The Fiscal Impacts of Alternative Land Uses:
An Empirical Investigation of Cost of Community Services Studies[1]

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Abstract

Current knowledge of the fiscal impacts of alternative land uses comes largely from cost of community services (CCS) case studies, the results of which are viewed skeptically in the literature because of numerous methodological concerns. In order to begin to fill the gap in our understanding of these impacts, we provide the first empirical estimates of the relationship between a complete accounting of community fiscal measures and the full distribution of acres of land uses in the jurisdiction. We find evidence in support of the broad conclusions of CCS studies: a shift from agricultural to residential land is associated with a deficit, whereas a shift to commercial land is correlated with a surplus. We provide insights into which revenue/expenditure and land use subcategories are responsible for these results.

Keywords: Cost of Community Services, Fiscal Impact, Revenues, Expenditures, Land Use

JEL Codes: C33, H71, H72, R14, R52

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I. Introduction

The land uses within a local government's borders strongly affect its revenues and expenditures. As a result, there has long been considerable interest in the fiscal impacts of alternative land uses.[2] These impacts are especially salient in light of recent events. In the aftermath of the Great Recession many local governments are fiscally stressed and a growing number have filed for bankruptcy.[3] Land uses that do not "pay their own way," in the sense that they are associated with increased costs of providing public services that exceed the revenues they generate, contribute to this stress. The "fiscalization" of land use planning, where all decisions are made with an eye toward their budgetary consequences, is one approach toward dealing with this stress. Unfortunately, there is little empirical evidence on the relationship between land use and community budgets to help inform these decisions. Instead, the conventional wisdom that guides land use policy is based on cost of community services (CCS) case studies.[4] As we outline in the next section, the CCS methodology is criticized as being crude, subjective, and biased in favor of producing a favorable expenditure to revenue ratio for agricultural/open space land at the expense of other land uses (Kotval and Mullin 2006, Kotchen and Schulte 2009).

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[2] The term "fiscal impact" is a misnomer because it implies a causal relationship that many studies do not identify. Nevertheless, since the term is commonly used to describe any type of study that relates land uses to the budget in a community, we continue with this convention.

[3] The fiscal stress of cities is monitored by the National League of Cities, which conducts an annual survey of cities (Hoene and Pagano, 2009, 2010, 2011, 2012). There have been eight recent bankruptcy filings of cities and counties (Governing, http://www.governing.com/gov-data/municipal-cities-counties-bankruptcies-and-defaults.htm).

[4] CCS studies analyze the effects of three types of land uses (residential, commercial/industrial, and agricultural/open space) on a jurisdiction's revenues and expenditures. These studies, which number in the hundreds, have consistently found that the ratio of expenditures to revenues is greater than one for residential land use, but less than one for commercial/industrial and agricultural/open space land uses. CCS studies should not be confused with fiscal impact analyses (FIAs). Unlike CCS 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, for example, a new shopping center. 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).

This paper adopts a new approach that provides the first empirical evidence on the relationships that exist between alternative land uses and numerous elements of community budgets. In contrast to traditional CCS studies, we relate changes in a local government's revenues and expenditures to shifts in the composition of the land use "portfolio" the community experiences. To accomplish this, we construct a novel, nine–year panel for Florida's counties that contains the annual government revenues and expenditures within each county (see Tables 1 and 2).[5] We use Geographic Information System (GIS) tools to augment these data with the percentage of the county's acreage that falls into different land use categories, then use our panel to estimate systems of revenue and expenditure equations that allow for correlations in the unobserved components of those equations. A change in land use is allowed to be correlated with a county's budget over multiple years by including a lagged measure as an explanatory variable for each land use. We use county fixed effects to control for unobservable heterogeneity across counties and year fixed effects to control for time–variant factors that uniformly affect all counties.

Our main finding is an empirical confirmation of the general findings from CCS studies: developing an agricultural parcel into residential housing is correlated with a small fiscal deficit whereas converting an acre of agricultural land into a commercial property is associated with a surplus. These findings are robust to various specifications. Additionally, our data allow us to provide new insights into the channels through which these fiscal impacts operate that cannot be determined from the CCS studies. We do so in two ways. First, we disaggregate land uses into finer categories and show that the broader residential and commercial findings are not uniform across different subcategories. For instance, relative to agricultural land, single–family and

[5] Revenues and expenditures include those at all four levels of local government in Florida: the county, city, school district, and special district levels (http://www.floridaleagueofcities.com/Resources.aspx?CNID=878).

retirement homes are correlated with deficits, whereas multi–family housing and condominiums are not associated with statistically significant changes in the deficit. Analogously, we find that our main commercial result is primarily driven by surpluses associated with shifts from agricultural land to office properties; shifts to retail and industrial properties do not have statistically significant relationships with community surpluses or deficits. Second, we disaggregate revenues and expenditures into 19 and 9 subcategories, respectively, and show that the conversion of agricultural land into residential properties is associated with significant increases in three revenue subcategories (*Contributions, Fines & Forfeitures*, and *Permits & Licenses*) and two expenditure subcategories (*Courts* and *Human Services*), as well as decreases in revenues from *Special Assessments* and *Physical Environment* expenditures.[6] Revenues from *Special Assessments* have the opposite relationship with commercial properties, as they are the primary channel through which commercial revenue increases operate.[7] On the commercial expenditure side, we find evidence that shifts to more commercial properties are correlated with significant decreases in *Human Services* and *Schools* expenditures.

While it may be tempting to interpret our findings to mean that a given change in a particular land use causes a change in the budget, we caution the reader not to view our empirical results in this way. Our modest goal in this paper is to extensively document empirical

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[6] The definitions of all revenue and expenditure subcategories can be found in Appendix A1. That our results suggest that special assessments on agricultural properties are high relative to residential properties is somewhat unexpected. Based on interviews with community representatives, we believe that the result is primarily due to the use of special assessments as means of charging for fire protection services for agricultural properties, whereas ad valorem taxes are used to fund those services for residential properties. Additionally, that shifts to residential land uses are not associated with significant increases in ad valorem revenues (although coefficient estimates do indicate a positive relationship) is also unexpected. We posit that this may be due to the loss of positive spillovers from agricultural land that reduces the residential tax base as agricultural land is developed (see McConnell and Walls (2005) for a review of the literature on land use spillovers) or Florida's Homestead Tax Exemption, which decreases the assessed value of homeowners' primary residences by $50,000.

