Implications of a Split-Rate Real Property Tax: An Initial Look at Three Virginia Local Government Areas

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Abstract

Since the time of Henry George, there has been interest in his "single tax" on land values only, and in the related notion of taxing improvements less heavily than land, if improvements are part of the property tax base. In the United States, though, the real property tax rate almost everywhere applies equally to the values of both land and improvements; several Pennsylvania cities have been the primary exceptions. Since July 2003, however, two Virginia cities – Fairfax and Roanoke – have had legal authority to tax improvements at a lower rate than land, and some other localities in the state have expressed an interest in such a "split-rate tax."

This study uses data on individual property parcels from the tax rolls of three Virginia localities to explore the initial redistribution of real property tax liabilities under a split-rate tax, compared to the current uniform tax on land and improvements. Emphasis is on the limiting case of a pure land tax, but the pattern of redistribution would be the same with less rate differentiation, although the changes would not be as large.

The three localities are quite different from one another: Roanoke, a central city of nearly 100,000 residents, has been experiencing slow loss of population but modest growth in employment; Chesterfield County, a first-tier bedroom county in the Richmond metropolitan area with over 250,000 residents, has been experiencing rapid growth of population and nearly as rapid growth in employment; and Highland County, a small rural county on the West Virginia border with fewer than 2,500 residents, continues its long-term population loss and has been experiencing a more rapid loss of jobs.

In all three localities, the move to an equal-yield split-rate tax would reduce the residential share of the real property tax while increasing the business tax share – although the general character of business properties is quite different in Highland County than in the other two jurisdictions. Indeed, there are differences in inter-class tax changes among the three areas due, in part, to different land use patterns. In all three localities, though, there is substantial variation in the magnitude of tax change within classes, with the exception of the vacant land class.

In Roanoke, it was possible to identify the property parcels' census tract locations, and this enabled us to explore relationships between tax changes and various population and property attributes. One of the strongest relationships is between residential tax change and residents' income. In general, larger residential tax increases (or smaller decreases) occur where incomes are higher and where poverty rates are lower. Other relationships are weaker, but some still are substantial. For example, larger increases (smaller decreases) also are associated with higher owner-occupancy rates, an older population, a larger white percentage of the population, and larger home size, while larger residential tax reductions are associated with crowded housing.

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Introduction

Legislation to allow a split-rate real property tax was passed by the Virginia General Assembly in each of the last three legislative sessions. The first bill was vetoed, but the next two were signed (by a new governor). Thus, effective July 1, 2003, the cities of Fairfax and Roanoke were authorized to move from the current uniform tax on land and improvements to a split-rate structure taxing land at a higher rate than improvements.[1] To date, neither city has taken formal action to move to a split-rate tax. A preliminary staff study of the distributional consequences of shifting to a split-rate tax has been done in Fairfax [City of Fairfax 2001]. The study found that residential neighborhoods generally would experience reduced tax liabilities under a split-rate tax, with the greatest benefits in newer developments with larger houses and smaller lots. Taxes would increase for land-intensive recreational uses (primarily the Army-Navy Country Club) and land-intensive commercial uses, such as auto dealerships. Shopping centers that have made recent investments and are fully leased would benefit more under a split-rate tax than other centers.

Given local interest in a split-rate tax and the state's apparent willingness to allow local governments latitude for such change, it is appropriate to investigate the redistribution of tax liabilities under split-rate taxation of real property.[2] In an attempt to determine the possible range of experience in a small, initial effort, this study considers three Virginia localities that differ widely in terms of geographic extent, population size, number of property parcels, and density and nature of development. The localities are the City of Roanoke, Chesterfield County, and Highland County, each of which is described briefly in the next section, after first considering the role of the real property tax in Virginia local government tax structures.

Case Study Sites

Virginia has 95 counties and 39 independent cities[3] that lie outside county areas; together, these two types of local jurisdictions encompass the whole of Virginia. Each of the 134 units is a primary assessing unit for real property taxation. Virginia has a comparatively simple local government structure, which includes neither independent school districts nor townships; in addition, special districts have very limited tax authority. As a result, municipalities (towns, as well as independent cities) and counties account for 100.0 percent of all property taxes, 99.9 percent of all taxes, and 91.1 percent of all own-source general revenues [Census Bureau 2000, Table 48].

These Census Bureau figures lump real and personal property taxes, and also combine towns and cities into a single municipal category. Virginia data from the state's Auditor of Public Accounts provide a finer breakdown. The most recent data, for fiscal 2002, show the real property tax accounting for 54.4 percent of all local taxes, with some differences among the three types of taxing units: counties, 58.4 percent; cities, 47.2 percent; and towns, 26.2 percent (Table 1). Personal property taxes raise roughly one-third as much revenue for each type of local government as the real property tax, and other taxes make up the rest; these include a general sales tax for counties and independent cities, various selective excise taxes, and business and professional

occupational license taxes. The "other" category is significant, especially for towns (nearly two-thirds of their own-source taxes) and cities (over one-third of taxes), but towns account for a very small portion of all local taxes. Between them, counties and independent cities account for over 98.3 percent of the 2002 local tax revenue and for 99.1 percent of real property tax revenues – counties 72.6 percent, cities 26.5 percent. To sum up, the real property tax is the largest of Virginia local tax sources, counties account for by far the largest portion of statewide real property tax revenues, and counties depend on the real property tax for a larger share of local tax dollars than cities.

In part because of the greater importance of the property tax to counties, and of counties to the tax, we selected two counties for this study – Chesterfield and Highland. In addition, we include the independent City of Roanoke. Among cities, we selected Roanoke primarily because it has legal authority to implement a split-rate property tax. Chesterfield County is a large county – both geographically and in terms of population – and is still experiencing strong population growth, while Highland County is a rural county with declining population. Our three case study areas represent a wide range of real property tax base composition and differing socio-economic profiles.

The data in Table 2 describe the population characteristics of our three case study jurisdictions. Chesterfield is a relatively large county (2000 population of 259,903) and is experiencing rapid growth; its population grew 24 percent from 1990 to 2000, compared to just over 14 percent statewide. It is a suburban county in the first tier of counties beyond the city of Richmond, the state capital. Chesterfield has a relatively young population, with only 8.1 percent over 65 years old compared to 11.2 percent statewide.

Alternatively, Highland County is the least populated county in the state (2000 population of just 2,536) and, continuing a long-term trend, it lost 3.8 percent of its population during the 1990s. Highland is a rural county in the Allegheny Mountains, located on U.S. 250 northwest of Charlottesville, on the West Virginia border. Highland County has a relatively older population; 20.4 percent of the residents of the county are over 65, nearly double the statewide level of 11.2 percent. The population density of the county is a mere six people per square mile.

Finally, Roanoke is a central city in the Blue Ridge Mountains in the southwestern part of the state, served by Interstate 81 and U.S. 460. Its 2000 population was 94,911, and it experienced a slight population loss during the 1990s. The city is, on average, quite densely populated, with 2,213 people per square mile compared to 179 per square mile statewide. Its population is somewhat older, with 16.4 percent over 65 compared to 11.2 percent statewide.

Information on the demographic characteristics of our case study jurisdictions in Table 3 gives further evidence of the differences among them. Chesterfield County largely mirrors the state in racial composition, with 17.8 percent black compared to 19.6 percent statewide, but its adult population is somewhat more educated than the average in the

Table 1. Real Property Tax Role in Virginia Local Taxation, by Type of Local Government Unit, FY2002				
Government Type	Local Tax Types			
	Real Property	Personal Property	Other	Total
Local Taxes ($000)				
Cities	1,230,624.2	391,213.0	984,358.2	2,606,195.4
Counties	3,366,309.2	1,079,260.0	1,317,039.6	5,762,608.8
Towns	38,360.6	13,224.3	94,961.8	146,546.7
Total	4,635,294.0	1,483,697.3	2,396,359.6	8,515,350.9
Revenue Composition by Type of Unit (Percentage Distributions)				
Cities	47.2	15.0	37.8	100.0
Counties	58.4	18.7	22.9	100.0
Towns	26.2	9.0	64.8	100.0
Total	54.4	17.4	28.1	100.0
Tax Distributions Across Types of Units (Percentage Distributions)				
Cities	26.5	26.4	41.1	30.6
Counties	72.6	72.7	55.0	67.7
Towns	0.8	0.9	4.0	1.7
Total	100.0	100.0	100.0	100.0
Source: Virginia Auditor of Public Accounts. *Comparative Report of Local Government Revenues and Expenditures, Year Ended June 30, 2002*. Richmond: Auditor of Public Accounts, 2003, Exhibit B. In fiscal 2002, there were 39 independent cities, 95 counties, and 36 towns.				

Table 2. Population Characteristics of Case Study Jurisdictions						
Jurisdiction	Population 2000	Population Change 1990-2000	Percent Under 5 Years Old	Percent Over 65 Years Old	Land Area (sq. miles)	Density (Persons per sq. mile)
Chesterfield	259,903	24.0%	6.7%	8.1%	426	611
Highland	2,536	-3.8%	3.7%	20.4%	416	6
Roanoke	94,911	-1.6%	6.5%	16.4%	43	2,213
Virginia	**7,078,515**	**14.4%**	**6.5%**	**11.2%**	**39,594**	**179**
Source: U.S. Census Bureau, State and County QuickFacts [http://quickfacts.census.gov/qfd/index.html].						

state. The county's other demographic characteristics are consistent with its being a rapidly growing suburban county –very high home ownership rate, share of housing units in multi-unit structures well below average, per capita income above the state average, and a poverty rate under half the state rate.

Table 3. Demographic Characteristics of Case Study Jurisdictions

Jurisdiction	Percent Black	Percent High School Grad	Percent Bachelors Degree	Home Ownership Rate (Percent)	Percent Multi-Unit Housing Structures	Per Capita Income (Dollars)	Persons Below Poverty (Percent)
Chesterfield	17.8	88.1	32.6	80.9	11.9	25,286	4.5
Highland	0.1	72.8	13.2	83.8	3.0	15,976	12.6
Roanoke	26.7	76.0	18.7	56.3	35.3	18,468	15.9
Virginia	**19.6**	**81.5**	**29.5**	**68.1**	**21.5**	**23,975**	**9.6**

Source: U.S. Census Bureau, State and County QuickFacts [http://quickfacts.census.gov/qfd/index.html].

Similarly, Highland County has demographic characteristics consistent with its rural status. Its population is very homogeneous in terms of race, with only 0.1 percent black.[4] The average adult in Highland has somewhat less education than the statewide average. The county has an extremely high home ownership rate (83.8 percent, compared to the statewide average of 68.1 percent) and virtually no multi-unit housing structures. This is the poorest of our case study jurisdictions; per capita income is just two-thirds of the state average, and 12.6 percent of the people live below the poverty line, compared to 9.6 percent statewide.

Roanoke City's demographic characteristics reflect its role as a central city. More than one-fourth of Roanoke citizens are black, compared to one-fifth statewide. The share of the adult population with a high school diploma or a college degree is somewhat less than the state average. The home ownership rate is below the state average, and more than one-third of the housing units in the city are in multi-unit housing structures (compared to 21.5 percent in the state as a whole). Per capita income is nearly 25 percent below the state average and nearly 16 percent of the City's population is living below the poverty line compared to just 9.6 percent statewide.

A brief overview of the economy of each case study jurisdiction is provided in Table 4. Although private non-farm employment in 1999 was higher in Chesterfield County than in either of the other two study areas, the raw statistic is not very informative, given the vastly different demographic profiles of the areas. We have expressed this employment figure as a percentage of the 2000 population 18 years of age and over. Statewide, employment was 52.3 percent of this population group; the relationship varies widely across the three study areas, and each differs substantially from the state average. On this population-normalized basis, private non-farm employment in Chesterfield County is closest to the state average but, at 41.6 percent, about one-fifth less than the state average.

Employment in Highland County is 19.2 percent of the population 18 and over, less than half the Chesterfield level. On this basis, both the counties in our case study group appear to be bedroom communities.

Table 4. Selected Economic Indicators for Case Study Jurisdictions

Jurisdiction	1999 Private Non-farm Employment			1997 Retail Sales Per Capita (Dollars)	1997 Local Government. Employment (FTE Per 1,000 Population)
	Number	As Percent of 2000 Population Age 18 or More	Employment Percent Change from 1990		
Chesterfield	77,429	41.6	20.8	9,762	35.0
Highland	390	19.2	-17.7	1,606	41.4
Roanoke	74,556	101.5	3.3	19,422	48.2
Virginia	**2,791,977**	**52.3**	**20.3**	**9,293**	**35.8**

Source: U.S. Census Bureau, State and County QuickFacts [http://quickfacts.census.gov/qfd/index.html] and authors' calculations.

This impression is heightened by comparison to the City of Roanoke, where employment is over 100 percent of the identified population segment; Roanoke is an employment center. Despite Roanoke's 1.6 percent loss of population between 1990 and 2000 (Table 2), private non-farm employment in the city increased by 3.3 percent (Table 4). For Highland County, the employment loss exceeded the population loss by a wide margin, perhaps due to increased commuting to jobs outside the county, but perhaps also reflecting the aging of the population. Chesterfield County posted a 20.8 percent increase in private non-farm employment between 1990 and 1999, a bit below its population growth rate, but nearly identical to the percentage increase in employment statewide. The difference between the central city and the two counties also is quite evident from 1997 retail sales data. Retail sales per capita in Roanoke are more than double the statewide average level, while the Chesterfield level per capita is about 5 percent above the average. In Highland County, on the other hand, per capita retail sales are less than one-fifth the state average.

Finally, Table 4 shows that local government employment (full-time equivalents) in 1997 per 1,000 residents in Chesterfield County was at about the state average level (35.0 per 1,000 compared to 35.8), but 15 percent to 35 percent above the state average in Highland County (41.4) and Roanoke (48.2).

Split-rate Real Property Taxation

In Virginia, and virtually every U.S. system of local government, the local property tax is an ad valorem levy that taxes the value of land and improvements to land (structures and buildings) at the same rate. An alternative to a uniform tax rate on both land and improvements is a rate structure that taxes the two components of real property at different rates; typically the land rate is higher than the improvements rate. Such a rate

structure often is referred to as a *split-rate*, or *two-tiered*, property tax. At the extreme, the improvements rate is zero and the property tax is known as land tax, or site value tax.

Expressing concern about the erosion of the property tax as a means of raising local own-source revenues over the last several decades, David Brunori [2003, Chapter 10] argues that adoption of a split-rate property tax system could revitalize local government finances in the 21st century. Such a tax has many perceived advantages compared to the current tax on land and improvements. Specifically:

- One argument for a split-rate tax is improved incentives (or smaller disincentives) to investment in improvements. The current tax is said to discourage, or penalize, investment in improvements, including property maintenance; lowering the rate on improvements would reduce the tax penalty for such investment. Examining the urban renaissance in Pittsburgh after adoption of a split-rate property tax in the early 1970s, Oates and Schwab [1997, p. 19] concluded, "… land taxation provides city officials with a tax instrument that generates revenues but has no damaging side effects on the urban economy. In this way, it allows the city to avoid reliance on other taxes that can undermine urban development." It appears that a split-rate tax did not cause a building boom in Pittsburgh, but it did allow the city government to avoid policies that might have undercut the boom [Schwab and Harris 1998, p. 228].
- Another argument is that taxing land more heavily than improvements is fairer. Two separate reasons are offered. First, because land ownership tends to be concentrated in high-income families and individuals, a tax on land values is said to be more progressive than a tax on land and improvements [Bahl 2002; Case 1998]. The other reason is that land values are "unearned increments" resulting from the actions of society in general, whereas individual owners are responsible for decisions to add improvements to their respective properties. In taxing land more heavily, a portion of socially-created value is reclaimed for collective use in the public sector. Netzer characterizes this as a moral basis for land value taxation [Netzer 1998a, p. x].
- Not only is it argued that a land tax is fairer across individuals, there is also some preliminary evidence that a land tax may reduce fiscal disparities across local governments within a metropolitan area. Bell and Clark [forthcoming] found that shifting to a land tax would reduce modestly fiscal disparities across local governments within the Washington D.C. metropolitan area.

- Finally, some argue for a land tax on administrative grounds. We have encountered this view in parts of South Africa, where a large number of local governments tax only land value. Our research using data for South Africa provides some preliminary evidence to support the argument that administrative ease is a factor in the adoption of this property tax variant there; jurisdictions with large numbers of properties and those with a large share of housing in informal settlements are somewhat more likely to use a site value tax.[5] Any perceived savings in administrative costs, however, would not be realized under a split-rate property tax if the rate on improvements is

greater than zero, or if data on improvements are otherwise required to be developed, stored, and maintained.

