# The Effects of Land Development on Municipal Finance: A Conceptual Overview

Kurt Paulsen



**Lincoln Institute of Land Policy**
**Working Paper**



**Lincoln Institute Product Code: WP09KP1**

**Abstract**

The purpose of this paper is to provide a theoretical and conceptual understanding of the fiscal effects that might be expected to result from land development within a community. The paper begins with a description of an "initial equilibrium" within a community prior to land development in order to exposit the mechanisms by which local government revenues and expenditures are determined. Understanding and predicting the effects of land development on municipal revenues and expenditures begins with an understanding of how levels of public expenditure are determined in the complex interaction between demand for public services and the production function which translates public inputs and outputs into levels of service outcome experienced by voters and residents. The paper then traces the effects of land developments through this system, discussing assumptions about service demands, service production, and the effect of socio-economic and demographic characteristics on both demand and costs. This paper identifies that the direct fiscal impacts, which are measured in most fiscal impact analysis techniques, are only a subset of the types of fiscal impacts that would be expected to result from land development within a community.

## About the Author

Kurt Paulsen is an Assistant Professor in the Department of Urban and Regional Planning at the University of Wisconsin – Madison. He received a B.A. from Northwestern University, a Masters in Agricultural and Applied Economics and a Masters in Development Policy and Public Administration from the University of Wisconsin – Madison, and a Ph.D. in Urban Planning and Policy Development from Rutgers, The State University of New Jersey. His teaching and research interests focus on local government land use planning, local government public finance, housing and intergovernmental relations.

**Acknowledgements:** This document was prepared as part of a team project funded by the Lincoln Institute of Land Policy (Fiscal Dimensions of Planning), with team members, Mary Edwards and Samina Raja. I thank my team members for excellent comments and collaboration. We received helpful feedback from Jack Huddleston and Roz Greenstein, as well as seminar participants at the Association of Collegiate Schools of Planning conference in 2007 and seminar participants at the Lincoln Institute in February 2008. Any errors are mine alone, and the usual disclaimers apply.

**Contact Information**:
Kurt Paulsen
Dept. of Urban and Regional Planning
University of Wisconsin – Madison
Old Music Hall, 925 Bascom Mall
Madison, WI 53706
tel. 608-262-8990
fax. 608-292-9307
email: kpaulsen@wisc.edu

**Table of Contents:**

**The Effects of Land Development on Municipal Finance: A Conceptual Overview**

## 1. Introduction

Land development within a city is expected to bring about a change in local public finance because it alters existing expenditure and revenue patterns. New development or redevelopment generates changes in the levels and/or quality of service demanded and generates changes in revenue amounts or patterns. Forecasting and understanding the magnitude and direction of these revenue and expenditure changes is of tremendous interest to local governments. Fiscal impact projection and analysis techniques claim to provide some estimate of the changes in revenues and expenditures associated with land development within a jurisdiction. In order for fiscal analysis to provide accurate and reliable information for local government budget and policy decisions, its models and methods provide some account (either explicit or assumed) of the mechanisms by how land use change affects service demands, revenues and expenditures. Often, most fiscal impact analyses prepared for local governments make strong (but not explicitly states) assumptions regarding the mechanism between land development and fiscal outcomes.

While fiscal impact analyses, cost-revenue analyses,[1] or costs-of-community-services analyses[2] have existed in various forms for decades to help local governments make short and long term land use and infrastructure decisions (Schaenman & Muller, 1974), they have come into widespread use and understanding in the last 30 years. There are at least two reasons for more widespread adoption of fiscal projection techniques in connection with land development policies. First is the publication and widespread availability of standardized workbooks and spreadsheets, beginning with Burchell and Listokin's seminal 1978 (and later revisions) workbook (Burchell & Listokin, 1978, 1980, 1991; Burchell, Listokin, & Dolphin, 1985, 1994). These workbooks made fiscal impact analysis possible by practitioners in that they provided methods, multipliers and data sources for use in jurisdictions of all sizes. The second reason for greater interest in fiscal projection techniques in land development policies was the decline in federal assistance to local communities for infrastructure and revenue sharing (Fisher, 2003). Because federal funding was no longer available on advantageous terms for local governments to deal with the infrastructure service requirements of new growth, local governments became increasingly concerned to understand the impacts of new growth on services and revenues.

That land development should affect local revenue and expenditure patterns is nearly universally believed and accepted. However, there has been a lack of conceptual or theoretical clarity as to ***why*** and ***how*** land development should affect the local fiscal circumstances. Any analysis of the fiscal impacts of land development requires making some assumption(s) about how local governments raise and spend public dollars, and also requires some assumption(s) about how land development alters (or does not alter) this relationship.

---

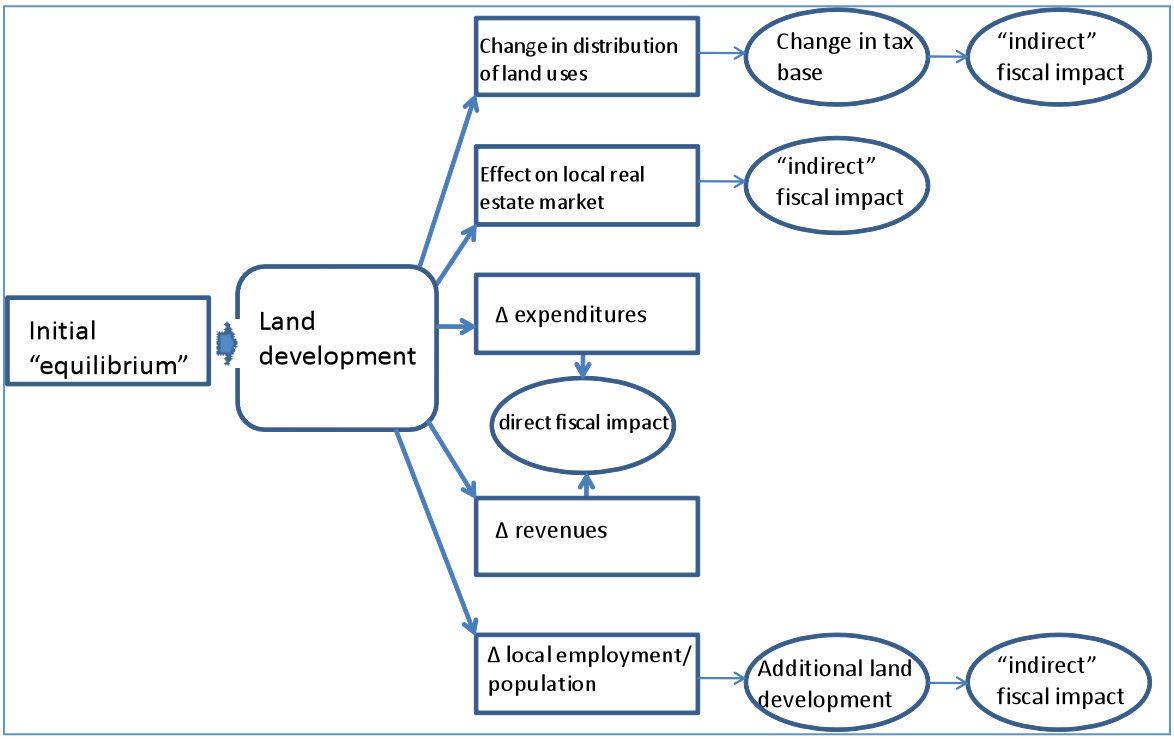
[1] The term "cost-revenue" analysis is described by (Wheaton, 1959)

[2] Throughout this paper, I use lower-case punctuation on "fiscal impact analyses" to indicate that I am talking about a wide range of analysis and projection techniques and approaches, rather than any one specific technique, workbook, approach or model.

The purpose of this paper to provide a coherent and comprehensive conceptual and theoretical basis for understanding the effects of land use change on local government revenues and expenditure patterns. As part of a research project evaluating fiscal impact analysis techniques, this theoretical understanding can help examine the assumptions fiscal impact analysis techniques make, as well as understand under what conditions fiscal projections are likely to be more or less accurate.

This paper is organized as follows. Section 2 outlines a way to think about what an "initial equilibrium" in a community (representing a baseline or status quo prior to land development) might look like. In order to project changes and impacts, this section provides a way of thinking about the relationships that relate present land development to local expenditures and revenues. This section also describes the types of data and assumptions needed to understand and project changes. Section 3 introduces and exposits the concept of the "production function" of public services provision. Understanding the "production function" of local public services has been called the "missing link" in planners' understanding of the fiscal impacts of land development (Heikkila, 1997, 2000). Section 4 describes the process of "land development" and outlines the process by which land development could alter existing fiscal relationships. This section provides an analytical "road map" by which to trace the different effects of land development. A simplified version of this "road map" is below as Figure 1, which also serves as a schematic outline of the paper. Section 5 offers some conclusions.

**Figure 1. Conceptual "Road Map" of Land Development and Fiscal Change**



## 2. Characterizing an "initial" equilibrium

In order to understand and trace the effects of land use change through the municipal finance system, it is first important to understand how this system works in what we might call an "initial equilibrium," where we can specify existing relationships prior to a land development or "shock" to the system. Included in the discussion of "equilibrium" is a description of what characteristics of local finance would need to be known – and therefore what data would need to be collected -- in order to trace the effects of land use change through the system.

The concept of "equilibrium" in this paper is used here in a heuristic and expository sense, not as constituting any substantive claim about the actual existence of or properties of equilibrium. In fact, in many dynamic models of local public goods and household sorting, equilibrium conditions may involve substantial household mobility and land development. My concept here is more like "initial conditions." Indeed, modeling and deriving the equilibrium properties of local governments can be incredibly complex. Many researchers within the field of local public finance have pointed out that there does not yet exist fully general, empirically tractable equilibrium models of the local public sector which encompasses land development and housing markets, and many even question whether stable equilibriums exist (Hanushek, 2002; Nechyba & Strauss, 1998; Ross & Yinger, 1999). Although the recent RELU-TRAN model (Anas & Liu, 2007) represents a move forward in equilibrium modeling of local economies, no local public sector expenditures or revenues were included. Again, in this paper, I use "equilibrium" only as a heuristic device to think about local public goods production.

We start by imagining a city[3] in this equilibrium with an existing level of land development, expenditures and revenues. In this initial equilibrium, the observed pattern of land use and local public finance (expenditures and revenues) reflects the decisions of and interactions of a large number of independent actors over time, as constrained by the legal and political institutional structure. At the beginning stage of the argument, it is important to describe these various actors and their roles, so that changes in local finance brought about through land development can be more fully described. In this discussion, we focus the discussion on 6 actors likely to have the most influence on local land use patterns and local finance decisions.

## 2.1 Actors in Local Government Service Provision and Public Expenditure

2.1.1: Residential Population

We start by characterizing the residential population of the city. At equilibrium, residents are in the city because it provides the range of housing, public goods, and quality of life they have reason to value at their current income level.[4] These residents pay taxes, demand local public services, shop, are employed, and consume real estate services (primarily housing) through a local real estate market. They may shop or be employed outside of their community of residence. Empirical studies of local government expenditure and revenue patterns pay great attention to the socio-economic and demographic characteristics of this resident population because residents demand local public goods, face taxes to pay for public goods, and determine local fiscal and land development policies through zoning.

In terms of characterizing the residential population, important variables would be size, income (per-capita income, income distribution, median income, percentage of families in poverty, etc.), age structure (particularly the number or percentage of senior citizens and school age children), propensity to consume public services (e.g. the percent of school age children who enroll in public or private schools), racial and ethnic composition, and household structure (types of households, relationships, etc.). The socioeconomic and demographic characteristics of the residential population will be a key factor in both expenditure determination (determining the level of public services to provide) on the demand side, as well as on the cost side in the relationship between inputs and outcomes, as described below in §3.

### *2.1.1. a: Voters*

While the economics literature has tended to utilize simple median-voter models to explain local policies, literature from other fields has looked more in-depth at the composition of local voting populations and processes of local agenda-setting political mobilization. A subset of the residential population is those voters who influence local political processes. Voters influence expenditure, revenue and land use decisions either through elections for local officials and/or through direct voting (referenda and initiatives in states where those are allowed). Two concerns are worth noting here. First is the recognition that service demanders and voters may not have

[3] Throughout this paper, I use the terms city or local government or municipality interchangeably to represent any general purpose local government unit.

[4] This is the same as standard housing sorting models where the utility level of residents equals the utility level in a reference community, so that households are indifferent between moving and staying.

the same interests. For example, the marginal homebuyer is likely to demand a different tax-service bundle than existing voters. If the marginal homebuyer is not the median voter, this may be a source of conflict between new and existing residents. A salient example of the different interests between voters and service demanders may be that school-aged children are not voters, while senior citizens are voters – and vote in higher proportions. If the level of provision of local public goods represents the characteristics of the median voter, there can be a situation where senior citizens (who are alleged to bear heavy property tax burdens relative to income) might vote to reduce support for public education because they don't have school-aged children.[5]

Second, it is worth noting that non-residents (employees, employers, owners of undeveloped land, future residents, etc.) are not allowed to vote in local elections, even though they may have great interests in the tax and service levels chosen through local political processes. A whole literature has developed on the equity and efficiency implications of this potential disconnect, which it is not necessary to review here, but see, for example Babcock (1966), de Bartolome (2002), Benabou (1993), Fischel (2001a, 2001b).

