Land Use, Municipal Revenue Impacts, and Land Consumption

A Study of Property Tax Revenue per Acre in Fairfax County, Virginia

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Table of Contents

List of Figures

List of Tables

Abstract

In recent years, concerns about the fiscal impacts of suburban sprawl have led some planning professionals to embrace a new way of looking at land use that incorporates the consumption of land and the effects on municipal government revenues of different development types. This study determines the property tax revenue per acre of 159 land uses in Fairfax County, Virginia using a data set of nearly 358,000 properties. The results are largely consistent with previous studies, which find a high correlation between density and property tax revenue per acre. The study concludes with policy implications that include a recommendation to incorporate land consumption into property or other local tax systems.

Introduction

As local governments across the United States face budget crises, many have sought new and creative ways to increase their revenues. Economic struggles as well as other issues including housing affordability, environmental concerns, and growth pressures provide a rationale for a new way of looking at land use. This method, calculating property tax revenue per acre, takes the consumption of land and municipal revenue impacts into account. Many local governments pursue the construction of "big box" retail stores and other land-intensive developments, whose long-term infrastructure costs tend to be higher, to bring jobs and economic activity to their jurisdictions. Meanwhile, many local governments restrict the development of multi-family housing for a variety of reasons. This study quantifies the effects of such policies on local government budgets to determine whether such strategies make sense relative to their costs.

This study uses data on nearly 358,000 properties in Fairfax County, Virginia to calculate the amount of property tax revenue per acre generated, county-wide, by 159 land use types. The purpose of the study is to determine the land uses that produce the largest revenues for the local government coffers relative to the amount of land they consume. This allows a more precise calculation of the opportunity cost local governments end up paying if and when they favor low-density development through zoning and other policies.

First, I will discuss the background of this topic and study area. I then review the literature on historical land use theories, fiscal zoning, infrastructure costs, and other property tax studies to provide a foundation and context for the methods and results of this study. I then profile four different developments in Fairfax County to provide case examples of the study's results. Next, I detail important considerations in evaluating the results, a discussion of the results, and responses to arguments against the property tax revenue per acre approach. I conclude with some preliminary policy implications as well as potential areas for future research.

Background

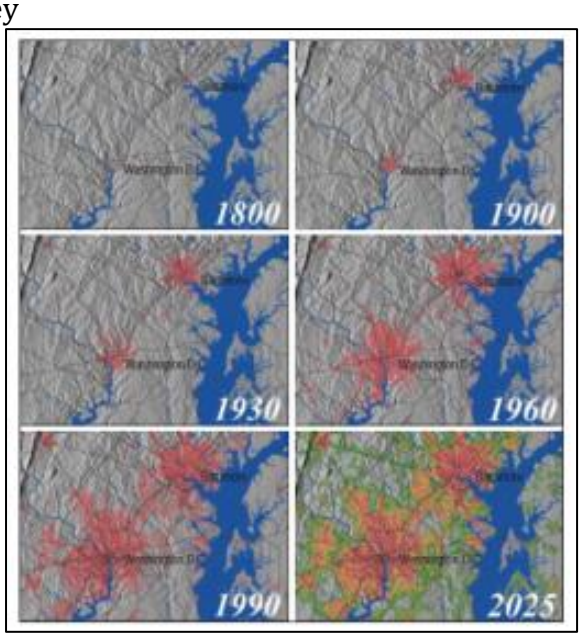
I chose Fairfax County as the area in which to conduct my study for a number of reasons. Fairfax County is located outside of Washington, DC (see Figure 1 below) and has undergone rapid transformation in the last 80 years, evolving into a largely suburban county with a number of employment centers. Fairfax continues to be a dynamic area within the Washington, DC region; it will likely undergo significant changes in coming years due to the expansion of the Metrorail system through new parts of the County and changing demographic and federal government spending trends.

Figure 1: Map of Fairfax County, Virginia
Source: Washington Post

Located on what were once the fringes of the Washington, DC metro area, Fairfax County remained largely rural and farm-oriented until the 1930s; since then, the County has experienced rapid growth. Its population quadrupled from 1930 to 1950 (from around 25,000 to 100,000). Between 1950 and today, Fairfax's population increased over ten-fold, from 100,000 to nearly 1.1 million (Fairfax County 2010; Fairfax County Economic Development Authority 2012). Furthermore, the County is now home to the 12th largest central business district in the country, Tysons Corner, and has the second-highest household median income of all counties in the US after neighboring Loudoun County (Fairfax County Economic Development Authority 2012; Exner 2011).[1]

[1] See also Heimlich et al. 2001 for more information about urbanization rates and population growth trends over the last 50 years.

Figure 2: Urbanization History and Projections for the Washington, DC Metro Area
Source: US Geological Survey



Note: The red areas are already urbanized, yellow areas are those likely to be urbanized by 2025, and green areas have a moderate to low probability of being urbanized by 2025.

As would be expected in any jurisdiction experiencing rapid growth, especially in a large metropolitan region, the value of land in Fairfax County has increased significantly. It is not uncommon to see land listed for sale for nearly $1 million per acre in desirable residential areas, while data provided by the County indicates that its most expensive land has values reaching over $20 million per acre where the potential for more intense development exists.

Fairfax County leaders seem to have accepted or even embraced trends toward increasing zoning intensities in strategic locations to permit mixed-use development (see, for example, Fairfax County 2012), and the County is home to one of the largest suburban "retrofitting" projects in the country, the redevelopment of Tysons Corner (Fairfax County 2012(b)). Nevertheless, suburban and auto-oriented development dominates in the County, with walkable, transit-oriented areas with mixed-use development remaining the exception to predominant patterns. Many residents and leaders in the county reason that auto-oriented development has served the county well, as evidenced by the county's phenomenal economic growth, and see little need to initiate large-scale change, while others, including some in the County government, support the redevelopment of key corridors in the County to mirror the type of development that has occurred along the Rosslyn-Ballston corridor in neighboring Arlington County (Fairfax County, Rosslyn-Ballston 2005). The Rosslyn-Ballston corridor is considered to be an economic success due to its attraction of over 21 million square feet of office, commercial, and retail space over the last few decades and a smart growth success due to the area's walkability and decreased traffic congestion despite population increases (US EPA, Smart Growth).

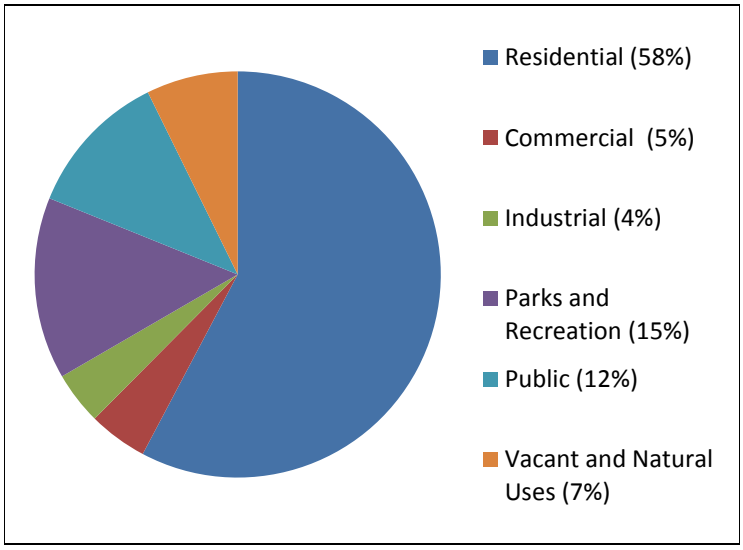
Current Land Uses in Fairfax County

Before analyzing the relative contributions to the tax base of different land uses, it is important to have an idea of the relative importance and prevalence of these land uses. The breakdown of the total area of Fairfax County by broad land use types is as follows: 57.8 percent residential, 4.7 percent commercial, 4.2 percent industrial, 14.5 percent parks and recreation, 11.6 percent public, and 7.3 percent vacant and natural uses (see Table 1 and Figure 3 below). Calculations I performed using data provided by the County indicate that approximately half the County's land (in other words, over 80 percent of all residential areas) is zoned with a density of one dwelling unit per acre or a lower density (such as one dwelling unit per five acres). Of this half of all County territory, the average density at which the land is zoned is approximately 1.9 dwelling units per acre.[2]

Table 1: Land Uses in Fairfax County by Acreage and Percent of Total, January 2010
Source: Fairfax County Department of Neighborhood and Community Services, 2010

Existing Land Use	Total Acres	Percent of Total
Parks and Recreation	32,979	14.5
Residential	131,646	57.8
Public	26,487	11.6
Industrial	9,599	4.2
Commercial	10,623	4.7
Vacant and Natural Uses	16,577	7.3
Fairfax County	**227,912**	**100.0**
Note: Figures may not sum to total due to rounding. Total acreage figures do not include areas in roads, water, or small areas of land unable to be zoned or developed.		

Figure 3: General Land Use Breakdown of Land in Fairfax County
Source: Fairfax County Department of Neighborhood and Community Services, 2010



[2] See Appendix A for a discussion of the calculation of this figure.

Land use breakdowns can vary significantly by region and jurisdiction, but one general estimate of global land use found that residential uses occupy between 65 and 75% of a city's surface, while commercial and industrial uses occupy 5-15% and 15-25%, respectively (Rodrigue 2012). This means that Fairfax County is zoned for slightly less residential, commercial, and significantly less industrial than the average city or town, although differences in how land uses are categorized may result in significant inconsistencies in making a comparison of land use in Fairfax County to these rough global averages. To provide some US examples for comparison, the land use breakdown of New York City's five boroughs (combined) is below, as is the breakdown for Manhattan alone. Table 2 contains these percentages in a side-by-side comparison.

Table 2: Land Use Breakdown of New York City and Manhattan Alone
Source: New York City 2010

Land Use	Percentage in New York City	Percentage in Manhattan Alone
Residential	39.5	24.7
Mixed-use (residential, commercial, and/or office)	7	23.8
Industrial and Transportation	10.7	8.5
Open Space	27	25.4
Public Facilities and Institutions	6.9	11.6
Vacant land	5.8	2.6
Parking	1.3	1.5
No Data	1.8	1.9

Perhaps an even more useful comparison is that of Roseville, California, a generally suburban part of the Sacramento metropolitan area with a population of approximately 120,000 for which data was available. In Roseville, 47 percent of the land is occupied by residential uses, 20 percent parks and open space, 10 percent industrial, 8 percent commercial and retail, 7 percent right-of-way (including roads), 5 percent public or quasi-public, and 3 percent business and office space (Roseville 2012; see Table 3 below).

Table 3: Land Use Breakdown of Roseville, California
Source: Roseville 2012

Land Use	Percentage
Residential	47
Commercial/Retail	8
Industrial	10
Parks and Open space	20
Public or Quasi-Public	5
Right-of-Way (including roads)	7
Business/Office	3

By comparison to New York City as a whole, Manhattan alone, and Roseville, California, Fairfax County has significantly more land in residential uses and significantly less land in industrial uses. In addition to providing useful comparison points, these examples illustrate that there is no universally-accepted or -used standard for categorizing land uses. Under a single-use zoning paradigm, it is relatively easy to group separate land uses, since there is little overlap or sharing of multiple uses on the same land; however, it can become more complicated when it comes to categorizing land uses for mixed-use development. Likewise, cities' zoning classifications vary in definition and nature, making apples-to-apples comparisons problematic.

Literature Review

Several strands of literature pertain to the topics of zoning for particular land uses and costs to municipal governments of different types of development. The first is a historical perspective that addresses how the value of land is determined based on location and proximity to critical production factors. The second addresses the trend of many if not most jurisdictions to "zone out" particular land uses – a practice that can sometimes result in significant opportunity costs for the municipality. The third discusses infrastructure costs and how they influence cost-benefit analyses of different types and intensities of development. Finally, a number of previous studies of tax revenue per acre based on land use type and optimal residential lot size for municipal revenues have been conducted and provide both a foundation and comparison points for the results of this study.