There are two potentially major disadvantages to site value taxation. One concerns assessment practice.[6] In many places, the value of the whole property is determined and then the total value is somehow divided between the land component and the improvements component. Accepted appraisal practice in Virginia, however, is said to entail the initial and separate step of estimating the market value of land, regardless of the use class of the subject property [Morelli]. Even so, the division of total value into land and improvements components represents an important caveat for efforts to explore the distributional implications of moving to a split-rate tax. We use the separate land and improvements values provided by each of the three jurisdictions to calculate tax liabilities under a split-rate tax. Currently land and improvements are taxed at the same rate, so the division of value between the two components is of no consequence in determining tax liability. This fact may affect both property owners' attention to the division and tax assessors' efforts in determining the split. Partly because the separate assessed values for land "are of no utility" Netzer suggests caution in their use in contemplating issues related to land value taxation, and indicates they may understate true land values because (1) placing more value on improvements and less on land does not affect property tax yield but (2) it may reduce property owners' income tax liabilities by increasing the depreciable portion of their properties [Netzer 1998b, p. 119]. More attention to the separate values of land and improvements should be expected under a split-rate tax. The more important the distinction is in determining property tax liabilities, the more closely property owners are likely to look at how land value is determined, and more assessment appeals seem likely to result.[7] Therefore, the shares of value represented by each of the two components might be expected to change after adoption of a split-rate tax.

In their study of the distributional implications of moving to a land value tax in the District of Columbia, Schwab and Harris [1998, p. 233] express a similar reservation:

> (First), while we can have confidence in the assessed valuation of the sum of improvements and land, it is unclear how much faith we can place in the accuracy of the separate assessment of land and improvements. Under current District tax policy, land and structures are taxed at the same rate and thus it would make little sense for the District to put a great deal of effort into developing accurate measures of land values…

They continue, "If the District did adopt a graded tax, it would need to determine land values much more carefully and it is quite possible that, as a consequence, our view of the distribution of the burden of the tax could change significantly" [Schwab and Harris 1998, p. 233].

We are not sure how important this caveat is for the three jurisdictions we include in this study. For example, Highland County is a very rural area, with a relatively small number of parcels and three land-intensive uses account for more than 94 percent of the assessed value – properties with land up to 20 acres (28 percent of assessed value), properties with

between 20 and 100 acres (26 percent of assessed value), and properties with more than 100 acres (40 percent of assessed value).[8] There is a relatively active real estate market in the county and many vacant land sales. We were told that assessed values were developed by looking at land sales prices and then adding in the depreciated replacement cost of structures, which is consistent with information from the Virginia Department of Taxation regarding accepted appraisal practice, noted above.

We were also told that this same approach is used in the City of Roanoke. Individual parcels are valued by aggregating estimated land price, based on vacant land sales, and the depreciated replacement cost of structures. We are not clear, however, whether the land sales used to estimate land value in a given neighborhood come from that neighborhood, or whether sales in one neighborhood are used to value land in other neighborhoods.[9]

The second frequently discussed disadvantage of a tax on only land is that the value of land is a much smaller tax base than the value of land and improvements. As a result, sufficient revenues can be generated only at higher tax rates. Bahl asserts there is no doubt that it is politically easier to levy a lower property tax rate on a broader base (one that includes the value of improvements) than vice versa. This argument is not easily dismissed. Financial officers and elected officials of fiscally strapped local governments too often see downtown office buildings, hotels, and luxury residences as legitimate and fruitful objects of taxation; some countries have made exceptions to a land value tax just to capture the value of these types of improvements – in part because it is perceived as a way to place the tax burden on others [Bahl 2002].

This second argument is not a major issue in Highland County, where land accounts for 57 percent of the property tax base. The issue is considerably more important in Chesterfield County and Roanoke City, where land accounts for 25.3 and 21.5 percent, respectively, of total taxable assessed value. Thus, for Highland County to generate the same revenue as the current tax rate of $0.62 per $100 of assessed value, the tax rate for land only would need to be increased to just $1.09 per $100 of assessed value; while this would be a 75 percent increase in the rate, the resulting land rate is not out of line with statewide average rates under the current tax. The situation is different in Chesterfield County and Roanoke City. In Chesterfield, the current rate of $1.07 per $100 of assessed value would have to rise to $4.2265 if imposed on land only; this is an increase of nearly 300 percent. In Roanoke, the tax rate for land only would have to be $5.6303 per $100 of assessed value, an increase of 365 percent over the current rate of $1.21 per $100 of assessed value.

A few other caveats are in order before we turn to our empirical analysis. First, we look at changes in the distribution of the tax *impact* – i.e., the legal tax liability – across real property classes and selected geographic areas within the study areas. We do not consider the ultimate *incidence* of the property tax (i.e., the reduction of real income at the final resting point of the tax burden) after any tax shifting. For example, although business property represents a significant portion of the real property tax base, the businesses per se do not bear the ultimate incidence of the tax; people always bear the

incidence of business taxes, in one of three roles: as customers of the business, to the extent forward shifting is possible; as suppliers of labor or other factors of production, to the extent that the tax is backward shifted; or as owners of the business (including shareholders of corporations), to the extent market conditions do not permit shifting.

Tax shifting is legal tax avoidance. Taxes create incentives to change decisions, or behavior, to reduce tax liability. The fewer opportunities there are to change behavior, the less shifting there will be. Owner-occupied residential property generally is thought to provide less opportunity for tax shifting, because legal responsibility for the tax (tax impact) is on the people who occupy and use the property; there is no further transaction to enable the tax to be passed on to others. However, a tax on improvements may discourage investment in improvements, both through less maintenance of existing structures or making new structures smaller or otherwise less valuable than they would be without the tax. Such decisions reduce incomes available in construction and the supply of building materials, for example.

As the examples suggest, a tax on reproducible capital is more likely to be shifted (to alter decisions) than a tax on land. In fact, because land per se is not mobile, it generally is concluded that a tax on land is not shifted, and this sometimes is an argument for a land tax, or a split-rate tax. Raising the tax rate on land is said to cause land to be put to its most valuable use, thus promoting development and discouraging land speculation. The ad valorem property tax, however, is on the value of land; a sufficiently high land tax rate could reduce demand for land in a given location, and thus the value of that land. The land itself could not flee the jurisdiction, but land value might; instead of developing the land, owners might abandon it to be sold at tax auction. This scenario seems most likely if very much higher rates were imposed in a small area, such as a small city or town within a metropolitan area; this would make flight to another location of even local economic activity more feasible.

Because the ability to shift taxes depends on market forces, generalization is risky. Shifting opportunities tend to vary for an industry over time, as conditions change, and across industries at a given time. The safest general rule is that the incidence of a tax (i.e., reduction of real income) tends to fall most heavily on entities with the fewest options that they are willing to exercise. For example, a higher property tax on a business that is prepared to move to where its taxes would be lower might be shifted backward to the people who work for the business, if their attachment to the area is strong enough that they are willing to work for less to keep their jobs from moving out.

Empirical Analysis

In this section we address the distributional implications of moving from the current property tax to one that taxes land more heavily than structures. We explore, in each of the three study areas, how real property tax liabilities (tax impact) would change under a split-rate tax compared to the current uniform tax on land and improvements. Gross tax liabilities are calculated, applying the appropriate tax rates to the assessed values on the 2003 tax rolls provided by each locality. Tax credits, exemptions, or other adjustments to

calculated liabilities are not considered, in part because local policy makers might well wish to revamp any tax relief measures in light of the changes in tax liabilities brought about by moving to a split-rate tax.[10] Our focus on initial tax changes does not take into account the effects that changed incentives under a split-rate tax and the passage of time might have on development and land value patterns in the localities; ultimately, these might result in a different distribution of property tax burdens.

Our objective is to identify winners and losers, among land use types and among some geographic subunits within the three study areas, in moving to a split-rate tax. Because the focus is, appropriately, on the implications of the form of the tax, rather than on the magnitude of the tax levy, we hold constant the aggregate tax liability in each study area in developing alternative tax rate structures. The local split-rate tax authority established by Virginia provides that the rate on improvements must be greater than zero and no higher than the rate on land. Within this framework, literally an infinite number of rate combinations could be devised. Although a zero rate on improvements (buildings) is not legal, a rate very close to zero could be set. It is useful, therefore, to use the limiting case of a zero rate on buildings as one alternative, as it defines the upper limit to the redistribution of initial impact of the real property tax, for a given set of assessed values. The current tax, with a uniform rate applied to both land and buildings, is the other limiting case. In between, different degrees of differentiation in tax rates would bring about different degrees of realignment of tax burdens, but the pattern of change would be the same.[11] For these reasons, we work with the limiting cases in our analysis of tax-share changes.

Available information does not permit the same level of analysis in all three areas. More has been possible in Roanoke City, because the real property database provided us identifies the census tracts in which the various parcels are located. This made it possible to relate tax changes to various characteristics of the census tracts' residents and properties.

Highland County

The Highland County Commissioner of Revenue made available tax year 2003 assessment data for the nearly 4,000 individual properties in the county. Along with other information, the database provides assessed value for each property, in total and for the land and improvements components separately.

To determine the distributional impact in Highland County of moving from the current property tax (the baseline scenario) to a tax on land only (the limiting case of a split-rate tax with a tax rate of zero on improvements), we first created a work file with only taxable properties. The data file received from the county listed 3,927 individual properties. Property use class 7 is for tax-exempt property and primarily includes cemeteries. We sorted the initial data file by land use class and deleted the 194 properties in class 7, leaving 3,733 taxable properties.

Tax Base Profile

The next step is calculation of aggregate property tax liabilities under the current tax for each of the six taxable land use classes identified in the county:

- Class 1, residential property located in the town of Monterey, the county seat
- Class 2, properties with up to 20 acres
- Class 3, multi-unit dwellings
- Class 4, commercial
- Class 5, properties with 21 to 100 acres
- Class 6, properties with over 100 acres.

Table H-1 presents a profile of the Highland County property tax base. Properties in the town of Monterey (class 1) account for just over 3 percent of the parcels in the county and just 3 percent of assessed value. Most properties (55 percent) are classified as properties with up to 20 acres (class 2), and these properties account for nearly 28 percent of total assessed value in the county. Properties with 21 to 100 acres (class 5) account for nearly one-quarter of the parcels in the county and over 26 percent of assessed value. Properties with over 100 acres (class 6) account for less than 15 percent of the parcels in the county, but 40 percent of assessed value. Commercial and multi-unit housing properties (classes 4 and 3 respectively) collectively account for 2.7 percent of assessed value in the county.

Table H-1. Profile of Property Tax Base in Highland County, Tax Year 2003

Use Class	Assessed Value (Dollars)			Percentages of Total Value	Land as % of Total Value	Property Parcels	
	Land	Improvements	Total			Number	Percent
1	1,341,800	7,164,000	8,505,800	3.0	15.8	114	3.1
2	20,782,700	58,108,400	78,891,100	27.7	26.3	2065	55.3
3	68,000	467,400	535,400	0.2	12.7	5	0.1
4	1,398,800	5,848,600	7,247,400	2.5	19.3	88	2.4
5	47,141,300	27,998,000	75,139,300	26.4	62.7	909	24.4
6	91,835,300	22,411,100	114,246,400	40.1	80.4	552	14.8
Total	162,567,900	121,997,500	284,565,400	100.0	57.1	3733	100.0

Source: Authors' calculations from Highland County real property tax database for 2003.

Total taxable assessed value in Highland County for tax year 2003 is approximately $285 million. Applying the 2003 nominal tax rate ($0.62 per $100 assessed value) to this base gives a countywide real property tax liability of $1,764,305. Because land and buildings currently are taxed at the same rate, the distribution of tax liability across land use classes

is exactly the same as the distribution of assessed value. Tax liabilities by land use class under the baseline scenario are presented in Table H-2.

Table H-2. Property Tax Liabilities by Land Use Class for the Current Real Property Tax and an Equal-yield Land Tax, Highland County, Tax Year 2003

Use Class	Current Tax Liabilities by Property Component				Land Tax Liabilities		Percent Change
	Land	Improvements	Total	Share	Total	Share	
1	$8,319	$44,417	$52,736	3.0%	$14,562	0.8%	-72.4%
2	$128,853	$360,272	$489,125	27.7%	$225,549	12.8%	-53.9%
3	$422	$2,898	$3,319	0.2%	$738	0.0%	-77.8%
4	$8,673	$36,261	$44,934	2.5%	$15,181	0.9%	-66.2%
5	$292,276	$173,588	$465,864	26.4%	$511,612	29.0%	9.8%
6	$569,379	$138,949	$708,328	40.1%	$996,663	56.5%	40.7%
Total	$1,007,921	$756,385	$1,764,305	100.0%	$1,764,305	100.0%	0.0%

Source: Authors' calculations from Highland County real property tax database for 2003.

Tax Changes Between Classes

For our first approximation of the distributional consequences of moving to a split-rate tax, we take the most extreme case of a split-rate tax – a tax rate of zero on improvements. As already noted, we hold countywide tax liability constant under alternative scenarios to highlight the reallocation of tax liability due to the change in tax rate structure. Highland County would need a rate of $1.09 per $100 of assessed value to produce a $1,764,305 aggregate liability under a land tax, using 2003 land values. Multiplying this rate times the land value in each land use class produces the tax liabilities displayed in Table H-2.

On average, the assessed value of land accounts for 57 percent of total assessed value in Highland County (see Table H-1). Under a land tax, the more land-intensive use classes would bear a higher share of the property tax burden than they do under the current tax. In fact, Table H-2 shows tax reductions under a land tax for all land uses except classes 5 and 6. Properties in Monterey (class 1), which account for 3 percent of the liability under the current tax, account for less than 1 percent of the tax under a land tax, a 72.4 percent decline in aggregate tax liability. Similarly, properties with up to 20 acres (class 2), which account for 55 percent of total taxable parcels in Highland County, see their share of the property tax burden fall from just under 28 percent under the current system to less than 13 percent, a reduction of almost 54 percent.

Making up for these cuts, properties with over 100 acres (class 6), which account for just 15 percent of the taxable properties in the county, see their share of property tax liability increase from 40.1 percent ($708,328) under the current tax to 56.5 percent ($996,663)

under a land tax, an increase of 40 percent. Similarly, properties with 21 to 100 acres (class 5) see their share of the property tax burden increase from 26 to 29 percent.

Tax Changes Within Classes

While a move to a tax on land only would result in a clear reallocation of the tax burden from class 1 and 2 properties to class 5 and 6 properties, there are also significant within-class variations. For example, each property class includes vacant parcels. Under a land tax, they would bear a higher share of taxes within each class than properties with a lower land-to-improvements ratio.

For each property in each class, we calculated the tax liability under both the current tax and the land tax alternative. We then calculated the percent change in tax liability for each individual property. Table H-3 presents descriptive statistics for the individual-property changes in tax liability, by property class, resulting from moving to a land tax. It includes the median percentage change for each class, as well as measures of tax-change variability across properties within each class. The measures of variability include minimum and maximum percentage changes and the coefficient of dispersion, which measures the distribution of the individual changes in tax liability relative to the median change.[12]

Table H-3. Within Class Variation in Change in Property Tax Liabilities from Replacing the Current Tax with an Equal-yield Land Tax, Highland County, Tax Year 2003

Land Use Class	Percent Change in Tax Liabilities for Individual Parcels			Coefficient of Dispersion
	Minimum	Maximum	Median	
1	-89.7	75.0	-72.4	-54.1
2	-94.5	75.0	25.2	264.4
3	-86.5	-63.2	-75.0	-8.1
4	-91.8	75.0	62.8	67.2
5	-91.6	75.0	75.0	46.0
6	-64.7	75.0	69.7	78.2

Source: Authors' calculations from Highland County real property tax database for 2003.

The coefficient of dispersion will be familiar to many readers, as it is commonly used to measure property tax assessment uniformity across properties; as we use it here, though, it measures the variation in the percentage change in tax liability across parcels. If all parcels experienced the same percentage change, there would be no variation and the coefficient of dispersion would equal zero; the greater the departure of the parcels' experience from the median, the higher the value of the coefficient of dispersion. In Highland County, class 3 (multi-family) property experiences the most uniform impact of moving to a land tax, as indicated by the -8.1 value of the coefficient of dispersion (Table H-3). Each property in the class experiences a decline in tax liability, and the range of

decline is concentrated around the median reduction of 75 percent; the low value of the coefficient of dispersion captures this.

