0.00906	0.00942
	(0.02146)	(0.00305)	(0.02359)	(0.00417)
Other commercial	0.01178	0.02551	0.02152	0.03782
	(0.01483)	(0.01429)	(0.02090)	(0.02431)
Composite	0.00317	0.00213	0.00302	0.00456
	(0.00191)	(0.00178)	(0.00171)	(0.00388)
Transfers (*t*)	0.08585	–0.04136	0.09059	–0.03163
	(0.01664)	(0.02499)	(0.01661)	(0.02990)
Base (*t–1*)	0.29768	–0.00251	0.21548	0.05261
	(0.07384)	(0.07096)	(0.08124)	(0.08076)
Tax price (*t*)	–0.00633	–0.02792	0.01118	–0.02392
	(0.04662)	(0.04347)	(0.04548)	(0.05162)
Zillow (*t–1*)	–0.36929	–0.08536	0.42817	–2.11699
	(0.15782)	(0.23890)	(0.24799)	(0.91495)
Population (*t–1*)			–0.01564	–0.00001
			(0.01056)	(0.00010)
Income (*t–1*)			–0.19800	0.47020
			(0.11836)	(0.18321)
Revenues				
Counts (*t*)				
Single–family	–0.00388	0.04185	–0.00256	0.06144
	(0.00507)	(0.00931)	(0.00482)	(0.01246)
Multi–family	–0.29702	0.02145	–0.26157	0.03958
	(0.06796)	(0.00854)	(0.07014)	(0.01150)
Condominium	–0.00753	0.03470	–0.00420	0.04946
	(0.00380)	(0.00908)	(0.00326)	(0.01193)
Office	–0.11749	0.06284	–0.12656	0.10043
	(0.04289)	(0.01127)	(0.04284)	(0.01765)
Retail	0.02093	0.06231	0.01744	0.09477
	(0.02327)	(0.01535)	(0.03002)	(0.02108)
Industrial	0.24977	–0.02710	0.18308	–0.08005
	(0.12185)	(0.02332)	(0.10792)	(0.06002)
Other commercial	–0.00376	0.03265	–0.00033	–0.03733
	(0.09284)	(0.01995)	(0.08776)	(0.05157)
Composite	–0.00568	–0.02065	–0.00300	–0.02642
	(0.00550)	(0.00977)	(0.00519)	(0.01082)
Counts (*t–1*)				
Single–family	0.01034	–0.00784	0.00738	–0.01220
	(0.00309)	(0.00463)	(0.00307)	(0.00475)
Multi–family	0.14217	0.00333	0.13551	0.00056
	(0.01697)	(0.00478)	(0.01694)	(0.00522)
Condominium	0.00804	–0.01386	0.00876	–0.01997

	(0.00287)	(0.00528)	(0.00348)	(0.00626)
Office	0.01068	–0.00909	0.01838	–0.02542
	(0.03076)	(0.01185)	(0.03376)	(0.01496)
Retail	–0.02504	–0.00785	–0.02015	–0.01194
	(0.02257)	(0.00571)	(0.03212)	(0.00687)
Industrial	–0.25088	–0.06265	–0.20890	–0.08091
	(0.06193)	(0.01716)	(0.05649)	(0.02812)
Other commercial	0.07678	–0.07899	0.08499	0.03359
	(0.06237)	(0.03776)	(0.05899)	(0.05350)
Composite	0.00019	0.01868	–0.00044	0.01913
	(0.00494)	(0.00522)	(0.00468)	(0.00491)
Counts (*t–2*)				
Single–family	–0.00185	–0.00391	–0.00410	–0.00578
	(0.00390)	(0.00217)	(0.00362)	(0.00176)
Multi–family	0.02257	–0.00269	0.01248	–0.00144
	(0.01961)	(0.00515)	(0.01898)	(0.00775)
Condominium	–0.00152	–0.00534	–0.00580	–0.00550
	(0.00250)	(0.00138)	(0.00322)	(0.00127)
Office	–0.01876	–0.00887	0.00187	–0.02786
	(0.05302)	(0.00721)	(0.04493)	(0.01271)
Retail	–0.01970	–0.01021	–0.01915	–0.01816
	(0.00925)	(0.00351)	(0.01305)	(0.00332)
Industrial	0.13517	–0.02995	0.11486	–0.01442
	(0.06314)	(0.01114)	(0.06083)	(0.00998)
Other commercial	0.13380	0.13685	0.15188	0.12899
	(0.03990)	(0.04272)	(0.04506)	(0.04806)
Composite	0.00532	–0.00354	–0.00039	–0.00318
	(0.00802)	(0.00267)	(0.00880)	(0.00350)
Zillow (*t–1*)	2.09989	–0.31547	0.95789	–4.42800
	(0.55594)	(0.33976)	(0.64780)	(1.49918)
Population (*t–1*)			0.08618	0.00001
			(0.03929)	(0.00000)
Income (*t–1*)			0.19468	0.89809
			(0.30486)	(0.32392)
Millage rate (*t–1*)	0.06724	0.03122	0.06305	0.00769
	(0.02608)	(0.03542)	(0.02461)	(0.02923)
Hansen's *J*				
X^2	0.08	12.83	11.39	12.41
p–value	0.772	0.615	0.725	0.648
Observations	370	283	370	283