2.1.2: Functional Population

A second group of actors -- often ignored in considering the effects of land development on local finance – is the "functional population:" employees and visitors in the city who are not residents (Nelson, 2004). Commuters enter the city and consume services (and may contribute revenue) during the daytime, while visitors/tourists may come for day-trips or longer stays. We can think of the functional population in terms of the "daytime functional population" (commuters), or a 24/7 functional population, which considers all commuters and visitors. In some cases, the commuting and/or tourist population can have impacts on service demand and levels of service exceeding that of residents, such as peak-hour traffic congestion caused by non-residential employees' journey-to-work trips. In tourist-dependent economies, populations can more than double during peak-tourist season, posing large service demands on hospitals, streets, police, water and sewer, etc. It is therefore important for fiscal impact analyses to account not just the residential population or employees associated with land developments but the functional population and their differential demand for services and/or impacts on service levels or service costs.

2.1.3: Developers

A third local actor are "real-estate developers" who build, develop, maintain, re-develop, lease and sell residential, non-residential, governmental, and institutional space, as they interact through regional real-estate markets and (inter)national capital markets. Real-estate developers and property managers provide residential and non-residential space subject to the demand for such space arising from the regional economy and in interaction with the land use regulations (zoning, building codes, etc.) of the local government. Residential homeowners can also be thought to act as "real estate developers" when they sell their house on the market. Because new land development will bring about some change in the local real estate market, an analysis of the fiscal impacts of land use change should involve some description and understanding of local

[5] Although, the capitalization effect should lead seniors to care about the overall quality of public goods within their jurisdiction.

residential and non-residential real-estate markets. Similarly, changes in the local real estate market conditions can have substantial impacts on revenues and expenditures, even in the absence of any explicit land use change or development proposals.

2.1.4: Employers/Local business interests

The fourth local actor is businesses or employers. Businesses demand real estate services and space, provide employment and income to residents and commuters, generate tax revenue, and create demands on local public services such as roads, police and fire protection, water and wastewater, etc. Local communities may offer tax and expenditure packages (and/or discretionary tax abatements) in attempts to lure mobile business capital to invest in their town (Anderson & Wassmer, 1995; Wassmer, 1992). Businesses contribute an important component of the tax base within a community. In communities where revenues accrue through the property tax system (and given uniform taxation provisions in state constitutions), higher percentages of the property tax base in non-residential development reduces the net tax price to residents of public services.[6] While many fiscal models assume that businesses affect local revenue and expenditure patterns only through direct service demands and revenues, and not through the local political process (because only residents can vote), this ignores businesses' substantial influence on local land development regulations and public service levels. Much of the "growth machine" literature, for example, suggests that local business interests and developers are able to induce a higher level of public expenditures for development (infrastructure) and a lower level of land development regulation than residents' might prefer.

2.1.5: Institutional sector

A fifth local actor, also often overlooked in analyses, is the "institutional" sector, both for-profit and non-profit. This can include museums, hospitals, churches, etc. Organizations within this sector may receive some public monies, may be contracted as social services providers, or may be exempt from local property taxes. Local organizations may have negotiated various service arrangements with local governments, or may participate in PILOT (Payment in Lieu of Taxes) programs. Thus, they play a significant role in both revenue and expenditure patterns. For example, many local churches may receive some public monies for programs of assistance to needy families, but pay no property taxes. Non-profit hospitals provide important sources of health services. The institutional sector provides a crucial component of the service provision infrastructure within a community, as well as providing their own service demands and revenue structure. Taking churches again as an example: churches do not provide direct tax revenues because of their constitutionally protected tax-exempt status (although they can and are charged service fees for trash, water and sewer, etc.) and yet produce service demands such as streets, traffic control, trash removal, police responses, etc. Social service organizations also provide a social infrastructure for poverty alleviation or service provision, and may also play important local political roles in service level determination through advocacy and mobilization.

[6] To see this, consider a city with 30 percent of its tax base in non-residential development. Because of uniform taxation requirements, this would mean that $0.30 of every $1 raised in property tax revenues would come from this non-residential tax base. Thus, to existing residents, the "tax price" of an additional $1 in revenue would only be $0.70 from residents.

Non-profit groups provide interesting challenges for fiscal impact analyses by their tax-exempt status. A strict cost-revenue analysis might, for example, find that non-profit groups and agencies are a fiscal loss to the city because they provide far less in revenue than they demand in services. Such calculations, however, would ignore the roles that local non-profits play in local service provision and the significant amount of charitable services provided by non-profits, which might reduce needs for government social service funding. It is helpful to keep in mind that there are many other agencies and groups which contribute to the level of "public services" and quality of life within a community.

2.1.6: Local Governments

Local governments are often the sole focus of fiscal impact analyses. Fiscal impact analyses or "cost-revenue analyses" (Altshuler & Gomez-Ibanez, 1993; Ladd, 1998) were developed only to deal with the projected public service costs for local governments. Therefore, it is understandable that many techniques focus only on local government costs and revenues, and do not focus on the relationships between and among the other 5 actors listed above. Yet, such assumptions may miss many of the important relationships described above.

In thinking about which local governments are the object of analyses, we need to specify that the local government sector can include general-purpose local governments (cities, towns, townships, counties, etc.), single-purpose governments (e.g. school districts), special-purpose governments (sewage districts, water supply authorities, etc.), and a whole range of quasi-governmental agencies and/or public-private partnerships (e.g. redevelopment authorities, port authorities, etc.) These agencies may have significant influence on land development patterns. In an attempt to keep the analysis manageable, this paper and fiscal impact analyses in general limit themselves to those governments and government agencies whose direct expenditures, revenues, and/or service provision are affected by land development. In practice, the most common focus is on general-purpose local governments and school districts.

The purpose of this extended exposition of the actors involved in local public service provision and determination is to begin to "open up the black box" of the local sector in order to provide a basis for understanding the linkages between land use change and fiscal impacts. A number of different actors and sectors interact to produce the pattern of public services, expenditures and revenues observed at the initial "equilibrium" stage. Although some lines of research reduce local public service determination to a median voter's preferences, other research has long recognized the complexity of actors, interests, and institutions that shape the local political landscape.

## 2.2 A Note on Non-monetary Public Service Provision

The focus of fiscal analysis techniques has always been on the direct effects of land use and land use change on local government revenues and expenditures and how these relate to the planned local service levels. By focusing only on actual expenditures, such analyses obscure the fact that there are at least 3 mechanisms for local service provision outside of actual expenditures: dedications, discretionary tax abatements (tax-expenditures), and regulation(s).

It is now commonplace in most jurisdictions of the country that property developers are required to build (and pay for out of their own funds) capital-intensive on-site infrastructure improvements. On-site infrastructure can typically consists of residential streets, sidewalks, street-trees and other landscaping features, and pipes for conveyance of wastewater and storm water. Developers may be required to dedicate these facilities (along with utility and other rights-of-way) to the local governing body.[7] Fiscal analysis of local land development must be careful to account for costs all the way through the infrastructure process. Once facilities are dedicated to the municipality, the citizens of the municipality at large are financially liable for operations, maintenance, and replacement of the infrastructure.[8] Even though the initial capital costs were not borne by the public, ongoing maintenance and operation costs may be. Local government dedication requirements provide a level of public service without direct expenditures.

Rather than actual expenditures, a "tax expenditure" describes a financial benefit to a household of property owner through foregone taxes (Mikesell, 2002). For the beneficiary, the results are monetarily equivalent, while the expenditure does not show up on local budgets and doesn't impact revenue limits or equalization grants. Suppose, for example, a redevelopment project requires $1 million in public assistance for infrastructure or land assembly. If the local government expended $1 million for the project, that would show up on its balance sheet. If, however, the local government gave tax credits of $1 million, this wouldn't necessarily show up as a separate line item on its budget, even though revenue forecasts should reflect the credit. Because they rarely show up in the expenditures or revenues accounting framework of local governments, these "tax expenditures" may be left out of local fiscal analyses. Tax expenditures are a way for local policymakers to favor important local constituencies (e.g. exemptions for seniors) or to recruit additional economic development (discretionary tax abatements). As a mechanism for providing public services, tax expenditures may constitute a significant component of the provision of local public services in some jurisdictions, which might make cross sectional expenditure and revenue comparisons potentially misleading.

Regulatory provision of services also constitutes an important and significant component of the portfolio of local public services, not included in fiscal analyses. For example, a nationwide trend has been the increased demand and pressure placed on local governments to provide local environmental protection and open-space and recreational opportunities. In terms of local environmental protection, local governments could raise revenues and make expenditures to purchase environmentally sensitive land such as wetlands. Or, through zoning and permitting regulations, local governments could preserve environmentally sensitive lands, without any

[7] Alternatively, maintenance, operation and repair responsibilities for on-site infrastructure can be controlled by a private homeowners association, with assessments on individual lot holders. In this case, mandated "public" services are provided without public expenditure. In fact, some have argued that local governments increasingly mandate homeowner's associations in response to local fiscal stress. This area is a growing controversy in the fiscal effects of development, because residents of homeowner associations who provide "public" services through private means feel as if they are paying double (through both property taxes and homeowners-association assessments) and should receive some tax rebates. Just as developers who dedicate on-site infrastructure may be eligible for proportional credits on impact fees, so residents of these communities are sometimes pressing for refunds from property taxes.

[8] Although, again, a municipality may have the ability to levy special assessments for neighborhood-specific infrastructure repairs.

"direct" fiscal expenditure. In both cases, the local service of environmental protection is provided, but only the purchase would show up in fiscal analyses. Similarly, the provision of the local service of "health and safety" includes a large number of regulations carried out by public health services, code enforcement, and the like. In some communities, services such as solid waste (trash) may not be provided publically, while the city requires each homeowner and business to contract their own trash provision. In this case, solid waste removal services are provided, but through regulation not public provision. Again, comparisons across places that fail to account for regulatory provision of public services may incorrectly specify the relationships between land use and expenditures.

## 2.3 Regional Context and Intergovernmental Relations

The observed pattern of land uses, expenditures and revenues within a jurisdiction occurs in the context of the regional economy, the mobility of households and capital, and reflects intergovernmental relations. Intergovernmental relations include both horizontal -- competition with neighboring jurisdictions -- and vertical relationships with the state and federal governments. For purposes of characterizing the initial equilibrium and therefore the effects of land use change on local finance, these four external factors seem most important to specify: intergovernmental relations, mobile households, mobile capital, and the regional economy.

### 2.3.1 Intergovernmental Relations

#### *2.3.1.1 Intergovernmental Relations: Vertical*

State governments through enabling legislation or home-rule charter provisions specify the structure of local government finance and land use in a number of ways. Based on history, law, court decisions and political culture, the structure of local government finance and service provision varies greatly from state to state. This variety should lead to some caution in making empirical or theoretical generalizations across states absent a more robust understanding of institutional contexts.[9] In this section we briefly highlight 5 structural areas of potential variety across states.

First, state governments assign functional service provision requirements and obligations among different governmental levels. For example, in some states, local governments have responsibility to conduct real-estate assessments or to provide public health and welfare services, while in other states these may be county responsibilities. Second, state-enabling legislation defines the types of taxes local governments may, may not, or must collect, with specifications as to the composition of the tax base, and limits on tax rates. For example, some states enable local governments to levy local option income taxes, and other states allow local governments to collect a portion of *in situ* sales taxes. Third, states specify the terms and conditions of public employment, particularly in requirements for public employee compensation and benefits.

[9] We can actually push this argument further to suggest that national-level studies examining the link between land development and local finance are misleading because of the great variation in state institutional structure.

Because public employee wages and benefits constitute a substantial portion of local government budgets, local governments may feel as if they do not have control over their costs. Pension calculations or benefit eligibility changes (through state legislation or court cases) can provide significant fiscal challenges to local governments.[10]

Fourth, many states impose something like TELs (tax or expenditure limitations), super-majority or referenda requirements on local governments, and other local budget process requirements. These constraints on local fiscal decision-making can alter the effects of land development on actual fiscal outcomes. Understanding the decision making structure of local governments under TELs or super-majority requirements has frequently been difficult, and therefore are treated inconsistently by many fiscal analysts. In some cases, the effect of TELs on the relationship between land development and actual expenditures is likely to be significant. For example, suppose that a large land development would provide revenues and/or generate expenditures, which would cause a local government to exceed its assigned cap. In such a case, the marginal impact of the land development would be different than in a community further away from their cap.