At the other extreme are properties in class 2 – single-family residential-rural. For one property in this class, moving to a land tax means a decline in tax liability of nearly 95 percent, while the maximum tax increase is 75 percent; the median change is a 25 percent increase. In class 2, there are 940 properties (46 percent) that are vacant land; accordingly, these experience a significant percentage increase in their individual tax liabilities under a land tax. While the percentage increase is large, the absolute change is more modest. These 940 properties account for just 9 percent of class 2 property tax liability under the current tax, but their share increases to 35 percent under a land tax. Thus, moving to a land tax not only reallocates the tax burden among classes, but also within them; because they have no improvements to benefit from reducing (removing, in this limiting case) the tax on improvements, in each class the vacant parcels experience the largest tax increases, and their aggregate share of class tax liability rises.

Finally, we have information on ownership status (resident/non-resident) by use class. Not all of the data in this field transferred to the diskette provided us, so we had to fill in the blanks with "R" for resident and "N" for non-resident. Based on information provided by the Highland County Commissioner of the Revenue, any parcels with a blank cell in this field are considered to be resident owned if the mailing address for the property tax bill (included in the database) is in any of six local zip codes: 24413, 24433, 24442, 24458, 24465, and 24484.

Data on owners' residency status in Table H-4 show, for example, that residents own 51.7 percent of land parcels in the county, while non-residents own 48.3 percent. Ownership rates are not uniform across land use classes, however. For example, Highland County residents own a majority of parcels in use classes 1, 2, 3, and 4. They own 71 percent of the parcels in class 1; 100 percent in class 3; 84 percent in class 4; and a slight majority of 54 percent in class 2. Non-residents own a slight majority of the parcels in class 5 (53 percent) and a somewhat larger majority in class 6 (57 percent). Because classes 5 and 6 are the two that experience an increase in property tax liability under the land tax scenario, it appears this may be a way to reallocate the tax burden to non-resident landowners.

Table H-4. Resident Status of Owners of Real Property Parcels by Land Use Class, Highland County, Tax Year 2003

Use Class	Resident	Non-Resident	Unknown	Total	Resident Percentage	Non-Resident Percentage
1	81	33	0	114	71.1	28.9
2	1,111	953	1	2,065	53.8	46.2
3	5	0	0	5	100.0	0.0
4	74	14	0	88	84.1	15.9
5	424	485	0	909	46.6	53.4
6	235	317	0	552	42.6	57.4
Total	1,930	1,802	1	3,733	51.7	48.3

Source: Authors' calculations from Highland County real property tax database for 2003.

Chesterfield County

Chesterfield County Department of Real Estate Assessments made available assessment data for over 123,000 properties in Chesterfield County. The database provides, among other information, the tax year 2003 assessed value for each property, in total and for the land and improvements components separately.

The Chesterfield County property record file was provided as a Microsoft Access database. We wanted to transfer the file to Microsoft Excel to carry out a series of simulations to estimate the distribution of the property tax liability under alternative scenarios. The file exceeded the physical size limits of Excel by a very substantial margin, so we broke the data into several files.

For each file we had to carry out a series of steps to develop working files for our simulations. Specifically, we made the following adjustments:

- First, we sorted the data by the parcel status code, which is "I" for inactive and "A" for active. There were 11,662 inactive files, all of which were deleted.[13]
- Second, we sorted by "assessment land market value," which is the assessed value of land. We deleted the 2,341 for which the assessed land value was either zero or missing.
- Finally, we sorted by the land use code, identified as "state code." Land use code 07 indicates exemption from property taxation. The 1,233 properties with this code were deleted, as they do not bear on the distribution or redistribution of tax liabilities.

The remaining file contains 107,886 active, taxable parcels for which land values were provided.

Tax Base Profile

To determine the distributional impact in Chesterfield County of moving from the current system of property taxes (the baseline scenario) to a tax on land only (the limiting case of a split-rate tax with a tax rate of zero on improvements), we first look at total property tax liability by property use class under the current system. There are ten taxable land use codes in Chesterfield County:

- Class 1, single-family residential-urban
- Class 2, single-family residential-rural
- Class 3, multi-family residential
- Class 4, commercial
- Class 5, properties with 20 to 99 acres
- Class 6, properties with 100+ acres
- Class 8, industrial zoning
- Class 9, mineral
- Class 10, trailer park
- Class 11, mobile home subdivision.

Table C-1 provides an overview of the property tax base in Chesterfield County. Total assessed value in the county exceeded $17 billion in the 2003 tax year. Class 1 property, single-family residential-urban, accounts for 73 percent of the parcels in our database and 60 percent of total assessed value. Class 2 property, single-family residential-rural, accounts for another 21.5 percent of the parcels and 17.5 percent of total assessed value. Thus, single-family residential properties account for nearly 95 percent of the parcels and 78 percent of total assessed value in the county. As described earlier, Chesterfield County is a suburban, bedroom community.

Table C-1. Profile of Property Tax Base in Chesterfield County, Tax Year 2003

Use Class	Assessed Value (Dollars)				Percent of Total Assessed Value	Number of Parcels	Percent of Total Parcels
	Land Market Value	Land Tax Value	Improvements	Total			
1	2,364,182,664	2,352,302,392	8,090,165,000	10,442,467,392	60.1	78,726	73.0
2	783,415,055	780,132,036	2,262,312,600	3,042,444,636	17.5	23,227	21.5
3	82,980,800	82,980,800	415,741,600	498,722,400	2.9	430	0.4
4	784,843,200	776,689,189	1,443,721,400	2,220,410,589	12.8	3,185	3.0
5	100,635,860	70,745,322	52,232,700	122,978,022	0.7	909	0.8
6	128,176,400	76,089,919	16,565,900	92,655,819	0.5	310	0.3
8	216,679,295	213,624,602	687,205,000	900,829,602	5.2	938	0.9
9	22,031,200	20,174,336	1,314,100	21,488,436	0.1	3	0.0
10	24,935,400	24,935,400	4,225,000	29,160,400	0.2	29	0.0
11	1,816,000	1,816,000	5,200,700	7,016,700	0.0	129	0.1
Total	4,509,695,874	4,399,489,996	12,978,684,000	17,378,173,996	100.0	107,886	100.0

Source: Authors' calculations from Chesterfield County real property tax database for 2003.

Class 4, commercial property, accounts for only 3 percent of the parcels, but nearly 13 percent of total assessed value. The remaining property classes (3, 5, 6, 8, 9, 10, and 11) account for just 2.5 percent of taxable parcels in the county, but 9.6 percent of assessed value.

Another important feature of the Chesterfield County property tax base is the information on the assessed value of land. Virginia allows agricultural land to be assessed at use value rather than market value, and Chesterfield County (unlike Highland County) has exercised this option. Because Chesterfield County is a rapidly developing suburban community in transition from its rural roots, some properties in the database include information on both estimated market value of land and estimated use value of land. Typically, in a rapidly urbanizing county such as Chesterfield, the use value of land is less, sometimes much less, than the estimated market value of land, as the latter reflects

the highest and best use of the land. For properties that have a use value of land determined by the assessors, the total assessed value of the parcel includes that use value, not the market value of the land. This is reflected in Table C-1 in the distinction between column 2 (market value of land) and column 3 (the value of land used for tax purposes).[14]

Table C-2 looks at this matter more closely for each land use class. For example, for single-family urban residential properties, a use value of land is included in the assessments for less than one-tenth of one percent of the 78,726 parcels. Alternatively, in class 5 property, which consists of properties with 20 to 99 acres, 41 percent of the parcels include the use value of land, not the market value, in assessed value for tax purposes; similarly in class 6, parcels of more than 100 acres, 62 percent include the use value of land in assessed value for tax purposes.

Table C-2. Real Property Parcels with Use-value Assessments and Vacant Parcels by Land Use Class, Chesterfield County, Tax Year 2003

Use Class	Total Parcels	Parcels with Land Use Value		Parcels with Zero Improvements	
		Number	Percent	Number	Percent
1	78,726	61	0.1	5534	7.0
2	23,227	144	0.6	6278	27.0
3	430	0	0.0	12	2.8
4	3,185	8	0.3	1016	31.9
5	909	371	40.8	512	56.3
6	310	193	62.3	223	71.9
8	938	8	0.9	434	46.3
9	3	2	66.7	2	66.7
10	29	0	0.0	6	20.7
11	129	0	0.0	4	3.1
Total	107,886	787	0.7	14,021	13.0

Source: Authors' calculations from Chesterfield County real property tax database for 2003.

Table C-2 also includes information on vacant parcels by land use class. We sorted parcels by land use class and then by the value of improvements. Those with zero value for improvements are thought to be vacant parcels. In the aggregate, 13 percent of the 107,886 parcels in our data are vacant. In each of three use classes, a majority of parcels show no improvements value; the three are properties with 20 to 99 acres (class 5; 56 percent vacant), properties with 100 acres or more (class 6; 72 percent vacant), and mineral properties (class 9; two of the three parcels are vacant). Just 7 percent of class 1(single-family residential-urban) parcels are vacant, and less than 3 percent of those in class 3 (multi-family) are vacant. Somewhat surprisingly, nearly one-third of class 4

(commercial) parcels are vacant, and for class 8 (industrial), nearly half the parcels show no improvements value.

Table C-3 looks at the division of total assessed value between land and improvements components for the county as a whole, and for each land use class. On average, for the entire county, land accounts for about one-fourth of total assessed real property value. For only three classes is the land share of total assessed value smaller than the average – single-family residential-urban (22.5 percent), multi-family residential (16.6 percent), and industrial zoning (23.7 percent). In all the other land use classes, land is a higher percentage of total assessed value than the countywide average. The land percentages above the average range from 25.6 and 25.9 percent of assessed value for single-family residential-rural and mobile home subdivisions, respectively, to 93.9 percent for mineral properties; for properties with more than 100 acres and those with 20 to 99 acres, the land shares are 82.1 percent and 57.5 percent, respectively.

Table C-3. Land and Improvements Value by Land Use Class, Chesterfield County, Tax Year 2003

Use Class	Total Parcels	Assessed Values Used to Calculate Taxes (Dollars)			Land Value Percent of Total Value
		Land	Improvements	Total	
1	78,726	2,352,302,392	8,090,165,000	10,442,467,392	22.5
2	23,227	780,132,036	2,262,312,600	3,042,444,636	25.6
3	430	82,980,800	415,741,600	498,722,400	16.6
4	3,185	776,689,189	1,443,721,400	2,220,410,589	35.0
5	909	70,745,322	52,232,700	122,978,022	57.5
6	310	76,089,919	16,565,900	92,655,819	82.1
8	938	213,624,602	687,205,000	900,829,602	23.7
9	3	20,174,336	1,314,100	21,488,436	93.9
10	29	24,935,400	4,225,000	29,160,400	85.5
11	129	1,816,000	5,200,700	7,016,700	25.9
Total	107,886	4,399,489,996	12,978,684,000	17,378,173,996	25.3

Source: Authors' calculations from Chesterfield County real property tax database for 2003.

Tax Changes Between Classes

The current nominal property tax rate in Chesterfield County is $1.07 per $100 of assessed value. Total taxable assessed value in the county is approximately $17.4 billion, so the current rate applied to taxable assessed values produces a $185.9 million aggregate real property tax liability. The total assessed value of taxable land in the county is

approximately $4.4 billion. If the tax applied only to land, the tax rate needed to produce the same revenue would be $4.2265 per $100 assessed value.

Table C-4 provides information on the aggregate tax liability for each land use class in Chesterfield County under the current tax and under the alternative of taxing only land value. Three classes, collectively, account for most of the county's parcels, and also most of the tax liability under both the current property tax and the land tax alternative. Specifically, classes 1, 2, and 4 (the two categories of single-family housing, plus commercial) account for 97.5 percent of taxable parcels in the county (Table C-1); under the current tax, they account for 90.4 percent of property tax liability, and under the land tax, they account for 88.9 percent of total liability. Disaggregating, class 1 (single-family residential-urban) accounts for 73 percent of taxable parcels, but only 60 percent of the tax liability under the current tax scheme; its tax share falls to 53.5 percent under the land tax. Alternatively, class 4 (commercial) properties account for 3 percent of taxable parcels in the county, but 12.8 percent of the current property tax; under the land tax, the aggregate tax liability for class 4 properties rises 38.2 percent, increasing the class's share of the countywide total tax to 17.7 percent from the current 12.8 percent. The share of taxes paid by class 2 properties, which account for 21.5 percent of parcels, is relatively constant under both tax schemes – specifically, 17.5 percent of tax liability under the current system and 17.7 percent under the land tax alternative. This slight increase reflects the fact that the class 2 land share of assessed value is just slightly above the countywide average.

Table C-4. Property Tax Liabilities by Land Use Class for the Current Property Tax and an Equal-yield Land Tax, Chesterfield County, Tax Year 2003

	Tax Liability (Dollars)		Percentage Distribution		Percent Change in Tax Liability
Use Class	Current Tax	Land Tax	Current Tax	Land Tax	
1	111,734,401	99,421,139	60.1	53.5	-11.0
2	32,554,158	32,972,638	17.5	17.7	1.3
3	5,336,330	3,507,222	2.9	1.9	-34.3
4	23,758,393	32,827,125	12.8	17.7	38.2
5	1,315,865	2,990,083	0.7	1.6	127.2
6	991,417	3,215,975	0.5	1.7	224.4
8	9,638,877	9,028,942	5.2	4.9	-6.3
9	229,926	852,678	0.1	0.5	270.8
10	312,016	1,053,906	0.2	0.6	237.8
11	75,079	76,754	0.0	0.0	2.2
Total	185,946,462	185,946,462	100.0	100.0	0.0

Source: Authors' calculations from Chesterfield County real property tax database for 2003.

The absolute amount and percentage share of taxes on properties with 20 to 99 acres (class 5) more than doubles under the land tax; tax liability rises from $1,315,865 to $2,990,083 – an increase of 127 percent – and their share of the property tax increases from 0.7 percent to 1.6 percent. For properties with over 100 acres (class 6), the tax share more than triples, rising from 0.5 percent to 1.7 percent.[15] Class 9 properties (minerals) see their relative share of the tax burden increase by 400 percent – from 0.1 percent to 0.5 percent.[16]

Tax Changes Within Classes

As in Highland County, moving from the current property tax to a tax on land value only not only reallocates the property tax burden among land use classes; it also reallocates the burden within each class.

For each property in each land use class, we calculated the tax liability under both the current tax and the land tax alternative, and then calculated the percent change in tax liability. Table C-5 presents descriptive statistics for the individual-property changes in property tax liability within each land use class. The table includes information on the median percentage tax change for each class, as well as measures of the variation in the changes within each class. The measures of variability include the minimum and maximum percentage tax change and the coefficient of dispersion.

All classes of property have vacant parcels, so the maximum increase in tax liability is 295 percent, the same as the increase in the tax rate from $1.07 to $4.22566 per $100 assessed value. The minimum tax change varies much more across the classes, ranging from a decline of 97.4 percent for one single-family residential-urban parcel and increases of 206 and 269 percent for parcels in land use classes 10 and 9, respectively.

Land use classes 9 and 10 have the most uniform pattern of changes in tax liability across individual properties within the class, as demonstrated by their coefficients of dispersion of 3.0 and 8.5, respectively. In both these classes, the tax liability rises for each property in moving from the current tax to a land tax; the *minimum* tax increase for any property is over 200 percent in both classes 9 and 10.

Single-family residential-rural (class 2) properties are characterized by the most variation in percent tax change across individual properties, as revealed by the astronomical coefficient of dispersion of -1,665.5. This is in spite of the fact that the average land share of assessed value for the class (25.6 percent) approximates the ratio for the county as a whole (25.3), and there is only a very modest change in aggregate tax liability for the class – specifically, a 1.3 percent increase, from $32.6 million to $33 million. More than one-fourth of the parcels in this class are vacant (27.0 percent). The median land share of value for the class is 23.8 percent while the mean is 44.4 percent, indicating a skewed distribution; the range in the land share is from 100 percent (for the 27 percent of the parcels that are vacant) to just 1.5 percent.

Table C-5. Within Class Variation in Change in Property Tax Liabilities from Replacing the Current Tax with an Equal-yield Land Tax, Chesterfield County, Tax Year 2003				
Land Use Class	Percent Change in Tax Liabilities for Individual Parcels			Coefficient of Dispersion
	Minimum	Maximum	Median	
1 (File 1)	-97.4	295.0	-17.6	-150.7
1 (File 2)	-95.4	295.0	-17.6	-238.7
2	-93.9	295.0	-6.1	-1,665.5
3	-81.0	295.0	-55.2	-57.8
4	-95.8	295.0	107.2	115.6
5	-70.3	295.0	295.0	31.9
6	-60.2	295.0	295.0	16.0
8	-88.3	295.0	155.9	96.2
9	268.9	295.0	295.0	3.0
10	206.2	295.0	254.4	8.5
11	-37.5	295.0	4.9	401.6
Source: Authors' calculations from Chesterfield County real property tax database for 2003.				