[7] The commercial–special assessment result is much more intuitive: communities use special assessments to ensure that new commercial development pays an appropriate share of the capital improvements and service upgrades required to support the converted land.

correlations that have not yet been formally established in the literature. As such, our methodology does not address the fact that the distribution of land uses within a given community is not determined at random. There may be time–varying omitted factors that influence both the budget and how land is used. In addition, policymakers, developers, and/or residents may base their land use decisions on the fiscal health of the community. Both situations confound causal inference.[8]

While our study is primarily descriptive, our methodology and panel provide numerous improvements over existing fiscal impact (CCS) studies. First, we estimate the relationships between observed acres of land use within categories and local budgets instead of relying on the ad–hoc assignment of revenues and expenditures to land uses. Second, our model allows us to determine the magnitude of the deficit or surplus associated with a change in a particular land use as opposed to simply the change in the ratio of revenues to expenditures, which is the focus of a CCS study. Third, our estimates are of marginal changes associated with the composition of land uses, as opposed to the average changes found in CCS case studies. Fourth, our empirical approach captures both direct and indirect fiscal effects from changes in land use. For example, an industrial property directly adds to the tax base but may indirectly reduce the base by producing negative spillover effects, such as noise and air pollution. These indirect effects are ignored in CCS studies. Fifth, our work is the first to document empirical estimates of fiscal impacts based on the full distribution of land use in a community, and our data allow us to document the revenue and expenditure changes associated with changes in the land areas of much finer land use subcategories than the heavily aggregated, three categories commonly found

[8] See Baum–Snow and Ferreira (2015) for an overview of causal inference related to urban and regional research questions. Developing a methodology that identifies causal relationships between land uses and community budgets is left for future research.

in the CCS literature. Sixth, we completely account for all revenues and expenditures within a county by summing those of the county government and all subjurisdictions within the county (cities, school districts, and special districts). Finally, we estimate separate revenue and expenditure models to uncover which components of the budget are most important in explaining more aggregate findings. This provides a deeper understanding of the relationship between land uses and community budgets.

We proceed by providing background information on the CCS studies and elaborating on the known flaws in their methodology that we improve upon in Section II before detailing a basic theoretical framework to motivate our empirical analysis in Section III. We describe our data in Section IV and our empirical methodology in Section V. Section VI presents our results and Section VII concludes.

II. Cost of Community Services Background

The methodology of a CCS study is uncomplicated. The revenues and expenditures of a local government (city or county) are grouped and then allocated to the three alternative land uses mentioned previously (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. This methodology was pioneered by Burchell and Listokin (1978) and is commonly known as an average cost approach because it averages total revenues/expenditures across land uses at a point in time (Coupal, McLeod, and Taylor 2002).

Kelsey (1996) and 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 issue with the former is that this level of aggregation misses the fact that there may be countervailing forces in the subcategories of land use at work. For instance, it may be the case that single–family residential properties are associated with a deficit but condos are not, but when aggregating this distinction will not be apparent. The problem with the latter is that ratios do not reflect the magnitude of the deficit or surplus generated by the land use. 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. Despite frequently being interpreted in this way, CCS studies do not provide this information because of the nature of how they are constructed. Kelsey (1996) also raises the issue that by denominating land in terms of value when calculating default percentages, CCS studies do not provide an "apples–to–apples" comparison of land uses. Instead, he advocates measuring land in terms of acres (producing ratios in terms of dollars per acre).

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 maintenance, garbage collection, or fire protection, associated with agricultural use.[9] Paulsen (2014) emphasizes that CCS studies (and FIAs) ignore indirect effects, arising from the externalities that some land uses emit (as illustrated by the industrial properties example

[9] 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.

provided in the previous section) 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. Coupal, McLeod, and Taylor (2002) point out that CCS studies are based on a "snapshot" of land uses and finances, so they implicitly assume that the relationship between land uses and community budgets is constant over time. There is no reason to think that this is the case which implies that an approach that allows for dynamics is required.

Given the numerous, well–known issues with CCS studies, we use a marginal cost approach to estimate the relationship of interest. We are not the first to estimate a statistical model of the association between community characteristics and elements of community budgets. However, much of the existing literature has focused on a single expenditure category (Craig and Heikkila 1989, Heikkila and Craig 1991, Heikkila and Kantiotou 1992, and Lieske, et. al. 2012) or used broad land use measures to explain community revenues and expenditures (Coupal, McLeod, and Taylor 2002; Hortas–Rico 2014). To our knowledge, ours is the first study that jointly models the relationship between revenues, expenditures, and a detailed set of land use categories and addresses all of the outlined concerns with CCS studies raised in the literature.

III. Conceptual Framework

There are a number of straightforward ways that land use mix impinges upon a local government's budget.[10] More generally, however, these relationships are complex and little can be said a priori about the expected effects of land development on public finance without making strong assumptions (Paulsen 2014). Hence, we do not attempt a formal model or the

[10] For example, the first–order change in property tax revenue from a new development is the change in the tax base caused by the development times the millage rate.

development of specific hypotheses. This complexity arises for a variety of reasons; for example, each land use impacts different revenues and expenditures, the time patterns of the impacts vary across land uses, there are spillover effects from one land use to another, and some land uses complement one another, while others are substitutes. Our modest goal in this section is to demonstrate this complexity and convince the reader that changes in the mix of land uses within a community can have important effects on both revenue and expenditure sides of the local government budget. To accomplish this, we lay out a number of the pathways whereby a change in the mix affects revenues in Subsection III.A. and expenditures in Subsection III.B.

III.A. Revenues

County revenues can be expressed in a simplified form as

$$R = m * B + t*C,$$

where R are revenues, m is the millage rate, B is the tax base, t is the sales tax rate, and C is aggregate, composite consumption.[11] A county's most important fiscal resource is its property tax base. The base can be expressed as

$$B = \sum_{\ell=1}^{L} \overline{v}_{\ell} X_{\ell},$$

where $\bar{v}_{\ell}$ is the average value of properties in land use category ℓ, X_{ℓ} is the number of acres of properties in ℓ, and L is the number of categories. A shift in the land use mix toward properties with a higher $\bar{v}$ will raise the tax base. Ihlanfeldt and Willardsen (2014) have shown that an increase in the base raises property tax revenues.[12] The $\bar{v}$ values can also be affected by the land use mix due to spillover effects. For example, a shift in the mix in favor of industrial properties

[11] We normalize the price of composite consumption to one without loss of generality.
[12] They show that an increase in the base lowers the millage rate but not by enough to prevent property tax revenues from rising.

directly increases B because $\bar{v}$ is relatively larger within this category. However, industrial properties emit negative externalities that lessen the livability of the community, reducing $\bar{v}$ for the residential land use categories. Hence, the effect of more industrial properties on B and therefore revenues is ambiguous.

There is also a second pathway on the revenue side of the budget. The mix of land uses and the composition of the community's residents are highly interconnected. This suggests that consumption based revenues (i.e., sales taxes) can be affected both directly and indirectly by the land use mix through community level demand for taxable goods. This demand can be expressed in general functional notation as

$$C = f\,(X, I, U),$$

where I and U are community level measures of income and preferences, respectively, and both are affected by the distribution of land uses (X).[13] Demand is directly affected by the land use mix because more commercial land use means more spending will occur within the community by both residents and non–residents generating greater sales tax revenues. The indirect effect comes from the fact that the land use mix affects the demographic mix of the community, which affects the income and preferences of the community's residents. This, in turn, affects spending patterns. For example, a shift away from agricultural land in favor of single–family housing will raise average household income and thereby the amount of spending and sales tax revenue within the community.