Fifth, state governments significantly impact local finance through revenue sharing, grants, school aids, equalization formulas and the like. Because outside-source revenues often play such an important role in local government budgets, and therefore significantly alter land use and fiscal decisions, this is perhaps the single greatest area of impact on local budgets by relations with the state government. Fiscal analyses of local governments should therefore pay careful attention to the structure of outside source revenues, including projections of the likely impact of land development proposals on outside-source revenues. One area of great difficulty has been projecting the impacts of land development on state aids or equalization grants; especially where such formulae depend on property tax based fiscal capacity and fiscal effort. For example, while a large non-residential development may appear to add to the tax base of a community without an increase in school children, this change in the tax base per student may cause the school districts' equalization aid from the state to decline (Gottlieb, 2006; Huddleston, 2009).

#### *2.3.1.2 Intergovernmental Relations: Overlapping Jurisdictions*

A second area of intergovernmental relations involves overlapping-jurisdictions. Many governments may levy taxes on the same tax base (particularly property taxes) and make expenditures in areas in which other governments overlap. A common example is that a city, a county, a school district and any number of special-purpose governments levy property taxes on the same property. Land use decisions taken at the city level (for example, to approve a large residential subdivision) affects the school district's expenditures and revenues, while the school district has no control over land use. Metropolitan sewage districts may open up new lands for development through sewer extensions, imposing potential future revenue and expenditure changes on municipal governments and school districts. Most fiscal analysis techniques do try to project revenues and expenditures for all of the overlapping jurisdictions, in an effort to try to

[10] This example anticipates a point later in this paper: there may be substantial impacts on local revenues or expenditures which exist outside of any land use change. Because most fiscal impact techniques, by definition and in an accounting framework, assign all expenditures to land use classes, they are unable to capture expenditure changes which do not result from land use changes.

capture some of these coordination problems. However, there is always the concern that the results of a fiscal analysis conducted by the jurisdiction with responsibility to approve or deny a land development request may still lead to an approval (denial) when such approval (denial) may actually be fiscally harmful (beneficial) to overlapping jurisdictions. Likewise, a more general concern is that reliance on fiscal criteria in development approval may lead jurisdictions to approve or deny more development than is regionally efficient.

#### *2.3.1.3 Intergovernmental Relations: Horizontal*

A third area of intergovernmental relations ("horizontal") refers to governments of the same type (county, municipal, school, etc.) within the same region. Many scholars have posited that local governments compete with one another for mobile households and desirable tax bases, particularly those land uses thought to generate a "fiscal surplus" with good "ratables" (Alesina, Baqir, & Hoxby, 2004; Bayer, McMillan, & Rueben, 2004; Bell et al., 2004; Bradbury & Stephenson, 2003; Brueckner, 1999; Fischel, 1999, 2001a; Gottlieb, 2006; Heikkila, 1996; Ross & Yinger, 1999; Tiebout, 1956; Wassmer, 2002). Local governments may compete through a variety of tax exemptions, tax expenditures, infrastructure projects, TIFs, etc. This competition may limit the ability of one community to finance desired services through higher taxes if neighboring jurisdictions keep their tax rates lower. The decisions of nearby local governments can have tremendous influence on the land use and public finance patterns of all other local governments. While the more common influence is in spillover effects (traffic congestion, changing demand for housing, etc.) across borders, competition among municipalities in the form of "ratable chasing" behavior can significantly impact land use and finance decisions (Gottlieb, 2006). It is frequently the case in fiscal impact analysis that the competitive local fiscal environment is not analyzed. Thus, for example, a forecast may simply project linear revenue increases while such increases may not actually result because competitive pressures force the local government to hold revenues constant.

### 2.3.2 Mobile Households

One of the most significant external constraints on local public finance is the fact that households are mobile. When households purchase a housing unit, they also "purchase" the local public goods attached to that house, both neighborhood amenities and local public services like schools, police, water, etc. Because households have a number of different communities to chose from within a metropolitan area, they are often able to "shop" or "vote with their feet" for the community with the mix of taxes and expenditures (and socio-economic and demographic composition of neighbors) which most closely approximates their demand for public goods. Mobile households thus play an important role in determining the levels of public goods provided by local governments. Communities try to compete for – or exclude -- mobile households, and this may impact the overall level of public expenditure, and is likely to bias local governments away from redistributive social services. The literature is unclear, however, whether the aggregate effect of this competition is beneficial. Because of the nature of many fiscal impact techniques (to account only for direct expenditures in an accounting framework), considerations of the dynamic nature of inter-jurisdictional competition and mobile households are not usually included, despite the rich empirical literature linking the sorting of households by public service demand characteristics to local public service levels.

### 2.3.3 Mobile Capital

Just as household mobility acts as an external constraint on local fiscal policy, so too does capital mobility. Businesses and investment can choose from a number of communities in which to invest, and thus municipalities compete to attract businesses. Likewise, if taxes in one municipality become too high, businesses can move to other municipalities (or even other regions or countries). The mobility of capital suggests that business tax rates will be kept low and that municipalities will compete for mobile capital. Like with competition for desirable land uses, "ratable chasing" behavior can significantly affect local land use decisions. Competition for mobile capital can directly impact the types of revenue instruments chosen as well as expenditure priorities.

### 2.3.4 The Regional Economy

The fourth category of external constraints on local land use and public finance decisions is the structure of the regional economies in which the jurisdiction is located. Whether a city is small or large relative to the metropolitan area, the demand for housing will be driven by regional employment and income trends, as well as national interest rates. Wages paid to municipal employees will be a function of regional labor markets, regional wage and unemployment trends. The cost of capital for borrowing (bonds) will be determined by national economic trends and interest rates. The demand for commercial, industrial, and office development as well as employment levels (and corresponding service demands and tax revenues) will vary with secular trends in the regional and national economies.

Because the regional economies in which they are embedded are "open" relative to the national economies, substantial components of local government budgets are beyond its direct control. One of the main implications of this openness for the analysis of local fiscal conditions is that a whole range of exogenous macro-economic and regional-economic shocks alters local government expenditures, costs and revenues. These exogenous changes cannot be accounted for nor explained by reference to land development or land use change. To the extent to which a fiscal impact analysis attributes all expenditures and revenues to specific land uses, these analyses may have difficulty accounting for exogenous changes in expenditures or revenues independent of land use change.

A downturn in the macro-economy which reduces housing prices and consumer demand will reduce local government revenues, while perhaps also increasing the demand for ameliorative social services. Conversely, rapid growth in the national or regional economies may put upward pressure on housing prices and lead to rapid fiscal surpluses in local governments. Because local governments are usually required to maintain fiscal balances, and face political pressure to increase spending and/or cut taxes during periods of fiscal abundance, local government budgets can be thought of as "counter-cyclical" (Dye, 2004; Pagano, 2002). While the inability of most local governments to smooth revenues and expenditures over longer term macroeconomic cycles poses significant challenges to fiscal management, this same volatility implies that fiscal impact analyses which utilize linear projections of revenues and expenditures are subject to potentially large errors. Because most projections of future revenues and expenditures in fiscal impact

analyses have difficulty projecting macroeconomic volatility, actual revenues and expenditures in any one-time period may be significantly different than forecasted.

## 2.4 Characterizing Existing Expenditure Patterns

In the previous sections, we outlined some of the actors involved in local public finance decision making, as well as outlining how intergovernmental relations and mobile households and capital represent the institutional structure and regional context in which local finance decisions are made. Now we are able to turn our attention to a fuller description of the pattern of expenditures within a community. The existing pattern of expenditures by local governments represents the evolution of interactions between the 6 actors mentioned in section 2.1 and in the context of intergovernmental relations and the regional economy as in section 2.3. The fiscal analyst seeking to understand expenditure patterns may only have available actual expenditure data, by service category, for the city as a whole, as reported in either budget documents, year-end financial statements, reports to the state government or census data. Even though expenditure data may show magnitudes for each service category, per capita expenditure trends, and change in expenditures over time, by themselves expenditure data do not indicate the fundamental determinants of local public expenditures. It is thus to the process of expenditure determination that we now turn.

At the outset, it is very important to clarify terminology because of frequent confusion in discussions of local public finance, particularly the difference between "***costs***" and "***expenditures***." Although these terms are frequently used interchangeably, care must be taken to be precise about the distinction. As has been frequently pointed out, data simply do not exist consistently on local government input costs. Instead, reported data represent only *expenditures*. When expenditure data is compared across places or across time and used to make statements about costs, the data are being used incorrectly. This confusion is seen, for example, when policy makers or the public observe that expenditures in a place have increased or that some places have higher or lower expenditures than others. This comparison is used to imply that higher expenditures mean higher costs.

Expenditure data, however, represent the ***product*** of the per-unit costs of public goods multiplied by the number of units of the public good produced (Ladd, 1994, 1998). Differences between places in terms of expenditures may reflect different per-unit costs, but may just as likely represent different levels of service or different number of units of a public good produced. Newly developed and lower-density places tend to have higher income residents, while denser, older communities tend to have lower income residents. Thus, since local public service expenditures are income elastic, it would not surprise us to find higher levels of expenditure in more "sprawling" places. However, it is certainly not possible to conclude from this result that the density of development is related to public service ***costs***.

An illustration from local police expenditures can illustrate the distinction between costs and expenditures. Local residents who control expenditure determination have a demand for a certain level of "public safety"[11] -- that is, the experience of being safe from crime. If we could have access to detailed police department accounting data, we could measure input prices or

[11] In empirical studies, this is often the inverse of the crime rate.

"costs" in terms of police employee wages and benefits, capital and current costs of buildings, patrol cars, fuel, materials and supplies, etc. We could measure labor-input ratios such as number of police officers per capita, as well as measuring "outputs" such as number of patrols, response rates, arrest rates, case clearance rates and the like. We could also measure "outcomes" such as the crime rate or insured losses to property. Generally, however, across jurisdictions or across time within a jurisdiction we only have data on total police expenditures. Expenditure information is indeterminate with regard to "costs." One municipality may spend more per-capita on police because it is adjacent to a higher-crime area and needs to spend more to produce a desired level of the "public safety" outcome. Another municipality may spend more on police per capita because its costs per labor input are higher. Yet another municipality may spend more on police per-capita because it is a wealthy community with a low crime rate, but public safety is an income-elastic public good and higher income residents pressure their community to produce a higher level of safety. Two communities may spend the exact same amount on police and have the same crime rate, while one community faces higher wage costs and thus uses more technology per officer or fewer neighborhood patrols, while the other community uses more officers on the streets.

Analyses of the fiscal impacts of land development should therefore maintain clear definitions and distinctions between costs and expenditures. Projections of anticipated expenditure changes associated with additional land development should clearly specify to what extent expenditure changes are projected based on assumptions of changes in per-unit costs and assumptions of changes in number of service units to be provided.

Having now clarified the distinction between costs and expenditures, the purpose of this section is to provide an understanding of the level of expenditure within a municipality. The observed level of expenditure within a municipality should be a function of the socio-economic and demographic demand characteristics of residents, visitors and businesses, the costs per-unit of service, costs of capital, revenue constraints, and legal and institutional structures. We can describe the process of determining the level of expenditure in a community as resulting from the determination by the policy body (city council) of the level of spending which will provide the highest level of service to meet demands, constrained by costs, institutional rules, mobile households and mobile capital, and revenue availability.[12] In practical terms, leaving institutional structure and regional contexts constant, empirical work to explain variations and patterns in local government expenditures has focused more on the "demand side" of socioeconomic and demographic tastes and preferences, and less on the "supply side" of the production function of local public services.

The empirical and theoretical literature on the determinants of expenditures in local governments can be characterized as "expenditure demand" studies (Bradbury & Stephenson, 2003; Bradbury, Mayer, & Case, 2001; Ladd, 1998; Merrifield, 2000; Shadbegian, 1998; Sjoquist, Walker, & Wallace, 2005). These studies use the analytic techniques of consumer demand studies, combined with the assumption that household sorting into communities based on preferences serves as a "demand" or "preference" revelation mechanism. Households' "demand" for local

[12] This heuristic description obscures the body of work which argues that expenditures and revenues are simultaneously and jointly-determined, rather than taking the level of revenue as given (Gill & Haurin, 2001). A discussion of this complication is beyond the scope of this paper.

public services should approximate the level of service offered in their community, or they would move to a different community more closely matching their underlying demand for services. Thus, the level of expenditure within a community should reflect the demand characteristics of its population, and these demand characteristics are empirically represented by the socioeconomic and demographic characteristics of the population. Beginning with pioneering studies in the early 1970's (Bergstrom & Goodman, 1973; Borcherding & Deacon, 1972), local public goods have been studied using this consumer demand framework. Empirically, local public goods have been found to exhibit more of the characteristics of private goods (particularly congestability and rivalry in consumption) than of "pure" public goods, lending some credence to analyzing the demand for local public goods within a consumer demand framework.[13]

To put some context on discussions of expenditures, Table 1 below presents summaries of local government expenditures across the United States for fiscal year 2004-2005. While there is considerable difference across local governments as to the composition of expenditures, the major categories of public expenditure are education, social services, transportation, public safety, administration, and infrastructure/utility services. For purposes of the census data, counties, municipalities and school districts are summarized as "local governments." By far, the largest category of current and capital expenditures are for elementary and secondary education, followed by infrastructure/utility services (water supply, wastewater treatment, solid waste, electricity, gas) social services, public safety and transportation.