[1] Counts of land uses are measured in 100s. The property tax base and income are measured in $10,000 units, and population is measured in 10,000 units.

[2] Standard errors clustered at the city level are in parentheses.

Appendix Table A2
Complete Results for Small Suburban Cities

	Without Income and Population		With Income and Population	
	Before Crash	After Crash	Before Crash	After Crash
Expenditures				
Counts (*t*) [1]				
Single–family	0.02643	0.00311	0.02406	0.00145
	(0.01712) [2]	(0.01273)	(0.01703)	(0.01280)
Multi–family	0.06447	–0.02461	0.11127	0.03200
	(0.03928)	(0.01967)	(0.06454)	(0.03686)
Condominium	0.00258	–0.01279	–0.00108	–0.00977
	(0.00508)	(0.01094)	(0.00522)	(0.01184)
Office	0.18479	–0.12085	0.33058	–0.12858
	(0.12195)	(0.18382)	(0.19417)	(0.18990)
Retail	–0.04797	–0.00543	–0.05648	0.02244
	(0.03118)	(0.04408)	(0.03864)	(0.04555)
Industrial	–0.05585	0.00767	–0.07045	0.02168
	(0.04048)	(0.02706)	(0.04022)	(0.02835)
Other commercial	0.52605	–1.11599	0.64994	–0.81313
	(0.47799)	(2.27080)	(0.47231)	(2.33794)
Composite	0.00876	–0.01852	0.01822	–0.01444
	(0.03046)	(0.02869)	(0.03026)	(0.02975)
Counts (*t–1*)				
Single–family	0.04302	0.00402	0.03599	0.02135
	(0.01934)	(0.01530)	(0.01938)	(0.01854)
Multi–family	–0.00881	–0.02318	0.00129	–0.00585
	(0.03665)	(0.03345)	(0.03747)	(0.03466)
Condominium	0.01386	–0.00270	0.00794	0.01460
	(0.00545)	(0.01522)	(0.00657)	(0.01898)
Office	0.01476	–0.03742	0.00899	–0.04027
	(0.25178)	(0.09506)	(0.27141)	(0.09428)
Retail	0.02659	0.01470	0.03658	0.06579
	(0.05455)	(0.03635)	(0.06199)	(0.04000)
Industrial	0.07576	0.04479	0.03691	0.06282
	(0.03989)	(0.01959)	(0.04726)	(0.02351)
Other commercial	–0.59249	0.18067	–0.63505	0.25064
	(0.34984)	(0.20118)	(0.46298)	(0.20033)
Composite	0.01525	–0.00601	0.03750	0.01687
	(0.03053)	(0.02930)	(0.03008)	(0.02923)
Counts (*t–2*)				
Single–family	–0.01531	0.02292	–0.02415	0.03152
	(0.02325)	(0.01121)	(0.02605)	(0.01198)
Multi–family	–0.00993	0.09598	0.00954	0.09453
	(0.03271)	(0.03308)	(0.04512)	(0.03195)
Condominium	0.00358	–0.00157	0.00117	0.00314
	(0.00602)	(0.00909)	(0.00561)	(0.00823)