City of Roanoke

To explore the redistribution of real property tax liabilities under a split-rate tax in Roanoke, we obtained from the City of Roanoke Office of Real Estate Valuation a CD with selected information on real property parcels within the city as recorded on the tax year 2003 tax roll. The information includes, for each parcel, the tax map number (a unique identifier), property class, assessed value of land, assessed value of buildings (if any), total assessed value, neighborhood number, and census tract number.[17]

Identification of property parcels by census tract sets the Roanoke data set apart from those for the other two jurisdictions in this initial study. The whole of Highland County, with about 2,500 residents, consists of only one census tract, so census tract information provides no way of differentiating among various portions of the county. Chesterfield County consists of many census tracts, but the real property tax database does not include census tract identification for the property parcels, and we were told the county's GIS staff could not provide a crosswalk between the tax data and census tract information.[18] Grouping properties by census tract is desirable because it permits them to be linked with various socio-economic data, including income and age data and home ownership rates for the population, as well as information on certain housing stock characteristics.

Not all pieces of information are available for each parcel in the Roanoke database. For example, several hundred of the more than 45,000 parcels have no census tract number. City-defined neighborhoods provide a possible alternative geographic breakdown, but they are less satisfactory. First, socio-economic data are not available at the

neighborhood level. Also limiting their usefulness is the large number of neighborhoods – a total of 185 different-numbered neighborhoods consisting of from two to 1,139 property parcels.

Tax Base Profile

The tax year 2003 database obtained from the City of Roanoke contains information for 45,494 parcels. We dropped from our study 448 parcels for which no land values are shown. The remaining 45,046 parcels include 2,283 – just over 5 percent – whose class codes identify them as exempt from real property taxation; these also were dropped out, leaving 42,763 taxable parcels available for analysis. Of the taxable parcels, 973 have no census tract identifier. We considered eliminating these, as well, but decided to retain all taxable properties and to place the 973 in a "not allocable" group; this group and the 23 census tracts provide 24 sets of parcels for analysis.[19] Before considering data at the census tract level, though, we summarize the distribution of parcels and values by use class.

Roanoke identifies four broad classes of real property: class 100 is vacant land, class 200 is single-family residential property, class 300 is multi-family residential property, and class 400 is commercial and industrial property.[20] Most of the real property parcels in Roanoke are in class 200. Its 26,680 taxable parcels represent 67.1 percent of all taxable parcels (Table R-1). Next is class 100, with 8,288 parcels, equal to 19.4 percent of total taxable parcels. Classes 300 and 400 parcels are much less numerous. The 3,140 multi-family parcels represent 7.3 percent of taxable parcels, while the 2,655 commercial and industrial properties account for the remaining 6.2 percent. Note that the exempt properties (also shown in Table R-1) are distributed much differently from the taxable ones, with nearly three-quarters being vacant land. Some exempt parcels are in each of the other three classes, as well.

Not surprisingly, the classes' respective shares of assessed (taxable) value differ from their shares of parcels. While vacant land (class 100) accounts for 19.4 percent of taxable parcels, it accounts for only 2.9 percent of total assessed value, and only 13.1 percent of all land value on the 2003 tax roll (Table R-2, compared to Table R-1). Single-family residential (class 200) properties also are less significant in terms of value than in terms of sheer numbers (58.2 percent versus 67.1 percent of taxable parcels). Both classes 300 and 400 represent shares of value that are disproportionately large in relation to the number of properties. The difference is comparatively small for multi-family housing (9.6 percent of value compared to 7.3 percent of taxable parcels), but the difference is quite large for the commercial and industrial class; at 29.4 percent, the class 400 share of assessed value is nearly five times its share of taxable parcels.

In considering the effects of placing more of the tax on land than on improvements, the distribution of value between land and buildings is of particular interest. Overall, land accounts for only 21.5 percent of all taxable assessed value, and buildings make up the other 78.5 percent (Table R-2). Somewhat to our surprise, value in the vacant land class (100) is not all land value; 1.3 percent of it is buildings.[21] Both housing classes (200 and

300) have below-average percentages of value in land, while the land component of value for the commercial and industrial class, at 25.2 percent, is comparatively high. Looked at somewhat differently, although class 400 represents "only" 29.4 percent of all taxable value (compared to 6.9 percent of parcels), it represents 34.4 percent of all land value, while single-family residential properties, which comprise two-thirds of taxable parcels and 58.2 percent of all taxable assessed value, account for less than half (46.7 percent) of land value. Thus, although single-family residential properties account for two times as much taxable value as commercial and industrial properties, they represent just over one-third again as much of the land value. As suggested by the findings for Highland County and Chesterfield County, these facts are quite important in determining the changes in initial property tax impact in moving from a uniform tax on land and buildings to one that taxes land more heavily.

Table R-1. Real Property Parcels by Property Class and Taxable or Exempt Status, City of Roanoke, Tax Year 2003*

Property Class	Number of Parcels			Percentage by Class		
	Total	Taxable	Exempt	Total	Taxable	Exempt
100 Vacant land	9,953	8,288	1,665	22.1	19.4	72.9
200 Single-family residential	28,766	28,680	86	63.9	67.1	3.8
300 Multi-family residential	3,213	3,140	73	7.1	7.3	3.2
400 Commercial & industrial	3,114	2,655	459	6.9	6.2	20.1
Total	45,046	42,763	2,283	100.0	100.0	100.0

* Excludes 448 parcels with no land values in database. Detail may not add to totals due to rounding.
Source: Authors' calculations from Roanoke real property tax database for 2003.

Table R-2. Assessed Values of Taxable Real Property Parcels by Property Class and Land and Buildings Components, City of Roanoke, Tax Year 2003*

Property Class	Assessed Value ($ Millions)			Percentage Distributions of Value				
				Across Property Classes			Within Classes	
	Total	Land	Buildings	Total	Land	Buildings	Land	Buildings
100	132.0	130.3	1.7	2.9	13.1	0.1	98.7	1.3
200	2,690.2	463.8	2,226.4	58.2	46.7	61.3	17.2	82.8
300	441.7	57.2	384.5	9.6	5.8	10.6	13.0	87.0
400	1,359.7	342.3	1,017.4	29.4	34.4	28.0	25.2	74.8
Total	4,623.6	993.6	3,629.9	100.0	100.0	100.0	21.5	78.5

* Based on 42,763 taxable parcels for which land values were provided. Detail mail not add to totals due to rounding.
Source: Authors' calculations from Roanoke real property tax database for 2003.

Alternative Split-rate Tax Structures

Although we focus on the limiting cases of the current tax and a tax on only land, we calculated citywide tax liabilities by class for two less extreme split-rate variants, to show how tax liability reallocation changes as the ratio of the land rate to the improvements rate diminishes. Given our revenue-neutrality constraint, each of the split-rate structures identified would have produced the same aggregate tax liability when applied to the taxable values on the tax year 2003 roll (Table R-3). The nominal real property tax rate in Roanoke City in recent years has been $1.21 per $100 of assessed value – or, equivalently, 1.21 percent. This rate results in a gross real property tax liability of $55,945,011.[22]

Because buildings account for nearly four times as much assessed value as land, levying a zero (or nearly zero) rate on buildings while maintaining aggregate citywide tax liability would require a very large increase in the land rate. In the limiting case of a zero rate on improvements, the land rate would have to be 5.6303 percent, a 365.3 percent increase over the current 1.21 percent rate. The other alternatives for which citywide results are presented in Table R-3 have ratios of land rate to buildings rate of 3:1 and 1.5:1. The revenue-neutral rate pairs that go with these land-to-building ratios are, respectively, 2.5402 percent for land and 0.8459 percent for buildings, and 1.6383 percent for land and 1.0928 percent for buildings.[23]

Citywide Tax Changes

Changes Between Classes: Applying the rates for these alternative tax rate structures to citywide tax year 2003 taxable values of land and buildings produces the inter-class redistributions shown in Table R-3. For the limiting case of a zero rate on buildings (a land-to-buildings rate ratio of 1:0), the class 100 tax increase is 359.3 percent[24] and the tax liability for class 400 rises by 17.1 percent; these increases just offset declines of 19.7 percent and 39.7 percent, respectively, for single- and multi-family residential parcels (classes 200 and 300). This situation reflects the fact that land accounts for only 17.2 percent of class 200 value and 13.3 percent of class 300 value compared to the 21.5 percent average for all classes; by comparison, land represents 25.2 percent of value in class 400, which, after class 200, has the largest share of total value (29.4 percent and 58.2 percent, respectively). For the other two split-rate alternatives in Table R-3, the pattern is the same – compared to the current tax, the liability for class 400 increases and that for class 100 increases by a substantially larger percentage, while class 200 enjoys a lower liability and class 300 benefits from an even larger percentage reduction. The least differentiation calculated features a 1.5:1 ratio of the land rate to the buildings rate. This comparatively mild differential results in tax liability changes from the current uniform tax of less than 2 percent for classes 200 (a decrease) and 400 (an increase), and a change of under 4 percent for class 300 (a decrease), but the class 100 change – although much less than under the limiting case of a zero buildings rate – is about a 35 percent increase.

Changes Within Classes: These changes are based on citywide aggregate values by class. Changes will differ across individual properties, depending upon their relative mix of land and building values. The extent of variation is shown in Table R-4, which also presents citywide figures. Average tax change statistics, however, differ in the two tables; in constructing Table R-3, the tax rates were applied to aggregate values by class (total value for the current tax, land value for the land tax), so that only five calculations were needed (one for each class, plus the total) to determine tax liabilities under each of the tax variants. For Table R-4, however, the tax rates were applied to the values for each of the 42,763 properties, individually; thus, the mean percent change in tax liability for class 200, for example, results from adding up the changes for each of the 28,680 parcels in the class, and dividing that sum by 28,680. The mean tax change for class 200 properties in Table R-4 is -20.7 percent, compared to the aggregate change for the class of -19.7 percent in Table R-3. The differences are larger for the other three classes.

Table R-3. Citywide Real Property Tax Shares by Property Class, Current Tax and Three Equal-yield Split-rate Variants, City of Roanoke, Tax Year 2003*

Item	100 Vacant land	200 Single-family	300 Multi-family	400 Commercial & industrial	Total
(Current tax: Rate = 1.21% on both land and buildings)					
Tax	$ 1,588,253	$ 32,560,034	$ 5,344,720	$ 16,452,003	$ 55,945,011
Percent	2.8%	58.2%	9.6%	29.4%	100.0%
(L:B Ratio = 1:0 – Rate on land = 5.6303%, rate on buildings = zero)					
Tax	$ 7,295,579	$ 26,154,601	$ 3,222,423	$ 19,272,472	$ 55,945,076
Percent	13.0%	46.8%	5.8%	34.4%	100.0%
Change**	359.3%	-19.7%	-39.7%	17.1%	0.000%
(L:B Ratio = 3:1 – Rate on land = 2.5402%, rate on buildings = 0.8459%)					
Tax	$ 3,305,758	$ 30,633,006	$ 4,706,154	$ 17,301,021	$ 55,945,940
Percent	5.9%	54.8%	8.4%	30.9%	100.0%
Change**	108.1%	-5.9%	-11.9%	5.2%	0.002%
(L:B Ratio = 1.5:1 – Rate on land = 1.6383%, rate on buildings = 1.0928%)					
Tax	$ 2,141,259	$ 31,940,313	$ 5,139,243	$ 16,725,713	$ 55,946,527
Percent	3.8%	57.1%	9.2%	29.9%	100.0%
Change**	34.8%	-1.9%	-3.8%	1.7%	0.003%

* Based on 42,763 taxable parcels for which land values were provided.
** Percentage change from tax liability under current, uniform tax.
Source: Authors' calculations from Roanoke real property tax database for 2003.

For all properties as a group, and for those in each of the four classes, Table R-4 gives average percentage tax changes (both median and mean) as well as measures of the

variability in the changes within each class of property; the latter include the standard deviation from the mean, as well as the minimum and maximum percentage changes in tax liability. As already noted, average tax change experience differs across the property classes. The median changes for classes 100, 200, 300, and 400, respectively, are 365.3 percent, -24.2 percent, -35.2 percent, and 36.5 percent; for all four classes in total, the median change is -17.0 percent. Median tax changes differ by several percentage points from the mean values for three of the four classes. The exception is class 100 (vacant land); at 364.3 percent, the mean for this class is nearly the same as the median. Like class 100, the mean and median tax changes for class 400 (commercial and industrial) also are positive, but they are much smaller than for class 100; moreover, the class 400 mean of 54.8 percent is half again as large as the median (36.5 percent). The higher value for the mean compared to the median suggests that higher-value properties tend to have more of their value in land, and thus to experience larger increases. Both classes of residential property have negative tax changes, whether measured by the median or the mean. For class 200 (single family), the difference between the median and mean tax changes is moderate; -24.2 percent and -20.7 percent, respectively. The difference is larger for class 300 (multi-family), with a median change of -35.2 percent and a mean change of -28.4 percent.

Table R-4. Within Class Variation in Change in Property Tax Liabilities from Replacing the Current Tax with an Equal-yield Land Tax, City of Roanoke, Tax Year 2003

	Class 100	Class 200	Class 300	Class 400	Total
Median	365.3	-24.2	-35.2	36.5	-17.0
Mean	364.3	-20.7	-28.4	54.8	58.0
Standard deviation	16.5	37.1	37.4	95.5	156.6
Maximum	365.3	365.3	365.3	365.3	365.3
Minimum	-84.1	-97.7	-95.7	-98.7	-98.7
Exhibit: City-wide coefficients of dispersion for tax changes across individual parcels.					
Coefficient of dispersion (%)	0.3	-87.4	-65.5	202.7	565.9
Number of parcels	8,288	28,680	3,140	2,655	42,763
Source: Authors' Calculations based on data from the Roanoke real property database for tax year 2003.					

The maximum tax change for parcels in each of the four classes is a 365.3 percent increase. This indicates there is some unimproved property in each of the classes, for this change is exactly the percentage increase of the 5.6303 percent land rate over the current 1.21 percent tax rate. The minimum tax change in each class is a reduction. The smallest is a -84.1 percent tax change in class 100; the smallest changes (i.e., largest reductions) in the other three classes are very close (-97.7 percent, -95.7 percent, and -98.7 percent for classes 200, 300, and 400, respectively) and not terribly different from that in class 100. The other data on variability in tax change, however, underscore the danger of considering only extreme values.

Despite great similarity across the classes in terms of maximum and minimum tax change values, changes for individual parcels in each group vary rather widely, and the degree of within-class variability is different for the different classes. In the top panel of Table R-4, the standard deviation is between 1.3 and 1.8 times as large as the absolute value of the mean tax change for each class other than class 100. This indicates substantial within-class variation in the percentage change in tax liability; exact interpretation of this statistic, however, depends upon the data being normally distributed [Eckert 1990, p. 532], and there is evidence that the distributions of the tax changes are skewed. Another measure of within-class variation, the coefficient of dispersion, is provided in the bottom panel of Table R-4.

Class 100 exhibits by far the least variation across the parcels in the percentage change in tax liability, as indicated by the 0.3 value of its coefficient of dispersion. There is considerable variation in the tax changes of individual parcels in all the other classes, but particularly in class 400, for which the coefficient of dispersion is 202.7. The respective coefficients of dispersion for classes 200 and 300 are -87.4 and -65.5.

Meaningful consideration of nearly 43,000 parcels individually is not possible; some aggregation is needed. As already noted, we have selected the census tract as the geographic subunit in the City of Roanoke, largely because of the availability of other data for these areas that enable us to relate the property tax liability changes to other characteristics. We turn now to that analysis. At the census tract level, we consider only the two limiting cases – the current uniform tax and the tax imposed solely on land. As noted earlier, intermediate split-rate variants produce the same pattern of change as the land tax, only at lower levels.

Tax Changes by Census Tract

Lack of census tract numbers for 973 parcels poses a bit of a problem. While these parcels represent only 2.3 percent of taxable parcels and 3.0 percent of value, as a group their percentage of total value represented by buildings is well above the city average (89.4 percent compared to 78.5 percent) and, indeed, above that of any of the 23 census tracts (Table R-5). Not being able to allocate these parcels causes the calculated numbers for one or more census tracts to differ from the values that would result from full attribution of parcels to specific census tracts, but we cannot say how many tracts are affected or how great the differences would be.