[13] The concept of "demand" for local public goods is not, however, without controversy, especially given the various welfare and equity considerations involved in those local public goods, such as education or public safety which many people think should be treated as "merit" goods rather than "benefit" goods.

Table 1. Local Government Expenditures (2004-2005)

| | All U.S. Local Governments | Percent of Expenditures | Percent of Capital Outlays |
|---|---|---|---|
| Direct general expenditures and utility expenditures | $1,272,006,424 | | |
| Interest on general debt | $46,617,464 | 3.66% | |
| Capital outlay | $152,947,917 | | |
| | | | |
| **Education:** | **$497,426,812** | **39.11%** | |
| Higher education | $29,711,251 | 2.34% | |
| Capital outlay | $3,082,480 | | 2.02% |
| Elementary & secondary | $467,715,561 | 36.77% | |
| Capital outlay | $54,038,806 | | 35.33% |
| Libraries | $9,394,832 | 0.74% | |
| **Social services and income maintenance:** | **$141,512,479** | **11.13%** | |
| Public welfare | $44,712,587 | 3.52% | |
| Hospitals | $60,989,787 | 4.79% | |
| Capital outlay | $3,789,141 | | 2.48% |
| Health | $35,804,607 | 2.81% | |
| **Transportation:** | **$104,751,499** | **8.24%** | |
| Highways | $48,112,256 | 3.78% | |
| Capital outlay | $18,106,383 | | 11.84% |
| Air transportation (airports) | $17,031,470 | 1.34% | |
| Parking facilities | $1,387,197 | 0.11% | |
| Transit | $35,480,413 | 2.79% | |
| Sea and inland port facilities | $2,740,163 | 0.22% | |
| **Public safety:** | **$121,077,230** | **9.52%** | |
| Police protection | $64,662,110 | 5.08% | |
| Fire protection | $30,738,976 | 2.42% | |
| Correction | $20,885,203 | 1.64% | |
| Capital outlay | $1,131,626 | | 0.74% |
| Protective inspection and regulation | $4,790,941 | 0.38% | |
| **Environment:** | **$34,834,508** | **2.74%** | |
| Natural resources | $7,441,012 | 0.58% | |
| Capital outlay | $1,740,668 | | 1.14% |
| Parks and recreation | $27,393,496 | 2.15% | |
| Capital outlay | $7,275,971 | | 4.76% |
| **Housing and community development:** | **$35,037,331** | **2.75%** | |
| **Governmental and judicial administration:** | **$61,420,365** | **4.83%** | |
| **Infrastructure/Utility services** | **$152,366,349** | **11.98%** | |
| Water supply | $45,636,724 | 3.59% | |
| Electric power | $46,225,058 | 3.63% | |
| Gas supply | $7,168,181 | 0.56% | |
| Sewerage | $35,254,120 | 2.77% | |
| Capital outlay | $13,616,183 | | 8.90% |
| Solid waste management | $18,082,266 | 1.42% | |
| Capital outlay | $1,527,127 | | 1.00% |

Source: U.S. Census, State and Local Government Finances, Dollar amounts are in thousands.

## 2.5 Characterizing Existing Revenue Patterns

Analysis of the revenue side of local government budgets is usually more analytically straightforward than on the expenditure side. Categorizing revenue patterns amounts to examining patterns of revenue sources, tax base compositions, and tax rates. First, local government revenues can be divided into own-source and outside-sources. Outside-source revenues include grants and aids from state and federal governments. Depending on the state institutional and budget structure, outside source revenues can range from a few percent to well over 50 percent (for example, for school districts in high equalization states.) Own-source revenues are further divided into taxes, fees, and user charges.[14] The main sources of local government tax revenues are property taxes, local option income taxes, and local sales taxes. In many states, sales taxes only accrue to the state and are not allocated to municipalities *in situ*. Table 2 presents aggregate U.S. data (over all local governments) on own-source revenues.

Table 2. Local Government Revnue Sources (2004-2005).

| | All U.S. Local Governments | Percent of Revenues | Percent of Tax Revenues |
|---|---|---|---|
| Own-Source Revenues | $708,901,221 | | |
| Own-Source Tax Revenues | $448,273,481 | 63.23% | |
| Property Taxes | $324,328,967 | 45.75% | 72.35% |
| Sales Taxes/Gross Receipts Taxes | $71,830,490 | 10.13% | 16.02% |
| Individual Income Taxes | $20,675,556 | 2.92% | 4.61% |
| Corporate Income Taxes | $4,446,941 | 0.63% | 0.99% |
| Motor Vehicle Taxes | $1,433,269 | 0.20% | 0.32% |
| Other Taxes | $25,558,258 | 3.61% | 5.70% |
| Current Charges | $185,454,628 | 26.16% | |

Source: U.S. Census, State and Local Government Finances, Dollar amounts are in thousands.

As indicated on Table 2, of local government own-source revenues, more than 63 percent of these revenues come from taxes, while 26 percent come from user fees or other charges. There is substantial variation, of course, from state to state and city to city. Table 2 also indicates that of local own-source tax revenue, the dominant source (almost 73 percent) is the property tax, while 16 percent comes from sales taxes and just over 5 percent comes from personal and corporate income taxes.

The composition of the property tax base (including assessment practices, mandatory exemptions, and the like) is defined by state law, and state law may also specify maximum rates or specify procedures for rate increases. For the fiscal analyst, parcel-specific assessed property values are public information; it is reasonably easy to specifically attribute property tax revenues to specific parcels. Attributing sales tax or income taxes to specific land uses proves to be more complicated unless we have specific data on wages or sales for specific business parcels, or income data for specific households.[15] In practice, revenues by land use category are often estimated based on aggregate data. While attributing specific revenues to specific-parcels of land

[14] Of course, there are more sources of revenues, such as fines, lotteries, sale of public property, etc.

[15] Local income taxes in the census can include "income taxes" collected from residents at place of residence or "wage taxes" collected at place of employment.

uses is somewhat straight forward, we often do not have similar data at the expenditure level. Apportioning expenditures to specific parcels or land uses requires more assumptions.

In addition to characterizing the sources of local government revenues from own-source taxes, own-source fees and outside source revenues, an understanding of the relationship between land development and revenues requires an examination of the composition of each tax base relative to the distribution of land uses. Generally speaking, for cities with heavy reliance on the property tax, the percent of the tax base in residential and non-residential development is a key variable of interest. As above in section 2.1.4, the percent of the tax base in non-residential development represents the "tax price" of an additional dollar in local property tax revenues to local residents. Because states have some version of "uniformity" provisions that requires all parcels to be taxed at the same property tax rate regardless of use, if non-residential parcels comprise 20 percent of the property tax base, 80 cents of every dollar raised in property taxes comes directly from residents while 20 cents comes from businesses.

When communities have multiple tax bases to use (e.g. property and income taxes, or property and sales taxes), the distribution of land uses and the composition of the community plays an important role in the tax effort directed at each tax base. In a study of Ohio school districts, which are statutorily enabled to levy both property and income taxes (Gill & Haurin, 2001), it was found that, all other things being equal, voters actually prefer property to income taxes. However, when farmers dominate the demographics, districts are more likely to choose income taxes. And, when there is a substantial non-residential property tax base, voters are more likely to choose property taxes. Analysis in western states (with *in situ* sales taxes) suggests that municipalities will prefer non-residential land uses to residential land uses (Lewis, 2001; Wassmer, 2002).

In practice, most fiscal impact analyses are able to understand and characterize own-source revenues sources because specific revenue sources can more easily be assigned to specific land uses. For this reason, projecting the changes in direct own-source revenues associated with land development is reasonably straightforward. Based on assumptions about projected changes in tax rates, estimates of actual revenues can be arrived at. However, this does not mean that projections of outside-source revenues are as straightforward. Because many states use complex equalization formulas which rely on formulas of market and assessed value, significant land development which alters aggregate property values within a municipality may have substantial effects on equalization aids.

### 2.6 Characterizing Initial Debt Levels

For local governments, financing capital facilities frequently entails substantial debt service through bond markets. Debt financing for capital infrastructure is a mechanism whereby future residents who will benefit from the infrastructure services share in paying for capital facilities. In the situation of an "initial equilibrium," the level of debt (and debt payments out of current revenues) in the municipality would be a function of capital financing decisions in previous years. The effects of future land development on the municipality will therefore also be a function of the existing debt levels and debt ratings. If, for example, a municipality is already at a high debt level, it may be unwilling or unable to finance new or improve existing capital

facilities. In such a situation, new land development may lead to congestion of existing capital services, such as overcrowding of schools or roadway congestion. Alternatively, if a municipality has high existing debt levels, new facilities required to service new land development may come at increased borrowing costs because of lower bond ratings. Although debt financing is a way for municipalities to smooth the costs of lumpy new capital investments over many years, previous debt burdens may reduce the ability for additional infrastructure to service new land development.

In thinking about the relationship between different land uses and the debt burden of a municipality, there are a number of comments to be made. First, just as the choice of which tax base to utilize is influenced by the land use distribution, so too are debt decisions. Residents of a city may be more likely to pass a referendum to build a new community facility (one which primarily benefits residents) if the burden of future debt payments will be spread across a larger non-residential tax base. Existing residents might be more likely to choose debt instruments for financing if they believe that new land development and new residents will pay a larger part of the future debt service. If impact fees are available, current residents may prefer impact fees for capital facilities to debt financing. If capital facilities built with debt financing serve existing residents but are paid for through future debt service from property tax payments of future residents, there is at least some partial subsidy of existing residents by future residents. Conversely, if facilities are paid for out of current property taxes, existing residents may subsidize future residents.

## 3. The "production function" of local public services

The previous section examined the actors involved in determining the levels of expenditures and revenues in the local public sector, and examined the determination of levels of expenditure. These are the necessary building blocks to trace the effects of land development through the local public finance system. However, before being able to move on to examining the fiscal impacts of land development, it is necessary to "open the hood" and examine even more closely the production function of public services: the relationship between inputs, outputs and outcomes. If the determination of public expenditure and public service levels through resident preferences represents the "demand" side of the equilibrium concept, the production function of local public services represents the "supply" side.

Economically speaking, the term "production function" is used to describe the underlying technological relationships by which firms translate "inputs" (labor, capital, energy, materials, etc.) into "outputs." Production functions are representations of the underlying technology and firms make decisions (maximizing profit and minimizing cost) based on the interaction between their technologies, factor input prices, and output prices. The concept of a production function can be a helpful heuristic in understanding local government service provision, but not without some complications.

It is important to emphasize that the observed patterns of expenditures by a municipality (such as the amount spent on education or police or water treatment) will be a combination both of voters' desired level of public service (test scores, crime rates, water quality etc.) and the underlying "production function" by which local governments transform inputs (teachers, police officers,

water treatment plants) into desirable public service outcomes.[16] Thus, as before, a high level of expenditures in any municipality may reflect either high levels of service demand, high per-unit costs, or both. Without a clear theoretical understanding of both of these characteristics (service-level determination and the production function,) it is difficult to understand the observed relationship between land use and expenditure patterns.

However, before an exposition of the production function of local public services, it is important to define clearly the concept of "level of service," particularly because this term is often used differently by planners and public finance economists. All fiscal impact analyses make some type of assumption about "levels of service" (LOS) projecting the expenditure impacts of land development. Within the economics literature, general terms such as "service levels" or "service quality" or similar terms are used. Planners and engineers tend to use the very specific term "level of service" (LOS), a more technical term derived originally from earlier engineering work on roadway traffic volumes. Although the LOS concept originated in traffic engineering, it has been more applied in planning to everything from parks to housing to air quality to bicycle friendliness or transit accessibility. For many major services categories such as traffic, police, fire, wastewater, etc., LOS standards are derived from either national professional-technical organizations or federal regulatory institutions. (e.g. AASHTO, ICMA, Safe Drinking Water Act, etc.) For example, AASHTO design guidelines measure roadway capacity level-of-service as a function of volume to capacity. ICMA publishes guidelines on police officers per capita. The Public Library Association publishes recommended levels-of-service standards for number of materials and/or library square footage per capita. The National Recreation and Park Association (NRPA) have levels-of-service standards for parkland per capita. The National Fire Protection Association produces level of service scores based on staffing (per capita) and response times. Virtually all areas of local government services have seen the proliferation of LOS standards, and to the extent that local government comprehensive plans and fiscal studies specify a planner LOS in response to land developments, this is an improvement from ad hoc policy making. Compendiums of different level-of-service standards are available (American Planning Association, 2006; Heikkila, 2000; Nelson, 2004).

But the concept of LOS is not without complications in the arena of local public goods. LOS standards are often what economists would call "input ratios" (the most notable examples are labor input ratios such as teacher-student ratios or police officers per 1000 people). Sometimes LOS standards are specified as to what we call "outputs" (teacher-student contact hours, response times, number of crimes solved, acres of parkland provided) and sometimes LOS standards are specified as to what we call "outcomes" (how congested a roadway is, test scores, levels of public safety).