Office	–0.15441	0.10717	–0.12909	0.02878
	(0.24429)	(0.13443)	(0.24709)	(0.13354)
Retail	–0.39433	0.03923	–0.27997	0.00009
	(0.16225)	(0.03299)	(0.17228)	(0.04255)
Industrial	–0.06674	–0.01541	–0.07515	–0.08521
	(0.03681)	(0.01746)	(0.04146)	(0.03790)
Other commercial	–0.35980	–0.06105	–0.34853	–0.04942
	(0.45133)	(0.18619)	(0.45745)	(0.21027)
Composite	–0.00746	–0.02243	–0.00796	–0.01233
	(0.01966)	(0.01441)	(0.02134)	(0.01548)
Transfers (*t*)	0.03351	0.03790	0.05155	0.03052
	(0.01990)	(0.01201)	(0.02068)	(0.01299)
Base (*t–1*)	–0.00552	0.30649	0.02757	0.30113
	(0.00498)	(0.06974)	(0.01856)	(0.07106)
Tax price (*t*)	–0.01121	–0.04815	–0.00833	–0.05285
	(0.00515)	(0.03973)	(0.00527)	(0.04211)
Zillow (*t–1*)	–0.10021	–0.19036	–2.32214	–0.21603
	(0.09193)	(0.07841)	(1.13105)	(0.13005)
Population (*t–1*)			–0.02153	–1.66412
			(0.19307)	(0.69757)
Income (*t–1*)			0.60673	0.01748
			(0.31016)	(0.01626)
Revenues				
Counts (*t*)				
Single–family	0.01944	–0.04837	0.01414	–0.04217
	(0.02864)	(0.07344)	(0.03184)	(0.07898)
Multi–family	0.05502	–0.27938	0.09720	–0.20188
	(0.09676)	(0.18328)	(0.09315)	(0.17193)
Condominium	0.04322	–0.09593	0.04458	–0.09844
	(0.01649)	(0.07226)	(0.01624)	(0.07975)
Office	0.16652	1.99123	0.03642	1.94755
	(0.38931)	(2.03034)	(0.39575)	(2.25911)
Retail	–0.07097	0.21365	–0.04917	0.22305
	(0.18824)	(0.31504)	(0.19353)	(0.37782)
Industrial	–0.08735	0.02805	–0.05061	0.01178
	(0.06898)	(0.12804)	(0.06659)	(0.14244)
Other commercial	–1.85155	37.23205	2.39797	45.94671
	(4.70449)	(16.59350)	(5.36923)	(16.57967)
Composite	0.06006	0.56830	0.02185	0.59264
	(0.07345)	(0.31137)	(0.07084)	(0.35287)
Counts (*t–1*)				
Single–family	–0.04774	–0.12180	–0.01568	–0.08826
	(0.05001)	(0.08653)	(0.05435)	(0.08057)
Multi–family	–0.22930	–0.28202	–0.24698	–0.25286
	(0.12184)	(0.23602)	(0.13614)	(0.24398)
Condominium	–.004868	–0.05884	–0.03800	–0.01937

	(0.01746)	(0.07545)	(0.01792)	(0.07359)
Office	–1.56607	–0.39452	–1.55743	–0.41217
	(0.57439)	(0.69802)	(0.53371)	(0.77014)
Retail	–0.35512	–0.27914	–0.32623	–0.21453
	(0.19647)	(0.20700)	(0.19935)	(0.19767)
Industrial	0.10719	0.19503	0.17728	0.22425
	(0.07705)	(0.17243)	(0.06742)	(0.17857)
Other commercial	0.25086	–2.37316	0.53336	–2.42427
	(0.92530)	(0.98771)	(0.79132)	(1.07824)
Composite	–0.03878	–0.14169	–0.06802	–.010850
	(0.05437)	(0.12961)	(0.05709)	(0.13866)
Counts (*t–2*)				
Single–family	0.06959	–0.01615	0.09759	–0.01761
	(0.03610)	(0.09008)	(0.03627)	(0.09926)
Multi–family	0.36464	–0.10668	0.35197	–0.13450
	(0.08154)	(0.19603)	(0.08463)	(0.20598)
Condominium	0.00363	0.00201	0.01515	0.01057
	(0.01355)	(0.03910)	(0.01490)	(0.04121)
Office	0.82435	0.75645	0.73458	0.62693
	(0.52884)	(0.43602)	(0.51140)	(0.47835)
Retail	–0.24469	–0.19786	–0.21429	–0.29116
	(0.35047)	(0.18366)	(0.34504)	(0.21978)
Industrial	–0.09680	–0.13586	–0.06559	–0.20233
	(0.07086)	(0.18687)	(0.07034)	(0.20670)
Other commercial	2.37746	0.89922	1.86837	0.63217
	(1.30566)	(1.97178)	(1.30774)	(2.44882)
Composite	0.07500	0.09394	0.05809	0.011029
	(0.05679)	(0.09616)	(0.05946)	(0.10235)
Zillow (*t–1*)	0.03355	–0.57900	2.24869	–0.80411
	(0.21434)	(0.30505)	(1.16478)	(0.62500)
Population (*t–1*)			–1.29508	–2.44747
			(0.57683)	(1.22972)
Income (*t–1*)			–0.54226	0.05286
			(0.27839)	(0.06244)
Millage rate (*t–1*)	0.02070	0.00017	0.03271	0.01065
	(0.04388)	(0.04492)	(0.04017)	(0.05408)
Hansen's *J*				
X^2	6.739	5.123	4.458	5.900
p–value	0.346	0.528	0.615	0.434
Observations	673	591	673	591

[1] Counts of land uses are measured in 100s. The property tax base and income are measured in $10,000 units, and population is measured in 10,000 units.