Census Tract Size: If the population of Roanoke were distributed evenly across census tracts, each would have 4,127 residents. In fact, 11 tracts have less than this mean population and 12 have more (Table R-5). The smallest population of any census tract is 874 (tract 11), the next smallest is 2,642 (tract 8), the largest is 7,468 (tract 6), the next largest is 5,475 (tract 16), and the median is 4,406 (tract 2).[25] Another measure of size, the number of real property parcels, gives a very similar picture. The smallest number of parcels in any tract is 531, the largest is 4,502, and the median number is 1,826; these occur in the same tracts as the smallest, largest, and median population counts (tracts 11, 6, and 2); the correlation between parcels and population for the 23 tracts is 0.8625.

Census Tract Taxable Values: Table R-5 shows the distribution of value across census tracts, which naturally differs from the distribution of the number of parcels. If distributed evenly across census tracts, each would account for a bit more than 4 percent of citywide value. As it is, four tracts (7, 8, 10, and 13) have less than half that portion – i.e., less than 2 percent of the city total – and three have more than double the mean value (tracts 3, 6, and 16); the figures range from a low of 1.2 percent of citywide assessed value (tracts 8 and 10) to 11.0 percent (tract 16). A notion of the average parcel value is given by comparing the percentage distributions of parcels and assessed values; if a tract's share of assessed value is greater than its share of parcels, then its average parcel value is above the city average. Extremes of the average value per parcel are one-third of the city average (tract 8) and four times the city average (tract 11). For five census tracts, average parcel value is less than half the city average (tracts 2, 7, 8, 10, and 13), and for another five, it is more than 1.5 times the city average (tracts 3, 11, 16, 17, and 21).

Whether a tract's share of the tax rises or falls in moving to relatively heavier taxation of land, however, logically depends on the division of value between land and improvements, not the total value per parcel. The percentage of total value represented by land averages 21.5 percent citywide and the median among the 23 census tracts is 19.3 percent. In three census tracts (7, 14, and 22) the land share of value is less than 90 percent of the median, and in six (3, 5, 6, 11, 16, and 21) it is more than more than 110 percent of the median value. The high for the land share of value is 29.6 percent (tract 3) and the low is 12.9 percent (tract 7), a ratio of more than 2:1. Thus, tax changes are likely to vary substantially across census tracts.

Changes in Total Tax by Census Tract: Both the wide variation in tax changes across census tracts and the importance of the breakdown of value between land and buildings in determining the different changes are shown in Table R-6. To help in presenting the latter relationship, the second column of Table R-6 reproduces the land share of total assessed value from the next-to-last column of Table R-5, and the census tracts are arrayed by decreasing size of the land share of value. Tract 1 is the median tract, with a 19.3 percent land share. There is a clustering of census tracts close to the median; five are within 2 percentage points above the median value land share and eight are within 2 percentage points below the median; thus, 14 of the 23 tracts are clustered within a range of four percentage points. The highest land share (29.6 percent in tract 3) is about half again as large as the median and 2.3 times the lowest land share (12.9 percent in tract 7). Column 3 of Table R-6 shows the amount of property tax liability in thousands of dollars under the current tax, which is imposed at the rate of 1.21 percent on both land and buildings (1:1 ratio of land rate to buildings rate), and column 4 shows the percentage distribution of the tax liability. Columns 5 and 6 present this information for an equal-yield tax rate of 5.6303 percent levied on only land (1:0 ratio of land rate to buildings rate).

The last two columns in Table R-6 give the tax change, in thousands of dollars in column 7 and, in column 8, as a percentage of current tax liability. Aggregate real property tax liability rises in six census tracts (3, 5, 6, 11, 16, and 21) and falls in the other 17 tracts.

The skewed distribution of tax changes is indicated by comparison of the median and mean values for the 23 census tracts: the mean of the 23 percentage changes is -6.8 percent, while -10.1 percent is the median. The largest increase among the census tracts is 37.6 percent, in tract 3, followed by 13.9 percent in tract 16 and 12.4 percent in tract 21; no other increase is in double digits. At the other extreme, the largest tax decreases (or smallest increases) are -39.9 percent in tract 7, -27.3 percent in tract 22, and -26.5 percent in tract 14; no other decrease is as much as 20 percent. Despite the changes, however, the same three census tracts bear the largest percentage of the citywide tax under both the current tax and the land tax, and the same three census tracts have the lowest percentages of the citywide tax under both limiting cases, although in each grouping the ranks change somewhat from the current to the extreme opposite tax form.[26]

How nearly three times as many census tracts could experience tax decreases as the number with increases in a move to a land tax with equal citywide tax liability is revealed in Table R-6. First, the three tracts with the highest shares of citywide total assessed value (the same as the shares of the current uniform tax in column 4 of Table R-6) are among those with tax increases under the move to a land tax; tracts 16, 3, and 6 account, respectively, for 11.01 percent, 10.12 percent, and 9.36 percent of total assessed value. Moreover, land accounts for an above-average share of total assessed value in each (the same as the share of the land tax in column 6). While these three tracts account for 30.49 percent of total assessed value, they account for 36.42 percent of land value, which means a collective average tax increase of over 19 percent. Each of the other three tracts with tax increases accounts for 4.06 percent to 6.19 percent of total assessed value, and somewhat above average land shares of value. By contrast, only four of the tracts with tax decreases have at least 4 percent of citywide total assessed value (tracts 4, 17, 20, and 23) – the highest is 6.17 percent (tract 23) – while four have less than 2 percent of total citywide value (tracts 7, 8, 10, and 13). In each case, the share of citywide land value is less than the share of citywide total value, with seven falling below 2 percent in the former category (the same four plus numbers 2, 14, and 22).[27]

Census tracts with tax increases in moving to a split-rate tax have larger shares of land value than of total value, while the reverse is true for those with tax reductions (compare columns 4 and 6 in Table R-6). Indeed, as noted earlier, the land share of total assessed value is the key to explaining the tax-change experience. Recall that Table R-6 arrays the census tracts by decreasing size of the land share of assessed value, and note that the percentage changes in aggregate tax liability shown in the last column of the table go from highest to lowest, line to line, without exception. The correlation between the tax change and the land portion of assessed value is 1.0. As noted earlier, the tax changes for the limiting case of a tax on only land define the upper bounds for any split-rate tax placing a lower rate on buildings than on land; moreover, the changes under a less extreme split-rate structure would follow the same pattern as that shown in Table R-6, although the changes would be smaller.

Table R-5. Taxable Property Parcels, Assessed Values, and Land and Buildings Shares of Value by Census Tract, City of Roanoke, Tax Year 2003*							
Census Tract	Population	Number of Parcels	Percentage Distributions		Percent of Value by Component		
			Parcels	Value	Total	Land	Buildings
1	3,800	1,752	4.1	2.3	100.0	19.3	80.7
2	4,406	1,826	4.3	2.1	100.0	18.2	81.8
3	4,758	1,942	4.5	10.1	100.0	29.6	70.4
4	4,533	2,003	4.7	4.5	100.0	20.4	79.6
5	4,666	2,256	5.3	4.1	100.0	23.4	76.6
6	7,468	4,502	10.5	9.4	100.0	22.9	77.1
7	3,546	1,773	4.1	1.5	100.0	12.9	87.1
8	2,642	1,540	3.6	1.2	100.0	17.6	82.4
9	5,259	1,444	3.4	2.8	100.0	19.2	80.8
10	2,785	1,328	3.1	1.2	100.0	19.2	80.8
11	874	531	1.2	4.8	100.0	22.9	77.1
12	3,628	1,166	2.7	3.2	100.0	20.8	79.2
13	4,411	1,992	4.7	1.6	100.0	17.4	82.6
14	3,573	1,848	4.3	2.2	100.0	15.8	84.2
15	4,844	2,349	5.5	3.4	100.0	18.9	81.1
16	5,475	2,277	5.3	11.0	100.0	24.5	75.5
17	2,860	1,033	2.4	4.7	100.0	21.2	78.8
18	4,083	1,498	3.5	3.5	100.0	17.6	82.4
19	4,842	1,846	4.3	3.9	100.0	19.0	81.0
20	4,536	1,970	4.6	5.2	100.0	19.5	80.5
21	3,810	1,553	3.6	6.2	100.0	24.1	75.9
22	3,033	1,243	2.9	2.2	100.0	15.6	84.4
23	5,079	2,118	5.0	6.2	100.0	20.6	79.4
NA		973	2.3	3.0	100.0	10.6	89.4
Total	94,911	42,763	100.0	100.0	100.0	21.5	78.5

* Based on 42,763 taxable parcels for which land values were provided, including 973 parcels not allocable to one of the 23 census tracts (24th category on preceding page). Detail may not add to totals due to rounding.
Source: Authors' calculations from Roanoke real property tax database for 2003, except population data are from http://factfinder.census.gov/servlet/GCTTable?_ts=89681140387.

Changes Between Classes by Census Tract: We have seen from Table R-6 that total tax changes differ widely across census tracts, but what is the experience for different types of property? Table R-7 provides percentage-change figures, not only for the aggregate change by census tract, but also for the change for each of the four classes of real property in each census tract. Just as the total tax changes differ across census tracts, the changes differ among the classes within a census tract, and also citywide. Moving to a split-rate tax would produce a tax increase for class 100 (vacant land) properties in each of the 23 census tracts, and in the limiting case of the land tax, the change is quite substantial. If all class 100 parcels were truly vacant land, with no improvements value, there would be a 365.3 percent increase in tax liability, because this is the increase from the current uniform 1.21 percent rate to the revenue-neutral rate of 5.6303 percent for a land tax. Only seven census tracts have zero improvements values in class 100 (tracts 2, 3, 7, 12, 17, 18, and 20), and in each of these the tax liability change for class 100 is, in fact, 365.3 percent. Among the 23 census tracts, the smallest change for class 100 is a 355.5 percent increase in tract 23, where land is 97.9 percent of assessed value for the class.[28]

The other three classes are less homogeneous in the makeup of their taxable values, and thus in their calculated tax changes from removing the tax on buildings. For class 200 (single-family residential properties), such a change produces a tax reduction in 21 of the 23 census tracts, and the median change is -26.9 percent in the limiting case of a zero tax on buildings. The changes for the two census tracts that experience an increase are 0.4 percent (tract 21) and 4.2 percent (tract 16). Seven tracts show reductions of at least 35 percent for this class (tracts 7, 8, 10, 12, 13, 14, and 22), with the largest being a 55.0 percent decrease (tract 7). For class 300 (multi-family residential properties), tax liability decreases in all 23 census tracts. Thus, for class 300, as for class 100, the change in all census tracts is in the same direction; however, for class 100 all the changes are positive and close to the same percentage value, while for class 300 all the changes are negative and rather widely varied. With a zero rate on buildings, the range of change is from -16.7 percent (tract 16) to -76.0 percent (tract 7), and the median is -41.2 percent. Finally, for class 400 (commercial and industrial), tax liability change from moving to a split-rate tax is positive in 14 census tracts and negative in the other nine. Tract 7 is an outlier; its class 400 change in tax liability is -47.4 percent, while the next-largest reduction is -26.7 percent (tract 10); moreover, tract 14 is the only other with a more than a 20 percent reduction (-23.9 percent). Thus, in three census tracts class 400 liability declines at least 20 percent, but it increases at least 20 percent in 10 census tracts, and the class median change is an increase of 15.1 percent.

Winners and Losers from Tax Change

This section seeks to illuminate the question of who would win and who would lose in moving from a uniform property tax on land and improvements to a split-rate tax that falls more heavily on land. At a simple level, we can say that differences in the land share of assessed value cause the differences in tax change. The split-rate tax recently authorized by the state for the cities of Fairfax and Roanoke entails removing some of the tax from buildings and – if the tax change is revenue-neutral, as in our examples –

Table R-6. Property Tax Liabilities by Property Class, Current Tax and an Equal-yield Land Tax, and Tax Changes with the Land Tax, by Census Tract, in Descending Order of the Land Share of Total Assessed Value, City of Roanoke, Tax Year 2003*

Census Tract	Land Percent of Value	Current Tax [L:B = 1:1]		Land Tax [L:B = 1:0]		Change in Tax	
		Tax ($000)	% of City	Tax ($000)	% of City	$000	Percent
3	29.6	5,660.2	10.12	7,790.2	13.92	2,130.0	37.6
16	24.5	6,161.9	11.01	7,016.9	12.54	855.0	13.9
21	24.1	3,464.7	6.19	3,892.6	6.96	427.9	12.4
5	23.4	2,270.2	4.06	2,476.7	4.43	206.5	9.1
6	22.9	5,236.6	9.36	5,572.6	9.96	335.9	6.4
11	22.9	2,695.5	4.82	2,866.9	5.12	171.4	6.4
17	21.2	2,632.8	4.69	2,594.3	4.64	-29.5	-1.1
12	20.8	1,783.8	3.19	1,728.2	3.09	-55.6	-3.1
23	20.6	3,453.9	6.17	3,311.4	5.92	-142.5	-4.1
4	20.4	2,503.2	4.47	2,377.2	4.25	-126.0	-5.0
20	19.5	2,892.7	5.17	2,626.8	4.70	-265.9	-9.2
1	19.3	1,300.7	2.32	1,168.7	2.09	-132.0	-10.1
10	19.2	651.0	1.16	582.6	1.04	-68.4	-10.5
9	19.2	1,542.3	2.76	1,376.3	2.46	-166.0	-10.8
19	19.0	2,173.5	3.89	1,917.3	3.43	-256.2	-11.8
15	18.9	1,918.7	3.43	1,690.8	3.02	-227.9	-11.9
2	18.2	1,190.6	2.13	1,010.3	1.81	-180.3	-15.1
18	17.6	1,961.4	3.51	1,607.8	2.87	-353.6	-18.0
8	17.6	648.1	1.16	530.5	0.95	-117.6	-18.1
13	17.4	874.8	1.56	707.2	1.26	-167.6	-19.2
14	15.8	1,218.2	2.18	895.4	1.60	-322.8	-26.5
22	15.6	1,207.6	2.16	877.8	1.57	-329.8	-27.3
7	12.9	822.7	1.47	494.1	0.88	-328.6	-39.9
NA	10.6	1688.7	3.02	832.5	1.49	856.2	-50.7
Total	21.5	55,945.0	100.00	55,945.1	100.00	0.1	0.00

* Current tax rate = 1.21%; equal-yield land tax rate = 5.6303%. Based on 42,763 taxable parcels for which land values were provided, including 973 parcels not allocable to one of the 23 census tracts. Detail may not add to totals due to rounding.
Source: Authors' calculations from Roanoke real property tax database for 2003.