III.B. Expenditures

To illustrate how the mix of land uses can affect expenditures, we first write

$$E = P * N,$$

[13] We use the convention that $X=\{X_1, X_2, \ldots, X_L\}$ to represent the vector of land uses more compactly.

where E are expenditures, P is the cost of providing a unit of public services, and N is the total number of public services units provided to the county's residents. N equals the number of residents (R) times the units of services consumed per resident (S), so

$$E = P * R * S.$$

The demand for public services per resident can be expressed as

$$S = g\ (I, U, m, t).$$

The mix of land uses within the county affects P, R, and S and therefore expenditures. In regard to the latter (S), as noted previously, the mix of land uses affects the composition of the resident population, which in turn affects the income and preferences of the community's residents (the I and U arguments of the S function). The tax rate arguments of S are also affected by the mix because, as outlined previously, the mix affects the base, which alters the rates. Next, R is affected by the mix of land uses because not all land uses are residential. A shift in the mix in favor of residential land use enables more people to live in the county. Finally, the mix affects P for two reasons. First, the mix of land uses affects population density, and unit cost has been shown to be lower where density is higher (Real Estate Research Corporation 1974, Burchell et al. 1998, 2002). For example, shifts in the mix from farms to residential properties increase the average density in the county thereby driving down per unit costs. Second, the cost of providing a unit of public services depends on environmental factors (Bradford, Malt, and Oates 1969; Ladd 1994). For example, more police expenditure is required to deliver a unit of public safety where crime is more of a problem. Community demographics affect crime levels and the mix affects the demographics. The mix also affects targets of opportunity for criminals, which can increase the crime rate. For example, crime is worse where commercial land use is more prevalent because there are more valuable goods for criminals to steal.

While many of the net budgetary effects of a shift in land use composition are ambiguous, we have detailed that there are multiple channels through which land use composition can impact a jurisdiction's revenues and expenditures. We proceed with an exploratory, empirical analysis to determine the magnitudes of these net effects. We are especially interested in whether our taking an econometric approach to the estimation of the fiscal impacts of alternative land uses yields results consistent with the conventional wisdom that, relative to agriculture, residential land use imposes a fiscal deficit on the community while commercial land use generates a fiscal surplus.

IV. Data

Our panel consists of all 67 of Florida's counties and covers the years from 2006 to 2014. Our data come from three main sources: city, county, and special district revenue/expenditure records from the Florida Department of Financial Services (FDFS), school district revenue/expenditure records from the Florida Department of Education (FDOE), and property tax appraisers' standardized parcel maps that every county is required to submit to the Florida Department of Revenue (FDOR).

The data from the first source, the revenue and expenditure figures, are found in the Annual Financial Reports (AFRs) that taxing authorities must submit to the FDFS.[14] While the FDFS data contain information about city and county revenues and expenditures, school districts are considered separate entities and their budgets are not included with those figures. Kelsey (1996) explains that failure to include educational expenditures has a large influence on CCS study ratios, so we augment our data with information from complete profiles of each district's

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[14] The AFRs are audited and standardized according to the Uniform Accounting System Manual published by the FDFS.

revenues and expenditures that the FDOE publishes as part of a transparency initiative. Although school districts and counties are politically distinct, they are geographically identical; hence, we avoid many of the typical complications associated with assigning school district revenues and expenditures to multiple jurisdictions. Mean values ($2014) for total revenues and expenditures and for each subcategory from the FDFS and FDOE data are reported for selected years of our panel in Tables 1 and 2, respectively.

Our third primary data source contains administrative and geographic information from the FDOR submitted by the local property appraiser for every property in Florida.[15] The county property appraisers have access to 99 different land use codes that categorize properties by their actual use (or in the case of unimproved properties by their intended use), and each parcel record is associated with one of those land use designations.[16] We combine those 99 land uses into well recognized groups (that vary by specification) and use GIS software to calculate the total land area in each county/year falling into each land use group.[17] Table 3 summarizes this information. The columns contain the percent of total land area in each subcategory averaged over counties. For example, on average, 9.98% of the acres in each county were classified as being part of the *Single–Family* land use subcategory in 2006.

We merge our data sources by county and year. Figure 1 illustrates the timing of variables from the financial record and land use data sources by showing two concurrent

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[15] The FDOR standardized property tax roll data are available both as a digitized map and as tabular data. Parcel size is found in the tabular form of the data that stretches back to 1995, whereas the parcel maps only exist after 2005. Unfortunately, the reported land areas in the tabular property tax roll files are unreliable. First, total parcel areas in a given county do not aggregate to the total area of the county. Second, collecting the records of a single parcel over the course of the panel and comparing its size over the years frequently reveals wild swings in the parcel's area. These changes are too large and too transitory to be attributed to anything other than measurement error, and attempts to correct these errors were unsuccessful: we could not accurately aggregate corrected parcel areas to the known, total area in each county. These issues are not present in the digitized property assessor maps, so we use the GIS maps as our primary source of data for our land use areas at the expense of 11 years of the panel.

[16] Appraisers, who are labeled "assessors" in other states, must meet certain performance standards as mandated by state statutes.

[17] Appendix A2 provides more details about these calculations and how we addressed complications in the data.

timelines for the two year period from January 1, 1999, to January 1, 2001. The revenue and expenditure amounts are reported for the fiscal year that runs from July 1, 1999 to June 30 of the following year and are represented on the top timeline.[18] The ending calendar year is attached to these data. The land use data are reported as of January 1 of the tax roll year and are denoted on the bottom timeline. The panel matches land uses on January 1, 2000, to expenditures/revenues that occurred from July 1, 1999, to June 30, 2000. Stated more generally, revenues and expenditures for a fiscal year are associated with land uses in the middle of the fiscal year.

V. Methodology

In this section, we first provide an overview of our empirical approach to estimating the fiscal relationships between alternative land uses and community budgets (V.A.) and then describe in detail the equations estimated (V.B.).

V.A. Overview

Our observational unit is the county. We study the fiscal impacts of alternative land uses at the county level for two reasons. First, fiscal impacts extend beyond the boundaries of cities and special districts; aggregation of revenues and expenditures up to the county helps to mitigate the effects of spillovers at finer levels of geography.[19] While there may be fiscal spillovers across counties, they are expected to be minimal in comparison to those across cities and districts within the same county. Second, as noted in the previous section, school districts have their own authority to levy millages, and their exclusion from CCS analyses has been found influential (Kelsey 1996). Since school districts and counties share boundaries in Florida, county level

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[18] The fiscal year for Florida counties, cities, and school districts all coincide.

[19] The majority of Florida's special districts reside wholly within a given county. However, 72 of Florida's 1,325 special districts span multiple counties. In these instances we split the spending of that district evenly between the counties.

analysis is an ideal way to account for all relevant revenues and expenditures in the context of our data.

To estimate the fiscal relationships of alternative land uses, we regress the natural logs of revenues and expenditures on the percentages of county land area in each of the land use categories listed in Table 3, save for the agricultural land use (to avoid perfect collinearity). Expenditures are the sum of spending on personal services, operating expenses, and debt service payments for counties, cities, schools, and special districts.[20]

Our conceptual framework suggests several control variables. Revenues are, in part, a function of the demand for private sector consumption (through sales taxes) and expenditures reflect the demand for public services. Both the demand for private and public goods are functions of the aggregate income and preferences of the community's residents. We therefore include median income and proxy preferences with community level controls for population, unemployment, and political affiliation. Our preferred specification also includes county and year fixed effects.

Our expenditure and revenue equations are estimated as a system using seemingly unrelated regression (SUR). SUR allows for tests of significant differences in estimated coefficients across equations. This is necessary because we are interested in the difference between revenues and expenditures; a reliable test of this difference requires system estimation.