[2] Standard errors clustered at the city level are in parentheses.

Appendix Table A3
Complete Results for Large Suburban Cities

	Without Income and Population		With Income and Population	
	Before Crash	After Crash	Before Crash	After Crash
Expenditures				
Counts (*t*) [1]				
Single–family	0.00505	0.00352	0.00498	0.00342
	(0.00212) [2]	(0.00306)	(0.00211)	(0.00316)
Multi–family	–0.01015	0.00672	–0.00919	0.00682
	(0.00705)	(0.00352)	(0.00656)	(0.00335)
Condominium	–0.00084	0.00265	–0.00085	0.00255
	(0.00106)	0.00286)	(0.00109)	(0.00294)
Office	–0.00870	–0.00595	–0.00811	–0.00913
	(0.01491)	(0.01792)	(0.01506)	(0.01828)
Retail	–0.03887	0.01330	–0.04029	0.01235
	(0.01087)	(0.00815)	(0.01114)	(0.00803)
Industrial	–0.04202	–0.00259	–0.05303	–0.00332
	(0.02987)	(0.00402)	(0.03332)	(0.00413)
Other commercial	0.01265	–0.00122	0.01246	–0.00171
	(0.01722)	(0.00345)	(0.01224)	(0.00362)
Composite	–0.00652	–0.00216	–0.00703	–0.00172
	(0.00393)	(0.00236)	(0.00391)	(0.00232)
Counts (*t–1*)				
Single–family	–0.00319	0.00070	–0.00307	0.00069
	(0.00140)	(0.00162)	(0.00154)	(0.00170)
Multi–family	0.00160	–0.00085	0.00134	–0.00057
	(0.01160)	(0.00260)	(0.01175)	(0.00263)
Condominium	0.00422	0.00096	0.00443	0.00098
	(0.00164)	(0.00147)	(0.00169)	(0.00156)
Office	0.03984	0.00145	0.04336	0.00081
	(0.01759)	(0.00405)	(0.01893)	(0.00400)
Retail	–0.03627	0.00537	–0.03884	0.00489
	(0.01847)	(0.00235)	(0.01827)	(0.00237)
Industrial	0.03545	0.00145	0.03546	0.00030
	(0.03024)	(0.00419)	(0.03015)	(0.00431)
Other commercial	–0.16285	0.02154	–0.16736	0.02205
	(0.12489)	(0.00357)	(0.12733)	(0.00351)
Composite	–0.00139	0.00330	–0.00114	0.00371
	(0.00197)	(0.00330)	(0.00200)	(0.00288)
Counts (*t–2*)				
Single–family	–0.00139	0.00124	–0.00139	0.00187
	(0.00091)	(0.00092)	(0.00094)	(0.00107)
Multi–family	0.00127	0.00059	0.00006	0.00074
	(0.00744)	(0.00152)	(0.00747)	(0.00157)
Condominium	–0.00415	0.00066	–0.00421	0.00120
	(0.00172)	(0.00085)	(0.00177)	(0.00097)