When the "level of service" which is the referent for service quality is outcome-based, the level of service results not only from the units of the service produced by the local government, but also on cost characteristics of the local population. For example, how congested a roadway is depends not only on the amount of local spending on roads, but also depends on peoples' driving habits. Test scores depend not only on educational expenditures but also on student socio-

[16] A further complication from the world of production economics, not covered in this exposition, is the endogeneity of output. There is good reason to believe in local public finance that output levels (level of service) are endogenous to factor input prices, which complicates standard production estimation.

economic status. Public safety depends not only on police expenditures but also on the propensity to commit and propensity to report crimes. Households who demand public goods do not receive utility from labor-input ratios, but rather from outcomes. That is, formally, the level of service enters into household utility functions. Because measuring the utility households receive from different levels of service is difficult, analysts are often forced to use strong assumptions about planned levels of service.

The economics literature has long recognized the difference in local public goods production between various types of outputs, but its presentation has often been confusing in terminology. One early paper in this line of research (Bradford, Malt, & Oates, 1969) makes a distinction between what they call D-outputs and C-outputs. D-outputs are what are directly produced by the local public sector, while C-outputs are the "outputs" of interest to voters, which enter into household utility functions. C-outputs are thus a function of D-outputs and the socioeconomic characteristics of the residents (Schwab & Oates, 1991). This same terminology, D and C-outputs is found in Schwab and Zampelli (1987) and Schwab and Oates (1991). In a survey of the public finance literature, Duncombe (1996) references this previous work, but refers to these as G-outputs (direct government activities) and S-outputs (outputs of concern to voters). A more helpful terminological presentation is by Helen Ladd, who summarizes this literature and presents the terms "inputs," "outputs," and "outcomes" (Ladd, 1998).

What voters and citizens are interested in (we might awkwardly call it "levels of service as experienced" or "quality levels of service") we term "outcomes." Safe streets, good-tasting unpolluted water at adequate pressure levels, uncongested roads, high test scores, public safety, accessible and well-maintained parks -- these are what voters and citizens care about. Residents care about the level of public safety experienced and the quality of schools, not "labor input ratios" such as police officers per 1000 population or teacher-student ratios.[17] Moreover, citizens care about the crime rate in their neighborhood or the quality of their school, not the average crime rate in the city or district-wide average test scores. What voters care about are "outcomes" but outcomes are the end result of the complicated process of local public service delivery as it interacts with the characteristics of the population.

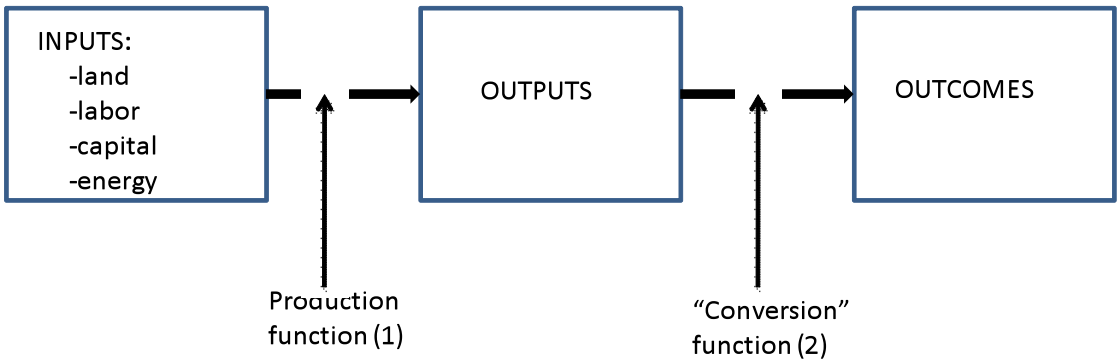
What the local public sector produces are "outputs." Outputs represent the transformation of inputs (labor, capital, energy, land, etc.) through the production function, and represent the efforts put forth by public agencies. Outputs range from million gallons of water treated per day to number of police patrols, to lane miles of roads provided, to teacher-student contact hours.

We call "inputs" what in traditional production analyses are also considered "inputs": land, labor, capital, and energy. These inputs are what show up in local government budgets and expenditures. Aggregate expenditures on police, for example, represents labor costs for police officers, capital costs for buildings and patrol cars, fuel costs for patrols, materials costs for paper and handcuffs, etc. The observed expenditures on police represent the number of input units (labor, capital, and fuel) multiplied by the cost per input unit (hourly wage, operating cost per square foot of building, etc.). In the production of "education," inputs would be labor payment to teachers, capital spending on schools, fuel for school busses, etc. while for "water quality,"

[17] There is advocacy for "smaller class sizes" which is the same as reduced teacher-student ratios. Such advocacy sees teacher-student ratios as proxies for school quality.

inputs would be labor payments to workers and capital spending on pipes and treatment facilities, etc. Public service providing agencies will use labor and capital inputs, combined with energy (fuel, electricity, etc.) and materials (text books, gauze pads, and weapons) to provide public service outputs.

In a simple diagram, the relationship between inputs, outputs, and outcomes looks like:




Traditional "production function" analysis in economics maps the relationship between what we are calling "inputs" and "outputs," indicating how different inputs can be combined to produce a given level of output. This relationship is shown as "production function (1)" in the diagram above. There really is no common analog in production analysis of the relationship between "outputs" and what we are calling "outcomes" as shown above by what we call the "conversion" function (2).[18]

Under production function (1), mapping inputs to outputs, there exists a range of tools and analyses to characterize this function. For example, embedded in the production function can be economies of scale, economies of scope, network economies, economies of density, elasticities of substitution between inputs, factor input demands, and the elasticity of output with respect to factor input prices. The Conversion function (2) would include specific environmental cost variables, congestion effects, and economies of density again.[19] However, probably the most important factor mapping outputs to outcomes is the socio-economic and demographic characteristics of the population itself. That the characteristics of the service population is an

[18] The term "conversion" function is, admittedly, imprecise and stylistically infelicitous.

[19] To see why economies of density shows up in both production function (1) and the conversion function (2), consider police services. Under the production function, economies of density may indicate that, for a given level of inputs (police officers and patrol cars), more population can be provided services in shorter time because of density. That is, with people living in close proximity, officers can "cover" more persons per hours driven than in more spread out areas. However, density can also show up as a environmental cost variable as one of the socioeconomic/demographic characteristics of the population. Density may affect the propensity to commit crimes, either because more people in close proximity provide better targets, or because of a perception of anonymity or social dislocation, etc. If density leads to isolated social networks, it may take more officer-hours to track down crimes than in communities where there are strong social networks for information. These factors may produce diseconomies of density in terms of public safety. The literature on density and public service costs has never attempted to isolate economies of density in production function with (dis)economies of density in the conversion function.

important component of the production of public service outcomes has been recognized at least since Bradford, Malt and Oates (1969). See also Schwab and Oates (1991) and Schwartz (1993).

To illustrate this relationship, consider again the production of "public safety." As above, the most common "outcome" measure of public safety is the inverse of the crime rate and property loss. This measure is based on reported crimes and property losses and does not include residents' perceived fear of crime – which may actually be more important in service level determination and the political distribution of policing services across neighborhoods.[20]

Again, the labor inputs of providing public safety are payments to police officers and other administrative support personnel in police departments. Capital inputs would include police cars, computers and technology, weapons, police stations, jails, etc. Outputs here would include such things as number of patrols made, number of arrests made, response time to calls, number of investigations conducted, etc. The production function, which maps inputs to outputs, would express the elasticity of substitution of labor for capital in producing outputs. Police services are generally labor intensive, but there is some ability to substitute capital for labor, for example as in traffic and security cameras. Departments could also, for example, increase the number of patrols by purchasing more police cars and sending out patrols of single officers.

The environmental cost characteristics of the city and the socio-economic/demographic characteristics of the population influence the process by which outputs are mapped to outcomes. The exact same number of officers and patrol cars, for example, when applied to a less-dense city may result in fewer patrols or reduced response time to calls than in a denser city, all other things being equal. Density is just one of many environmental cost factors, although frequently suggested as the most important, but cities with large ports or rivers or specialized gambling or athletic facilities may require more or fewer officers to produce the same desired level of service.

However, the main factor in the relationship between outputs of policing services and the outcome "public safety" is the propensity of citizens (or visitors) to commit crimes. It is actually better here to refer to the propensity of residents and visitors to commit crimes within the jurisdiction rather than the "crime rate," because the crime rate only measures actual crimes. Indeed, if one of the main purposes of public safety services is crime suppression, then a large expenditure of police resources can suppress potential crimes, resulting in the appearance of a low crime rate. The difficulty from an analytical standpoint is that we have no data observations on crimes that don't occur. We may observe larger than proportional increases in police expenditures in a jurisdiction either in response to or in anticipation of a potential increase in crime.

### 3.1 Production Function: Mapping Inputs to Outputs

It is worthwhile here to specify more fully the production function that maps inputs to outputs. Specifically, in this section, we will explain economies of scale, economies of scope, network economies, economies of density, and the elasticity of substitution between inputs. Economies of scale are common in production analysis. Economies (diseconomies) of scale arise in those

[20] This fact may partially explain why many upper-income communities tend to "over-provide" police services relative to objective crime-rate measures.

regions of the production technology where average costs are greater than (less than) marginal costs or equivalently where the marginal cost of producing an additional unit of output decreases (increases) with the volume of the output. Alternatively, and perhaps more intuitively, economies of scale (diseconomies) occur where a given percent increase in inputs leads to more than (less than) that percentage increase of outputs. Within local public goods, while there is evidence that many capital-intensive public services (such as water supply, wastewater, utilities, etc.) exhibit substantial economies of scale, there is ambiguous evidence for labor-intensive public services such as education or public safety (Callan & Thomas, 2001; Duncombe & Yinger, 1993; Hopkins, Xu, & Knapp, 2004; Ladd, 1998; Torres & Paul, 2006).

Economies of scope are less commonly estimated for public goods. For firms, economies of scope exist when producing more than one product can reduce the production costs of each product. A multi-product firm may thus be more efficient than a single-product firm. Shared inputs, bulk purchasing of common inputs, sharing of administrative services may give rise to economies of scope. Within the local public services literature, this could imply that a general-purpose government that provides a range of services may produce each service at lower per-unit costs than if each service was provided by a separate level of government.[21] For example, there can be shared capital inputs between the parks department and the streets department, and workers and equipment can be moved from function to function based on seasonal variations. Common administrative services in terms of budgeting, payroll and benefits may also provide cost savings. Callan and Thomas (2001) find significant economies of scope for cities that offer both solid waste and recycling services because of a significant overlap in shared inputs. Torres and Paul (2006) find economies of scope in municipal water supply services, which partially explains forces driving consolidation. Whether economies of scope extend beyond these utility-like services is an open and understudied question.

Network economies generally refer to networked infrastructure systems (such as water supply, wastewater, utilities and roads) where the relevant concept is not just volume of output, but its spatial distribution, connectivity, and density. In practice, network economies as measured by customer density, length of network, number of nodes relative to network distance, and spatial extent of service area, are all likely to have significant influences on the costs of providing public services (Torres & Paul, 2006).[22]

Economies of density have been a frequent concern among planners, as it is often believed that per-unit service costs are lower in more dense environments. From the perspective of engineering cost estimates of per-capita or per-housing unit capital intensive services such as water, wastewater, and roads, there is some evidence that per-unit capital costs are less (Speir & Stephenson, 2002), but this is almost by definition. There is ambiguous and confusing evidence about public services such as education, social services, public safety, air quality, etc. with regard to economies of density. Generally, economies of density occur if, all other things being

[21] As far as I know, there has not been any general study of whether local governments exhibit economies of scope over the range of services provided, and whether controlling for such factors influences estimates of the efficiency of the local public sector. There is a countervailing literature which suggests that larger, more bureaucratically complex cities are more easily subject to capture by public sector unions or to budget-maximizing bureaucrats.
[22] When studies claim to measure economies of density, they may in fact be measuring either economies of scope or network economies.

equal, per-unit costs decrease as a function of the density of the population serviced. The empirical difficulty in disentangling the true cost effects of density economies is that "population density" is both a public goods demand variable, a production function (1) variable, and a conversion function (2) variable, as described below, and that estimating economies of density may actually be picking up network economies or economies of scope. While density is indeed a key variable in thinking about the relationship of land use to local finance, research in this area suffers from many conceptual and empirical problems.

There has not been much empirical work estimating the elasticity of substitution between inputs within the public sector, although theoretically this is reasonably straightforward to do. The main reason for the lack of empirical research is that it is difficult to acquire consistent data across multiple cities measuring both input prices and input quantities. Such research would be helpful to the fiscal analysis of land development decisions if it indicates the degree to which there is sufficient flexibility within the local public sector to combine different inputs to produce outputs.