We include lagged explanatory variables in our regressions to capture two features of the data. The first relates to how the county budget is determined. As Figure 1 illustrates, by matching the revenues and expenditures for a fiscal year to the distribution of land use as measured in the middle of that fiscal year, we capture the direct relationship between the

[20] Note that expenditures exclude capital outlays. Because these outlays tend to be quite lumpy, including them could distort the annual cost of providing public services.

composition of land uses and the budget. We also include a lag of our measures of land use because local governments in Florida create draft budgets during the first quarter of each calendar year (Huddleston 2005). When they do so, the most current available information about land use composition is based on the previous year's data. We call this relationship the budget effect, which provides a theoretical justification for including a one period lag in the model.[21] To compute the full relationship of a land use and an expenditure or revenue we obtained the long–run propensity (LRP) by summing the estimated coefficients on the *t* and *t–1* variables.[22]

V.B. Estimated Equations

Let *ln* (rev_{jt}) denote the natural log of total revenues in jurisdiction (county) *j* in period *t* and *ln* (exp_{jt}) denote the natural log of total expenditures. These variables are the dependent variables in our primary regressions. Let $i \in I$ so that we can more generally represent our dependent variables as y^i_{jt}. In our baseline specification, $I = \{rev, exp\}$ and in a subsequent specification, I contains the 19 revenue and 9 expenditure subcategories listed in Tables 1 and 2.

We are interested in estimating the effects of shifts in land uses over time, and we construct our explanatory variables to this end. We first define $acres_{j\ell t}$ as the number of acres within the boundaries of county *j* that are classified in land use category ℓ (*Residential*, *Commercial*, etc.) during period *t*.[23] This allows us to define $x_{j\ell t}$ as the percent of acres in the given category, denominated in percentage points. Formally,

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[21] Although a one period lag is justified, the exact lag structure is not theoretically defined. Additional lags are necessary if the full fiscal impact of a land use takes several years to materialize. We therefore experimented with alternative lag structures by estimating our system with an increasing number of lags. Akaike's (1973) information criterion is minimized by including the maximum possible number of lags. This results in an infeasible trade-off between flexibility in our specification and precision in our estimates due to the loss of degrees of freedom. Given that the appropriate empirical test does not provide clear guidance on the precise lag structure and the limited length of our panel, we use the theoretical concept illustrated in Figure 1 to guide our choice of specification.
[22] The LRP reflects the long–run change in revenues (expenditures) after a permanent shift to the given land use.
[23] Totals are defined as the sum of all given land use categories. Swamplands, lakes, forests, canals, drainage ditches, etc. were removed from the analysis.

$$x_{j\ell t} = \left(\frac{acres_{j\ell t}}{\sum_{\ell=1}^{L} acres_{j\ell t}}\right) \times 100.$$

To estimate the fiscal impacts of alternative land uses, we regress log revenues and log expenditures on the percent of acres in each of L–1 land use categories in the current year (*t*) and the one year lag (*t–1*) of the same measure. We omit the percent of agricultural acres (and its lag) to prevent perfect collinearity. This means that our coefficients are interpreted as the effect of a one percentage point shift in the county's land from agriculture to the given land use.[24] We include a vector of controls (Z_{jt}) and county and year fixed effects (α_j and δ_t, respectively). We also allow ε_{jt}^{rev} and ε_{jt}^{exp} to be correlated across equations by estimating the equations as a SUR system. Formally, we estimate

$$y_{jt}^{i} = \alpha_j^i + \sum_{\ell=1}^{L-1}\left(\sum_{m=0}^{1} \beta_{\ell m}^{i} x_{j\ell(t-m)}\right) + Z_{jt}\gamma^i + \delta_t^i + \varepsilon_{jt}^{i}, \ \ \forall \ i \in I \,. \tag{1}$$

The LRP for either revenues or expenditures and for each land use category can be expressed as

$$LRP_\ell^i = \left(\beta_{\ell 0}^i + \beta_{\ell 1}^i\right).$$

In order to determine whether a shift from agriculture to a particular land use is associated with a change in the surplus/deficit, we calculate long–run budget effects as

$$\pi_\ell = LRP_\ell^{rev} - LRP_\ell^{exp}$$

for each land use category.

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[24] Alternatively, we could have defined our explanatory variables as the natural log of acres in each category and omitted the natural log of agricultural acres. Interpretation of coefficients in this specification is problematic because of the categorical nature of land uses. Unlike our preferred specification where a percentage point is the same unit across all land uses, a one percent increase in residential land is unlikely to be the same as a one percent increase in commercial land (for instance). That means that coefficients imply different changes in the baseline land use (agriculture). Nevertheless, we ran this specification and estimates do not alter our primary conclusion that shifts to residential land are correlated with deficits and shifts to commercial land are correlated with surpluses. We could have addressed the concern that shifts from different land uses do not represent equal changes in agricultural land by taking advantage of the nonlinear nature of the natural log function and controlling for the natural log of agricultural acres, but coefficients would represent the effect of adding the acres from a one percent increase in the given land use to the total area in the county, as opposed to the more realistic shift in land uses we desire.

VI. Results

This section is divided into three parts. Subsection VI.A reports the estimated LRPs for total revenues, total expenditures, and their differences from a specification designed to match the CCS studies as closely as possible. Subsection VI.B demonstrates the relationships between a county's fiscal position and a more disaggregate set of land uses. Subsection VI.C reports the results obtained from estimating our SUR system with expenditures and revenues broken down into their component subcategories. These results show the types of revenues and expenditures associated with changes in land use.

VI.A. Estimated LRPs for Total Revenues, Total Expenditures, and their Differences

We begin by estimating the SUR regressions focusing on the same land use categories used in the CCS studies; namely, residential, commercial, and agricultural.[25] Estimates can be found in Table 4. Columns (1) and (2) report LRP_{ℓ}^{i} estimates from the revenue and expenditure equations, respectively. The difference between the two estimates (π_{ℓ}) is reported in Column (3).[26] When multiplied by 100, each of the coefficients represents the long–run percent change in the given budget variable (revenues, expenditures or the difference) associated with a one percentage point increase in the given land use.[27] Standard errors clustered at the county level are reported in parentheses, followed in brackets by the magnitude of the change implied by the LRP applied to the level of total revenues or expenditures in the median county (in $100,000). The latter are to give the reader a better sense of the magnitude of the estimated relationships.

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[25] Estimated equations include controls for the percent of acres in the county associated with government, institutional, miscellaneous, and vacant land uses.
[26] A positive (negative) coefficient estimate in this column indicates that the given change is associated with a surplus (deficit) and is analogous to a CCS study ratio of less than (greater than) one.
[27] Stated another way, the residential land use coefficient of 0.0537 from the revenue equation in the baseline specification indicates that a one percentage point increase in residential acres is associated with a 5.37% increase in long run revenues.

We estimate four different specifications of our model. Columns 1–3 of Panel A report the results obtained from estimating our baseline specification, which includes only time fixed effects.[28] Columns 4–6 of Panel A add controls which include: the natural logs of the county population, per capita income, the unemployment rate, and the percent of registered voters identifying as Democrats in the given year. The regressions in Panel B include county fixed effects, both without (columns 1–3) and with the controls (columns 4–6).