Table R-7. Real Property Tax Shares by Property Class and Census Tract, Current Tax and an Equal-yield Land Tax, and Tax Changes with the Land Tax, City of Roanoke, Tax Year 2003*					
	Class 100	Class 200	Class 300	Class 400	Total
CENSUS TRACT 1					
Current tax	$ 30,033	$ 986, 830	$ 72,618	$ 211, 218	$ 1,300,699
Percent	2.3%	75.9%	5.6%	16.2%	100.0%
Land tax	$ 139,356	$ 721,737	$ 42,672	$ 264,956	$ 1,168,721
Land tax percent	11.9%	61.8%	3.7%	22.7%	100.0%
Change**	364.0%	-26.9%	-41.2%	25.4%	-10.1%
CENSUS TRACT 2					
Current tax	$ 40,679	$ 916,673	$ 137,662	$ 95,634	$ 1,190,607
Percent	3.4%	77.0%	11.6%	8.0%	100.0%
Land tax	$ 189,285	$ 634,411	$ 69,669	$ 116,930	$ 1,010,295
Land tax percent	18.7%	62.8%	6.9%	11.6%	100.0%
Change**	365.3%	-30.8%	-49.4%	22.3%	-15.1%
CENSUS TRACT 3					
Current tax	$ 124,669	$ 1,529,288	$ 227,280	$ 3,778,957	$ 5,660,194
Percent	2.2%	27.0%	4.0%	66.8%	100.0%
Land tax	$ 580,101	$ 1,287,790	$ 140,983	$5,781,344	$ 7,790,218
Land tax percent	7.4%	16.5%	1.8%	74.2%	100.0%
Change**	365.3%	-15.8%	-38.0%	53.0%	37.6%
CENSUS TRACT 4					
Current tax	$ 18,952	$ 1,918,540	$ 193,060	$ 372,688	$ 2,503,241
Percent	0.8%	76.6%	7.7%	14.9%	100.0%
Land tax	$ 88,075	$ 1,561,367	$ 131,974	$ 595,804	$ 2,377,220
Land tax percent	3.7%	65.7%	5.6%	25.1%	100.0%
Change**	364.7%	-18.6%	-31.6%	59.9%	-5.0%
CENSUS TRACT 5					
Current tax	$ 74,425	$ 1,287,012	$ 226,178	$ 682,579	$ 2,270,194
Percent	3.3%	56.7%	10.0%	30.1%	100.0%
Land tax	$ 346,083	$1,044,657	$ 143,466	$ 942,490	$ 2,476,696
Land tax percent	14.0%	42.2%	5.8%	38.1%	100.0%
Change**	365.0%	-18.8%	-36.6%	38.1%	9.1%

Table R-7, continued					
	Class 100	Class 200	Class 300	Class 400	Total
CENSUS TRACT 6					
Current tax	$ 213,005	$ 2,397,398	$ 478,078	$ 2,148,160	$ 5,236,642
Percent	4.1%	45.8%	9.1%	41.0%	100.0%
Land tax	$ 990,083	$ 1,851,597	$ 181,977	$ 2,548,916	$ 5,572,573
Land tax percent	17.8%	33.2%	3.3%	45.7%	100.0%
Change**	364.8%	-22.8%	-61.9%	18.7%	6.4%
CENSUS TRACT 7					
Current tax	$ 31,018	$ 414,525	$ 122,464	$ 254,692	$ 822,700
Percent	3.8%	50.4%	14.9%	31.0%	100.0%
Land tax	$ 144,316	$ 186,346	$ 29,401	$ 134,018	$ 494,081
Land tax percent	29.2%	37.7%	6.0%	27.1%	100.0%
Change**	365.3%	-55.0%	-76.0%	-47.4%	-39.9%
CENSUS TRACT 8					
Current tax	$ 27,069	$ 340,339	$ 93,613	$ 187,104	$ 648,124
Percent	4.2%	52.5%	14.4%	28.9%	100.0%
Land tax	$ 124,683	$ 200,495	$ 43,866	$ 161,505	$ 530,549
Land tax percent	23.5%	37.8%	8.3%	30.4%	100.0%
Change**	360.6%	-41.1%	-53.1%	-13.7%	-18.1%
CENSUS TRACT 9					
Current tax	$ 44,800	$ 842,381	$ 246,257	$ 408,828	$ 1,542,266
Percent	2.9%	54.6%	16.0%	26.5%	100.0%
Land tax	$ 208,315	$ 599,040	$ 83,064	$ 496,846	$ 1,376,265
Land tax percent	15.1%	42.7%	6.0%	36.1%	100.0%
Change**	365.0%	-30.2%	-66.3%	21.5%	-10.8%
CENSUS TRACT 10					
Current tax	$ 38,362	$ 171,089	$ 135,282	$ 306,235	$ 650,968
Percent	5.9%	26.3%	20.8%	47.0%	100.0%
Land tax	$ 178,295	$ 97,742	$ 82,146	$ 224,379	$ 582,562
Land tax percent	30.6%	16.8%	14.1	38.5%	100.0%
Change**	364.8%	-42.9%	-39.3%	-26.7%	-10.5%

Table R-7, continued					
	Class 100	Class 200	Class 300	Class 400	Total
CENSUS TRACT 11					
Current tax	$ 162,267	$ 9,198	$ 97,021	$ 2,427,036	$ 2,695,523
Percent	6.0%	0.3%	3.6%	90.0%	100.0%
Land tax	$ 739,180	$ 6,210	$ 78,374	$ 2,043,185	$ 2,866,949
Land tax percent	25.8%	0.2%	2.7%	71.3%	100.0%
Change**	355.5%	-32.5%	-19.2%	-15.8%	6.4%
CENSUS TRACT 12					
Current tax	$ 75,162	$ 375,658	$ 612,922	$ 720,090	$ 1,783,832
Percent	4.2%	21.1%	34.4%	40.4%	100.0%
Land tax	$ 349,737	$ 219,255	$ 457,558	$ 701,665	$ 1,728,215
Land tax percent	20.2%	12.7%	26.5%	40.6%	100.0%
Change**	365.3%	-41.6%	-25.3%	-2.6%	-3.1%
CENSUS TRACT 13					
Current tax	$ 27,149	$ 562,151	$ 154,369	$ 131,157	$ 874,826
Percent	3.1%	64.3%	17.6%	15.0%	100.0%
Land tax	$ 125,314	$ 340,954	$ 82,653	$ 158,392	$ 707,222
Land tax percent	17.7%	48.2%	11.7%	22.4%	100.0%
Change**	361.6%	-39.3%	-46.5%	20.8%	-19.2%
CENSUS TRACT 14					
Current tax	$ 33,706	$ 830,295	$ 131,341	$ 222,904	$ 1,218,245
Percent	2.8%	68.2%	10.8%	18.3%	100.0%
Land tax	$ 155,408	$ 500,534	$ 69,951	$ 169,540	$ 895,432
Land tax percent	17.4%	55.9%	7.8%	18.9%	100.0%
Change**	361.1%	-39.7%	-46.7%	-23.9%	-26.5%
CENSUS TRACT 15					
Current tax	$ 83,173	$ 1,620,709	$ 149,043	$ 65,754	$ 1,918,679
Percent	4.3%	84.5%	7.8%	3.4%	100.0%
Land tax	$ 385,253	$ 1,146,267	$ 99,893	$ 59,366	$ 1,690,779
Land tax percent	22.8%	67.8%	5.9%	3.5%	100.0%
Change**	363.2%	-29.3%	-33.0%	-9.7%	-11.9%

Table R-7, continued					
	Class 100	Class 200	Class 300	Class 400	Total
CENSUS TRACT 16					
Current tax	$ 177,146	$ 4,624,066	$ 471,813	$ 888,918	$ 6,161,943
Percent	2.9%	75.0%	7.7%	14.4%	100.0%
Land tax	$ 822,457	$ 4,816,249	$ 393,074	$ 985,145	$ 7,016,925
Land tax percent	11.7%	68.6%	5.6%	14.0%	100.0%
Change**	364.3%	4.2%	-16.7%	10.8%	13.9%
CENSUS TRACT 17					
Current tax	$ 54,538	$ 1,590,240	$ 225,085	$ 753,936	$ 2,623,800
Percent	2.1%	60.6%	8.6%	28.7%	100.0%
Land tax	$ 253,775	$ 1,233,244	$ 117,392	$ 989,857	$ 2,594,268
Land tax percent	9.8%	47.5%	4.5%	38.2%	100.0%
Change**	365.3%	-22.4%	-47.8%	31.3%	-1.1%
CENSUS TRACT 18					
Current tax	$ 12,763	$ 1,429,623	$ 417,477	$ 101,508	$ 1,961,371
Percent	0.7%	72.9%	21.3%	5.2%	100.0%
Land tax	$ 59,388	$ 1,141,279	$ 290,287	$ 116,812	$ 1,607,766
Land tax percent	3.7%	71.0%	18.1%	7.3%	100.0%
Change**	365.3%	-20.2%	-30.8%	15.1%	-18.0%
CENSUS TRACT 19					
Current tax	$ 27,152	$ 1,576,763	$ 400,062	$ 169,5578	$ 2,173,535
Percent	1.2%	72.5%	18.4%	7.8%	100.0%
Land tax	$ 126,214	$ 1,357,443	$ 291,897	$ 141,777	$ 1,917,331
Land tax percent	6.6%	70.8%	15.2%	7.4%	100.0%
Change**	364.8%	-13.9%	-27.0%	-16.4%	-11.8%
CENSUS TRACT 20					
Current tax	$ 31,257	$ 2,509,213	$ 218,077	$ 134,176	$ 2,892,723
Percent	1.1%	86.7%	7.5%	4.6%	100.0%
Land tax	$ 145,442	$ 2,135,899	$ 146,759	$ 198,699	$ 2,626,800
Land tax percent	5.5%	81.3%	5.6%	7.6%	100.0%
Change**	365.3%	-14.9%	-32.7%	48.1%	-9.2%

Table R-7, continued					
	Class 100	Class 200	Class 300	Class 400	Total
CENSUS TRACT 21					
Current tax	$ 85,834	$ 2,644,186	$ 208,258	$ 526,431	$ 3,464,709
Percent	2.5%	76.3%	6.0%	15.2%	100.0%
Land tax	$ 399,171	$ 2,654,152	$ 81,431	$ 757,833	$ 3,892,587
Land tax percent	10.3%	68.2%	2.1%	19.5%	100.0%
Change**	365.1%	0.4%	-60.9%	44.0%	12.4%
CENSUS TRACT 22					
Current tax	$ 24,201	$ 998,601	$ 64,210	$ 120,575	$ 1,207,587
Percent	2.0%	82.7%	5.3%	10.0%	100.0%
Land tax	$ 112,403	$ 637,057	$ 28,264	$ 100,028	$ 877,753
Land tax percent	12.8%	72.6%	3.2%	11.4%	100.0%
Change**	364.5%	-36.2%	-56.0%	-17.0%	-27.3%
CENSUS TRACT 23					
Current tax	$ 106,727	$ 1,910,323	$ 221,660	$ 1,215,231	$ 3,453,940
Percent	3.1%	55.3%	6.4%	35.2%	100.0%
Land tax	$ 486,413	$ 1,421,268	$ 110,247	$ 1,293,471	$ 3,311,399
Land tax percent	14.7%	42.9%	3.3%	39.1%	100.0%
Change**	355.8%	-25.6%	-50.3%	6.4%	-4.1%
NOT ALLOCABLE					
Current tax	$ 44,166	$ 1,074,931	$ 40,929	$ 528,636	$ 1,688,663
Percent	2.6%	63.7%	2.4%	31.3%	100.0%
Land tax	$ 146,833	$ 370,609	$ 25,517	$ 289,516	$ 832,474
Land tax percent	17.6%	44.5%	3.1%	34.8%	100.0%
Change**	232.5%	-65.5%	-37.7%	-45.2%	-50.7%
CITYWIDE TOTALS					
Current tax	$ 1,588,253	$ 32,560,720	$ 5,344,720	$ 16,452,003	$ 55,945,011
Percent	2.8%	58.2%	9.6%	29.4%	100.0%
Land tax	$ 7,295,579	$ 26,154,601	$ 3,222,423	$ 19,272,472	$ 55,945,076
Land tax percent	13.0%	46.8%	5.8%	34.4%	100.0%
Change**	359.3%	-19.7%	-39.7%	17.1%	0.000%
23-tract median change**	364.8%	-26.9%	-41.2%	15.1%	-10.1%

* Based on 42,763 taxable parcels for which land values were provided, including 973 parcels not allocable to one of the 23 census tracts (24th category on preceding page). Detail may not add to totals due to rounding.
** Percentage change from tax liability under current, uniform tax.
Source: Authors' calculations from Roanoke real property tax database for 2003.

increasing the land tax by an equal amount. In such a change, properties for which land accounts for an above average percentage of total value will see tax increases, and those for which land is a below average portion of value will experience lower taxes. The relationship is illustrated by the Roanoke data for 23 census tracts. Whether considering each of the four classes separately, or all them in the aggregate, the percentage of assessed value represented by land for a group of properties correlates perfectly with the change in tax for that same group of properties.[29]

A more difficult question concerns why the land percentage of value differs. The answer surely lies in the interaction between individual property owners' preferences and broader market forces – i.e., choices concerning the nature, size, and quality of buildings; the amount of land relative to building size; and the location of the land.[30] We take these market forces and the resulting value differences as given, and focus on how various characteristics of the properties and of the population relate to (vary with) the property values. To consider these relationships, we explore tax changes at the census tract level to enrich our analysis by tapping into the information available for census tracts from the decennial censuses. Using these data along with data from the Roanoke real property database enable us to consider how age and income of residents and age and size of housing units – to take just a few examples of the variables in the census tract data – are related to tax changes.

We rely largely on correlation coefficients derived from the data for the 23 census tracts (Table R-8); they provide a better overall perspective on and understanding of the tax changes shown in Table R-7 than can be gotten by individual consideration of many census tracts. Most correlations between variables are not perfect, so two census tracts (and by extension, two homeowners) with the same value of an important variable, such as income level, often will have different tax changes. This contributes to the difficulty of gaining an understanding of the relationships between such variables and the tax changes by studying just the individual cases. After considering the correlations, however, we do present the values of several variables for each of a few selected census tracts, to provide this perspective on some of the relationships.

Table R-8 is a matrix showing the levels of correlation between pairs of several selected variables. One is a measure of the relative size of land value, although for just one class of property; this is land as a percentage of class 200 assessed value (Lnd%200). Four variables relate to different aspects of the housing stock. One concerns the density of residential development, given by the number of housing units per square mile (HU/sqmi). The median number of rooms per housing unit (MedRms) provides a measure of housing unit size. The other two variables measure two tails in the age distribution of the housing stock: the percentage of housing units in 2000 that were built after 1990 (BltPost90) and the percentage of housing units built before 1940 (BltPre40). Three variables describe certain aspects of housing occupancy: the extent to which housing is crowded, that is, the percentage of occupied housing units with more than 1.01 people per room (%>1/Rm); the overall occupancy rate, given by occupied housing units as a percentage of total housing units (Occ%); and the extent of owner-occupancy, given by the percentage of occupied housing units occupied by their owners (OwnOcc). Four

income-related measures are given. One is the average income per capita (PCInc) and the other is median family income (MFamInc). The other two are poverty rates: the percentage of families below federal government poverty thresholds (Pov%Fam) and the poverty rate for the overall population, or individuals (Pov%Pop). Other attributes of the residents include the percentage of the population that is white (%White) and the median age of the population (MedAge). Finally, the percentage change in property tax liability in moving from the current uniform tax to the opposite limiting case of a land tax is given for all properties (ChTotTx), for single-family residences, which are class 200 properties (Ch200Tx), and for multi-family residences (Ch300Tx).

Change in Total Tax: Correlation between the change in total tax (ChTotTx) and each of the other variables in Table R-8 is below the absolute value of 0.7, although two variables – the land share of class 200 value (Lnd%200) and the change in class 200 tax (Ch200Tx) – come close, with coefficients of 0.6716 and 0.6739, respectively. Because the correlation between these two variables, in turn, is nearly perfect (noted above, but not shown in Table R-8), the two really are registering the same association with change in total tax. The high, positive correlation indicates a tendency for the total tax in a census tract to increase (or for the decrease to become smaller) as the land portion of class 200 value rises. Class 200 is the most significant class numerically, accounting for over half of all value citywide and nearly half of land value (Tables R1 and R2), so this correlation is not surprising.

Only two other variables in Table R-8 correlate with total tax change above the 0.4 level: median family income (MFamInc, 0.4682) and the number of housing units per square mile (HU/sqmi, -0.4254). The positive correlation with income indicates the tendency for tax increases to be larger, or reductions to be smaller, in higher-income census tracts than in lower-income tracts.[31] Lower density of housing units also is associated with larger tax increases or smaller decreases, as indicated by the negative correlation coefficient for this variable. This is consistent with either of two quite different situations. In a given number of square miles, a smaller number of housing units will exist if lot sizes are larger and each unit is surrounded by more land, or if more of the land is in the other classes, such as vacant (class 100) or commercial and industrial (class 400). That the former situation dominates in the Roanoke data is suggested by the negative correlations between housing density and each of the two income variables and the positive correlations with the two poverty measures (although all four coefficients are comparatively low). Also, there is a very high, positive correlation between the land percentage of class 200 value and the two income measures (over 0.8 with each).

Change in Residential Tax: General Discussion: Tax changes for residential properties relate more directly to the city's residents. Single-family (class 200) residential properties are considerably more important in terms of both numbers and value than multi-family housing (class 300); also, because multi-family housing typically is rented, the effects of tax changes for class 300 are less certain to have an immediate effect on the residents. For these reasons, we focus on class 200, although occasional reference is made below to class 300.