Historical Perspective

A long line of economists has sought to examine how the value of land is determined. David Ricardo, widely credited for the theory of comparative advantage and law of rent, believed that the rent of land was the economic advantage that could be gained from using the land in the most productive way possible, as determined by the market for land. In his view, published in *On the Principles of Political Economy and Taxation* in 1817, the value of land was derived from the overall supply of land, which he considered fixed (not taking into account changing allocations of land for different uses), and the fertility of that land (Ricardo 1817; Evans 2004). Johann Heinrich Von Thünen's land use model, presented in 1826 in his work *The Isolated State*, by contrast, argued that location was the strongest influence on the value of land, noting that more fertile but less accessible land was often worth less than less fertile but more centrally-located land (see, for example, Hite 1997). His model may also have been the first to acknowledge the role transportation costs can play in the value of land (as they influence the relevance of location). American economist Henry George argued in favor of a tax on the value of property that is not earned, but simply inherited and ultimately derived from nature. His "single tax" would be applied therefore to the value of land – the rent – while, he advocated for not taxing that which is produced upon it through labor, i.e., transactions, improvements, and income (see, for example, Backhaus 1997). While hardly a principle of modern economic thinking, the property tax, which is assessed only to owners of real property, may have some theoretical basis in this line of thinking.

The theory of opportunity costs also plays into land use regulations. The opportunity cost of any given action or decision is the benefit forgone by not pursuing the next best alternative (Henderson 2008). Ricardo's theory supporting the use of land in its most productive form has implications for the idea that considerable opportunity costs must be borne by society when regulations restrict landowners' ability to use their land in the most productive way possible. Often, regulation of land use through zoning or other legislative measures is seen as a tool that costs the local government nothing, but this reasoning relies on a very narrow definition of costs that provides little consideration of externalities. For example, there is minimal marginal cost to a local government of passing a zoning ordinance limiting the density of development to one dwelling unit per ten acres in a residential area. This type of action, however, has the opportunity cost of limiting the

amount of property tax revenue the local government can collect as the result of less development in that area (vis-à-vis otherwise-available regulatory alternatives) *and* the opportunity cost of raising the cost of housing for other prospective residents through a reduction in the supply of housing that can be constructed.

Fiscal Zoning

Zoning is a practice justified by the need to separate people and their places of domicile from land uses that could threaten public health, safety, morals, and general welfare (Village of Euclid v. Ambler Realty Co. 1926). Fiscal zoning is the practice of zoning only or primarily to accommodate those land uses that are either deemed more profitable by the local government or encompass only those segments of the population that current residents desire to have in the community. Fiscal zoning has been practiced in the US as long as zoning has existed, and may even have provided the initial motivation for institutionalizing the practice. In *Euclid v. Ambler Realty*, the US Supreme Court supported single-use zoning by agreeing with the notion that the "segregation of residential, business, and industrial buildings" would, among many other benefits, "increase the safety and security of home life" (Ibid.). Justice Sutherland, in explaining the Court's reasoning, stated that "very often the apartment house is a mere parasite" that retards the development of detached homes and encourages the development of other apartment buildings to the point that the "desirability as a place of detached residences [is] utterly destroyed" (Ibid.). This perspective is apparent in public discourse and most zoning regulations to this day.

Myron Orfield, author of *American Metropolitics* and proponent of regional solutions to problems such as insufficient supply of affordable housing, points out that prosperous suburbs (the description of which could also be used to describe many localities in Fairfax County), have been criticized by planning scholars and practitioners for "choos[ing] to allow only land uses that contribute significantly to their tax bases while making few demands on public services" (Bates 2010). Numerous other studies support the argument that local governments "zone out" multifamily housing and other "undesirable" land uses (see, for example, Levine 2006). Orfield's claim provides one of many rationales for this study; in order to determine whether fiscal zoning accurately describes what is occurring, it is important to understand the degree to which land uses contribute to the tax base.

Infrastructure Costs

Incorporating the costs to a municipality and its taxpayers of infrastructure outlays is critical if one is to accurately determine and compare the costs of different types of development and land uses. For example, comparing just the property tax per acre differences between revitalized downtown buildings and Wal-Marts does not tell the full story of the cost of infill development vis-à-vis Greenfield development, the latter of which often requires significantly higher infrastructure outlays. Factoring in infrastructure costs allows a determination of whether local governments actually engage in fiscal zoning, or if preferences in zoning codes for single-family homes are driven by other forces. The Brookings Institution researchers conducted a "Review of the Fiscal and Competitive Advantages of Smarter Growth Development Patterns" in 2004 and found that more compact growth patterns can reduce road-building outlays between 12 and 26 percent

(Muro and Puentes 2004). The report also evaluates the infrastructure and operating costs of five types of development ranging from "low-density sprawl" to "high-density planned" by factoring in the costs of recreation, schools, public facilities, roads, utilities, and others. The researchers found that low-density sprawl can result in upfront public costs that are nearly 100 percent higher than those of high-density planned development, while the public portion of annual operating costs (the portion paid with tax revenue collected from residents rather than through fees and other direct payment structures) is nearly 20 percent higher in low-density sprawl areas than in high-density planned areas (Ibid.). In another study discussed in this report, researchers found that when comparing community and regional costs per single family dwelling unit of unplanned and planned development, the costs were over 50 percent higher in unplanned development. The costs of roads ($2,784 in planned developments versus $7,014 in unplanned developments) and utilities ($1,320 in planned developments versus $2,187 in unplanned developments) accounted for most of the differences, with school costs being only slightly higher in unplanned developments ($5,625 in planned versus $6,079 in unplanned) and other costs actually $11 (1.7%) lower in unplanned developments (Muro and Puentes 2004). These findings all demonstrate the significant impact that lower-density development has on infrastructure and operating costs borne by local governments (and, by extension, taxpayers). Thus, comparing the contributions of different land uses to local government revenues alone is only one part of the story in terms of the ways in which some land uses benefit local governments from a fiscal perspective more than others.

Previous Studies

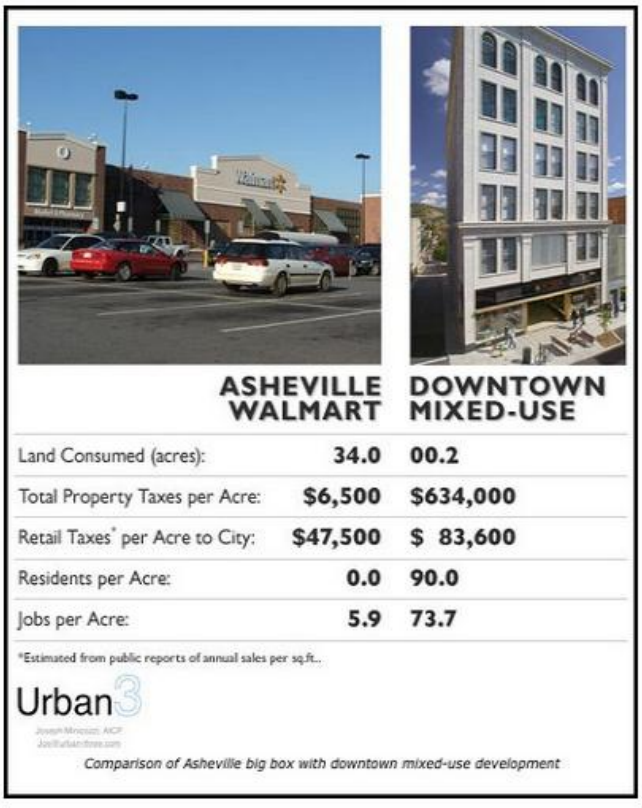
Previous studies and related literature lay the groundwork upon which this study builds. While it is intuitive, even obvious, that denser development results in a higher property tax revenue yield on a per acre basis, recent studies have attempted to quantify differences in property tax revenues based on land use in a number of localities, with the ultimate aim of determining the opportunity cost of fiscal zoning (Katz 2010; Minicozzi 2012; Layman 2012). In 2008, Joseph Minicozzi conducted a study of Bumcombe County, North Carolina, which looked at property tax yield from a variety of Asheville-area properties on a per acre basis (Katz 2010). The study found that a six-story mixed-used building in the city's downtown area yielded about 31 times as much property tax per acre as the local mall ($250,125 versus $7,995). Even after sales tax information was added to the overall annual tax yield of mall- or big box-style retail properties in the Asheville area, the per acre yield was approximately $51,000 – significant, but still only one-fifth of the six-story mixed use building downtown (even without including sales tax contributions from the mixed-use building). See Table 4 for a summary of the findings from this study and Figure 4 for a comparison of relevant figures (amount of land consumed and property tax revenue, retail tax revenue, residents, and jobs per acre) for a downtown mixed-use development in Asheville and the city's Wal-Mart. The graphic clearly attempts to demonstrate the fiscal benefits to the city of downtown, mixed-use development vis-à-vis its big box competitor(s).

Table 4: Annual Property Tax Yield per Acre in 2007 for various development and development types in Asheville, NC
Source: Katz 2010

Land Use Type	Property Tax Per Acre
County residential	$1,236*
City residential	$1,716*
City commercial	$2,406*
1-2 story office buildings	$7,059
Asheville Mall	$7,995
4-story apartments	$18,109
4-story mixed-use condos	$44,887
6-story mixed-use condos	$250,125

* Average value as per Board of Realtors

Figure 4: Comparison of Land Consumed and Tax Revenue, Residents and Jobs per Acre for Downtown Mixed-Use Development and Wal-Mart in Asheville, NC
Source: Minicozzi 2012



Interested in the findings from the Asheville study, then-Director of Smart Growth and Urban Planning in Sarasota County, Peter Katz, commissioned Minicozzi to perform a similar study in Sarasota County. At the time, like most local governments around the country, Sarasota County's revenues had already been hit by the recession due to lower

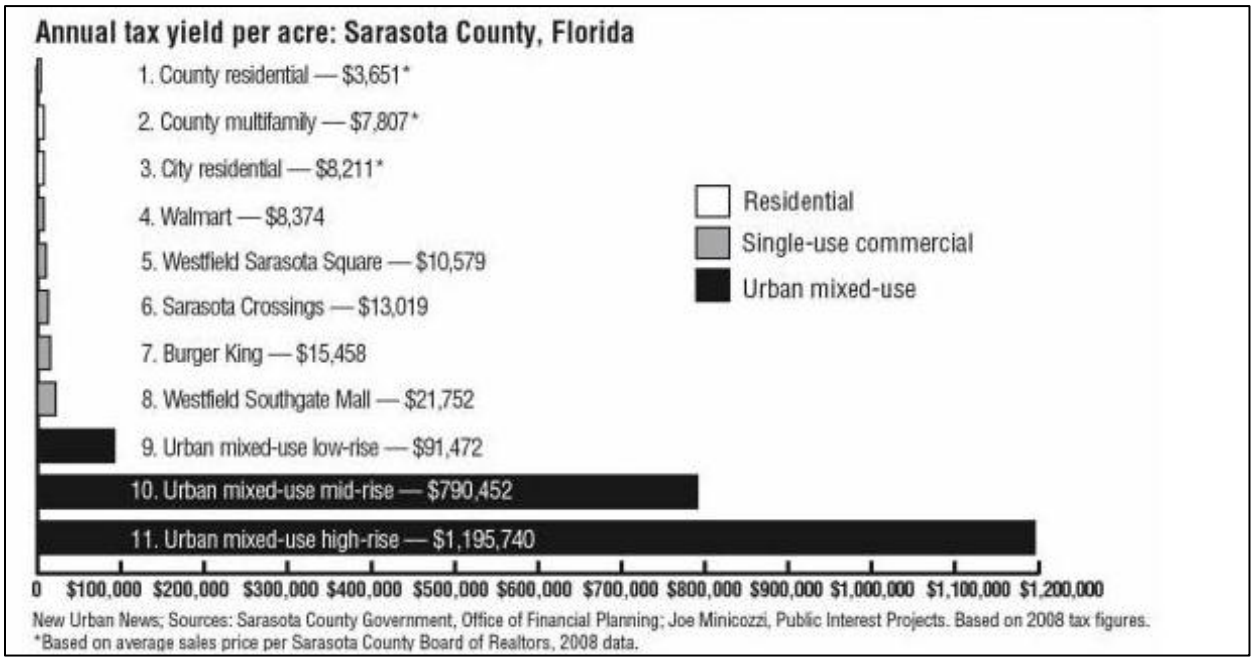
property values, and County leaders felt it was necessary to have a better idea of the precise sources of County revenues and their relative importance. Table 5 and Figure 5 contain the findings from this study.