### 3.2 Conversion Function: Mapping Outputs to Outcomes

As shown above, the relationships between outputs and outcomes are more difficult to model or measure. Because of both the conceptual and empirical difficulties, fiscal impact forecasts may face fundamental challenges that cannot be easily overcome. In practice, few fiscal impact analyses make clear specification of the differences between outputs and outcomes or specify the relationship between the two. If what we have argued above is correct, all fiscal impact analyses would need to make some assumption(s) about these relationships. Here, we further consider 4 areas to examine this point: environmental cost variables, economies of density, congestion effects, and the socio-economic and demographic characteristics of service population.

Environmental cost variables represent the physical environment under which services are provided. Because collecting such data is time consuming, in many empirical studies environmental costs are often proxied by the demographic characteristics of the service population, although this blurs two different types of cost factors. In jurisdiction-specific fiscal impact analyses, marginal-cost case- study techniques might be able to specify environmental variables which might alter local government per-unit service costs, where use of average per-unit costs from either past expenditures or national cost-estimating sources would obscure local environmental cost factors. For example, for a desired level of water quality, there are cost differentials associated with whether the source water is groundwater or surface water, contaminated or not, and the various geological and topographical features of the community. To achieve the same level-of-service outcome across cities might require some cities to either spend more or use alternative technologies or different capital-labor ratios. Similarly, to produce the same level of desired "outcome" in roads (say, for example, drivable streets without potholes) would require different levels of inputs and/or technology depending on climate, topography, geology, etc.

Economies of density also show up in the conversion function, and were discussed in the previous section 3.1 Congestion effects represent a substantial element of experienced levels of service or "outcomes," but may not be reflective of local expenditures. Congestion effects occur,

often only during limited peak use hours of the day, when the volume of service demands temporarily exceeds the capacity of the public service. Congestion effects show up in the conversion function because they represent the translation of public service outputs into level-of-service outcomes. The conversion of outputs to outcomes may be significantly beyond the control of service providers. The experienced level of service on roads will represent not only local government outputs (number of lane-miles provided) but also decisions by car owners of when and where to drive.

The fourth factor to consider in the translation of outputs to outcomes is the socio-economic and demographic characteristics of the population within a jurisdiction (Schwab & Oates, 1991; Schwartz, 1993). Fiscal impact analyses usually do include some information on the socio-economic and/or demographic characteristics of future populations anticipated as resulting from land developments (although usually proxied by housing unit characteristics).[23] However, demographic characteristics are only used to forecast service-unit demand and not as a cost-of-service provision factor. Yet the empirical literature shows that community characteristics have significant effects on the translation of public service outputs into experienced outcomes, as controversial as this may seem to planners.[24] If fiscal impact analyses do not try to address these issues, then the implicit assumption may be that new residents have the same cost characteristics as existing residents, but this is unlikely to be the case.

We can illustrate the conceptual difficulties here by looking at the empirical literature in education. Consider, for example, two school districts that have exactly the same expenditure levels (per pupil expenditures) and exactly the same output levels (teacher-student contact hours). If these districts vary by some relevant socio-economic characteristic (income or poverty status, family structure, English proficiency, etc.), there are likely to be different outcomes in terms of test scores. That is, to convert a given unit of output (teacher-student contact) into an outcome (test scores) depends on some of the socio-economic characteristics of the schoolchildren themselves. Because the socioeconomic characteristics of the student population (including peer effects) substantially alter the conversion of educational expenditures to educational outcomes, expenditures alone are bound to be a very incomplete measure of actual service levels. Analogously, there is some evidence that the socioeconomic characteristics of

[23] It is an open and under-researched question as to whether and to what extent housing-unit characteristics map onto service demands and cost-related population characteristics.

[24] This does raise an important issue, an exploration of which is beyond the scope of this paper. It is perhaps commonly assumed (although never stated explicitly), that the presence of lower-income residents and/or presence of less-than-stable family households impose not only increased social service, educational and public safety expenditure demands, but also tend to be associated with reduced quality outcomes for a given level of expenditure. If this is the case, then incorporation of socio-economic and demographic characteristics as cost variables in fiscal analyses can raise substantial equity concerns. Many have indeed raised the concern that fiscal analysis techniques are utilized by local governments to justify exclusionary zoning practices, based on the belief that lower-income and affordable housing is a net fiscal loss to a community (Paulsen, 2006). If inclusion of demographic-specific cost variables was also included in fiscal analyses, communities might be even more likely to engage in fiscally-motivated exclusionary zoning. Although beyond the scope of this project, such a concern could lead to greater effort for more equitable equalization formulas and state-aids. If there is the belief that fiscally-motivated exclusionary zoning is inefficient from the point of view of regional welfare, grants-in-aid from higher levels of government to reduce the perceived negative fiscal consequences of affordable housing development would be necessary (Schwab & Oates, 1991).

neighborhoods, including rates of homeownership can play significant roles in translating public service inputs into "neighborhood quality" or "public safety."

### 3.3 Summary

The mechanisms by which public sector services are translated from public sector inputs to outputs and outcomes is complex, and this complexity is often obscured in the assumptions and simplifications necessary to produce a fiscal impact analysis in a jurisdiction. Yet, it is important to get behind this complexity by attempting to draw out a more fully specified model or understanding of the nature of public goods provision and service level outcomes. If we do undertake to analyze this complexity, it turns out there is little we can actually say *a priori* about the expected effects of land development on public finance.

Because fiscal analysis techniques are designed to inform local residents and policy makers about the anticipated fiscal consequences of land development, it is necessary to be more explicit about the assumptions used in developing projections. This section has identified a number of important considerations to explain the production function of local public goods and services. While it is unrealistic and impracticable to assume that every fiscal impact analysis must specifically model all of the factors here identified, this theoretical analysis serves as the basis for evaluation of fiscal impact analysis techniques. Fiscal projection techniques must make some implicit or explicit assumptions about each of the factors identified in this section. To the extent that factors that are likely to affect the relationship between land development and expenditures and revenues are not specifically incorporated in fiscal impact analyses, potential sources of inaccuracies or errors in the analysis are introduced.

## 4. Land Development

The purpose of this paper is to explore what might be the expected effects of land development on the revenues and expenditures of local governments. It began with an extended detour into characterizing the nature of expenditure and revenue patterns in local governments in an imagined "initial equilibrium." However, before advancing to the stage of tracing land developments through the local public finance system, two additional caveats are in order.

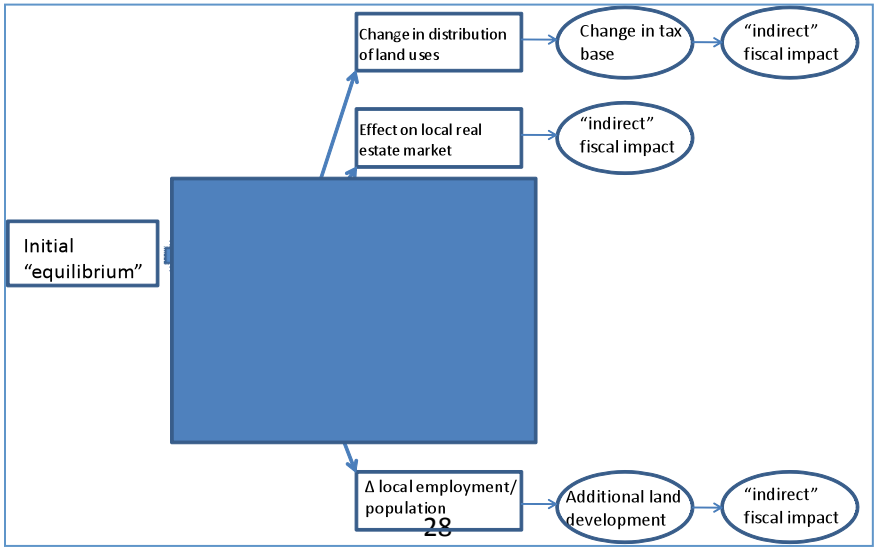
First, as the exposition of the demand and supply characteristics of local public goods illustrated there are a myriad of factors which create the observed pattern of local public expenditures and revenues, many of which are tied to land development within a community. However, it should be clear that an equal number of factors are not tied explicitly to land development within a community. There exists a range of policies and exogenous shocks which can alter the observed pattern of expenditures and revenues within a community without any actual change in land use patterns. This poses a substantive conceptual challenge for any technique attempting to project fiscal impacts. Most techniques, through an accounting framework, assign or apportion all expenditures and all revenues to the specified land uses within a community. However, the level of expenditures and revenues can change without any change in land use. Fiscal impact analysis techniques begin with the purpose of projecting changes in revenues and changes in expenditures resulting from land development. In order to do so, the techniques therefore apportion all existing revenues and expenditures to existing land developments. By definition and

assumption, therefore, these techniques can only explain changes in expenditures and changes in revenues resulting from changes in land development patterns, but not from other sources. If we want to understand the true fiscal impacts of land development, we would need a system that can separate out the effects of land development from other effects.

The second caveat is that we need to clarify the definition of "fiscal" in terms of defining the "fiscal" impact of land development, particularly with reference to level of service. Usually, "fiscal" is limited to actual expenditures and revenues. Yet land development can affect the public service levels without any direct expenditure or revenue changes (Heikkila & Craig, 1991). Land development may congest local public services, which reduces the level of service outcomes, but local governments may not engage in any direct expenditure to restore the level of service to the before-development level (Heikkila, 1997; Ladd, 1994). Thus, there is an impact of land development on levels-of-service but because there is no direct expenditure of funds, this impact is often not counted as a "fiscal" impact. One could approximate or estimate the dollar value of this congestion effect or service level reduction to local residents as being the amount of expenditure necessary to restore pre-existing service levels. In cross-sectional empirical work trying to estimate the expenditure impacts of land development, municipalities which let service levels decline might show a lesser "fiscal" impact of a land development that understates the welfare impact on existing residents.

Figure 1, introduced previously in section 1 is reproduced below to provide a conceptual overview of the next sections. We have already discussed the "initial equilibrium" in section 2. Section 3 discussed the production function of local public services, which is imbedded in the arrows connecting land development to changes in expenditures and revenues.

As shown in Figure 1, we call "direct" fiscal impacts that shaded area in the center of the figure that deals with direct changes in revenues and direct changes in expenditures resulting from and attributable to the land development. The area in the shaded box has been the domain of fiscal impact analysis techniques. Section 4.1 which follows will trace the effects of land development on changes in expenditures, while section 4.2 will examine the effects of land development on changes in revenues. Indirect impacts are covered in section 4.3. In this section, we discuss the characteristics of the land development that would need to be known in order to trace its fiscal impacts, and outline 2 prototype developments for illustrative purposes.



What are the features of the land development that need to be known in order to predict and model the impacts through the expenditure and revenue systems? On the expenditure side of the equation, we would need to be able to classify the land development in terms of its demand characteristics and its effects on the production function of local public services. On the revenue side, we would need to know about the type of land development, its value and direct economic activity (sales or employees).

For any land development, we need to know the type of land development (residential, commercial, industrial, office, institutional, etc.), the property value of the development (for property tax purposes), the direct economic activity associated with the development (employees and payroll for income tax purposes, estimated sales for sales tax purposes, etc.), the direct service demands associated with the development (number of new employees, number of new households, number of customer trips generated, etc.), environmental cost variables associated with the new development and some estimate of the socio-economic and demographic characteristics of the projected occupants of the land development.

In tracing the effect of the land development on demand characteristics, there needs to be assumptions about the relationship between the type, value and composition of the land development (e.g. square feet of office space, number of bedrooms per housing unit, size of housing unit, etc.) and the socio-economic and demographic characteristics of service demanding units.[25] All fiscal impact projection techniques make some assumption mapping land development characteristics to service demands. Similarly, projecting the effects of land development on the expenditure side requires some assumptions mapping land use characteristics to the production function of levels of service, and some account of the level of service standard applied.

In order to trace the effect of land development on expenditures and revenues, here we present two prototype developments for purposes of illustration. Let ***Development 1*** be a large residential subdivision, creating enough additional housing units to make a statistically significant change in expenditure and revenue patterns in the city. Let us start assuming an existing city size of 100,000 people. The residential subdivision in Development 1 is scheduled to produce 400 housing units, in a mixture of mostly singles, with a few town houses, and condos. At an average household size of 2.5,[26] these 400 housing units will generate an additional population of 1000 residents a 1 percent increase in the city population. For purposes of illustration, we also assume that all 1000 residents of the new development migrate into the city from outside, and therefore constitute new residents.[27]

---

[25] In order to keep the discussion most general, we can define a demand unit as being a person, a household, an employee, a square foot of non-residential development, etc.

[26] A more precise calculation would use recently published demographic multipliers produced by Prof. Burchell and the Center for Urban Policy Research to estimate the projected household size based on the value and number of bedrooms of constructed housing units.

[27] Again, most fiscal impact analysis techniques do assume that all the residents of projected developments are new residents to the city. But this is unlikely to be the case, as current residents may desire to move to the newer development. In such cases, new development may occur without actually attracting "new" residents to the city.