Table R-8. Correlation Matrix for Selected Variables, City of Roanoke Census Tract Data								
	Lnd%200	HUsqmi	MedRms	BltPost90	BltPre40	%>1/Rm	Occ%	OwnOcc
HU/sqmi	-0.2495	1.0000						
MedRms	0.5279	-0.0604	1.0000					
BltPost90	0.2436	-0.4251	0.2865	1.0000				
BltPre40	-0.3750	0.3484	-0.3665	-0.3116	1.0000			
%>1/Rm	-0.6158	0.1042	-0.5370	-0.2023	0.2973	1.0000		
Occ%	0.6359	-0.0822	0.5173	0.0669	-0.6712	-0.6339	1.0000	
OwnOcc	0.4903	-0.1756	0.8284	0.1708	-0.6361	-0.5778	0.7478	1.0000
PCInc	0.8168	-0.1425	0.6304	0.2997	-0.2802	-0.6411	0.5130	0.4532
MFamInc	0.8391	-0.3674	0.5566	0.2585	-0.1855	-0.6119	0.4015	0.4209
Pov%Fam	-0.7815	0.1692	-0.5682	-0.0653	0.4836	0.7792	-0.7831	-0.7459
Pov%Pop	-0.7490	0.1374	-0.6337	-0.1088	0.5869	0.7749	-0.8415	-0.8149
%White	0.5579	0.0013	0.2661	0.1099	0.0247	-0.6958	0.5136	0.3118
MedAge	0.6235	-0.3078	0.5232	0.3418	-0.5841	-0.6014	0.4697	0.5785
ChTotTx	0.6716	-0.4254	0.0530	0.2333	-0.1704	-0.3190	0.2661	0.0421
Ch200Tx	1.0000	-0.2479	0.5253	0.2406	-0.3737	-0.6161	0.6358	0.4888
Ch300Tx	0.3694	0.1332	-0.0278	-0.3626	0.4794	-0.3086	-0.0461	-0.1000

	PCInc	MFamInc	Pov%Fam	Pov%Pop	%White	MedAge	ChTotTx	Ch200Tx
PCInc	1.0000							
MFamInc	0.9245	1.0000						
Pov%Fam	-0.6804	-0.6939	1.0000					
Pov%Pop	-0.7019	-0.6631	0.9744	1.0000				
%White	0.5207	0.5231	-0.6388	-0.5762	1.0000			
MedAge	0.5898	0.5559	-0.6714	-0.6634	0.2880	1.0000		
ChTotTx	0.3918	0.4682	-0.3679	-0.3015	0.3409	0.2737	1.0000	
Ch200Tx	0.8156	0.8384	-0.7813	-0.7482	0.5597	0.6213	0.6739	1.0000
Ch300Tx	0.2784	0.4083	-0.2664	-0.1819	0.4328	-0.0840	0.3723	0.3718

Source: Calculations by authors based on data in the Roanoke tax year 2003 real property tax database, and census tract data from the 2000 decennial census.

The nearly perfect correlation between tax change and the land share of value already has been noted. Beyond this, the highest correlations between the change in class 200 tax

liability (Ch200Tx) and other variables are for the income measures (Table R-8). The coefficient for median family income (MFamInc) is highest at 0.8384, but this is followed closely by per capita income (PCInc) at 0.8156. Consistent with this, the coefficients for the two poverty measures also are large, but are negative (-0.7813 for Pov%Fam, -0.7482 for Pov%Pop). The family and individual poverty measures are correlated with each other nearly perfectly (0.9744), and median family income and per capita income also are very highly correlated (0.9245). Correlations between income and poverty measures are not quite as high and, of course, they are negative – higher income levels go with lower poverty rates; each of the four coefficients for different pairings of income and poverty measures is in the range of -0.6631 to -0.7019.

The rather high, positive correlation between class 200 tax change and median number of rooms (0.5253) suggests larger houses benefit more than smaller ones from moving to a split-rate tax (i.e., that despite their larger size, for housing units with more rooms a larger portion of total value is in land). The association between age of housing stock and tax change is less strong. For class 200, older houses tend to benefit more than newer ones. The correlation between class 200 tax change and the percentage of housing units built before 1940 is -0.3737. The negative sign indicates that a larger concentration of older homes is associated with a smaller change in tax (i.e., a smaller increase or a larger decrease). The correlation between tax change and the percentage of units built after 1990 is 0.2406, showing that a larger concentration of newer housing is associated with a larger increase or smaller reduction in property tax. This combination suggests more of the value of a single-family residential parcel is in the buildings for older-home parcels than for newer-home parcels.[32] The low absolute values of the correlations, however, make generalization risky. For example, the larger of the two increases in class 200 tax (4.2 percent) is in census tract 16, where 29.8 percent of the housing units were built before 1940 (17.8 percent is the median percentage among the 23 census tracts). By comparison, the next-smaller percentage of units built before 1940 (22.8 percent) is in tract 7 and is associated with the largest decrease in class 200 tax, a 55.0 percent reduction.[33]

Because income and poverty levels are important considerations for many public policy issues, including taxes, it is worth noting the relationships between these variables and some others in Table R-8.[34] Among the more significant correlations between these variables are those for the three housing occupancy measures. Crowded housing (%>1/Rm) correlates highly and positively with both poverty measures (0.7792; 0.7749), showing that crowding increases with poverty. Consistent with this are the negative, although somewhat weaker, correlations with the two income measures (-0.6411; -0.6119). Lower housing occupancy rates (Occ%) are associated strongly with higher poverty rates (-0.7831; -0.8415), while higher occupancy rates and higher income levels tend to go together (0.5130; 0.4015). The situation is quite similar for the owner-occupancy rate for occupied housing units (OwnOcc); correlations with poverty are high and negative (-0.7459; -0.8149) while those with income, though weaker, are positive (0.4532; 0.4209), indicating that home ownership is less common among low-income residents. In addition, the median number of rooms per housing unit (MedRms), a housing stock measure, falls as poverty rises (-0.5682; -0.6337) and rises with income

(0.6304; 0.5566). Finally, two population attributes are rather highly correlated with poverty and income. As the median age of the population (MedAge) rises, the incidence of poverty declines (-0.6714; -0.6634) and income rises (0.5898; 0.5559), indicating that an older population tends to be more affluent. Similarly, a larger percentage of the population comprised of whites (%White) is associated with lower poverty (-0.6388; -0.5762) and higher income levels (0.5207; 0.5231).

In summary, moving to a split-rate tax favors residential properties in general with tax reductions, and the largest reductions occur where income is lowest and poverty is highest. Other high and positive correlations with class 200 tax change, although not as high as those between income and poverty, are consistent with this picture. These include the correlations with the housing occupancy rate (0.6358), the owner-occupancy rate (0.4888), the median age of the population (0.6213), the percentage of the population that is white (0.5597), and the median number of rooms per housing unit (0.5253). In addition, the correlation between tax change and crowded housing (%>1/Rm) is high and negative (-0.6161). Associations between tax change and age of housing are weaker, so no easy generalization on this aspect of the housing stock is possible. It must be stressed that our analyses consider only the initial redistribution of tax liabilities. In other words, it is a static (or short-run) analysis. Over time, a lower tax on improvements and a higher tax on land would tend to favor increased investment in structures.

Change in Residential Tax: Considering Individual Census Tracts: Correlations between tax change and various characteristics of the population and the housing stock provide a general picture of the winners and losers in a move from uniform taxation of land and buildings to a split-rate tax that would tax buildings more lightly than land. As noted above, though, a small absolute value of the correlation between tax change and some other variable makes generalization on the basis of that other variable more risky. Because the relationships between tax change and nearly all the other variables are less than perfect, this section considers data for individual census tracts.

Class 200 tax change (Ch200Tx) is paired with each of three other variables in the three panels of Table R-9. Each panel shows the census tracts with the five highest and the five lowest values for a particular variable, and also shows the value of Ch200Tx for those same census tracts. The correlation with Ch200Tx is different for each of the three selected variables The variable in the first panel is the land percentage of class 200 value (Lnd%200); as noted earlier, this is perfectly correlated (1.0) with Ch200Tx. When the 23 census tracts are arrayed on the basis of the land percentage of class 200 value, the tract with the highest land-value percentage also is the tract with the largest increase in tax; the tract with the lowest land-value share is the tract with the largest reduction (i.e., smallest increase) in tax; and for every tract in between these extremes, as the land-value percentage falls, the tax increase falls (reduction rises). The 10 tracts with the extreme values of Lnd%200 in Table R-9 illustrate this.[35]

By contrast, the second panel in Table R-9 provides data on the portion of housing units built before 1940 (BltPre40). For the 23 census tracts, the correlation between this and Ch200Tx is -0.3737; as noted earlier, this level of correlation means generalization of the

relationship to a particular census tract (or property) is risky. In the table, there is unbroken progression from high to low for the value of BltPre40, but values of Ch200Tx jump around. The correlation is negative, indicating that as the percentage of units built before 1940 increases, the tax increase tends to become smaller (decrease becomes larger); still, tract 22, with only 2.5 percent of housing units built before 1940, has a larger *decrease* in tax (-36.2 percent) than tract 11 (-32.5 percent), where 66.1 percent of housing units were built before 1940. Also, the extreme values of Ch200Tx (-55.0 percent for tract 7; +4.2 percent for tract 16) are not among the tracts with the five highest and lowest values of BltPre40.

Finally, the correlation between Ch200Tx and median family income (MFamInc) is 0.8384, which is between the two cases already considered, but much closer to the first. Information for the census tracts with the five highest and lowest values of MFamInc is in the third panel of Table R-9. Once more, there is unbroken progression from high to low in the value of the subject variable, but – even with this high degree of correlation – not for the tax change variable; this is shown clearly by the discontinuities between tracts 17 and 18 and among tracts 7, 9, and 10.

To further the consideration of the varied experiences of individual census tracts, and their relationships between tax change and selected other variables, Table R-10 presents data on various characteristics of the two census tracts experiencing the largest decreases and the two with the largest increases in class 200 tax liability. The percentage changes in tax liability that we use throughout reflect the extreme case of a zero rate on buildings, a split-rate variant not permitted by state law, although localities could come quite close. It is worth noting again that the *pattern* of changes is the same regardless of the degree of rate differentiation, so the correlation for the limiting case of a land tax also apply to other sets of revenue-neutral land and buildings rates. The *percentage changes in tax liability* for the land tax shown here, however, are higher than for any other variant (see Table R-3).

The largest two – indeed only – increases in single-family residential (class 200) property tax occur in census tracts 16 and 21; their respective values are 4.2 percent and 0.4 percent. The smallest increases (or largest decreases) are -42.9 percent and -55.0 percent in tracts 10 and 7, respectively. These are shown in the first row of Table R-10, along with the median value among the 23 census tracts (-26.9 percent, in tract 1) and the citywide class mean change (-19.7 percent). That the median reduction is larger than the mean indicates the distribution is skewed; as noted, only two of the 23 tracts see an increase in class 200 tax. Note the very different changes for multi-family housing (class 300, in line 3). The tax for this class falls in every census tract, as noted earlier, and the average reduction is twice that for class 200. More important for current considerations, however, is that the class 300 tax reduction is larger for tract 21 than for tract 10, even though single-family taxes rise slightly in tract 21 and fall sharply in tract 10; this underscores the point that tax-change experiences differ across classes, even in the same census tract where income, age, and other variables are constant.

Table R-9. Class 200 Tax Change in Census Tracts with Highest and Lowest Values Three Variables with Different Levels of Correlation with the Tax Change, City of Roanoke, Tax Year 2003										
(Tax change and land share of class 200 value; correlation = 1.0)										
Variable	Highest 5 Values of Lnd%200					Lowest 5 Values of Lnd%200				
Lnd%200	22.4	21.6	18.5	18.3	18.1	13.0	12.7	12.5	12.3	9.7
Ch200Tx	4.2	0.4	-13.9	-14.9	-15.8	-39.7	-41.1	-41.6	-42.9	-55.0
Tract no.	16	21	19	20	3	14	8	12	10	7
(Tax change and percent of housing units built before 1940; correlation = -0.3737)										
Variable	Highest 5 Values of BltPre40					Lowest 5 Values of BltPre40				
BltPre40	66.1	55.3	54.4	44.7	41.3	4.1	3.7	2.9	2.5	1.7
Ch200Tx	-32.5	-41.6	-39.3	-39.7	-42.9	-18.6	-30.2	-36.2	0.4	-25.6
Tract no.	11	12	13	14	10	4	9	22	21	3
(Tax change and median family income in 1999; correlation = 0.8384)										
Variable	Highest 5 Values of MFamInc					Lowest 5 Values of MFamInc				
MFamInc	93,943	62,012	50,891	47,143	43,826	24,882	24,493	22,021	21,938	21,905
Ch200Tx	4.2	0.4	-14.9	-22.4	-20.2	-39.3	-41.1	-55.0	-30.2	-42.9
Tract no.	16	21	20	17	18	13	8	7	9	10
Source: U.S. Census Bureau, American Fact Finder (Census Web site) for data from 2000 decennial census; and authors' calculations from Roanoke real property tax database for 2003.										

Note, too, that although poverty has a high negative correlation with tax change (-0.7813 for Pov%Fam and Ch200Tx), the class 200 tax increase is larger (i.e., the reduction is smaller) by nearly one-fourth in tract 10 than in tract 7, even though the poverty rate is more than one-fourth higher in tract 10. Table R-10 also provides data for census tracts 16 and 7 that pertain to the comparatively weak correlation between housing stock age (BltPre40) and class 200 tax change, noted near the end of the preceding section on general discussion of residential tax changes.

On the other hand, partly because only the two highest and two lowest tax-change cases are presented in Table R-10, the relationships shown there between Ch200Tx and several variables appear perhaps too perfect. For example, the correlation between this and %White is just 0.5597, but for the four tracts in the table, the percent of the population that is white drops from

one tract to the next, along with the size of the tax increase. The progression is not unbroken, though, in the data for all 23 census tracts; indeed, the highest white portion of the population (95.1 percent) is in tract 14, which also has the fifth-smallest increase (fifth-largest decrease) in class 200 tax (-39.7 percent), while second highest %White value (94.6 percent) is in tract 16, with the largest class 200 tax increase.

Summary: Numerous specific statistics could be cited that tend to support or not to support the general relationships; that is the nature of data that are imperfectly correlated. As noted earlier, perfect correlation between tax change and the percent of value accounted for by land indicates that the split of assessed value between land and improvements determines, for any given set of properties, whether the tax will rise or fall in a revenue-neutral move from uniform taxation on land and improvements to one taxing land more heavily. This follows from the nature of the property tax, and the change to that tax entailed in changing to the split-rate variant. However, the division of property value between land and improvements is related to many other variables of interest to policy makers. Interestingly, the relationships revealed in the City of Roanoke data indicate that the change in initial impact of the real property tax brought about by adopting a split-rate tax would be pro-poor in that city. Interestingly, the relationships revealed in the City of Roanoke data indicate adopting a split-rate tax would produce the largest immediate tax reductions in areas where incomes are lowest or poverty is highest.

Findings and Conclusions

The purpose of this study is to explore the reallocation of property tax liability that would result from replacing the current property tax applied equally to land and improvements with a property tax falling more heavily on land. Because an infinite variety of differentials between the land rate and the improvements rate could be fashioned, but all would produce the same pattern across properties of changes in tax liabilities, we have focused on the limiting case of a land tax – i.e., a zero rate on improvements – to establish the maximum redistribution of tax liabilities across various classes and geographical groupings of properties.

The basic truism underlying all the analysis here is that those properties, and land use classes, with high land-to-improvements ratios will experience an increase in tax liability in a move from the current to a split-rate tax, while properties, and land use classes, with low land-to-improvements ratios will experience a decrease in property tax liabilities. Our analyses confirm this, for all three localities. Less obvious, though, is how the differences in ratios of land value to improvements value relate to other traits of the properties and their occupants. We consider differences between and within property use classes.

Between-class Variation

Our analyses produced some interesting findings on these relationships. For example, in all three case study jurisdictions, replacing the current tax with one taxing land more heavily would reallocate the aggregate property tax burden between land use classes, to the benefit of the residential classes. In all three study areas, the residential share of the property tax would fall, and significantly so in the limiting case of a land tax. For example, in Highland County, residential properties in the county seat of Monterey experience a 72 percent decline in property taxes and residential properties with up to 20 acres of land experience a 54 percent decline in property taxes. Similarly, single-family residential properties in urban areas of Chesterfield County experience an 11 percent

decline in tax liabilities, while single-family residential properties in the City of Roanoke experience a 20 percent decline. The average decrease in Chesterfield County is smaller because single-family-urban properties account for the majority of the tax base.

The other consistent finding across all three jurisdictions is that property tax liabilities of multi-unit housing properties would be less under a split-rate tax than under the current tax. Again in the limiting case of the land tax, the tax decreases for multi-family housing are 78 percent in Highland County, 34 percent in Chesterfield County, and 40 percent in the City of Roanoke.

At the other extreme, those land use classes with high ratios of land value to improvements value experience tax increases when moving to a split-rate tax. In Highland County that means properties with 20 to 100 acres (class 5) and those with more than 100 acres (class 6) experience the biggest increases: 10 and 41 percent, respectively, under the land tax. In Chesterfield County, land-intensive uses experiencing the largest increases in tax liabilities are mineral properties (271 percent increase), trailer parks (238 percent increase), properties with more than 100 acres (224 percent increase), and properties with between 20 and 100 acres (127 percent increase). In the City of Roanoke, vacant land (class 100) would experience a 359 percent average increase under a land tax, and commercial and industrial (class 400) properties would see their aggregate tax bills rise by 17 percent.