Table 5: Property Tax Revenue per Acre for Sarasota County, Florida in 2008
Source: Katz 2010

Land Use Type	Property Tax Revenue Per Acre
County residential	$3,651*
County multifamily	$7,807*
City residential	$8,211*
Wal-Mart	$8,374
Westfield Sarasota Square (single-use commercial)	$10,579
Sarasota Crossings (single-use commercial)	$13,019
Burger King	$15,458
Westfield Southgate Mall	$21,752
Urban mixed-use low-rise	$91,472
Urban mixed-use mid-rise	$790,452
Urban mixed-use high-rise	$1,195,740

* Average values per Board of Realtors

Figure 5: Chart of Property Tax Revenue per Acre in Sarasota County, Florida in 2008
Source: Katz 2010



Studies of this kind from at least 14 locations throughout the country (Urban 3, 2012) have yielded similar proportions but different values. To my knowledge, this is the first study of this type to be performed in Fairfax County. Because land is especially expensive in this region, and growth pressures strong, I believe an understanding of the fiscal and environmental impact of different land uses in Fairfax County is especially valuable.

Lot Size Effects on Municipal Revenues and Housing

Previous research on the effect of lot size on municipal revenues supports the findings from the tax revenue per acre studies described above. Michigan State University researchers performed a study of optimal density for municipal revenues, based on the knowledge that the "distribution of lot sizes and improvements affect property values, hence, zoning affects property tax revenues" (Adelaja and Chaudhuri 2007). They found through hedonic analyses of data from a Lansing, Michigan suburb that "optimal lot size is lower than current zoning on existing properties," leading to the recommendation that "local governments should therefore seriously consider the fiscal implications of their zoning decisions as they pursue growth control" (Ibid.). Because the property tax is the primary source of local government revenues in Michigan and a majority of other states, the authors conclude that "local units of government are constrained largely by the revenue generating capacity of their community's [sic] existing real estate endowment in deciding the level of services to deliver" (Ibid.). Other researchers have attempted to determine the effect of density restrictions on housing affordability and the findings have supported the hypothesis that tighter density restrictions are correlated with higher housing prices (Quigley and Rosenthal 2005; Glaeser and Gyourko 2002).

Methods

This primarily quantitative study relied on data I obtained from the Fairfax County Department of Tax Administration (DTA). The DTA supplied me with a parcel descriptor file, a spreadsheet containing information on all properties (over 357,000) in the county. Information available for each property was quite extensive and included land and property values (from 2010), addresses, land use codes, taxation districts, zoning codes, various details about the structure type, size, construction materials, etc. I also contacted a representative from the County's GIS Department, who supplied me with the DTA's Assessment Table Description. This file contained a key for the corresponding land use type for each of the 159 land use codes used in the parcel descriptor file. Upon review of my initial results, I realized that one land use code used in the parcel descriptor file did not exist in the Assessment Table Description with which the GIS Department had provided me. By again contacting the GIS office, I was able to fill in this missing information.

Having obtained the data parcel descriptor file and the Assessment Table Description, I used ArcGIS software to first join the parcel descriptor spreadsheet with the parcel polygon feature class that was available to me in Virginia Tech's GIS lab. Of the 357,000+ properties in my data set, about 500 appeared multiple times in the table that resulted from this attribute join. In about 200 cases, the same parcel was shown in the table more than twice (three or even four occurrences). Because the detailed information for each of these "duplicate" properties was completely identical, I assumed that the duplications were the result of error and that only one property on that same parcel with the same address, owner, etc. existed. Therefore, I removed duplicates by dissolving these parcels to create only one entry for what I assumed to be one property. Because the number of duplicates was so small compared to the size of the data set, I do not believe this assumption drastically changed my results nor introduced any significant bias. I also checked to make sure that in the case of each duplicate, the land use codes were consistent, so that making this assumption had no effect on the land use analysis. To do this, I used summary statistics to check the occurrences of each land use code. I used an attribute join by parcel number of the dissolved parcels to eliminate the duplicate entries that had resulted from my first attribute join.

As I reviewed the data set that resulted from the modifications described above, I became aware that the format of the parcel descriptor file was such that multiple properties on the same parcel of land occurred as multiple entries in the data set. For example, a condominium building with 100 units all located on the same parcel of land would have 100 entries in the data set, each with the unique values and characteristics of that property. Furthermore, each of these hypothetical 100 units had the same land area listed – that land area upon which all of the units were located. Therefore, I sought to determine the amount of land attributable to or consumed by each individual unit, to sum the value of all properties on that parcel of land without improperly counting the same land area upon which all units were located as many times as there were units. Because the land area listed for each entry was calculated to at least 6 digits of significance, I assumed that the same land area (down to one-millionth of a square foot) indicated the sharing of the same land parcel between multiple properties. I then used the Statistics function in

ArcMap to identify the frequency with which each land area occurred in the data set. (For the vast majority of parcels, the result was 1). Next, I performed a many-to-one join of the frequency number to each data set entry and then divided the area of each property by the frequency to determine what I called the "adjusted area," or the land area attributable to that specific property. For approximately 400 properties, the land and/or improvement values in the data set were listed as "<null>". To perform my calculation of the adjusted areas without receiving an error message, I converted these values to zeros.

Having then found the adjusted areas and resolved other irregularities, I chose to calculate tax revenue per acre for each land use type first based on the base property tax rate of $1.07 per $100 of assessed total value (land value plus improvement value). My rationale for doing so was that, while certain types of properties pay at a rate higher than the base rate due to the addition of special taxation district charges or charges for specific services, those additional taxes are devoted to very specific purposes and the base rate calculation allows for a better comparison of the value and contribution to general revenues of different land uses. Finding these values was a matter of using the Summarize function in ArcMap to sum all total values and adjusted areas based on land use code. I then multiplied the total values by (1.07/100) to determine the "basic" amount of property taxes paid and then divided those figures by the sum of adjusted areas (converted from square feet to acres by multiplying by 43,560) to determine "basic" tax revenue per acre. The complete results from these calculations are in Appendix B.

In addition to the basic tax revenue per acre calculation, I calculated "total" tax revenue per acre, which factors in special taxes and fees applied to properties for certain projects or services provided to particular areas or types of property or from which particular properties receive disproportionate benefits. For example, I applied special tax rate additions for the construction of community centers, transportation improvements such as Route 28 and Dulles rail projects (sometimes applied only to commercial and industrial uses), watershed improvements, or stormwater services.[3] While the basic calculation gives a better overall sense of how different land uses compare in terms of value and contribution to general revenues for the County, some land uses contribute more to specific projects and improvements in the County; this is something that I felt should also be taken into account. To perform this calculation, I used the County's 2011 Tax Rate/Fee Table[4,5] to first create an Excel table listing the 5-digit tax district codes and the corresponding taxation rate (with all special district/fee charges added in). The "total" tax rates ranged from $1.086 per $100 of assessed value to $1.463 per $100 of assessed value. The data set already included information about the tax district in which each property was located, to enable a one-to-many join of the "total" tax rates to the specific properties.

[3] For more information on these specific tax districts, see:
http://www.fairfaxcounty.gov/dta/realestatetax_special taxdis.htm.
[4] http://www.fairfaxcounty.gov/dta/pdf_files/2011_tax_fee_table.pdf
[5] It is important to note that I used 2010 land and improvement values and 2011tax rates, as I was not able to obtain the 2011 land and improvement value data from the County, which charges a large fee for the more up-to-date property data. This may have produced slight inaccuracies in my results. I believe, however, that any year-to-year fluctuations in property values will have largely been due to factors that influenced all properties in the County, though possibly to greater extents in some areas or for some properties than others. I chose to use the 2011 tax rates rather than the 2010 values because I believe they were a better reflection of current special taxation districts and fees in places.

Then, I created an additional field of the total value (land and improvement summed) times the total tax rate for each property (for example, $1.366 per $100 of assessed value for properties in the "Hunter Mill Route 28 Dulles Rail West" district). Once that had been performed, I summed the total amount of taxes paid and adjusted areas for each land use type using Summarize statistics and then divided the total amount of taxes paid for all properties with each land use code and divided by the total of adjusted areas for all those properties to get the "total" tax revenue per acre based on land use code calculations. The results from this analysis are displayed in Appendix B.

Results

I calculated both the basic and total property tax revenue per acre for all 159 land use types; the complete results of these analyses are included Appendix B. For the sake of brevity and manageability, I have broken down the results by several considerations.

First, to show the wide variety of tax revenue per acre values for different land uses, I selected a number of land uses along the entire spectrum to demonstrate the disparities between land uses that generate a lot of revenue per acre and those that generate low property tax revenue per acre. Below, Table 6 shows the difference between the highest-value land use, high-rise (nine stories or more) condo apartments with no commercial uses, and a number of other land uses all the way on down to one of the lowest revenue-generating land uses – sand and gravel quarrying.[6] Figure 6 compares property tax revenue per acre for the same selection of land uses in bar chart form.

Table 6: Property Tax Revenue per Acre for a Selection of Land Uses

Land Use	Basic Property Tax Revenue per Acre	Total Property Tax Revenue per Acre
High-rise apartments (9+ stories, condo, no commercial)	$1,278,285.83	$1,278,285.83
Garden apartments condo (1-4 stories)	$184,118.25	$188,878.04
Condo offices (1-4 stories)	$134,490.31	$156,006.64
Low-rise offices (1-4 stories)	$36,141.53	$43,465.04
Supermarkets	$30,578.10	$35,149.77
Department stores	$22,918.40	$26,196.84
Restaurants	$21,344.50	$24,514.81
Discount stores	$18,541.08	$21,730.38
Single-family, detached homes	$11,562.92	$11,805.54
Vacant land	$1,470.42	$1,636.12
Golf courses (private)	$597.68	$670.70
Sand and gravel quarrying	$243.32	$271.97

[6] There are, however, land uses that produce even less property tax revenue per acre than sand and gravel quarrying. Police stations, libraries, military institutions, universities, post offices, recreational facilities, and many other uses generate no direct property tax revenue for the County, and a number of others such as rights-of-way, sewage plants, and conservation areas produce minimal property tax revenue per acre ($5 or less).