Office	0.11161	0.00075	0.11560	0.00415
	(0.03773)	(0.00653)	(0.03817)	(0.00545)
Retail	0.08387	–0.00182	0.08173	–0.00038
	(0.02406)	(0.00287)	(0.02407)	(0.00286)
Industrial	–0.02689	–0.00493	–0.02736	–0.00285
	(0.02746)	(0.00410)	(0.02793)	(0.00446)
Other commercial	0.30337	0.00368	0.30786	0.00589
	(0.13567)	(0.00365)	(0.13812)	(0.00457)
Composite	–0.00471	–0.00291	–0.00453	–0.00198
	(0.00177)	(0.00303)	(0.00167)	(0.00353)
Transfers (*t*)	0.09584	0.00449	0.09596	0.00700
	(0.02863)	(0.02026)	(0.02787)	(0.02027)
Base (*t–1*)	0.20403	0.13819	0.17766	0.14055
	(0.07328)	(0.08248)	(0.06984)	(0.08651)
Tax price (*t*)	–0.25706	–0.04018	–0.31821	–0.03644
	(0.18979)	(0.03786)	(0.19607)	(0.03899)
Zillow (*t–1*)	–0.05549	–0.17578	0.30468	–0.69063
	(0.10626)	(0.09576)	(0.25652)	(0.32283)
Population (*t–1*)			0.01625	–0.03751
			(0.02554)	(0.04382)
Income (*t–1*)			-0.06217	0.11275
			(0.03527)	(0.06642)
Revenues				
Counts (*t*)				
Single–family	0.00304	0.00648	0.00339	0.00869
	(0.00259)	(0.01205)	(0.00259)	(0.01226)
Multi–family	0.01767	0.02987	0.00821	0.03609
	(0.01794)	(0.01882)	(0.01861)	(0.01860)
Condominium	–0.00428	0.00569	–0.00352	0.00751
	(0.00491)	(0.01132)	(0.00505)	(0.01141)
Office	0.11880	–0.00431	0.11763	0.00245
	(0.04881)	(0.02197)	(0.05140)	(0.02295)
Retail	0.02647	0.04195	0.02247	0.04479
	(0.03157)	(0.01084)	(0.03154)	(0.01106)
Industrial	0.13007	–0.00504	0.15558	–0.00550
	(0.09549)	(0.01130)	(0.09553)	(0.01802)
Other commercial	–0.00925	0.08859	–0.02085	0.09310
	(0.08855)	(0.01454)	(0.08654)	(0.01715)
Composite	–0.01752	–0.00008	–0.01777	0.00012
	(0.01190)	(0.00640)	(0.01178)	(0.00639)
Counts (*t–1*)				
Single–family	0.00294	–0.00779	0.00583	–0.00900
	(0.00199)	(0.00531)	(0.00266)	(0.00620)
Multi–family	0.01222	–0.01232	0.00255	–0.01241
	(0.02461)	(0.00520)	(0.02430)	(0.00555)
Condominium	0.00089	–0.00008	0.00089	–0.01204

	(0.00375)	(0.00493)	(0.00382)	(0.00580)
Office	0.06654	–0.01349	0.07687	–0.01412
	(0.04643)	(0.01156)	(0.04460)	(0.01236)
Retail	–0.05315	0.02205	–0.05810	0.02146
	(0.09051)	(0.00525)	(0.08893)	(0.00556)
Industrial	0.12399	–0.03869	0.10162	–0.03872
	(0.08815)	(0.01000)	(0.08805)	(0.00987)
Other commercial	0.04232	0.01267	0.02647	–0.01514
	(0.05332)	(0.00788)	(0.05386)	(0.00838)
Composite	0.01489	0.01322	0.01628	0.01342
	(0.00395)	(0.00715)	(0.00413)	(0.00699)
Counts (*t–2*)				
Single–family	0.00057	–0.00207	0.00175	–0.00187
	(0.00191)	(0.00223)	(0.00172)	(0.00252)
Multi–family	0.00082	–0.00804	0.00261	–0.00832
	(0.01307)	(0.00251)	(0.01523)	(0.00281)
Condominium	0.00114	–0.00014	0.00292	0.00003
	(0.00683)	(0.00216)	(0.00666)	(0.00234)
Office	0.23330	-0.02286	0.25169	-0.01008
	(0.10637)	(0.01485)	(0.10872)	(0.01496)
Retail	0.10068	–0.02445	0.10778	–0.02552
	(0.12181)	(0.00852)	(0.12134)	(0.00820)
Industrial	–0.20284	0.01788	–0.22175	0.01856
	(0.08092)	(0.00784)	(0.07745)	(0.00847)
Other commercial	–0.08093	–0.01578	–0.08173	–0.01808
	(0.09473)	(0.01795)	(0.09436)	(0.01652)
Composite	0.00192	–0.01117	0.00079	–0.01005
	(0.00408)	(0.00870)	(0.00414)	(0.00901)
Zillow (*t–1*)	0.46845	–0.71985	2.01347	–0.72511
	(0.42111)	(0.20740)	(0.68202)	(0.62645)
Population (*t–1*)			-0.10867	–0.02434
			(0.07387)	(0.08677)
Income (*t–1*)			-0.26593	.00304
			(0.07779)	(.12106)
Millage rate (*t–1*)	0.09947	0.03063	0.09861	0.02913
	(0.09013)	(0.01126)	(0.08960)	(0.01136)
Hansen's *J*				
X^2	0.32	16.382	0.26	15.267
p–value	0.850	0.291	0.879	0.360
Observations	745	568	745	568

[1] Counts of land uses are measured in 100s. The property tax base and income are measured in $10,000 units, and population is measured in 10,000 units.

[2] Standard errors clustered at the city level are in parentheses.