Across specifications, the results of Table 4 are remarkably consistent in that shifts from agricultural to residential land are associated with deficits and shifts to commercial land are associated with surpluses; hence, we focus our attention on our preferred specification, which includes both time and county fixed effects and the control variables (columns 4–6 of Panel B).[29]

On the revenue side, a shift to *Residential* is correlated with a small, but precisely estimated decrease in revenues and a shift to *Commercial* is positively correlated with revenues. The former indicates that within a given county, residential land produces slightly less revenue than agricultural land (on the order of $150,000 for the median county where total revenues are over $200 million). We would expect an acre of developed residential land to be more valuable

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[28] In lieu of the year fixed effects, all specifications were also estimated with a linear time trend. Results are qualitatively similar between these two approaches for controlling for time effects.

[29] Examining the residential results in Table 4, we note that the sign of the revenue coefficient flips in Panel A and the significance of the expenditure estimate disappears when fixed effects are included in the model. These differences are unsurprising given the variation being exploited in each model. In the first two specifications, estimates are identified from cross-sectional variation. As such, the estimates reflect differences between counties in their level of development and their corresponding levels of revenues and expenditures. When we partially control for these county differences with our control variables, the revenue effect becomes negative. When we further control for these differences with fixed effects, and identify using variation within a county over time, we isolate the effect of shifts from agricultural land to the given land use, and our coefficients moderate as we would expect. Regardless of these differences in identifying variation, across all specifications, the “Difference” column results are remarkably consistent.

than an acre of agricultural land, so the *Residential* result is somewhat surprising.[30] Further exploration of this result follows in subsequent sections.

On the expenditure side, a shift in favor of neither *Residential* nor *Commercial* is associated with a statistically significant change in expenditures. These results are also unexpected and therefore will also receive more scrutiny in subsequent analyses.

Taken together, the revenue and expenditure estimates show a statistically significant reduction (increase) in the difference between revenues and expenditures associated with a shift from agricultural to residential (commercial) land use (see column 6 of Panel B), implying that the shift to residential is deficit producing, while the shift to commercial is surplus producing. These estimates provide empirical confirmation of the conclusions from CCS studies, but they also raise questions that indicate that further investigation is warranted. We proceed with additional analyses into the nature of these findings.

VI.B Estimated LRPs for Land Use Subcategories

Table 5 presents the results from estimating our preferred specification (columns 4–6) with *Residential* and *Commercial* land uses broken down into finer subcategories. This allows us to investigate which subcategories of residential and commercial land uses drive the results reported in Table 4. For the residential category, *Single–Family* and *Retirement Homes* are associated with significant deficits, while none of the other land use subcategories are associated with significant changes in the budget relative to the omitted category of agricultural.[31] None of the revenue coefficients are individually significant, although the *Single–Family*, *Condos*, and

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[30] Note that since our estimates cannot be interpreted as causal, it is plausible that these results are driven by reverse causation. For instance, if individuals have an increasing preference for living in communities with lower taxes over our period of analysis, we would expect to see more residential development occur in low tax localities and would find a negative, significant result.

[31] The *Retirement Homes* subcategory includes multi-residence facilities for senior citizens such as nursing homes and assisted living facilities. Retirement communities, neighborhoods where seniors live in detached homes, are coded as single–family dwellings by property tax assessors.

Retirement Homes estimates are negative and the analogous residential estimate from Table 4 indicates that the combined effect is significant. The increased deficit associated with a shift to single–family homes is the result of the combined effects of a decrease in revenues and an increase in expenditures, but only the latter effect is statistically significant.

The other residential land use subcategory that is deficit producing is *Retirement Homes*. In comparison to the deficit accompanied by a one percentage point increase in the amount of land devoted to single–family homes, the same increase in land area devoted to retirement homes is associated with a much greater deficit. In Florida, retirement homes tend to be substantial in size and have large dependent populations. They also have access to considerable tax exemptions.[32] It is not surprising, therefore, that the deficit they create results from both a reduction in revenues and an increase in expenditures. While these results provide additional insight into the aggregate residential deficit reported in Table 4, the role played by retirement homes is dominated by that of single–family homes. A shift in favor of residential land use largely involves the construction of new single–family homes, while new retirement homes are constructed less frequently.

A final interesting finding for the residential land uses reported in Table 5 concerns multi–family housing. Conventional wisdom holds that multi–family housing creates a fiscal deficit because it increases expenditures (by not only increasing population but also many times bringing in residents in need of a higher level of public services) while decreasing revenues (because it emits negative externalities that lower nearby property values). While our results show evidence of a marginally significant increase in expenditures, the relationship between

[32] See http://dor.myflorida.com/dor/property/taxpayers/exemptions.html for the details of these exemptions. As an example, in Miami–Dade County for fiscal years 2013 and 2014, retirement homes were only eligible to be taxed on approximately 58 and 54 percent of their assessed value.

Multi–Family and the difference between revenues and expenditures is negative and insignificant. This may be due to the extensive screening multi–family homes are subjected to in the development and approval process. This added scrutiny is thought to manifest itself in the form of impact fees and developer concessions in order to gain project approval. These allowances may mute the negative effects that multi–family housing development would otherwise have on local government budgets.[33] Further examination of this issue is left for future research.

The commercial land use subcategory most strongly contributing to the surplus associated with all commercial properties is *Commercial Offices*. The subcategory includes professional office buildings, financial institutions, and insurance offices. These types of properties tend to be coveted by local governments because they attract a highly skilled labor force to live and/or spend money in their jurisdiction, and they may compound this effect by attracting other businesses to the area. They also use little by way of public services relative to other land uses. A shift to *Commercial Offices* is correlated with an increase in revenues and a decrease in expenditures. Although the latter effect is not statistically significant, the net surplus effect is highly significant at better than the one percent level.

VI.C Estimated LRPs for Revenue and Expenditure Subcategories

In much the same way that we can decompose land uses into finer subcategories, we can investigate the effects from more disaggregate definitions of revenues and expenditures. Table 6 presents the results of estimating Equation (1) where I contains 28 revenue and expenditure

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[33] Developer concessions might include expanding or upgrading the road network, running utilities to the new development, or creating neighborhood amenities such as a new park.

subcategories.[34] Reported is the dollar change in the revenue (expenditure) subcategory experienced by the median county from a shift from agricultural land resulting in a one percentage point increase in residential or commercial land use, respectively.

Results are similar in sign, magnitude, and significance across specifications, so we focus on the specification with additional controls in Columns (3) and (4). The subcategory correlations are heterogeneous and reveal numerous significant, countervailing associations that are hidden in the aggregate revenue and expenditure estimates. Recall that Table 4 showed no significant relationship between residential land use and total expenditures. Decomposing total expenditure into its components exposes significant, offsetting relationships between shifts to residential land use and expenditures on *Courts* (+), *Human Services* (+), and *Physical Environment* (–). We would expect that as a community becomes more residential court–related and social services spending would rise. The negative correlation between residential land use and physical environment expenditures is likely due to developers and homeowners privately incurring the costs required to ensure a suitable living environment.

Turning to the estimated relationships between a shift to residential land use and the individual revenue subcategories, we find positive correlations between residential shifts and *Contributions*, *Fines & Forfeitures*, and *Permits & Licenses*. The former revenue source represents gifts to the community from private donors, and the latter two revenue sources are due to procedural and administrative costs imposed on property owners. It is intuitive that these revenues would increase with residential land use.

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[34] Since not all jurisdictions collected revenues from and/or spent funds on all subcategories in all periods, we estimate Tobit models where appropriate. Note that for ease of exposition, we report the results of each estimated equation in a different row, as opposed to a different column in the previous tables. Columns (1) and (2) contain results from a model with county fixed effects and time effects, and Columns (3) and (4) add in additional controls.