Figure 6: Chart of Property Tax Revenue per Acre for a Selection of Land Uses

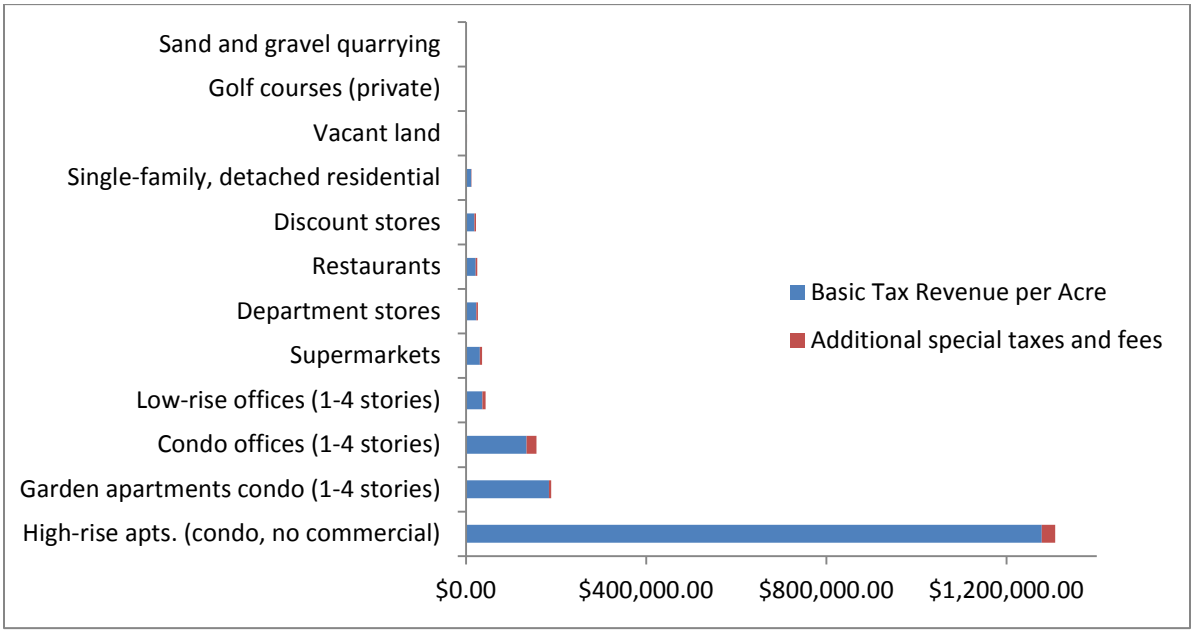


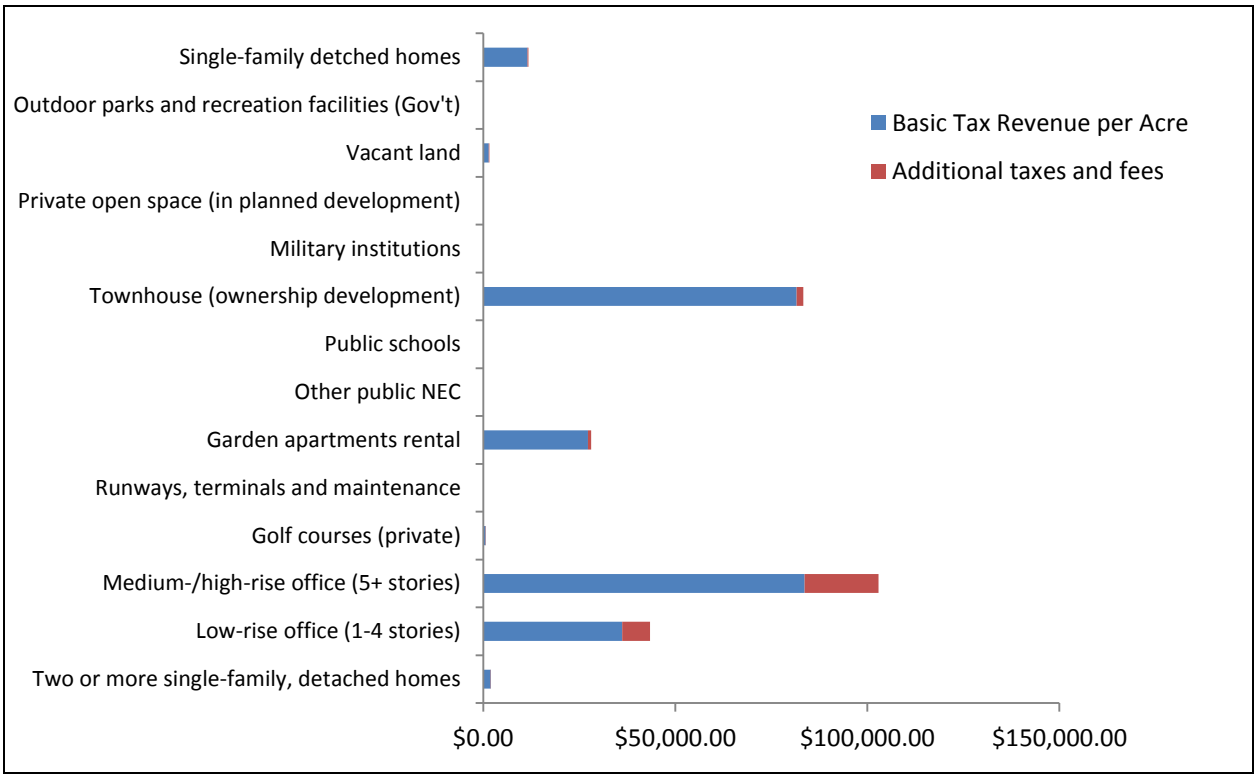
Table 7: Most Common Land Uses in Fairfax County[7] and Their Property Tax Revenue per Acre

Land Use	Basic Tax Revenue per Acre	Total Tax Revenue per Acre	Total Acres
Single-family detached homes	$11,562.92	$11,805.54	101,094.61
Outdoor parks and recreation facilities (Gov't)	$0.06	$0.07	24,470.31
Vacant land	$1,470.42	$1,636.11	22,403.37
Private open space (in planned development)	$0.23	$0.23	16,990.49
Military institutions	$0.00	$0.00	9,358.74
Townhouse (ownership development)	$81,601.87	$83,295.10	3,510.51
Public schools	$0.27	$0.30	3,401.04
Other public NEC	$0.61	$0.70	3,031.81
Garden apartments rental	$27,229.42	$28,139.53	2,553.71
Runways, terminals and maintenance	$0.00	$0.00	2,440.02
Golf courses (private)	$597.68	$670.71	2,226.04
Medium-/high-rise office (5+ stories)	$83,685.37	$102,866.97	2,116.56
Low-rise office (1-4 stories)	$36,141.53	$43,465.04	2,098.95
2+ single-family, detached homes	$1,922.94	$1,962.45	2,084.16

[7] Those occupying at least 2,000 acres.

Table 6 and corresponding Figure 6 demonstrate the wide disparities between the land uses that generate the most property tax revenue per acre for Fairfax County and those that produce little to no property tax revenue per acre. While high-rise condo apartments (without commercial uses) generate nearly seven times as much revenue as garden apartments, one of the next highest tax-generating land uses (per acre), they occupy only 11.6 acres of the County's entire 400 square mile area. Therefore, the share of the County's area occupied by each land use provides context for these results. Table 7 above contains the most common land uses in the County, including all of the uses with at least 2,000 acres. Figure 7 contains a bar chart with these land uses, listed in order of prevalence, and their respective property tax revenue per acre figures.

Figure 7: Property Tax Revenue per Acre for the Most Common Land Uses in Fairfax County



These results demonstrated that a large portion of the County's land is occupied by land uses that produce relatively little property tax revenue per acre. However, single-family, detached homes occupy approximately four times as much area in the County as the next-most-common land use, outdoor parks and recreational facilities, demonstrating just how dominated the County is by single-family homes, which account for nearly $1.193 billion in "total" property tax revenue per year. The following are the other most common land uses that produce a very significant amount of total property tax revenue for the County, in the order of their total acreage: townhouse in ownership developments ($292

million[8]), rental garden apartments ($72 million), medium- and high-rise office buildings ($218 million), and low-rise office buildings ($91 million). Having accounted for the land uses that are both common and contribute very significantly to Fairfax County's municipal revenue, I then identified those land uses that produce the most property tax revenue per acre. Table 8 lists the highest revenue-generating land uses. Included are all land uses that generate at least $100,000 in "total" property taxes revenue per acre. Figure 8 allows for a visual comparison of the relative magnitudes of these high revenue-generating land uses.

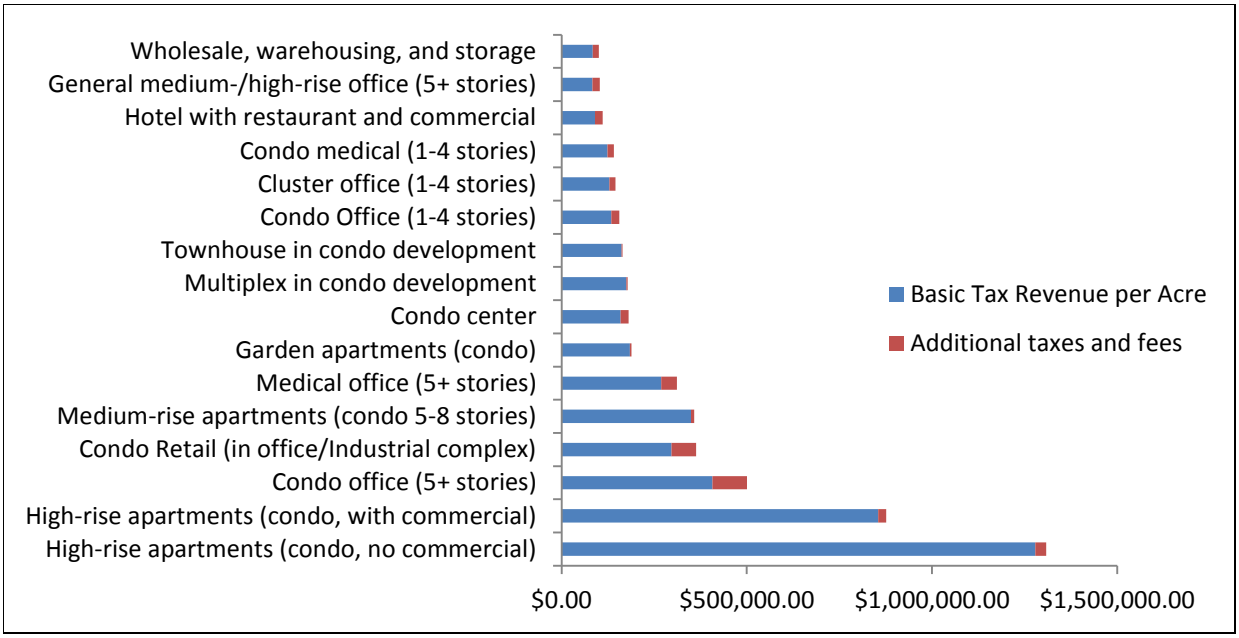
Table 8: Land Uses that Generate the Most Property Tax Revenue per Acre

Land Use	Basic Property Tax Revenue per Acre	Total Property Tax Revenue per Acre	Total Acres
High-rise apts. (condo, no commercial)	$1,278,285.83	$1,307,753.14	11.59
High-rise apts. (condo, with commercial)	$854,994.18	$876,108.78	18.09
Condo office (5+ stories)	$406,762.56	$500,110.69	2.62
Condo Retail (in office/Industrial complex)	$296,303.50	$362,726.26	0.98
Medium-rise apts. (condo, 5-8 stories)	$349,511.28	$357,999.29	9.16
Medical office (5+ stories)	$269,050.63	$311,161.25	3.15
Garden apartments (condo)	$184,118.25	$188,878.04	371.29
Condo center	$159,556.99	$180,539.57	3.58
Multiplex in condo development	$174,671.97	$178,727.32	135.01
Townhouse in condo development	$161,834.78	$164,814.79	53.73
Condo Office (1-4 stories)	$134,490.31	$156,006.65	106.12
Cluster office (1-4 stories)	$128,973.73	$145,901.30	6.81
Condo medical (1-4 stories)	$124,247.47	$140,792.95	8.58
Hotel with restaurant and commercial	$90,422.50	$110,884.42	177.50
Medium-/high-rise office (5+ stories)	$83,685.37	$102,866.97	2116.56
Wholesale, warehousing, and storage	$84,055.03	$100,915.25	52.91

The top six highest property tax revenue per acre-generating land uses are all relatively uncommon in Fairfax County, with 20 acres or less of total area. Condo garden apartments seem to be the first type of high-revenue per acre land use that occurs with any great frequency, while hotels and offices are also common high per acre revenue-generating land uses. I was surprised that wholesale, warehousing, and storage was one of the highest per acre revenue-generating land uses in Fairfax County; its "total" tax revenue per acre was in fact over nine times higher than that of single-family homes.

[8] These figures have been rounded to the nearest $1 million.

Figure 8: Land Uses that Generate the Most Property Tax Revenue per Acre



Given that nearly 60 percent of Fairfax County's total area is occupied by residential land uses, I decided to look at residential land uses specifically, to see how tax revenue per acre varies for different housing types. Table 9 lists residential land uses by their property tax revenue per acre, while Figure 9 provides a visualization of the significant differences in property tax revenue per acre of these residential land uses.