Let ***Development 2*** represent a mixed office-and retail development (no housing units) that results in 60,000 net square feet of leasable retail space and 300,000 net square feet of leasable office space. Assuming a ratio of 600 square feet per retail employee and 300 square feet of office space per employee,[28] this leads to projected employment of 100 new retail employees and 1000 new office employees. Average retail sales are $333.33 / square foot, for projected sales of $20 million, generating sales taxes of $1 million on a sales tax rate of 5 percent.

### 4.1 Direct Fiscal Impacts: Why and How Should Land Development Affect Expenditures?

The direct "fiscal impact" of any land development results from the change in expenditures and the changes in revenues. In this section we consider the changes in expenditures, while section 4.2 considers revenues. As above, we first discuss the land development effects on expenditures by means of alterations of service demands, and then effects on the supply side through the production function.

Looking first at the demand for public services on the expenditure side, the 1000 new residents alter the demand for public expenditures because there are 1000 new service- demanding units. First, assume that these new residents have exactly the same demand characteristics (e.g. tastes and income) of existing residents, an assumption to be relaxed later. These additional 1000 people need to be provided with education, public safety, and social services, as well as with roads, water supply, sewers, and the like. Using average service levels and employing linear projections, this could demand of about 80,000 new gallons of water supply, 75,000 new gallons of wastewater to be treated, 250 new school children to be educated, and 3880 additional vehicle trips on local roadways, etc.[29]

Apart from the cost and production function issues discussed below, the translation of these additional demand units into actual expenditures depends on whether slack capacity in service infrastructure is available and whether or not the local government responds by allowing services to be congested or quality to degrade. Thus these new demand units can directly impact expenditures at least one of the following four ways. First, to the extent that there is slack capacity within existing infrastructure systems, the new residents may be able to consume public services without necessarily increasing expenditures by a proportional amount. Second, conversely, to the extent that existing infrastructure systems are already at or near capacity, new residents may trigger large expenditures for increased/new infrastructure systems, which would result in an expenditure impact more than proportional to the population. Third, new residents could congest the public services (or degrade the level of service) if the local government was slow to respond with increased expenditures or if the local government did not increase expenditures proportionally. Or, fourth, new residents could be accommodated with an exactly proportional increase in public expenditures, such that aggregate real per-capita expenditures remain constant.

---

[28] Nelson (2004) uses national figures to illustrate adjusted space per employee of 600 $ft^2$/employee in retail and 329 $ft^2$/employee in general office (Table 4.2, p. 43). Here, I use rounded figures for simplicity of illustration. The difficulty for most analysts is adjusting nationally representative figures to the local situation without high quality local data.

[29] Again, using nationally representative figures as described in Nelson (2004).

That is, assuming that the socioeconomic demand characteristics of new residents are exactly the same as existing residents, and assuming constant returns to scale in the public goods production technology (both strong and unlikely assumptions), the accommodation of new residents' public service demands yields an ambiguous prediction in terms of changes in expenditures. A 1 percent increase in the population of the city can manifest in expenditures increasing:

- by less than 1 percent (either due to slack capacity, or degraded service levels/increased congestability),
- by exactly 1 percent (maintenance of exact per-capita expenditure levels), or
- by more than 1 percent (due to capacity threshold effects.)

There is no clear *a priori* way of determining whether expenditures will actually increase proportional to an increase in demand units. However, because fiscal impact analyses seek to arrive at some prediction regarding the effect of land development on local expenditures, analysts make assumptions. These predictions, presumably, must be based in some local government plans as to how they intend to respond.

But, if we drop the assumption that future residents have exactly the same demand characteristics as existing residents, projections become more difficult. These differences may or may not be proxied or related to the characteristics of the land development under consideration. For example, if newer developments contain higher average number of bedrooms, they may attract a greater percentage of families with school-aged children than in the existing city. Conversely, the development may be designed to attract more seniors or "empty nesters" to the city, which might reduce the percentage of school-aged children but increase demand for health and supportive transit services. Newer housing units may be more likely to attract higher income or more educated persons into the community. To the extent that public goods demand is related to income and education levels, these households will have different demands for local public services.

Now considering Development 2 (office and retail development), this land development will also see an increase in the number of service-demanding-units, here seen as employees, customers, and square feet of space. At a simple level, the new employees will generate additional demand units for water and wastewater services, public safety, and will produce additional trips on local roadways. The new development will also produce customers or visitors, who will demand services such as roads, transportation, parking, public safety, etc. Again, as above, how these additional demand units can be accommodated depends on the capacity of local infrastructure and whether they are accommodated through allowing congestion or a decrease in service levels. Like above, there is no *a priori* way to predict the expenditure response.

Turning from the demand characteristics to the production function of local public services, land development is likely to influence future expenditure patterns through altering the production function of public goods. In terms of economies of scale, a land development may alter the expenditure structure by altering the cost relationship between inputs and outputs. Many public services are likely to have different regions of the production technology where there are increasing, constant, and decreasing returns to scale or density. Without a representation of the underlying production function, it is difficult to predict whether these additional 1000 workers or

residents might move the city along its production function into an area of increasing or decreasing returns to scale.

In terms of environmental cost variables, if the new development is less dense than existing development, or has more cul-de-sacs, or is located further away from the police and fire stations, for example, it may alter the environmental costs that structure service delivery. Therefore, in order to maintain a given level of service, expenditures may need to be increased more than proportionally.

We can think about this problem by looking to the empirical analog to the fiscal forecast: observing a land development, observing changes in expenditures, and trying to separate cause and effect and empirically estimating direct effects. Absent some explicit data on or assumptions about the underlying public goods process (demand characteristics, service level determination, and production function) there is no clear way to map land use change to expenditure changes. If, for example, we were to observe that a land development increased residential population or worker population by 1 percent, and also observe that expenditures increased less than 1 percent, there is no clear way to tell the true fiscal effect of the land development because this observation would be equally compatible with explanations of slack infrastructure capacity, economies of scale, or congestion of the public good.

To the extent that the socio-economic and demographic characteristics of (new) residents plays a significant role not only as a "demand" factor but as a "supply" factor mapping outputs to outcomes, land development which alters the existing socio-economic composition of the community will also impact the production of public services. Taking education as an example: If the new residents have higher socio-economic status than existing residents and if peer-group effects in local public education matter, these new residents could alter educational outcomes without necessarily seeing a change in educational expenditures.

### 4.2 Direct Fiscal Impacts: Why and How Should Land Development Affect Revenues?

Property development or land use change alters the property tax base because property value is added or subtracted. Thus, if the property tax levy remains fixed, increased (decreased) property values would be associated with decreased (increased) property tax rates. Likewise, if the property tax rate remains fixed, increases (decreases) in property values are associated with increases (decreases) in the property tax levy. In the 2 land development scenarios envisioned, both increase the property tax base within a community. However, whether this increased property tax base will result in increased or decreased revenues depends on the policy choices of the local government.

Under development scenario 1, an increase in the number of residents would also be directly associated with increases in income tax collections in those jurisdictions with local income taxes. We would also expect to see an increase in user fees as well as current charges for some local services. In terms of fees and service charges, it should be reasonably straightforward to figure out the additional number of service units likely to result from the land development, and apply the rate schedule in order to project future fees and charges. Under development scenario 2, an increase in employees may be associated with increases in wage tax collections in jurisdictions

with wage taxes. The retail component of the development would also be associated with increases in sales tax revenues in jurisdictions with *in situ* sales taxes.[30]

Projecting the change in outside source revenues as a result of these land developments requires specification of the equalization grants formula from the state. Based on some assumption of school children generating ratios, an analyst could project the likely increase in state aid to local schools as a result of the land development. However, equalization aids are rarely awarded solely on a constant per-student basis. Formulas may include considerations of tax base, tax effort, poverty rates, etc. And, to the extent that the land development under analysis alters any of the variables in the equalization formula, it may alter the outside-source revenue structure (Huddleston, 2009). Likewise, the non-residential development scenario could alter the tax base composition of the district, and thereby alter outside source revenues.

### 4.3 Indirect Fiscal Impacts

As the previous sections made clear, estimating the direct fiscal effects of land development in terms of changes in revenues minus changes in expenditures requires a number of assumptions or specifications of the relationship between demand characteristics, the production function, existing infrastructure capacity, equalization formulas and the like To the extent that fiscal analyses explicitly state assumptions about each of these factors which influence expenditure determination and revenue generation, then the analysis provides local decision makers with tools to understand not just the magnitude of projected changes, but something about the mechanism through which they might work.

Fiscal impact analyses as a recognized technique have explicitly limited themselves to those "direct" fiscal impacts of land development, as illustrated in Figure 1 above. Whether such a limitation represents a prudent and necessary simplification is a matter for evaluation and debate. While on the one hand, assumptions and simplifications are necessary to produce precise estimates, on the other hand, these assumptions may be too strong, giving a false sense of confidence in the resulting estimates.

However, as shown in this section, "direct effects" should certainly not be the only expected fiscal effects of land development within a community. It may not be fair to expect a fiscal impact analysis to attempt to project the indirect (or second round) fiscal effects of land development, but certainly any theoretical analysis of the effects of land development will include a description of indirect effects. If the magnitude of these indirect effects exceeds those of the direct effects, then we would have reason to believe that estimates that do not account for indirect effects are less likely to be accurate.

In this section, we describe the two most likely "indirect" fiscal effects of land development within a city: the effects of a land development on local real estate markets, and the "multiplier"

[30] This discussion is not without complication. It is reasonable to assume that new residents in a community will go shopping, and that therefore new sales tax revenues will accrue to the jurisdiction. However, fiscal impact analysis techniques, from an accounting standpoint, have to be very careful to avoid double-counting revenue sources, and sales tax revenues are usually assigned to the retail land development which generates sales, not to the residential land development which generates customers.

effect of land development on local economic structure. As each of these effects also brings with them changes in demands for services and/or changes in revenues, they constitute fiscal impacts of the land development in question. While it is understandable from an accounting or legal perspective to avoid "double-counting" and only attribute to each land development its direct fiscal impact, in reality the full fiscal effects of any land development are likely to be larger than simply direct effects. We use the term "indirect" here in the most general sense as "not direct." Some of the confusion in using this term comes about because within economic multiplier analysis or Input-Output analysis, the term indirect is distinguished from the induced effect, while our term here tries to incorporate not only the multiplier effect(s) of land development on the local economy, but also the "cross-effects" of land development on local real estate markets.

Because land development occurs within the local real estate context, there are likely to be effects of one development on other land developments within a city. One indirect fiscal effect of land development would be the changes in the property value or real estate market conditions on other properties within a city. Both the residential and non-residential development scenarios could have impacts on the property values of other properties within the city. For the example of development scenario 1 (400 new residential units), it is possible that the additional 400 housing units could affect property values of existing housing units, in ambiguous ways. We could imagine a scenario in which an increase in the supply of housing units would exert a negative effect on existing property values. Because homebuyers now have more units from which to choose, an oversupply could depress prices. Conversely, we could imagine a scenario in which new housing developments increase the value of some existing homes. If there is a fixed amount of land available for retail development within the city, additional housing units in the market-area of existing retail could likewise increase the property value of retail facilities. Thus, a residential development, as envisioned here in development scenario 1, may increase or decrease the aggregate value of taxable property within the jurisdiction through these "cross-effects". To the extent that increased or decreased property values lead either to increased or reduced property tax revenues or rates, this constitutes an indirect fiscal effect.

The same might hold true for the non-residential development under consideration, development 2. We could imagine a scenario in which absorbing a significant amount of retail and/or office development within a city might have corresponding depressing effect on existing retail and office properties. Newer office developments could lead to lower rents for existing properties. Likewise, new retail development could draw business away from existing retail, depressing those property values. Thus, even though the direct fiscal impacts of a retail-office complex appear positive, if the net result is a decline in the property value of existing properties or increased vacancies, the total fiscal effect may not be as positive.[31] It is also possible to imagine that a large-scale retail-office development could create a synergistic, spillover effect and increase the value of residential and other non-residential properties within the community. In such a case, the "direct" estimate of fiscal impacts would understand the total fiscal effect. The point is now clear: land developments are likely to alter the property values of existing developments, and this change in property values can lead to changes in property tax revenues or

[31] This issue is frequently cited as a particular concern when evaluating the effects of "big box" retail developments on city finances. If "big-box" retail facilities drive smaller "mom-and-pop" retail out of business, the net fiscal effect of the larger retail development may, in actuality, be zero.

property tax rates or both. This resulting change in values and revenues is a *fiscal* effect of the land development under consideration, but is rarely included in standard fiscal impact analyses.

The second area of indirect effects of a land development is through what can be thought of as a "multiplier effect" of new investment in land development. This can be seen in a number of ways. Non-residential office and retail development create jobs, which in turn create additional residents and residential development. Taking Development 2 (retail and office) development again as an example. Regional economic analysis techniques often assume that regions are operating at full employment, so that additional employment is met with migration into the region. In the small community in this example, we assume that the 1000 new office workers move to the region, and eventually at least some fraction of them will buy houses in and become residents of the city, while others will remain commuters. This new demand for housing will result in additional residential land development. This new residential development has its own "direct" fiscal impact, but also constitutes an "indirect" fiscal impact of Development 2.