The most surprising finding is the decline in revenue from special assessments. Special assessments are fees paid by property owners to fund capital improvements or services that directly benefit the owner's property. A priori, we would expect that these assessments would be more prevalent on residential than agricultural land. We therefore decided to further investigate this result. We first estimated the *Special Assessments* equation separately by county to determine if a small subset of jurisdictions was driving the result.[35] This is not the case, as 15 of the 67 counties (22.4%) display a negative, significant relationship between shifts to residential land and special assessment revenues. We then contacted representatives from the counties where this negative relationship was the strongest and inquired about the properties on which they levy special assessments. From these conversations a potential explanation emerged. Special assessments for fire services on agricultural land are levied by nearly every county. As agricultural land is developed into residential properties, the new development occurs in either the incorporated or the unincorporated portion of the county. If it is in the incorporated area, fire service fees are part of ad valorem taxation. If the development is in the unincorporated area, in most cases, it is found within a fire services special district that also uses ad valorem taxation to collect these funds.[36]

Next, we turn to the changes associated with a shift to commercial land use. There are significant decreases in two expenditure subcategories: *Schools* and *Human Services*. That commercial properties are associated with decreased expenditures on schooling is intuitive, although the magnitude of this effect is larger than expected. The *Human Services* expenditure

[35] We estimated simpler models with all other land uses aggregated except residential, commercial, and agricultural (still omitted) to save degrees of freedom. These results are available by request.

[36] This mechanism implies that counties are the primary users of special assessments because special districts and cities use other revenue sources for the same service. Evidence of this mechanism could be found if removing county revenues from this subcategory led to reduced significance on special assessments. This is exactly what we found when we reran the regressions.

subcategory includes hospital, mental health, and public assistance services. Again, as commercial property takes up an increasing share of the land in the county, we would expect less need for spending in this subcategory. The only subcategory of expenditures that increases with more commercial land use is *Physical Environment*. This is also intuitive, since new commercial buildings typically require additional spending on road and other public infrastructure services.

Finally, there are the individual revenue subcategory correlations with a shift in favor of commercial land use. There is a negative relationship between those shifts and the sales of a community's assets (surplus materials). Why such a relationship exists is unclear. There is also a significant relationship between commercial shifts and revenues from *Special Assessments*. As is true for a shift to residential land use, the change in special assessment revenues is large. Unlike the residential case, the change is positive rather than negative so this is not a surprising result. New commercial developments frequently require special services related to security, traffic control, storm water management and utilities that are funded by special assessments.

While we have focused on the statistically significant effects found in Table 6, there are a number of insignificant effects that merit comment. In particular, neither a shift to residential nor commercial land use is found to have a positive, significant correlation with *Ad Valorem*. These results are surprising because we would expect conversions to these land uses to increase the tax base, all else equal. We offer two possible explanations for these results. First, it is well documented in the literature that agricultural land and other types of open spaces increase the values of neighboring properties (Irwin 2002; Irwin and Bockstael 2004; Ready and Abdalla 2005; Anderson and West 2006; Kuminoff 2009; Walls, Kousky, and Chu 2015). Given these spillovers, it is not clear how the total value of the tax base will be affected when land is converted from agricultural to residential or commercial use. Second and particular to the residential result, while we would expect the market value of an acre of residential development to be more valuable than an acre of agricultural land, the state's homestead exemption reduces the assessed value of a homeowner's primary residence by $50,000 when determining ad valorem property taxes. The vast majority of residential housing that results from the conversion of agricultural land is single–family, owner–occupied homes that would quality for the homestead exemption. This would tend to mute the association between a shift to residential land and ad valorem tax revenues, especially because agricultural land is largely commercially owned within the state of Florida.

VII. Conclusion

In this paper we use a new approach to document the first empirical estimates of the relationship between a complete accounting of community fiscal measures and the full distribution of acres of land uses in the jurisdiction. While our results provide support for the general conclusions of CCS studies, our methodology makes numerous improvements to the accounting approach taken by these studies. We estimate econometric models that show the actual changes in expenditures and revenues that result from the residential and commercial development of agricultural land.

We also provide new knowledge of fiscal impacts by analyzing subcategories of land uses and more disaggregate budget measures. Estimates exploiting the former type of disaggregation show that residential and commercial findings are not uniform after breaking down these aggregate land uses into their components. Commercial land use surpluses are driven by increases in revenues associated with commercial office development, and shifts to retirement homes are strongly correlated with residential deficits, most likely due to tax exemptions available to retirement facilities. When estimating the relationships between land use categories and revenue/expenditure subcategories, we uncover numerous significant relationships that are obscured by the aggregate data and surprisingly insignificant relationships between shifts from agricultural land and ad valorem tax revenues. Taken together, our subcategory results are consistent with the most striking conclusion of CCS studies; shifts from agricultural to residential land are associated with deficits, being due to either a reduction in positive agricultural spillovers that reduces the overall tax base or various favorable tax treatments given to residential properties.

We conclude by acknowledging a few caveats which serve to point to possible directions for future research. First, we remind the reader that our estimates represent correlations and cannot be interpreted as causal. Causal analyses will require modeling development decisions along with their fiscal impacts, which poses a considerable challenge to future researchers. Second, as is true of all studies that use local data, there is the concern that our results for Florida may not be generalizable to the nation as a whole. We therefore encourage research on fiscal impacts using data for other places, especially in light of the fact that our estimates represent the only econometric evidence available. Finally, our data cover nine rather tumultuous years in our nation's history, characterized by the housing market crash, the Great Recession, and the early recovery from these events. It is therefore important for future research to investigate whether the relationships we have discovered are applicable to more normal times. Despite these caveats and the obvious need for additional research, the relationships we estimate have not previously been documented, and they represent an important first step in our understanding of an issue that has significant policy implications. We hope that this work provides insight into the fiscal impacts of alternative land uses as well as useful directions for future research.

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Appendix A1: Revenue and Expenditure Subcategory Definitions

Subcategory	Definition*
	Revenue Subcategories:
Ad Valorem	Property taxes computed as a percentage of the Fair Market value of locally assessed real estate.
Contributions	Includes gifts, pledges, grants, or bequests from private sources.
Court–Related	All court related revenue associated with county and circuit, criminal, civil, traffic, juvenile, and probate courts.
Federal Grants	Includes revenues granted to local units from the federal government. Also includes all federally funded grant programs whether granted directly to the entity or administered by State agencies.
General Government (Revenues)	A variety of local option taxes that may include convention and tourism taxes, as well as various optional fuel taxes. It contains local business taxes along with all utility service taxes.
Interest	All interest earned on bank accounts, investments, contracts and notes.
Fines & Forfeitures	Includes revenues received from fines and penalties, imposed for the commission of statutory offenses, violation of lawful administrative rules and regulations, and for neglect of official duty.
Local Government Unit Grants	Contributions from other governmental reporting entities to be used for specified purposes.
Miscellaneous	Contains settlements, slot machine proceeds, deferred compensation contributions, and other miscellaneous revenues.
Other Sources	Contributions from enterprise operations, installment purchases and capital lease proceeds, any debt proceeds.
Permits & Licenses	Building permits, franchise fees, impact fees, and any other fee not categorized as a special assessment.
Rents & Royalties	Rents and percentages of proceeds for use of public property or other assets.
Sales of Assets	Disposition of fixed assets including surplus materials and scrap.
Sales Taxes	A tax of 2 percent imposed on the sale of food, beverages, and alcoholic beverages in hotels and motels, and a tax of 1 percent imposed on the sale of food, beverages, and alcoholic beverages in establishments that are licensed to sell alcoholic beverages on the premises, except for hotels and motels.
Service Charges	Reflects all revenues stemming from charges for current services. This definition encompasses service charges ranging from recording fees at courts to fees collected by one government for services rendered to another local government. It also includes service charge fees of public safety, transportation, economic environment, and housing.