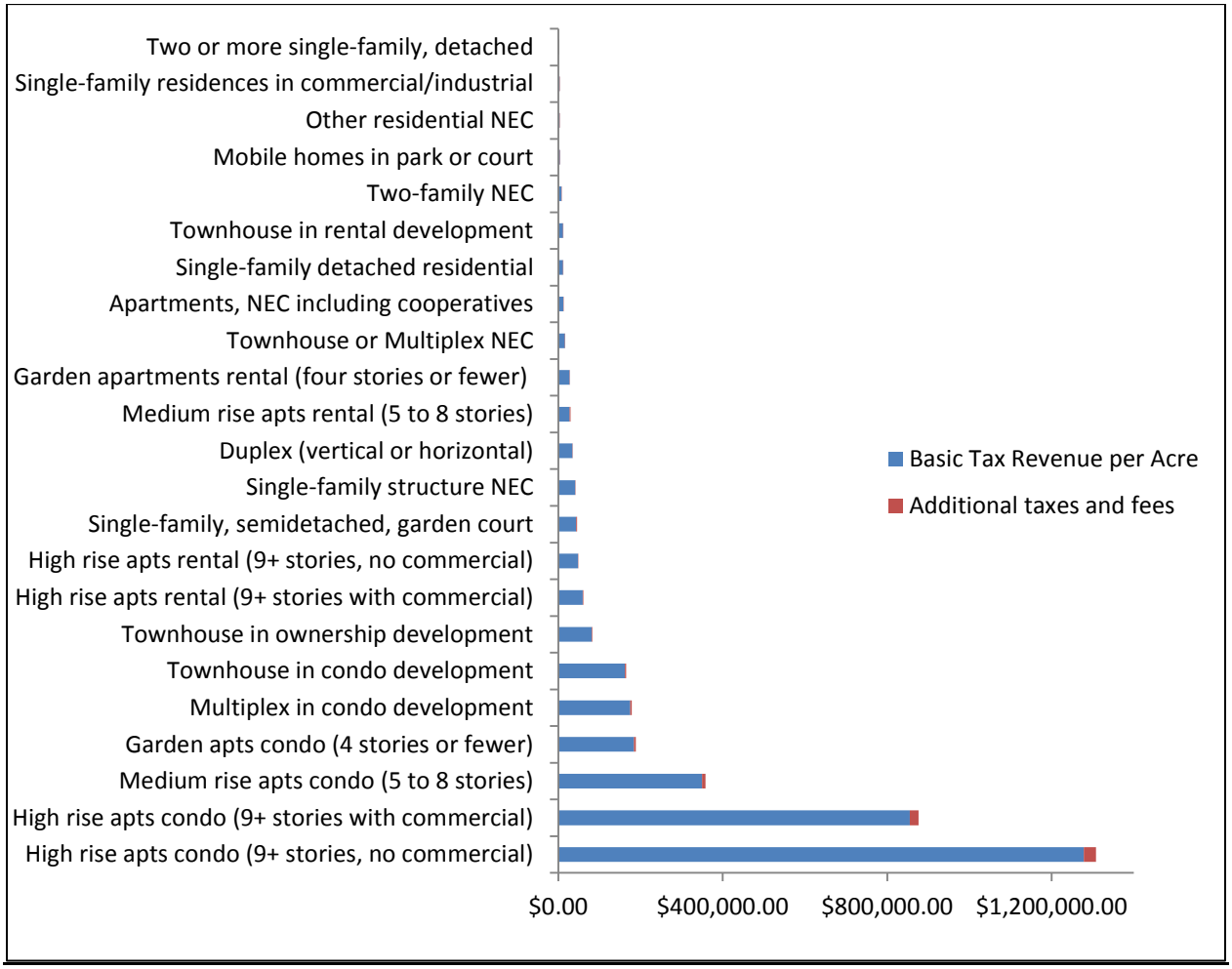
Table 9: Property Tax Revenue per Acre for Residential Land Use Types

Land Use	Basic Property Tax Revenue per Acre	Total Property Tax Revenue per Acre	Total Acres
High rise apts. condo (9+ stories, no commercial)	$1,278,285.83	$1,307,753.14	11.59
High rise apts. condo (9+ stories with commercial)	$854,994.18	$876,108.78	18.09
Medium rise apts. condo (5 to 8 stories)	$349,511.28	$357,999.29	9.16
Garden apts. condo (4 stories or fewer)	$184,118.25	$188,878.04	371.29
Multiplex in condo development	$174,671.97	$178,727.32	135.01
Townhouse in condo development	$161,834.78	$164,814.79	53.73
Townhouse in ownership development	$81,601.87	$83,295.10	3,510.51
High rise apts. rental (9+ stories with commercial)	$59,723.05	$60,797.97	56.56
High rise apts. rental (9+ stories, no commercial)	$47,623.38	$48,335.51	60.70
Single-family, semidetached, garden court	$43,300.61	$45,816.16	16.75
Single-family structure NEC	$41,251.97	$42,208.72	7.18

Duplex (vertical or horizontal)	$34,101.45	$34,633.83	217.03
Medium rise apts. rental (5 to 8 stories)	$27,471.87	$29,770.65	135.56
Garden apartments rental (four stories or fewer)	$27,229.42	$28,139.53	2,553.71
Townhouse or Multiplex NEC	$16,285.39	$16,528.91	13.80
Apartments, NEC including cooperatives	$12,288.98	$12,549.83	41.81
Single-family detached residential	$11,562.92	$11,805.54	101,094.61
Townhouse in rental development	$11,500.60	$11,756.69	148.36
Two-family NEC	$7,830.62	$8,024.03	17.37
Mobile homes in park or court	$3,696.30	$4,000.47	262.29
Other residential NEC	$2,976.92	$3,076.83	87.88
Single-family residences in commercial/industrial	$2,866.32	$3,027.00	328.94
Two or more single-family, detached	$1,922.94	$1,962.45	2,084.16

Although there is a clear correlation between density and tax revenue per acre among different residential land uses, density does not seem to tell the whole story. Notably, rental housing units of all types generated significantly less property tax revenue per acre than condominium units of similar character and density. This indicates that overall, rental units in Fairfax County are not as valuable as condo units of similar density and character. This is not surprising given the presence of federal tax incentives that favor owning one's home over renting and the strong culture of homeownership in the US. It is likely that a majority of people who can afford to own homes choose to do so, and those of lesser means are more likely to rent their housing. In addition, more expensive housing is more likely to be located in favorable locations, further differentiating the value of more-expensive and less-expensive (often rental) housing. Assuming the amount of each residential housing type available in Fairfax County is at least to some extent indicative of the demand for different types of housing in the County, townhomes and garden apartments seem to be the residential land uses that meet basic standards of desirability for a significant portion of the County's residents and produce significantly more property tax revenue per acre than single-family homes.

Figure 9: Property Tax Revenue per Acre for Residential Land Use Types



Given that this study began with mention of "big box" retail stores as an example of land-intensive development that is sometimes encouraged by local governments to bring in jobs and revenue, I decided to look at the property tax revenue per acre figures for big box retail stores in Fairfax County. To figure out how these retailers were classified, I used the quintessential big box retailer, Wal-Mart, as an example. Using the company's website, I found that there are seven Wal-Marts in Fairfax County. When I looked them up in the data set I discovered that different Wal-Marts occupy different land use categories, perhaps depending on building style and location with respect to other retail developments, etc. Four of the seven were classified as "discount stores," while the other three each had a different land use classification: one was considered a "community center," one a "promotional center," and the third a "department store." This indicated to me that there could be some inconsistency with the way in which County officials choose to classify big box retail stores such as Wal-Marts, though the differences could also depend upon a number of other factors. I checked the zoning of each Wal-Mart to examine the association between different land use codes and different zoning codes assigned to the Wal-Marts, but the correlation was low. I found five different zoning classifications for the seven stores in

the County, which included C-8 (highway commercial), PRC (general combination development), PDC (commercial/industrial/rental), C-6 (community retail), and commercial with industrial zoning. To see whether the Wal-Mart land use classifications were similar to those of other big box stores in Fairfax County, I identified a handful of Target stores and found that they were classified as either department stores (most common) or discount stores. In this case again, however, it appeared that the same type of store had different land use classifications, suggesting possible inconsistencies in assignment of land use classifications. Table 10 below lists the land use classifications assigned to the big box stores such as Wal-Marts and Targets and their respective property tax revenue per acre figures.

Table 10: Big Box Land Use Types and Property Tax Revenue per Acre

Big Box Land Use	Basic Property Tax Revenue per Acre	Total Property Tax Revenue per Acre	Total Acres
Department Store	$22,918.40	$26,196.83	116.91
Promotional Center	$25,036.88	$29,604.79	158.52
Community Center	$24,356.51	$27,730.01	888.66
Discount Store	$18,541.08	$21,730.37	196.27

As mentioned above, the complete results from my property tax revenue per acre calculations are available in Appendix B. I will discuss these findings in greater detail in the Discussion section below.

Sample Developments

To allow for a better understanding of my results, I chose to look at the tax revenue per acre for land uses in four specific developments or neighborhoods in Fairfax County. In doing so, I hope to create a clearer picture of the visual and density differences between these cases and their corresponding fiscal impacts.

Reston Town Center

Perhaps one of the most walkable, mixed-use developments in Fairfax County, Reston Town Center is the commercial center of the community of Reston, which was planned beginning in the late 1970s. Though most of Reston is predominantly suburban and residential, the arrival of several major employers including Google and Rolls Royce has transformed the Town Center area to an employment center as well. Reston Town Center is now also considered a prime shopping, dining, and entertainment center, complete with a movie theater and hotel complex. The area for which I analyzed land use and property tax revenue per acre is a 52.5-acre area bounded by New Dominion Parkway to the north, Reston Parkway to the east, Bluemont Way and the Washington & Old Dominion Trail to the south, and Town Center Parkway to the west (see Figure 11). Figure 11 below shows a central view of Reston Town Center, though there are also higher-rise buildings surrounding the Center not shown in this particular photo. Table 11 below lists the land uses present in this study area and their corresponding property tax revenue per acre figures.

Figure 10: Reston Town Center Study Area

Figure 11: Photo of Reston Town Center
Source: Reston.com

Table 11: Property Tax Revenue per Acre in Reston Town Center by Land Use

Land Use	Basic Property Tax Revenue per Acre	Total Property Tax Revenue per Acre	Total Acres
High rise apartments condo (9+ stores, no commercial)	$2,838,351.44	$3,005,469.33	0.38
High rise apartments condo (9+ stories, with commercial)	$2,263,142.28	$2,396,392.72	0.90
Low Rise Office (1-4 stories)	$882,327.00	$1,024,983.61	2.35
General medium/high rise office (5+ stories)	$570,473.76	$662,709.23	13.48
Garden Apartments condo (1-4 stories)	$483,625.49	$512,100.78	5.03
Hotel with restaurant and commercial	$407,647.57	$473,556.94	3.41
Auto parking	$264,026.60	$306,715.02	2.35
Town Center	$172,893.82	$200,847.69	7.86
Outdoor Recreation Facilities and Parks (private)	$24,273.72	$28,198.35	0.31
Vacant Land	$9,586.29	$11,136.22	12.61
Private open space (planned development)	$0.00	$0.00	3.86

Clearly, the land and buildings in this study area are quite valuable compared to County averages for the same land uses. Extremely high-value, dense housing and office space surround the Town Center, suggesting agglomeration benefits and perhaps a premium on the pedestrian accessibility of these properties to various amenities in the surrounding area. Given that there will be a Metro station and possibly infill residential development constructed near Reston Town Center in the next several years, it seems that this may also be contributing to the high land values seen in these results. Vacant land, for example, is nearly seven times higher than County averages in this area.

Tysons Corner

The second study area is Tysons Corner, the 12th largest central business district in the country and the area widely considered to be the economic center of the County. The study area (shown below in Figure 13) is triangular and bounded by the Dulles Toll Road to the north, the Capital Beltway (I-495) to the east, and Leesburg Pike (Route 7) to the south and west. Tysons Corner contains two large shopping malls and many other shopping destinations, office buildings, hotels, and entertainment venues. It is home to four Fortune 500 companies. Although Tysons Corner was designed as a primarily auto-oriented area, Fairfax County has taken on an ambitious "retro-fitting" plan to create a more walkable, transit-oriented Tysons Corner area over the next several decades, including a more traditional street grid with better connectivity and less reliance on large arterial roads. This project is largely being enabled by the Silver Line extension of the Metrorail system, which will bring four Metro stops to the area.