Likewise, additional housing units (to the extent they represent new residents of the region) will in turn generate a demand for additional retail land development and service-based office land use (such as medical offices, etc.). At least some of this increased non-residential development needs will be met within the city, triggering additional non-residential land development and employment. The full fiscal effects of the initial 400 housing units will include not only the direct fiscal effects of an additional 1000 people, but will also include the indirect fiscal effects of the resulting non-residential land development and employment. Even if, for example, the increase in residents' demands for shopping is met with increased sales at existing businesses but no new additional retail land development, the increase in sales tax revenues and retail employment constitutes an indirect fiscal effect of the residential land development in scenario 1.

Moreover, both the residential and non-residential land developments under consideration here would lead to increases in local employment or increased in local income. Through the multiplier effect, there would be additional impacts on land development and local finance. As new employees spend some of their new income at businesses within the city, this would increase sales tax collections from local businesses. New employees' spending will generate additional jobs, from schoolteachers to donut makers to janitorial services. These additional jobs will also generate wage taxes and sales taxes and, probably, additional service demands. Some of this resulting economic activity will show up in the revenues of local governments and in the expenditures of increased service demands from increased economic activity. Likewise, new residents of a community (from the residential development) may spend their money at local donut shops and motorcycle repair garages and beauty salons. This additional economic activity similarly generates additional revenues and expenditures. Although not traditionally included in fiscal impact analyses, these indirect "multiplier" effects of the land development under evaluation should be included in a discussion of the full fiscal impacts of a land development. Indeed, there is every reason to believe that the indirect fiscal effects of land development are likely to be substantial. Land development generates additional land development demands, alters the property value of existing parcels, and generates additional economic activity. Each of these effects has their own associated "direct" fiscal effects, which should be included as the "indirect" fiscal effects of the initial land development.

## 5. Conclusions and implications

The purpose of this paper was to provide a theoretical and conceptual understanding of the fiscal effects which might be expected to result from land development within a community, in order to serve as a basis for evaluation, understanding and potential improvement of fiscal impact analyses. This exercise has demonstrated that the underlying mechanisms by which local public expenditures are determined, produced and experienced has a richness and complexity which can often be obscured or assumed away in fiscal impact analyses, and which cannot necessarily be predicted *a priori*. Understanding and predicting the effects of land development on municipal revenues and expenditures begins with an understanding of how levels of public expenditure are determined in the complex interaction between demand for public services and the production and conversion functions which translate public inputs and outputs into levels of service outcomes experienced by voters and residents. Tracing the effects of land development through this system requires assumptions about service demands, service production, and the effects of socio-economic and demographic characteristics on both demand and costs. This paper has also identified that the direct fiscal impacts, which are measured in most fiscal impact analysis techniques, are only a subset of the types of fiscal impacts that would likely be expected to result from land development within a community.

**REFERENCES**.


Alesina, A., Baqir, R., & Hoxby, C. (2004). Political Jurisdictions in Heterogeneous Communities. *Journal of Political Economy, 112*(2), 348-396.

Altshuler, A., & Gomez-Ibanez, J. (1993). *Regulation for Revenue: The Political Economy of Land Use Exactions*. Washington, D.C.: The Brookings Institution and Lincoln Institute of Land Policy.

American Planning Association, (2006). *Planning and Urban Design Standards*: Wiley Press.

Anas, A., & Liu, Y. (2007). A Regional Economy, Land Use, and Transportation Model (RELU-TRAN): Formulation, Algorithm Design and Testing. *Journal of Regional Science, 47*(3), 415-455.

Anderson, J. E., & Wassmer, R. (1995). The Decision to 'Bid for Business': Municipal Behavior in Granting Property Tax Abatements. *Regional Science and Urban Economics, 25*, 739-757.

Babcock, R. (1966). *The Zoning Game: Municipal Practices and Policies*. Madison, WI: University of Wisconsin Press.

Bayer, P., McMillan, R., & Rueben, K. (2004). An Equilibrium Model of Sorting in an Urban Housing Market: National Bureau of Economic Research.

Bell, M., Clark, L., Cordes, J., & Wolman, H. (2004). Intrametropolitan Area Fiscal Capacity Disparities and the Property Tax. *State Tax Notes*, 195-211.

Benabou, R. (1993). Workings of a City: Location, Education, and Production. *Quarterly Journal of Economics, 108*(3), 619-652.

Bergstrom, T., & Goodman, R. (1973). Private Demand for Public Goods. *American Economic Review, 63*(3), 280-296.

Borcherding, T., & Deacon, R. (1972). The Demand for the Services of Non-Federal Governments. *American Economic Review, 62*(5), 891-901.

Bradbury, J. C., & Stephenson, E. F. (2003). Local Government Structure and Public Expenditures. *Public Choice, 115*, 185-198.

Bradbury, K., Mayer, C. J., & Case, K. (2001). Property Tax limits, Local Fiscal Behavior, and Property Values: Evidence From Massachusetts Under Proposition 2 $^{1/2}$. *Journal of Public Economics, 80*, 287-311.

Bradford, D., Malt, R., & Oates, W. (1969). The Rising Cost of Local Public Services: Some Evidence and Reflections. *National Tax Journal, XXII*(2), 185-202.

Brueckner, J. (1999). Property Taxation and Urban Sprawl. Typescript, University of Illinois.

Burchell, R., & Listokin, D. (1978). *The Fiscal Impact Handbook: Estimating Local Costs and Revenues of Land Development*. New Brunswick, NJ: Center for Urban Policy Research.

Burchell, R., & Listokin, D. (1980). *Practitioner's Guide to Fiscal Impact Analysis*. New Brunswick, NJ: Center for Urban Policy Research.

Burchell, R., & Listokin, D. (1991). *Fiscal Impact Analysis: A Manual and Software for Builders and Developers*. Washington, D.C.: National Association of Home Builders.

Burchell, R., Listokin, D., & Dolphin, W. (1985). *The New Practitioners Guide to Fiscal Impact Analysis*. New Brunswick, NJ: Center for Urban Policy Research.

Burchell, R., Listokin, D., & Dolphin, W. (1994). *Development Impact Assessment Handbook*. Washington, D.C.: The Urban Land Institute.

Callan, S., & Thomas, J. (2001). Economies of Scale and Scope: A Cost Analysis of Municipal Solid Waste Services. *Land Economics, 77*(4), 548-560.
De Bartolome, C. &. Ross, S. (2002). Equilibria with Local Governments and Commuting: Income Sorting vs. Income Mixing. University of Connecticut Working Paper.
Duncombe, W. (1996). Public Expenditure Research: What Have we Learned? *Public Budgeting and Finance*(Summer 1996), 26-58.
Duncombe, W., & Yinger, J. (1993). An Analysis of Returns to Scale in Public Production, with an Application to Fire Protection. *Journal of Public Economics, 52*, 49-72.
Dye, R. (2004). State Revenue Cyclicality. *National Tax Journal, LVII*(1), 133-145.
Fischel, W. (1999). Does the American Way of Zoning Cause the Suburbs of Metropolitan Areas to Be Too Spread Out? In *Governance and Opportunity in Metropolitan America*. Washington, D.C.: National Academy Press.
Fischel, W. (2001a). *The Homevoter Hypothesis: How Home Values Influence Local Government Taxation, School Finance, and Land-Use Policies*. Cambridge, MA: Harvard University Press.
Fischel, W. (2001b). Homevoters, Municipal Corporate Governance, and the Benefit View of the Property Tax. *National Tax Journal, LIV*(1), 157-173.
Fisher, R. (2003). The Changing State-Local Fiscal Environment: A 25-year Retrospective. In D. Sjoquist (Ed.), *State and Local Finances Under Pressure*. Northampton, MA: Edward Elgar.
Gill, H. L., & Haurin, D. (2001). The Choice of Tax Base by Local Authorities: Voter Preferences, Special Interest Groups, and Tax Base Diversification. *Regional Science and Urban Economics, 31*, 733-749.
Gottlieb, P. (2006). State Aid Formulas and the Local Incentive to Chase (or Shun) Ratables. *Urban Studies, 43*(7), 1087-1103.
Hanushek, E. (2002). Tiebout Meets Alonso. Working Paper, Hoover Institute, Stanford University.
Heikkila, E. (1996). Are Municipalities Tieboutian Clubs? *Regional Science and Urban Economics, 26*, 203-226.
Heikkila, E. (1997). Rethinking Fiscal Impacts. *Journal of Planning Education and Research, 16*, 201-211.
Heikkila, E. (2000). Rethinking Fiscal Impacts. In *The Economics of Planning* New Brunswick, NJ: Center for Urban Policy Research.
Heikkila, E., & Craig, S. (1991). Nested Fiscal Impact Measures Using the New Theory of Local Public Goods. *Journal of Regional Science, 31*(1), 65-81.
Hopkins, L., Xu, X., & Knapp, G. (2004). Economies of Scale in Wastewater Treatment and Planning for Urban Growth. *Environment and Planning B, 31*, 879-893.
Huddleston, J. (2009). Incentives and Disincentives in State Equalization Aids: "Gaming the System": University of Wisconsin-Madison, Department of Urban and Regional Planning.
Ladd, H. (1994). Fiscal Impacts of Local Population Growth: A Conceptual and Empirical Analysis. *Regional Science and Urban Economics, 24*, 661-686.
Ladd, H. (1998). *Local Government Tax and Land Use Policies in the United States: Understanding the Links*. Northampton, MA: Edward Elgar.
Lewis, P. (2001). Retail Politics: Local Sales Taxes and the Fiscalization of Land Use. *Economic Development Quarterly, 15*(1), 21-35.

Merrifield, J. (2000). State Government Expenditure Determinants and Tax Revenue Determinants Revisited. *Public Choice, 102*, 25-50.
Mikesell, J. (2002). Tax Expenditure Budgets, Budget Policy and Tax Policy: Confusion in the States. *Public Budgeting and Finance, Winter 2002*(34-51).
Nechyba, T., & Strauss, R. (1998). Community Choice and Local Public Services: A Discrete Choice Approach. *Regional Science and Urban Economics, 28*, 51-73.
Nelson, A. (2004). *Planner's Estimating Guide: Projecting Land-Use and Facility Needs*. Chicago, IL: American Planning Association, Planner's Press.
Pagano, M. (2002). Municipal Capital Spending During the "Boom". *Public Budgeting and Finance*(Summer 2002), 1-20.
Paulsen, K. (2006). Sprawl, Residential Density, and Exclusionary Zoning. *Property and Probate, 20*(3), 22-27.
Ross, S., & Yinger, J. (1999). Sorting and Voting: A Review of the Literature on Urban Public Finance. In E. Mills & P. Cheshire (Eds.), *Handbook of Regional and Urban Economics,* (Vol. III, pp. 2001-2060): Elsevier Science.
Schaenman, P., & Muller, T. (1974). *Measuring the Impacts of Land Development: An Initial Approach*. Washington, D.C.: The Urban Institute.
Schwab, R., & Oates, W. (1991). Community Composition and Local Public Goods: A Normative Analysis. *Journal of Public Economics, 44*(2), 217-237.
Schwab, R., & Oates, W. (1991). Community Composition and the Provision of Local Public Goods: A Normative Analysis. *Journal of Public Economics, 44*, 217-237.
Schwab, R., & Zampelli, E. (1987). Disentangling the Demand Function from the Production Function for Local Public Services: The Case of Public Safety. *Journal of Public Economics, 33*, 245-260.
Schwartz, A. E. (1993). Individual Production, Community Characteristics and the Provision of Local Public Services. *Journal of Public Economics, 50*, 277-289.
Shadbegian, R. (1998). Do Tax and Expenditure Limitations Affect Local Government Budgets? Evidence from Panel Data. *Public Finance Review, 26*(2), 118-136.
Sjoquist, D., Walker, M. B., & Wallace, S. (2005). Estimating Differential Responses to Local Fiscal Conditions: A Mixture Model Analysis. *Public Finance Review, 33*(1), 36-61.
Speir, C., & Stephenson, K. (2002). Does Sprawl Cost Us All? Isolating the Effects of Housing Patterns on Public Water and Sewer Costs. *Journal of the American Planning Association, 68*(1), 56-70.
Tiebout, C. (1956). A Pure Theory of Local Public Expenditures. *Journal of Political Economy, 64*(1), 416-424.
Torres, M., & Paul, C. J. M. (2006). Driving forces for consolidation or fragmentation of the US water utility industry: A cost function approach with endogenous output. *Journal of Urban Economics, 59*, 104-120.
Wassmer, R. (1992). Property Tax Abatements and the Simultaneous Determination of Local Fiscal Variables in a Metropolitan Area. *Land Economics, 68*(3), 263-282.
Wassmer, R. (2002). Fiscalization of Land Use, Urban Growth Boundaries, and Non-central Retail Sales in the Western United States. *Urban Studies, 39*(July 2002), 1307-1327.
Wheaton, W. (1959). Applications of Cost-Revenue Studies to Fringe Areas. *Journal of the American Institute of Planners, 25*(4), 170-174.