Special Assessments	Collections resulting from compulsory levies against certain properties to defray part or all of the cost of specific capital improvements or services presumed to be of general benefit to the public and special benefit to the assessed properties. As established in Florida case law, two requirements exist for the imposition of a valid special assessment. First, the property assessed must derive a special benefit from the improvement or service provided; and second, the assessment must be fairly and reasonably apportioned among the properties that receive the special benefit. Special assessments and taxes are distinguishable because no requirement exists that taxes provide a specific benefit to property. Taxes are levied for the general benefit of residents and property.
State Grants	Grants from the state of Florida for a variety of projects: safety, utilities (gas, water, etc.), transportation, economic environment, and human services.
State Revenue Sharing	State Shared Revenues refer to local government entities sharing with other local government entities statewide through a DOR reallocation process.
Schools (Revenues)	Total revenue gained through property taxes levied by local school districts.

Expenditure Subcategories:

Courts	All personnel and operating costs of county and circuit courts.
Culture/Recreation	Cost of providing and maintaining cultural and recreational facilities and activities for the benefit of citizens and visitors.
Economic Environment	Cost of providing services which develop and improve the economic condition of the community and its citizens.
General Government (Expenditures)	Services provided by the legislative and administrative branches of the local government for the benefit of the public and the government body as a whole.
Human Services	Cost of providing services for the care, treatment, and control of human illness, injury or handicap, and for the welfare of the community as a whole and its individuals.
Physical Environment	Cost of services provided for the primary purpose of achieving a satisfactory living environment by controlling and utilizing elements of the environment.
Public Safety	Cost of providing law enforcement and fire control.
Transportation	Cost of services for the safe and adequate flow of vehicles, travelers, and pedestrians.
Schools (Expenditures)	Total expenditure for current operations for each school district.

* Definitions come from the 2011 Edition of the “Uniform Accounting System Manual For Florida Counties.” This is the standard accounting guide all jurisdictions must use when submitting budget reports to the Florida Department of Financial Services. All definitions are verbatim when context and space allow.

Appendix A2: GIS Data Issues

There were three main issues that we confronted with when working with the GIS files.

1) Some county–years were missing a land use designation.
2) Vertically stacked parcels exist in the data.
3) Six county–year GIS maps were never produced or the files were corrupt.

To address the first issue, we took advantage of the unique parcel tax identification numbers that are present in the GIS files. Using these unique tax ID numbers we were able to fill in the missing land use designations with the given parcel's designation in the previous or preceding year. We only filled in a missing land use if the previous and preceding designations were the same. If an appropriate match could not be found using the parcel tax ID, we used the geographic coordinates of the parcel's centroid to uniquely identify parcels (there is one exception to this; see the discussion in the subsequent paragraph). Using the same technique as with the parcel ID, we then filled in the remaining land use codes.

The second issue was problematic because failure to address it would lead to overcounting certain land uses that are frequently stacked vertically (condos, retail). It is easiest to explain this with an example. Consider a one acre lot with a high rise condominium built on it. Each condo in the data set would be calculated as having a one acre footprint by the GIS program. If there were ten condos in our hypothetical building, then summing over those condos would overstate condominium land use by nine acres. We addressed this issue by using the geographic coordinates of each parcel's centroid to identify stacked parcels. We then divided the acreage by the number of parcels with the same centroid. In the example given, each of the ten condos would be recoded as having an area of $1/10^{th}$ of an acre. When recoded parcels are aggregated to the land use level, our total acreages will then be accurate.

Finally, dropping the missing county–year data from the data set was unavoidable.

Table 1. Revenue Subcategory Means by Year[1]

	Means		
Subcategory	2006	2010	2014
Ad Valorem Taxes	26,840	26,039	21,575
Contributions	3,133	3,023	3,553
Court–Related	738	188	523
Federal Grants	5,817	5,948	4,386
General Government (Revenues)	8,983	8,693	8,833
Interest	5,828	5,434	6,086
Fines & Forfeitures	665	473	585
Local Government Unit Grants	695	698	522
Miscellaneous	3,871	2,081	1,991
Other Sources	12,984	8,564	6,799
Permits & Licenses	2,870	2,503	2,775
Rents & Royalties	585	579	698
Sales of Assets	449	146	149
Sales Taxes	2,446	2,520	2,209
Service Charges	48,580	52,230	49,621
Special Assessments	4,885	3,038	3,537
State Grants	3,088	1,980	1,361
State Revenue Sharing [2]	6,005	5,269	4,930
Schools (Revenues)	21,603	21,744	17,826
Total Revenue	160,065	151,150	137,959

[1] Means are in $10,000 units and are expressed in real 2014 dollars. Detailed revenue subcategory definitions are listed in the Appendix.
[2] Florida has a county revenue sharing program. An allocation formula is used to distribute 2.9 percent of net cigarette collections and 2.044 percent of sales and use tax collections.

Table 2. Expenditure Subcategory Means by Year[1]

	Means		
Subcategory	2006	2010	2014
Courts	1,437	1,451	1,370
Culture/Recreation	6,804	5,873	4,989
Economic Environment	4,635	5,359	4,770
General Government (Expenditures)	24,897	24,435	23,640
Human Services	13,944	15,822	13,283
Physical Environment	29,836	27,455	23,967
Public Safety	23,093	23,850	22,602
Transportation	15,028	13,947	11,966
Schools (Expenditures)	36,180	37,146	35,235
Total Expenditures	155,854	155,338	141,822

[1] The means are in $10,000 units and are expressed in real 2014 dollars. Detailed expenditure subcategory definitions are listed in the Appendix.

Table 3. Land Use Subcategory Means by Year[1]

	2006	2010	2014
Residential Subcategories			
Single–Family	9.98	10.63	10.52
Multi–Family	0.60	0.67	0.67
Condominiums	0.26	0.20	0.25
Retirement Homes	0.01	0.01	0.01
Mobile Homes	2.50	2.44	2.52
Miscellaneous Residential	0.24	0.26	0.28
Cooperatives	0.01	0.01	0.01
Total Residential	13.60	14.22	14.26
Commercial Subcategories			
Offices	0.29	0.33	0.32
Retail	0.90	0.93	0.92
Industrial	0.94	1.04	1.00
Other Commercial	1.21	1.29	1.20
Total Commercial	3.34	3.59	3.44
Other Subcategories			
Agricultural	63.60	66.20	66.30
Government	1.45	1.56	1.91
Institutional	0.82	0.94	0.86
Miscellaneous	2.52	3.75	5.31
Vacant Lots	14.59	9.66	7.80
Total Other	82.98	82.11	82.18

[1] Numbers equal the percentage of acres on the tax roll falling into the designated land use subcategory.