Figure 12: Tysons Corner Study Area

Figure 13: Photo of Tysons Corner
Source: beyonddc.com

Table 12: Property Tax Revenue per Acre in Tysons Corner by Land Use

Land Use	Basic Property Tax Revenue per Acre	Total Property Tax Revenue per Acre	Total Acres
High rise apartments condo (9+ stories, no commercial)	$1,410,354.77	$1,431,444.19	4.77
Medium rise apts rental (5-8 stories)	$715,987.99	$873,906.83	0.68
Supermarket	$349,405.92	$426,471.15	0.68
Garden apartments condo (1-4 stories)	$342,361.19	$347,480.61	6.21
Townhouse in condo development	$252,996.75	$256,779.88	0.45
Condominium Office (1-4 stories)	$250,207.39	$331,115.58	0.92
Hotel with restaurant and other commercial	$168,145.78	$222,518.16	23.03
General medium/high rise office (5+ stories)	$161,123.96	$213,225.72	257.16
Wholesale, warehousing, and storage	$148,396.03	$196,382.03	4.14
Super Regional Center	$121,638.30	$160,971.81	107.65
Promotional Center	$88,954.28	$117,718.93	1.51
Furniture, house furnishings	$80,943.61	$107,117.90	4.91
Other food NEC (including fruit, meat, fish)	$80,502.23	$106,533.79	0.73
Low Rise Office (1-4 stories)	$66,938.11	$88,583.51	52.20
Garden apts rental (1-4 stories)	$66,888.16	$81,641.06	34.50
Specialty Center	$65,771.56	$87,039.75	5.65
Finance, insurance, real estate services	$65,588.07	$86,796.92	0.51
Apparel and accessories	$63,732.58	$84,341.43	1.49
Multiplex in condo development	$56,752.80	$57,601.44	0.19
Other Retail NEC (not in shopping center)	$53,197.79	$70,400.07	8.90
Carry-out with seating	$48,607.21	$64,325.05	1.93
Medical/dental low rise office (1-4 stories)	$47,088.43	$62,315.16	0.81
Outdoor Recreation Facilities and Parks (private)	$45,848.23	$60,673.92	2.35
Restaurant with alcohol	$45,233.61	$59,860.55	5.90
Gasoline and Service Station	$43,984.07	$58,206.95	0.46
Vacant Land	$43,022.86	$55,713.35	68.37
Gasoline Sale Only	$42,541.03	$56,297.28	1.30
Office Park	$40,030.04	$52,974.33	10.10
Mini-Warehouses (not in IP)	$39,273.15	$51,972.70	6.75
Motor vehicle sales (new and used)	$37,922.27	$50,184.99	22.27
Wholesale, warehousing and stories (not in IP)	$33,732.32	$44,640.15	19.17

Other automotive, marine, aircraft and NEC	$29,523.19	$39,069.94	9.40
Research and testing (not in IP or office)	$28,093.31	$37,177.69	0.84
Other repair services NEC	$27,886.49	$36,903.99	6.99
Other Industrial NEC	$8,384.21	$11,095.36	3.47
Private open space (planned development)	$0.00	$0.00	11.41
Electric, transmission right-of-way, plants	$0.00	$0.00	3.10
Water, pipeline right-of-way, plants, storage	$0.00	$0.00	0.83
Other communications, NEC	$0.00	$0.00	2.71
Fire and rescue stations	$0.00	$0.00	2.27
Other public NEC	$0.00	$0.00	3.04

Due to its status as an economic center with approximately 100,000 jobs, many of them filled by highly-paid and -skilled workers, it is not surprising that there is a huge premium on land in the Tysons Corner study area and that there is a mix of uses to meet the retail and amenity (and, to a lesser extent, housing) needs of the many people who work at Tysons and visit its retail venues. Interestingly, vacant land in the Tysons Corner study area is actually worth more than land currently in other revenue-generating uses, indicating that economic pressures will likely reduce the presence of these relatively low revenue-generating land uses over time. However, the property tax revenue per acre figures for most residential and office uses at Tysons are significantly lower than those at Reston Town Center. This may be due to the auto-dependent nature of Tysons, which makes parking a necessity and thus dilutes the property tax revenue figures when normalized for acres consumed once parking is factored in. The denser, walkable nature of Reston Town Center, combined with proximity to Dulles airport, appears to result in higher property values – however, the fact that vacant land at Reston Town Center is worth significantly less than that at Tysons indicates that perhaps developers do not perceive there to be significant expansion potential or a significant demand for missing amenities. The arrival of four Metrorail stations to the area in the next few years is likely to further increase the value of land in Tysons Corner.

Beacon Hill Mall

The third study area is that of Beacon Hill Mall, a relatively typical "strip mall" development along Richmond Highway in Fairfax County. Although Richmond Highway has long had a reputation as being one of the less attractive and less prosperous corridors in the County, recent investments in retail and mixed-use development show some signs of promise, and the relocation of thousands of workers to nearby Fort Belvoir also suggests that the housing market along Richmond Highway will continue to strengthen. Still, the area remains challenged by its heavily auto-oriented landscape, poor accessibility for transit riders and pedestrians, and lack of office development, which would otherwise provide a captive audience for more retail and other amenities. My 51-acre study area

(Figure 14 below) is the area bounded by Richmond Highway (Route 1) to the east, Southgate Drive to the north, Tower Drive to the west (although those properties between the shopping center and Tower Drive are not included), and Memorial Street to the south. Figure 15 shows the Beacon Hill Mall, which has a landscape typical of many of the big box retail establishments along the Richmond Highway corridor.

Figure 14: Beacon Hill Mall Study Area

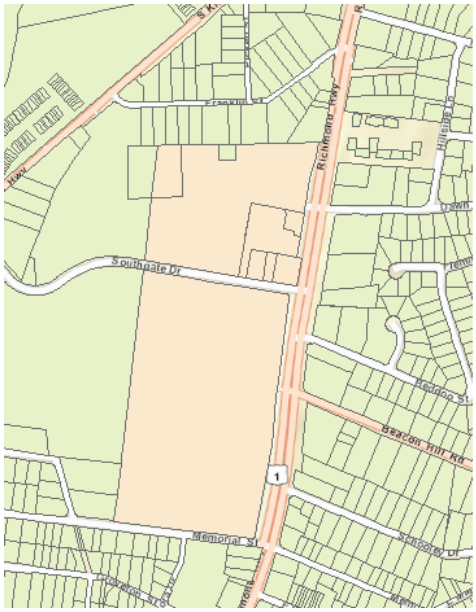


Figure 15: Photo of Beacon Hill Mall
Source: smartergrowth.net

Table 13: Property Tax Revenue per Acre in Beacon Hill Mall by Land Use

Land Use	Basic Property Tax Revenue per Acre	Total Property Tax Revenue per Acre	Total Acres
Veterinary hospitals	$26,182.54	$29,265.72	0.35
Other auto, marine, aircraft and NEC	$21,694.91	$24,249.64	0.41
Community Center	$20,942.25	$23,408.35	32.44
Low Rise Office (1-4 stories)	$17,121.86	$19,138.07	0.64
Discount Store	$16,695.63	$18,661.65	14.72
Auto parking	$14,091.32	$15,750.67	0.25
Radio and television	$119.15	$133.18	0.64
Water, pipeline right-of-way	$0.00	$0.00	0.64

Beacon Hill Mall and the Richmond Highway commercial corridor in general are characterized by a lack of investment in transportation infrastructure that would make the corridor more inviting to pedestrians, a lack of office uses that would increase demand for other amenities, and a lack of higher-end retail that could possibly attract consumers with greater buying power. While there are no immediate signs that the relatively low property tax revenue per acre for this area will increase in the future, the long-term effects of new mixed-use developments along the corridor remain to be seen.

Shady Oak

The fourth area I looked at in detail is a residential area in unincorporated Shady Oak, Virginia – a neighborhood of single-family homes located near the Potomac River and Riverbend Park, northeast of Great Falls Shopping Center. The average lot size for single-family homes in this area is 4.65 acres and the average single-family home value is slightly over $1.5 million (see Figure 17 for a picture of a typical home in the area). The study area is harder to define in terms of streets because of the cul-de-sac patterns, but it is roughly bounded by Bootlegger Trail and Riverbend Park to the east, the Potomac River to the north, River Bend Road to the west, and Jeffery Road to the south (See Figure 16).

Figure 16: Shady Oak Study Area

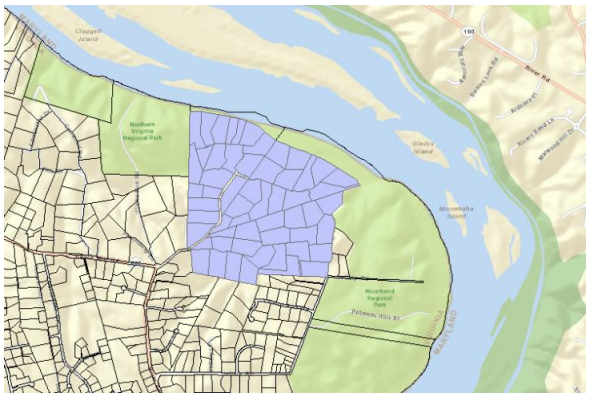


Figure 17: Photo of Typical Home in Shady Oak Neighborhood
Source: activerain.com

Table 14: Property Tax Revenue per Acre in Shady Oak Neighborhood by Land Use

Land Use	Basic Property Tax Revenue per Acre	Total Property Tax Revenue per Acre	Total Acres
Single-family detached	$3,463.16	$3,516.07	195.68
2+ single-family detached	$2,105.38	$2,136.86	6.26
Vacant Land	$2,039.48	$2,069.91	60.89

This last example demonstrates that although wealthy residents of single-family homes such as those in the Shady Oak area are often thought of as the "backbone" of the tax base, they often contribute relatively little through residential property taxes to municipal revenues relative to the amount of land they occupy. In fact, the property tax revenue per acre for homes in this exclusive, wealthy community is actually less than that generated by mobile homes in Fairfax County. Given higher infrastructure costs for low-density development discussed above in the Literature Review, this example demonstrates the regressive nature of the current property taxation system – not only in Fairfax County, but in the vast majority of US municipalities.

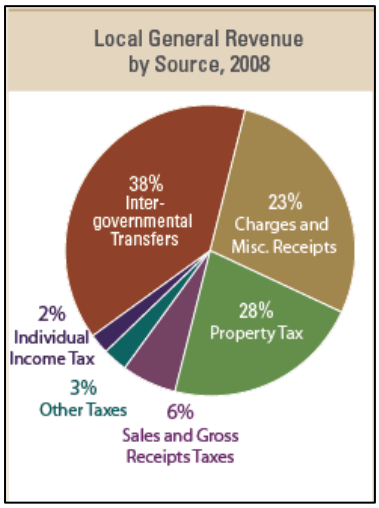
Important Considerations

In evaluating these property tax revenue per acre results, it is important to acknowledge and address a number of considerations. First and foremost, the results of a study of this type are more relevant from a fiscal perspective when land is a scarce commodity. It is difficult to make the case, for example, that small town residents should live in dense developments or invest in structured parking to reduce their land consumption. Even so, however, there may be environmental reasons to try to limit low-density and greenfield development through government policy. In addition, there are fiscal and equity reasons to prevent residents living in denser areas in a municipality from having to subsidize low-density living by other residents.

Also important to note is that the results of this study should not be interpreted to imply that only development of the most "profitable" or "valuable" land uses should be encouraged. Open and green spaces, for example, are extremely valuable in terms of improving quality of life, managing stormwater and air quality, and a variety of other reasons, even though they do not produce any property tax revenue per acre. Furthermore, there is plentiful evidence that parks and open spaces can actually enhance the value of the land that surrounds them (and, thus, the tax base, as property taxes are usually based on the value of the property). For example, the National Park Service has created a Money Generation Model, which attempts to quantify the economic benefits of National Parks (Michigan State 2002). Beyond the fact that libraries, nature reserves, swimming pools, and a variety of other land uses can enhance the value of properties in a community, the most important consideration in deciding what types of development to permit or encourage is the overall benefit to the community of that development. Property tax revenue per acre is only one of many considerations that go into determining the overall benefit of development.

Another critical point to consider in comparing the results of this study to results of similar studies in other states is that local governments' level of dependency on property taxes as a main source of revenue varies by state. The average local government in the US received 38 percent of its revenues from federal and state transfers in 2008, while property taxes were the largest source of local governments' *own* revenue, representing about 28 percent of general local government revenues (Tax Policy Center 2011). Charges and miscellaneous receipts accounted for 23 percent of revenues, while sales and gross receipts taxes, individual income taxes, and other taxes represented, together, approximately 11 percent of revenues (see Figure 18 below). Although local governments receive only 28 percent of their general revenues from property taxes, property taxes account for 72 percent of all local government tax revenue, and 79 percent of independent school district revenue (Tax Policy Center 2011(b)). Compared to other states, Virginia ranked 14th among all states in the proportion of all state and local government revenues derived from property taxes (18 percent) in 2006 (Ibid.).