The situation for commercial and industrial property varies across the jurisdictions examined here, however. For example, in Highland County, unlike Roanoke, commercial properties would see a 66.2 percent decrease in moving to a land tax. It should be noted that commercial and industrial properties in Roanoke (where they are a single class) account for 7 percent of parcels and 29.4 percent of total assessed value (34.4 percent of land value). In Highland County, on the other hand, the commercial properties account for just 2.4 percent of total parcels in the county, 2.5 percent of total assessed value, and less than one percent of land value. In Chesterfield County the situation is somewhat mixed. Commercial properties – which account for 3 percent of parcels, nearly 13 percent of assessed value, and nearly 18 percent of land value – experience a 38.2 percent increase in aggregate tax liability. Alternatively, industrial properties – which account for less than one percent of parcels, 5 percent of total assessed value and 5 percent of land value – experience a modest 6.3 percent decrease in tax liability.

While the general findings perhaps are not surprising, they play out across jurisdictions in different ways, reflecting differences in the characteristics of the property tax base and land use patterns in each jurisdiction, and differences in their socio-economic characteristics. In addition to differences across land use classes, some of these differences also produce different tax change experiences within property classes.

Table R-10. Selected Characteristics of Census Tracts with Largest Increases and Largest Decreases in Class 200 Tax, City of Roanoke, Tax Year 2003						
Selected Characteristic	Largest Increases		Largest Decreases		Median of 23 Tracts	City Total or Average
	CT 16	CT 21	CT 10	CT 7		
Tax change, class 200 (%)	4.2	0.4	-42.9	-55.0	-26.9	-19.7
Tax change, all property (%)	13.9	12.4	-10.5	-39.9	-10.1	0
Tax change, class 300 (%)	-16.7	-60.9	-39.3	-76.0	-41.2	-39.7
Median family income, 1999 ($)	93,943	62,021	21,905	22,021	39,452	37,826
Percent of population in poverty, 1999	4.0	6.0	43.8	34.0	12.9	15.9
Median age of population, 2000 (years)	42.1	54.1	31.6	34.6	36.2	37.6
Population percent white, 2000	94.6	94.3	41.1	12.2	82.1	69.4
Population, 2000	5,475	3,810	2,785	3,546	4,406	94,911
Percent of city population, 2000	5.8	4.0	2.9	3.7	4.6	100.0
Taxable parcels, 2003	2,277	1,553	1,328	1,773	1,826	42,763
Percent of taxable parcels, 2003	5.3	3.6	3.1	4.1	4.3	100.0
Assessed value, 2003 ($ millions)	509.3	286.3	53.8	68.0	162.1	4,623.6
Percent of total assessed value, 2003	11.0	6.2	1.2	1.5	3.5	100.0
Class 200 share of parcels (%)	71.6	80.0	30.2	53.1	71.6	67.1
Class 200 share of value (%)	75.0	76.3	26.3	50.4	64.3	58.2
Class 400 share of value (%)	14.4	15.2	47.0	31.0	18.3	29.4
Land percent of assessed value, 2003	24.5	24.1	19.2	12.9	19.3	21.5
Land percent of class 200 value, 2003	22.4	21.6	12.3	9.7	15.7	17.3
Housing units, 2000	2,686	1,994	1,291	1,738	2,096	45,257
Housing units per square mile, 2000	706.3	767.6	1,053.9	1,697.5	1,293.4	1,055.3
Median rooms per housing unit, 2000	6.8	6.0	4.9	4.7	5.3	5.3
Housing units built after 1990 (%)	8.5	19.7	11.2	8.5	3.1	6.2
Housing units built before 1940 (%)	29.8	2.5	41.3	22.8	17.8	21.0
Housing units occupied (%)	93.1	96.3	81.4	81.9	93.9	92.8
Occupied units owner-occupied (%)	67.8	66.0	32.2	38.1	54.4	56.3
Source: U.S. Census Bureau, American Fact Finder (Census Web site) for data from 2000 decennial census; and authors' calculations from Roanoke real property tax database for 2003.						

Within-class Variation

The data reveal large differences in tax changes across individual parcels within a class for most of the land use classes identified in the tax databases for the three study areas.

With few exceptions, every property class has individual parcels experiencing increases and others experiencing decreases, and the absolute percentage changes often are large. We were best able to explore some of the within-class differences in the City of Roanoke, however, because the parcel records in the database identify the census tract a parcel is in. Because the data available for census tracts pertain to residents and residential properties, our focus was on single-family residential (class 200) properties, which account for 67.1 percent of the city's taxable parcels, 58.2 percent of citywide assessed value, and 46.7 percent of land value

In Roanoke, replacing the current uniform real property tax with a split-rate tax reduces residential property taxes. Under the limiting case of a land tax, single-family residential properties as a class experience nearly a 20 percent tax reduction citywide. Tax liability for this class of property declines in 21 of the 23 census tracts, and the increases are small in the other two. Moreover, the decreases are larger where incomes are lowest or poverty is highest. Data for the other variables are generally consistent with this pattern of initial tax burden allocation.

Unfortunately, we have not been able to link property records in Chesterfield County to census tracts, and thus to the socio-economic data, and all of Highland County is in a single census tract. However, a finding for Highland County seems consistent with the nature of the tax change in Roanoke. Specifically, because of the relatively large share of parcels owned by non-residents, and the fact that non-residents own a majority of parcels in the land use classes experiencing increased tax liability, moving to a land only tax would reallocate a larger share of the tax to non-residents. Because Highland County is a comparatively poor county, it seems reasonable to believe that its residents' incomes, on average, are lower than those of the people from outside the county who are buying second homes or other real estate holdings there.

The notion that adopting a split-rate tax would produce larger percentage tax reductions in tax liability where incomes are lower seems to be at odds with a finding of the Fairfax staff analysis, although that study in Fairfax did not look at income or other socio-economic data.

In considering this report's findings, it is important to keep in mind the static nature of the analysis, which considers only the initial redistribution of the property tax burden. A key argument of proponents of a land tax, or of a split-rate tax with sufficient differentiation of the rates on land and on improvements, is that incentives would be changed. The biggest tax reductions in the Roanoke simulation are for multi-family residential properties, followed by single-family properties; for each of these two classes, reductions generally are larger where incomes are lower. Roanoke officials state that many grand old homes have deteriorated and been divided into multiple rental units, which often are occupied by low-income households. Our analysis suggests that taxes would be cut for such properties in moving to a split-rate tax. Another perspective, however, is that eliminating (or substantially reducing) the tax on improvements would remove (or reduce) a current disincentive to renovate deteriorated properties. Consider the land tax limiting case. Although the tax for a deteriorated, subdivided old home

would be lower than under the current tax, the tax no longer would be affected by upgrading the improvements. If there is a market among more affluent population segments for buying and restoring such properties for single-family occupancy, the tax change would support or enhance that market force. In this case, dynamic analysis taking into account the changed incentives and the passage of time might produce different development and land value patterns in the city, and ultimately result in a different distribution of property tax burdens.[36]

Further Study

Further study should provide more evidence on the nature of the winners and losers in any move to a split-rate tax. As noted earlier, although we were told that Chesterfield County cannot provide census tract identifications for the real property parcels, this capability exists through the U.S. Census Bureau's Web site. It needs to be determined whether identification can be made in a more efficient manner than typing in each of more than 100,000 street addresses. If it can, then extending the analysis of Chesterfield County is desirable. If it cannot, analysis of a different locality for which the link to census tract data can be established should be undertaken.

Another possible extension of the analysis presented in this report might seek to explore further the relationship between income and residential tax reduction in the City of Roanoke by analyzing individual property parcels. Linking property records to income tax records, for example, would reduce reliance on census tract averages. Because of confidentiality of income tax records, though, this approach would necessitate having linkage of the data elements for individual households or families done by government employees with legal access to the data, to prepare a database with identification of individuals removed (i.e., names, addresses, unique parcel identification numbers, and the like). This should be feasible in Virginia, where local commissioners of revenue also have access to state income tax information.

Because we find differences among localities due to differences in land use patterns and community makeup, extending such analysis to jurisdictions in the second and third tiers of metropolitan development would provide useful insights, potentially relating to such issues as urban sprawl.

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Endnotes

[1] House Bill 2663 was adopted in 2001 but vetoed by the governor. It would have allowed the city of Fairfax to adopt a higher rate on land than on improvements. In 2002 a similar measure, House Bill 239, was adopted and signed by the new governor; the effective date was July 1, 2003. In the 2003 session, Senate Bill 1095 was adopted and signed, extending the same authority to the City of Roanoke, also effective July 1, 2003. This authority is provided in the Virginia Code, Section 58.1-3221.1. [Virginia General Assembly, Session Tracking]

[2] The governor's veto of HB 2663 in 2001 stated, "Tax policy should be stable and based upon thorough study. This tax policy needs further study and examination before being implemented in one locality of Virginia" [Virginia General Assembly, Session Tracking].

[3] Virginia Commission on Local Government, "Local Governments." The number of independent cities was stable at 41 for a few decades, but in July1995 South Boston reverted to town status, and Clifton Forge did likewise in July 2001 [Virginia Commision on Local Government, "City Transition"].

[4] Moreover, nearly all other Highland County residents are white: 99.3 percent of the total, compared to 72.3 percent for the state as a whole [Census Bureau, State and County QuickFacts].

[5] Local governments in South Africa have a choice in how they tax property. About one-third of local governments in the mid-1990s taxed land and improvements at the same rate; about one third taxed land more heavily than improvements; and about one third taxed land values only [Bell and Bowman 2002].

[6] One consideration is efficiency, noted in arguments for land value taxation. Summarizing discussion at a conference on land value taxation, Netzer notes a "concern was the problems of administering a land tax so that tax liabilities actually and accurately reflect the value of the individual parcels as bare sites, which is essential if the tax is to be truly efficient" [Netzer 1998a, p. xii]. Our focus is the reallocation of tax liability among property classes.

[7] If Netzer is correct in thinking assessed values of land tend to be understated, this would temper any surge in appeals, to the extent that (1) property owners believe underassessment of land exists and (2) the appeals system is perceived as truly trying to arrive at accurate market value assessments.

[8] In Virginia, the term "fair market value" often is used in referring to assessed value, reflecting the market-based definition of the tax base [Virginia Tax Code, Section 58.1-3201].

[9] More generally, it is said land sales need not be in immediate proximity to a given property to be useful in estimating the parcel's land value; other evidence of value, combined with informed judgment, can be used to gain information from available sales somewhat removed from the property in question [Morelli].

[10] In Virginia, property tax relief is provided by local governments pursuant to state authorization. For information on the options available to localities, and on local policies adopted, see Knapp and Kulp [2003, Sections 3-6].

[11] Changes under three different split-rate structures were calculated for Roanoke City census tracts; correlation coefficients for different pairs of these changes are 1.0, indicating perfect correlation.

[12] To calculate the coefficient of dispersion, the median percentage tax change is subtracted from the percentage change for each parcel, and the absolute value of this difference is recorded; the mean value of these absolute differences is expressed as a percentage of the median tax change [Eckert 1990, p. 534].

[13] Inactive parcels no longer exist, as such. Through subdivision or consolidation, the land in these former parcels has become new parcels; including both active and inactive parcels would count some land area twice [Bugg].

[14] This may seem an exception to our earlier statement that various property tax relief measures are not reflected in our estimates of tax shares and tax changes. What we exclude, however, are

adjustments after calculation of tax liability. Our basic rule was to use the assessed values on the 2003 tax rolls; these use-value assessments are used to calculate the tax for properties participating in the program.

[15] It must be remembered that assessed value for tax purposes for these properties includes the use value of land, not market value, for properties in the use-value program. The share of the tax burden paid by these classes would be higher, if the market value of land were used to determine the tax base.

[16] Note that this class includes only three properties (Table C-3).

[17] The Roanoke tax records list "buildings" rather than "improvements" but we use the two interchangeably. The database also includes, for most parcels, zoning and land-use codes, land area, and buildings area.

[18] The American FactFinder portion of the Census Bureau's Web site seems to offer the ability to identify the census tract if a street address is entered, but with over 100,000 property parcels, this is not a feasible approach. We hope to explore the possibility of making the identification by computer in a later research phase, as American FactFinder reportedly provides the ranges of street addresses within each census tract. This needs to be explored more fully.

[19] This 24th set of properties is used primarily in calculating the revenue-neutral tax rates for split-rate tax options; only the 23 census tracts are used for correlation analysis.

[20] In each class, exempt properties are indicated by non-zero second and third digits.

[21] Although class 100 is said to be vacant land, 128 of the 9,953 parcels have building values associated with them. Many of the values are quite small (a third have a building value of $1,000 or less and all but 24 are below $10,000) and suggest a shed or some such minor structure, but a few of the values are too large for this (eight have building values in the range of $145,400 to $181,200) and may represent erroneous classification, or perhaps recently developed parcels whose classifications had not yet been changed. Whatever the case, they represent a very small percentage of both parcels and values; moreover, all but one of the eight parcels with the highest-valued buildings are in the group of parcels that are not identified by census tract.

[22] This is the gross liability, for it does not take into account the available homestead property tax relief for the elderly and disabled, or other tax relief programs. These programs have not been accounted for at this point, in part because it is likely there would be pressure to change the policies following a move to a split-rate tax.

[23] Carrying the percentage tax rates to the fourth place after the decimal resulted in nearly perfect revenue neutrality; the largest departure shown in Table R-3 is three thousandths of one percent (0.003 percent).

[24] The increase is less than the 365.3 percent increase in the land rate because of the existence of some building values within this class, as noted earlier and shown in Table R-2.

[25] Note that 76.9 percent of tract 11's population is in group quarters; next highest is 7.4 percent (tract 22), and the citywide average is 2.7 percent [Census Bureau, American FactFinder].

[26] In descending order for each tax, the top three for the current tax are tracts 16, 3, and 6, whereas for the land tax they are tracts 3, 16, and 6. In ascending order, the lowest three under the current tax are tracts 8, 10, and 7; for the land tax, they are 7, 8, and 10.

[27] While aggregate values seem more important here than averages, all five census tracts identified earlier with average parcel values less than half the city average are in the tax-decrease group; moreover, three of the four with average parcel values at least double the city average are among the six tracts with tax increases, while the fourth has the lowest of any of the decreases, -1.1 percent. For the not-allocable group of properties, the average land share of value is only 10.6 percent; they account for 3.02 percent of total assessed value (and current tax) but only 1.49 percent of land value (and land tax), and experience a 50.7 percent tax reduction.

[28] For the group of parcels not allocable to census tracts, only 71.4 percent of the class 100 assessed value is land value, and for these the increase in moving to a land tax is "only" 232.5

percent. Because it does not represent a 24th census tract, this group is omitted from the discussion in this section, but the data are included in Table R-7.

[29] The correlation coefficient carried to five places beyond the decimal rounds to 0.99996 in each case, and thus further rounds to 1.0000.

[30] This discussion assumes that the assessed value differences closely reflect differences in market values.

[31] Correlations between total tax change and other measures of income, including poverty rates (negative correlations), are not much weaker than that with median family income; Table R-8 shows correlation coefficients for these three variables with absolute values in the range of 0.3 to 0.4.

[32] This finding for Roanoke differs from that for Fairfax, noted in the opening paragraph of this report [City of Fairfax 2001].

[33] For class 300 the correlations between tax change and age of housing units take signs opposite those for class 200, as shown in Table R-8.

[34] Coefficients for the two poverty measures are given in the order of their Table R-8 appearance (Pov%Fam and Pov%Pop), as are those for the two income measures (PCInc and MFamInc).

[35] Although there is uninterrupted progression from high to low in both variables when moving from left to right across the table, the relationship between them is not constant – the ratio of one variable to the other differs across census tracts. Perfect correlation does not require a linear relationship.

[36] Roanoke provides a partial exemption for rehabilitation of structures 25 or more years old that will result in at least a 40 percent increase in assessed value of a residential property (at least 60 percent for commercial or industrial property). The exemption, equal to the change in assessed value, runs for five years after completion of the renovation, unless the property is in a designated conservation or rehabilitation district, in which case the exemption is for 10 years. In addition, if the number of dwelling units in a residential property is decreased by 50 percent or more, the exemption is granted for another five years [Code of the City of Roanoke, Secs. 32-93 through 32-101, available on line through http://roanokegov.com]. Compared to the current tax, a split-rate tax – especially the pure land tax variant – would reinforce the incentive effects of this partial exemption.