Table 4. CCS Analog SUR Estimates

	(1) Revenue	(2) Expenditure	(3) Difference	(4) Revenue	(5) Expenditure	(6) Difference
Panel A: Without Fixed Effects						
Residential†	0.0537*	0.0583**	-0.00468***	-0.0197***	-0.0130***	-0.00669***
Standard Error	(.053)	(.026)	(0.00)	(0.01)	(.004)	(0.00)
50th	[113.2]	[123.1]	[-9.882]	[-41.54]	[-27.43]	[-14.11]
Commercial	0.108	0.0934	0.0144**	0.0359**	0.0259	0.0100***
Standard Error	(.108)	(.088)	(.014)	(.035)	(.018)	(.010)
50th	[227.4]	[197.1]	[30.28]	[75.72]	[54.55]	[21.16]
County Fixed Effects						
Control Variables				x	x	x
Panel B: With Fixed Effects						
Residential	-0.00194***	0.000228	-0.00217***	-0.000714***	0.000627	-0.00134***
Standard Error	(0.00)	(.002)	(0.00)	(0.00)	(.003)	(0.00)
50th	[-4.092]	[0.480]	[-4.572]	[-1.507]	[1.323]	[-2.831]
Commercial	0.0273**	0.00807	0.0192**	0.0192**	0.00356	0.0157**
Standard Error	(.027)	(.006)	(.019)	(.019)	(.006)	(.015)
50th	[57.55]	[17.02]	[40.53]	[40.59]	[7.508]	[33.08]
County Fixed Effects	x	x	x	x	x	x
Control Variables				x	x	x

All regressions include time effects and the percent of government, institutional, miscellaneous, and vacant acres in the county.
*, **, *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.
† Estimates are LRPs of the given land use, standard errors clustered by county, and LRPs multiplied by median expenditures.

Table 5. Land Use Subcategory Estimates

	(1) Revenue	(2) Expenditure	(3) Difference	(4) Revenue	(5) Expenditure	(6) Difference
Residential Subcategories						
Single–Family†	-0.00686	0.0138*	-0.0207*	-0.00438	0.0149*	-0.0192*
	(0.0148)	(0.00801)	(0.0121)	(0.0147)	(0.00774)	(0.0112)
	[-74.72]	[150.6]	[-225.3]	[-47.73]	[162.0]	[-209.8]
Multi–Family	0.0224	0.0250	-0.00259	0.0297	0.0310*	-0.00134
	(0.0303)	(0.0181)	(0.0218)	(0.0289)	(0.0168)	(0.0221)
	[244.1]	[272.3]	[-28.22]	[323.6]	[338.2]	[-14.61]
Condos	-0.00535	0.0216*	-0.0270	-0.00539	0.0222	-0.0275
	(0.0278)	(0.0126)	(0.0216)	(0.0277)	(0.0137)	(0.0212)
	[-58.32]	[235.7]	[-294.0]	[-58.78]	[241.5]	[-300.3]
Retirement Homes	-0.960	0.205	-1.164**	-0.459	0.606	-1.065**
	(0.751)	(0.454)	(0.523)	(0.734)	(0.418)	(0.521)
	[-10462]	[2230]	[-12691]	[-5005]	[6604]	[-11609]
Mobile Homes	0.0436	0.00998	0.0336	0.0339	0.00301	0.0309
	(0.0388)	(0.0193)	(0.0279)	(0.0374)	(0.0173)	(0.0297)
	[475.1]	[108.8]	[366.3]	[369.9]	[32.77]	[337.1]
Miscellaneous Residential	0.0512	-0.00511	0.0564*	0.0525	-0.00343	0.0560
	(0.0407)	(0.0229)	(0.0323)	(0.0461)	(0.0242)	(0.0380)
	[558.6]	[-55.74]	[614.3]	[572.5]	[-37.36]	[609.9]
Cooperatives	0.0257	0.0730	-0.0473	0.0529	0.0991	-0.0461
	(0.485)	(0.274)	(0.351)	(0.395)	(0.191)	(0.329)
	[279.9]	[795.8]	[-515.8]	[576.8]	[1080]	[-503.0]
Commercial Subcategories						
Commercial Offices	0.362*	-0.0749	0.436***	0.360*	-0.0758	0.436***
	(0.191)	(0.129)	(0.133)	(0.194)	(0.126)	(0.128)
	[3941]	[-816.7]	[4757]	[3923]	[-826.1]	[4749]
Retail	-0.130*	-0.145***	0.0149	-0.153**	-0.162***	0.00890
	(0.0689)	(0.0462)	(0.0489)	(0.0631)	(0.0412)	(0.0493)
	[-1413]	[-1575]	[162.4]	[-1671]	[-1768]	[97.01]
Industrial	0.0412	0.0324**	0.00877	0.0337	0.0277***	0.00596
	(0.0299)	(0.0126)	(0.0248)	(0.0312)	(0.00961)	(0.0269)
	[448.8]	[353.3]	[95.56]	[366.8]	[301.9]	[64.95]
Other Commercial	0.0159	-0.00451	0.0204	0.00741	-0.0109	0.0184
	(0.0201)	(0.0102)	(0.0130)	(0.0177)	(0.00908)	(0.0125)
	[173.3]	[-49.12]	[222.4]	[80.72]	[-119.3]	[200.0]
County Fixed Effects	x	x	x	x	x	x
Control Variables				x	x	x

All regressions include time effects and the percent of government, institutional, miscellaneous, and vacant acres in the county.
*, **, *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.
† Estimates are LRPs of the given land use, standard errors clustered by county, and LRPs multiplied by median expenditures.

Table 6. Revenue and Expenditure Subcategory Estimates

	(1) Residential	(2) Commercial	(3) Residential	(4) Commercial
Revenue Subcategories				
Ad Valorem†	294	354	381	186
Contributions	121	321	160*	277
Court–Related	-334	550	-334	540
Federal Grants	106	-192	115	-292
General Government (Revenues)	-185	794	-174	770
Interest	282	-268	272	-472
Fines & Forfeitures	55*	41	52*	8
Local Government Unit Grants	39	9	41	-7
Miscellaneous	90	-262	60	-226
Other Sources	121	1747	278	945
Permits & Licenses	117*	-201	101*	-222
Rents & Royalties	14	-42	16	-72
Sales of Assets	137	-515**	142	-520**
Sales Taxes	-63	52	-49	55
Service Charges	42	-767	216	-537
Special Assessments	-1193*	5936**	-1814**	5813**
State Grants	-41	382	-68	244
State Revenue Sharing	-38	-39	-61	-84
Schools (Revenues)	135	399	313	261
Expenditure Subcategories				
Courts	314***	166	279*	167
Culture/Recreation	-62	148	-84	110
Economic Environment	-95	231	-156	287
General Government (Expenditures)	54	636	73	249
Human Services	516***	-1888**	608***	-2013**
Physical Environment	-827***	3063***	-790***	2964***
Public Safety	-32	-171	39	-61
Transportation	-195	537	-182	334
Schools (Expenditures)	552	-1769**	335	-1920***
County Fixed Effects	x	x	x	x
Control Variables			x	x

All regressions include time effects and the percent of government, institutional, miscellaneous, and vacant acres in the county.
*, **, *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.
† Estimates are the LRPs multiplied by the revenue or expenditure of the median county in that subcategory.

Figure 1. Illustration of the Timing of Revenue/Expenditure and Land Use Data