Figure 18: Sources of Local Government General Revenues in 2008
Source: Tax Policy Center 2011, 2011(b)



According to the Urban Institute and Brookings Institution's Tax Policy Center, property taxes are popular among state and local governments because they are generally a reliable source of income, as their base is immobile and (usually) property values rise over time, so revenues increase with no changes in tax rate (Ibid.). Property taxes, they add, are unpopular among taxpayers, given their high visibility, perceived subjectivity of assessments and costliness of challenging assessments, and the burden they place on fixed-income property owners (Ibid.). For these reasons and others, many states have implemented limits to property tax rates. For example, California limits the total property tax rate to one percent and annual assessment increases are limited to two percent (Ibid.). Homestead exemptions apply in 28 states (and the District of Columbia), circuit breaker credits limit 17 states' (and the District of Columbia's) share of income from property taxes, and property tax deferrals in 22 states (and the District of Columbia) allow postponement of property tax payment until the sale of property of the death of the taxpayer, although such deferrals are not widely used (Ibid.). The more a local government relies on property taxes for revenues, the higher the opportunity cost of both limiting the growth of property taxes (such as in California, where increases in property taxes are limited regardless of the increase in property value) and limiting the development of land uses that generate large amounts of property tax revenue per acre.

It is necessary to mention that although denser development, in most cases, results in overall net environmental benefits (lower driving rates and associated emissions, less destruction of farmland and natural habitats, less overall stormwater runoff[9]), there are also environmental costs that are the result of the development of high-rise buildings, especially when they are clustered close together. For example, the densest areas in most major cities have the most per-acre impervious surface, and thus generate the most on-site stormwater runoff as the result of rainfall, potentially causing more localized pollution and necessitating spending on expensive stormwater infrastructure (Benfield 2010). And

[9] See Benfield 2010.

although carbon dioxide emissions are of greatest concern on a global level, there is evidence to indicate that the greatest local concentrations of carbon dioxide are in areas of high density (Ibid.). In areas of extremely high density, the lack of green space can be detrimental to human well-being and health, as well as having aesthetic costs.

The question of which types of development "pay their own way" is also relevant to this topic, though a definitive answer regarding this question is beyond the scope of this paper. Barber writes that, according widely held beliefs, educating a school child costs local government an average of $5,000 yearly in local government funds, an amount that very few houses pay in property tax (Bacon 2012). He points out, however, that the typical household pays personal property taxes on two or more automobiles, one in seven households pay personal taxes on a boat, and that households generate sales taxes by patronizing local businesses (Ibid.). This analysis touches on just a few of the other revenue and cost factors that affect the complicated balance of how local services are sustained. The perception that affordable housing, and those who make their residences in it, present an overall drain on local government resources dominates local governments' thinking about how to zone and pay for services, but the results of this study show that even the most expensive single-family homes produce less property tax revenue per acre than the average affordable rental housing units in Fairfax County.

Finally, on a more theoretical level, although the correlation between economic resources available and quality of life is strong, it is not direct. Therefore, it may be problematic to assume that higher revenues for the local government will result in better outcomes for residents. The level and quality of services provided to residents depends significantly on the efficiency of the local government in delivering services as well. Still, I believe it is safe to conclude that there is a reasonably strong correlation between resources available for services and quality of life-type amenities and characteristics of a municipality.

Discussion

The results displayed above combined with those in Appendix B represent the complete set of my property tax revenue per acre findings by land use type. Due to the comprehensive and detailed nature of these tables and figures, I will attempt to address first some general trends and then move on to address specific observations that I made in analyzing my results.

In general, the findings seemed largely intuitive and consistent with previous studies. Topping the comprehensive lists tended to be those development types that are denser and/or those such as office uses that are typically seen as huge revenue generators for local governments. In addition, the relative differences in property tax revenue per acre between residential land uses, single-use commercial uses, and denser office and residential uses found in this study were largely consistent with the more basic findings published in the Asheville and Sarasota studies (Katz 2010). One factor that complicated comparisons was the fact that Fairfax County does not have a widely-used "mixed-use" land use classification. This is likely partly due to the fact that most of the County is zoned for single uses; however, it is also due to the way in which the data was structured, with multiple properties with different uses on a single parcel represented as separate entries in the data set. Thus, this study does not touch on the issue of single-use versus mixed-use developments to nearly the same extent as the Sarasota study.

Although density seemed highly positively correlated with property tax revenue per acre, density did not seem to be the only factor driving the per-acre "profitability" of land uses in the County. For example, total tax revenue per acre for government-leased low-rise (1-4 story-) buildings was nearly 70 percent higher than that of government-leased medium and high rise (5+ story-) buildings. A number of factors could be influencing this finding, such as the height of the buildings (it is possible that most of the medium- and high-rise buildings are five stories, making the distinction between four and five stories relatively arbitrary), "taxability" of the government entity leasing the building, age and overall quality of construction, etc.

Density also does not appear to explain all of the variation in revenue-generating potential of residential properties. As mentioned in the Results section, high- and medium-rise condominium apartments generated significantly more tax revenue per acre than other residential land uses. Condominium apartment and townhome developments tended to generate significantly higher tax revenue per acre than rentals of the same use, intensity, or density. In terms of land use, high-rise condo apartments generated $1.307 million without commercial and $876,100 with commercial, per acre, while high-rise rental apartments generated $60,800 with commercial and $48,335 without commercial. Interestingly, the high-end high-rise apartments did better with no commercial uses, while the rental high-rise apartments with commercial did better than their counterparts without commercial. This could be due to the small sample size of high-rise condo apartments and the high values of those apartments rather than any general trend in profitability that holds across various settings. For medium-rise apartments, condominiums generated $358,000 per acre in tax revenue while rentals generated $29,770 – over ten times less. For garden apartments, condominiums generated $188,880 per acre while rentals generated $28,140

and for townhouses, condominiums generated $164,815 per acre while rentals generated $11,760. As mentioned above in the Results section, it seems likely that this is due to the prices and quality of the rental and condominium units available. Given Americans' preferences for owning their homes vis-à-vis renting combined with the home mortgage interest tax deduction, it is likely that some of those residents renting in Fairfax are doing so because they are not able to buy, though this may be less true as a result of the recent recession and the toll it has taken on the housing market.

Also worth noting are the differences within the County in the values of properties based on their locations. The values of properties in Reston Town Center and Tysons Corner were significantly higher than those in a lagging commercial corridor such as Beacon Hill Mall along Richmond Highway; this could be partly due to the agglomeration benefits gained from a locating in these prime, high-demand areas, as well as the fact that Tysons Corner and Reston Town Center experience significantly higher demand for retail and other amenities as a result of being significant employment and office locations, unlike other retail corridors and areas.

The "basic" and "total" tax revenue calculations were both useful for their own purposes – the former for comparing the values of the land uses and their relative contributions to the general tax base and the latter for considering different land uses' contributions to special projects. In general, however, there were few dramatic discrepancies between the two. The only major difference was that total tax revenue per acre was significantly higher than basic tax revenue per acre for industrial and commercial properties, while total tax revenue per acre for residential land uses was only slightly higher than the basic tax revenue per acre. This is likely due to the fact that many of the special taxation districts in the County target industrial and commercial properties. Because households are sensitive to any increases in their property taxes, raising property taxes on larger-scale properties for specific transportation or other infrastructure improvements is much more politically viable than increasing property taxes on residential land uses.

Counterarguments

Proponents of developing large retail venues such as big box stores and shopping malls have been critical of focusing on the effects of property taxes on local government revenue. Sales taxes, they point out, are another important source of local government revenues. Though I was unable to obtain sales tax information for this study (sales tax data is not public information in Virginia), other studies have attempted to quantify the sales tax contribution of different types of commercial land uses to municipal government revenues. To my knowledge, none of these studies have found that sales tax revenue can compensate for large-scale commercial uses that generate relatively little property tax revenue.

In Minicozzi's study of property tax revenue per acre in Asheville, he found that the average Wal-Mart sells $77 million of merchandise per year. Based on North Carolina state and local sales tax structures, that would result in $1.6 million in revenue from sales taxes for Asheville, which would be $47,500 in sales tax revenue per acre. Combined with $3,300 in property taxes per acre, that would be about $51,000 per acre in total taxes for Asheville, still only one-fifth the amount of tax revenue per acre the city receives for a six-story mixed-use development *without* factoring in the sales tax revenue generated by properties in mixed-use developments in Asheville (Langdon 2010). In the Sarasota case, Peter Katz points out that competing for high-volume retailers for sales tax revenue becomes a zero-sum game at the regional level. He writes: "Sarasota County's total retail sales bring in $60 million to $70 million a year in sales tax revenue. Barring a huge influx of wealthy residents who decide to make most or all of their purchases locally, that number is unlikely to change" (Katz 2010). Although sales tax structures and dependency vary by state, it is unlikely that sales tax revenue could compensate fully for the low property tax revenue per acre yields of big box retail stores in Fairfax County.

Critics of this study or others of its type might also argue that a "per acre" view of property tax is misguided, because lot sizes are already factored into the price of a property and, thus, consideration of land consumptions is already made in determining the amount of property taxes due to the municipal government. However, there are economies of scale to be gained from purchasing larger lots – economies of scale enjoyed only by those residents with higher means than others. In addition, tax assessment formulae are generally structured in such a way that larger lots are assessed property taxes at lower rates per acre than smaller lots (Minicozzi interview 2012). Therefore, property prices (and, by extension, property tax revenue) do not seem to fully account for the externalities caused by properties that consume large amount of land relative to their values, such as decreased affordability of housing in the rest of the jurisdiction and subsidization of low-density development – problems more likely to affect residents of modest means.

Policy Implications and Conclusion

The results of this study provide support for greater consideration of the costs of land use regulation in the future. By looking at land use in a way that considers land consumption, municipal revenue impacts, and equity, I have formulated a number of policy recommendations that address some of these issues.

As noted above, municipal revenues must be but one of many factors taken into consideration in forming policy. Many land uses that produce relatively little or no revenue, especially parks, libraries, and other public facilities, are still critical to the creation and maintenance of healthy communities and living environments. Thus, my first policy recommendation and/or suggested area for further research and improvement of per-acre property tax revenue calculations is that the fiscal or economic benefits of those public, non-revenue-generating land uses such as parks be quantified and incorporated into a model for best evaluating land use decisions.

Commercial, hotel, residential, and other developments can be constructed in a variety of forms, some of which produce significantly more property tax revenue per acre than others and have a much lower negative environmental impact. In addition, land uses and associated development patterns that produce relatively little property tax revenue per acre often also require greater infrastructure expenditures, in many cases requiring that taxpayers living or owning property in higher-density area subsidize land uses that have larger negative environmental impacts. Therefore, my second policy recommendation is that property tax structures should be reformed to incorporate land consumption and long-term infrastructure maintenance costs (rather than one-time impact fees) into account. This would reduce the regressivity of the current system and its negative externalities. Under such a system, two equally-valued properties with different demands on infrastructure and rates of land consumption would not pay the same amount of property tax revenue. The premium assessed for those properties that consume large amounts of land under a reformed property tax system could potentially be linked to the demand for affordable housing; for example, if the demand for affordable housing is especially high in the County, the owners of properties that consume large amounts of land relative to the number of people that use or live on them, would be asked to contribute to solving the problem in exchange for the externalities caused by their large lots.

Given that studies by groups such as the National Association of Realtors have shown that there is significant unmet demand for housing in transit-accessible locations and walkable communities (Logan et al.), my third policy recommendation would be for counties like Fairfax to, at a minimum, not limit the residential choices consumers have by mandating low-density development in large swaths of the County, especially given the opportunity cost and negative externalities borne by all residents when this is done. While this study does not suggest that having all residents live in high-rise or garden apartments would be an ideal policy outcome, these land uses should not automatically be "zoned out" because they are unpopular with some residents.

Finally, improved communication between planners and tax assessment professionals will be necessary to begin the process of determining whether current property taxation models are equitable and, if not, how they might be reformed. Minicozzi's efforts to familiarize tax assessors with his property tax revenue per acre

research by working with assessors' trade organizations is a good first step in improving an inter-disciplinary dialogue with respect to this subject (Minicozzi interview 2012). Planners often do not know enough about how their recommendations or decisions affect local governments' fiscal capacity, while tax assessors may lack the tools or knowledge about broader planning and housing issues to understand the effects their assessment models have on communities.

In conclusion, my hope is that the results of this study provide a useful tool for planners and policymakers in Fairfax County and other Virginia jurisdictions to use in evaluating the fiscal impacts of the development regulations and decisions they make. Property tax revenue per acre studies such as this one emphasize the fact that land use regulations not only have environmental, social, and health consequences, but fiscal ones as well.

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Appendices

Appendix A

Of the 224,443 total acres in Fairfax County accounted for in the County's parcel descriptor file, 113,228 acres, slightly over half of the entire area, is zoned for one of the following: R-1 (35,509 acres at one dwelling unit per acre), PDH-1 (944 acres at one dwelling unit per acre), RE (26,966 acres at one dwelling unit per two acres), RC (49,652 acres at one dwelling unit per five acres), or RA (157 acres at one dwelling unit per five acres). If development occurred at the maximum allowable density in all of these areas, a total of 59,897 total dwelling units would be constructed on 113,228 acres, resulting in an overall average density of approximately 1 dwelling unit per every 1.9 acres.

Appendix B

Basic and Total Tax Revenue per Acre by Land Use Classification

Land Use	Basic Property Tax Revenue per Acre	Total Property Tax Revenue per Acre	Total Acres
High rise apartments condo(=>9 no comm)	$1,278,285.83	$1,307,753.14	11.59
High rise apartments condo(=>9 comm)	$854,994.18	$876,108.78	18.09
Condo office (= > 5 stories)	$406,762.56	$500,110.69	2.62
Condo Retail (in office/Indust complex)	$296,303.50	$362,726.26	0.98
Medium rise apartments condo(5to8 stry)	$349,511.28	$357,999.29	9.16
Medical office (= > 5 stories)	$269,050.63	$311,161.25	3.15
Garden Apartments condominium (=<4story)	$184,118.25	$188,878.04	371.29
Condo Center	$159,556.99	$180,539.57	3.58
Multiplex in condominium development	$174,671.97	$178,727.32	135.01
Townhouse in condominium development	$161,834.78	$164,814.79	53.73
Condominium Office (< = 4 stories)	$134,490.31	$156,006.65	106.12
Cluster Office (< = 4 stories)	$128,973.73	$145,901.30	6.81
Condominium Medical (< = 4 stories)	$124,247.47	$140,792.95	8.58
Hotel with restaurant & other comm	$90,422.50	$110,884.42	177.50
General med/hi rise off (= > 5 stories)	$83,685.37	$102,866.97	2,116.56
Whsle,wrhsing & stg (not in IP/in condo)	$84,055.03	$100,915.25	52.91
Med/dental med/hi rise(= > 5 stories)	$88,320.75	$98,721.14	15.00
Super Regional Center	$68,249.47	$85,311.07	298.32
Townhouse in ownership development	$81,601.87	$83,295.10	3,510.51
Research & Testing(not in IP/in condo)	$62,667.12	$80,588.74	0.70
Government leased low rise(<= 4 stories)	$54,078.65	$69,395.60	8.76
High rise apartments rental(=>9 comm)	$59,723.05	$60,797.97	56.56
Office Park	$40,030.04	$52,974.33	10.10
Medical/dental low rise (< = 4 stories)	$45,549.19	$52,854.07	98.51
Hotel without restaurant & other comm	$44,494.63	$52,134.07	76.60
High rise apartments rental(=>9 no	$47,623.38	$48,335.51	60.70

comm)			
Town Center	$40,032.78	$46,508.80	126.32
Single-family, Semidetached, garden court	$43,300.61	$45,816.16	16.75
Variety or junior department stores	$40,154.38	$44,882.84	2.68
Low Rise Office(< = 4 stories)	$36,141.53	$43,465.04	2,098.95
Single-family structure NEC	$41,251.97	$42,208.72	7.18
Gov leased med/hi rise(= > 5 stories)	$36,385.21	$41,179.89	1.29
Condominium Boat Slips -private for sale	$39,927.84	$40,524.90	1.99
Furniture, house furnishings	$32,481.43	$39,509.85	35.47
Apparel and accessories	$32,522.36	$38,302.41	10.70
Other food NEC (include fruit,meat,fish)	$32,468.37	$38,279.69	11.53
Motel without restaurant & other comm	$32,329.16	$38,053.59	70.35
Drug stores	$33,844.97	$37,888.30	22.39
Regional Center	$32,599.19	$37,081.32	74.71
Motel with restaurant & other comm	$30,732.30	$36,039.52	51.34
Specialty Center	$31,414.45	$35,649.60	388.95
Finance, insurance, real estate services	$31,343.83	$35,531.09	49.62
Supermarket	$30,578.10	$35,149.77	32.69
Duplex, either vertical or horizontal	$34,101.45	$34,633.83	217.03
Supermarket plus general merchandise	$28,404.01	$32,441.54	5.16
Neighborhood Center	$28,146.84	$32,056.33	264.64
Other repair services NEC	$23,834.79	$31,014.23	9.16
Motor vehicle sales (new and used)	$23,846.99	$30,298.37	229.80
Medium rise apartments rental(5to8 stry)	$27,471.87	$29,770.65	135.56
Promotional Center	$25,036.88	$29,604.79	158.52
Other automotive, marine, aircraft and NEC	$25,511.84	$29,568.63	57.48
Personal services (laundry, photo, beauty)	$26,107.39	$29,263.36	11.16
Garden Apartments rental (=<4 story)	$27,229.42	$28,139.53	2,553.71
Community Center	$24,356.51	$27,730.01	888.66
Combination of Structure types	$26,515.04	$26,911.53	166.22
Gasoline Sale Only	$22,526.01	$26,472.61	35.61
Other Retail NEC(not in shopping center)	$22,525.58	$26,416.54	168.82
Convenience grocery	$23,417.51	$26,394.85	26.98
Gasoline Sales and Car Wash	$23,110.17	$26,353.27	23.14

Department Store	$22,918.40	$26,196.83	116.91
Gasoline and Service Station	$22,677.21	$25,691.98	97.67
Mini-Warehouses (not in IP)	$21,474.41	$25,125.66	213.01
Other office NEC	$22,191.03	$24,952.94	88.50
Restaurant without alcohol	$22,006.12	$24,876.36	17.05
Restaurant with alcohol	$21,344.50	$24,514.82	136.98
Printing & Publishing	$20,467.50	$22,877.70	25.86
Carry-out Kitchen	$20,429.19	$22,834.88	5.15
Service Station out of operation	$20,261.53	$22,647.47	1.84
Carry-out with seating	$19,359.61	$22,515.98	91.16
Building Materials, Hardware, Farm Equip	$19,735.29	$22,071.87	50.89
Discount Store	$18,541.08	$21,730.37	196.27
Planned industrial park	$18,823.83	$21,573.33	46.21
Nondurable Manufacturing(not in IP)	$19,090.56	$21,350.20	33.96
Recreation Fac,Parks (private)-outdoor	$16,137.35	$20,889.30	7.67
Veterinary hospitals	$17,524.05	$20,023.91	39.52
Wholesale,warehousing & stg (not in IP)	$16,769.64	$19,690.08	1,874.59
Motor frieight transportation	$14,822.15	$19,061.01	7.61
Research & Testing(not in IP/not in off)	$15,691.55	$18,590.08	201.71
Townhouse or Multiplex NEC	$16,285.39	$16,528.91	13.80
Converted Residential office(exdwelling)	$14,512.08	$16,317.37	61.54
Retirement homes & orphanages	$15,893.62	$16,131.29	67.71
Other consumer/business services NEC	$13,502.07	$15,209.72	28.56
Contract Construction (not in IP)	$11,930.19	$14,832.08	39.07
Nursing homes	$14,270.16	$14,533.91	136.38
Auto parking	$12,201.77	$14,197.73	70.49
Nursery Schools	$12,185.56	$13,823.88	137.05
Apartment, NEC including cooperatives	$12,288.98	$12,549.83	41.81
Motor vehicle repair separately	$10,651.63	$12,094.10	105.59
Single-family, Detached	$11,562.92	$11,805.54	101,094.61
Other Industrial NEC	$9,982.56	$11,796.69	275.37
Townhouse in rental development	$11,500.60	$11,756.69	148.36
Recreation Fac, Parks (private)-outdoor	$8,550.54	$9,933.01	0.89
Two-family NEC	$7,830.62	$8,024.03	17.37
Recreation Fac,Parks (public) - indoor	$6,362.00	$7,435.64	112.57

Recreation Fac,Parks(public)-outdoor	$5,486.32	$6,152.59	36.67
Durable Manufacturing (not in Ind Park)	$4,527.42	$5,405.19	201.02
Hospital & Health Facilities	$4,323.42	$4,988.56	219.37
Tourist Home	$4,396.92	$4,497.26	2.75
Industrial conglomeration	$3,534.82	$4,026.02	91.93
Mobile homes in park or court	$3,696.30	$4,000.47	262.29
Pipeline ROW and NEC (petroleum)	$3,509.94	$3,923.26	47.93
Marine terminals	$2,768.54	$3,094.56	2.92
Other residential NEC	$2,976.92	$3,076.83	87.88
Single-family residences inf com/ind	$2,866.32	$3,027.00	328.94
Two or more Single-family, detached	$1,922.94	$1,962.45	2,084.16
Other communications, NEC	$1,558.66	$1,742.20	5.54
Vacant Land	$1,470.42	$1,636.11	22,403.37
Improved Land w dilapidated structure	$1,178.15	$1,235.06	747.19
Private Schools	$1,006.41	$1,191.99	736.39
Garage,barn,outhouse,shed adj prcl unit	$1,146.62	$1,170.96	342.02
Horticulture Activities & services	$1,050.71	$1,165.87	155.69
Agricultural Activities & services	$1,082.08	$1,098.26	9.98
Street and highway ROW	$979.46	$1,094.53	20.57
Golf Courses (commercial)	$940.22	$1,055.77	513.74
Radio & Television	$848.32	$963.94	123.50
Other Educational Services NEC	$788.50	$872.43	41.89
Private open space(not planned develop)	$836.89	$862.44	244.38
Other resources uses NEC	$723.06	$810.85	8.30
Welfare & Charitable services	$663.41	$673.33	16.25
Golf Courses (private)	$597.68	$670.71	2,226.04
Special Training Schools	$551.98	$616.98	33.93
Cemeteries	$324.73	$362.95	563.48
Telephone & Telegraph	$286.92	$324.73	61.14
Swimming pools - outdoor	$317.07	$321.81	7.90
Sand & Gravel Quarrying	$243.32	$271.97	417.46
Civil,social,Fraternal, Prof & Bus Assoc	$180.86	$188.82	150.01
Permanent Exhibition	$82.69	$92.30	1,863.89
Churches, Synagogues	$53.14	$59.31	1,893.63
Other utilities, NEC	$19.13	$21.38	177.57
Water,pipeline ROW,plants,storage,etc.	$4.30	$4.80	695.07

Sewage,plants,etc	$2.43	$2.47	594.54
Permanent Conservation area,wildlife	$1.97	$2.20	1,412.06
Railroad,ROW,terminals,maintenance	$1.11	$1.25	537.25
Other public NEC	$0.61	$0.70	3,031.81
Public Schools	$0.27	$0.30	3,401.04
Private open space(planned development)	$0.23	$0.23	16,990.49
Recreation Fac,Parks(govt) - outdoor	$0.06	$0.07	24,470.31
Electric,transmission ROW,plants,substat	$0.04	$0.04	314.09
Military Institutions	$0.00	$0.00	9,358.74
Air,runways,terminals and maintenance	$0.00	$0.00	2,440.02
Gov owned med/hi rise(= > 5 stories)	$0.00	$0.00	1,274.23
Golf Courses (government-owned)	$0.00	$0.00	998.25
College,Universities	$0.00	$0.00	641.59
Rail rapid transit,ROW,terminals,maint	$0.00	$0.00	286.95
Gas,pipeline ROW,plants,storage,etc.	$0.00	$0.00	161.75
Police Stations	$0.00	$0.00	152.11
Communtiy swimming pool	$0.00	$0.00	152.10
Public Assembly, Both Indoor & Outdoor	$0.00	$0.00	130.96
Government owned low rise(< = 4 stories)	$0.00	$0.00	115.37
Recreation Fac,Parks (govt) - indoor	$0.00	$0.00	80.13
Fire & Rescue Stations	$0.00	$0.00	74.17
Post Offices	$0.00	$0.00	71.88
Libaries	$0.00	$0.00	68.93
Religious quarters	$0.00	$0.00	48.48
Other group quarters NEC (not Military)	$0.00	$0.00	11.35
Rooming & Boarding Houses	$0.00	$0.00	10.40
Correctional Institutions	$0.00	$0.00	7.87
Multiplex in rental development	$0.00	$0.00	7.04
Other cultural & entertainment NEC	$0.00	$0.00	2.26