Abstract - England and Zhao report that changing the Dover, New Hampshire, property tax to one taxing land more heavily than improvements would increase the tax on single-family residences and changes across residences would be regressive. We replicate their analysis for Roanoke, Virginia, with results opposite those for Dover. We extend the Roanoke analysis beyond England and Zhao by linking property tax changes to income and poverty data for census tracts; the resulting tax change would benefit most those areas with lowest incomes and highest poverty rates. Thus, both approaches for Roanoke show initial tax burden changes to be progressive.

INTRODUCTION

In a recent article in this journal, England and Zhao (2005) examine the redistribution of the tax levy that would result in Dover, New Hampshire, if the real property tax were changed from the existing uniform tax on land and improvements to one taxing land more heavily. Property taxes that tax both land and improvements but at different rates are a form of land value taxation; they are variously known as two-tier, split-rate, or graded property taxes. Typically, the land rate is the higher of the two; in the limiting case discussed here, improvements are zero-rated and the tax is a pure land (or site) value tax. Although land is taxed more heavily than improvements in some countries, in the United States split-rate taxes are found in fewer than 20 Pennsylvania municipalities and one Hawaii county (Bell, Bowman, and German, forthcoming).

England and Zhao report that single-family residential properties in Dover bear a larger percentage of the total property tax under the split-rate approach than under the existing uniform tax, and that the tax changes within this class of property are regressive. They suggest, “A general reason for the limited adoption of two-rate property taxation is that tax reforms always redistribute income and net worth among taxpayers. Those who stand to lose from tax reform
can be counted upon to oppose adoption even if implementation of the reform proposals would improve efficiency of resource allocation and increase society’s real income” (2005, p. 248).

This paper presents evidence from the city of Roanoke, Virginia, showing distributional consequences of changing to a land–only tax that are very different from the England–Zhao findings for Dover, New Hampshire.

First, however, we provide a brief review of some advantages claimed for a tax that falls more heavily on land, including the efficiency advantage alluded to in the England–Zhao quote, above. Next, we summarize the England–Zhao research approach and their findings for Dover as well as our findings from this approach for Roanoke. This is followed by our extended analysis, linking Roanoke property records and tax changes to census tract data on income and other selected variables, which adds an important new dimension to the analysis. Finally, we present some concluding comments.

TAXING LAND MORE HEAVILY THAN IMPROVEMENTS: ADVANTAGES

There is remarkable agreement among economists and public finance professionals with the principles of sound tax policy articulated in 1988 by the National Conference of State Legislatures (NCSL). Two of the most important of these principles refer to the effects of individual taxes on economic efficiency and equity.1

For efficiency, taxes should have as little unintended effect on market decisions as possible. In the arena of local taxes on real property, such efficiency concerns typically argue for a tax on land values, rather than both land and improvements to land. Because the supply of land is essentially fixed (perfectly inelastic), higher taxes on land would not affect the behavior of landowners, thereby avoiding the efficiency losses (excess burdens) associated with most other forms of taxation. A land value tax is said to be neutral with regard to land use decisions.2

The equity principle says that a tax should be fair, both horizontally and vertically. Horizontal equity requires that a tax treat similarly situated taxpayers the same. Vertical equity notions generally suggest that tax burdens should reflect, at least to some extent, differences in ability to pay. Beyond these general principles, it is difficult to gain consensus on precisely what equity entails. The vertical equity concept is more problematic than horizontal equity because appropriate vertical distribution of tax burden is inherently a matter of judgment. A common judgment, however, is that vertical equity requires a progressive form of taxation—i.e., tax payments that increase more than in proportion to income as income rises.

A property tax based solely on land values is often thought to be more equitable than one taxing land and improvements at the same rate for two reasons. First, because land ownership tends to be concentrated in high–income families and individuals, a tax on land values is thought to be more progressive than a tax on land and improvements (Bahl, 2002; Case, 1998).3 Second, increases in land values often represent “unearned increments” resulting from the actions

---

1 These issues are explored by papers in Netzer (1998) and Wenzer (1999) and in a new book by Dye and England (forthcoming); see also a recent land value taxation annotated bibliography by Grote and Dye (2008).
2 Some suggest a land value tax encourages development; Tideman (1999) provides theoretical refutation of the claim and Oates and Schwab (1997, p. 18) argue the tax should be neutral and that Pittsburgh’s split–rate tax appears to have been neutral, making it better than some alternative taxes.
3 Consistent with these sources, the land percentage of residential value correlates highly with median family income (0.839) and per capita income (0.817), based on data for the 23 Roanoke census tracts.
of society in general, whereas individual owners are responsible for decisions to add and/or maintain 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, 1998, p. x).4

In light of the efficiency and equity advantages from taxing land at higher rates than improvements, it is curious that more local governments do not adopt this variant of the property tax. Bahl and Linn (1992, p. 99) observe, “One could not say that there is a groundswell of enthusiasm for site value taxation among local governments in developing countries.”

ANALYSIS OF A SPLIT–RATE TAX IN DOVER, NEW HAMPSHIRE

England and Zhao explore the distributional implications of moving to a pure land value tax. They use 2002 data for 8,475 developed taxable parcels in Dover, New Hampshire. Sixty–two percent of the parcels are single–family homes with a mean assessed value of $198,170 and a 1.88 mean ratio of assessed building value to assessed land value, termed a value ratio, while the average for the city as a whole is 2.07 (England and Zhao, 2005, Table 4, p. 252). The authors recognize that properties with a value ratio greater than the citywide average would benefit from a revenue–neutral change to a tax with a higher rate on land values than on building values. Accordingly, the biggest winners in Dover include condominiums, because of their relatively high mean value ratio (3.68); detached residential properties are the largest losers because this land use has the lowest value ratio (1.88).5

Further analysis by England and Zhao investigates the impact of such property tax change on individual homeowners in Dover. Focusing on single–family residences, they array the properties by total assessed value and divide them into three groups: the top 30 percent of residential properties, the middle 40 percent, and the bottom 30 percent. They then calculate tax liabilities for each property under a number of alternative scenarios for a split–rate tax that places a higher rate on land than improvements.

Based on their simulations, and the assumption that the assessed value of residential property is a reasonable proxy for permanent income, the authors conclude, “… a pure land value tax in Dover would … have a highly regressive impact on homeowners. This type of property tax reform would also tend to incite political opposition by a majority of homeowners” (England and Zhao, p. 254). To overcome the politics of such a tax reform measure, they recommend a less extreme split–rate tax, rather than a pure land tax, in conjunction with a credit to compensate losers for increased tax liabilities under a split–rate tax.

ANALYSIS OF A SPLIT–RATE TAX IN ROANOKE, VIRGINIA6

We recently explored the implications of changing from the existing uniform tax on land and improvements to a revenue–neutral (equal aggregate liability) tax on

---

4 Although this section is concerned with land value tax advantages, it should be noted that because such a tax at least partially exempts improvements, the major component of value, it raises some equity concerns.

5 Condominiums had a mean ratio of building to land assessed value of 3.68; small rentals, 2.14; large rentals, 4.34; small commercial, 2.37; large commercial, 2.73; and industrial, 4.95.

6 Distributional implications of changing from a traditional property tax to a land tax in three Virginia jurisdictions—Chesterfield and Highland counties and the city of Roanoke—are discussed more fully in Bowman and Bell (2004).
land values only—the limiting split-rate tax case—in three very different Virginia local government areas: the city of Roanoke and the counties of Chesterfield and Highland. Roanoke is a central city that has experienced some population loss but remains an employment center; Chesterfield is the largest jurisdiction in the Richmond metropolitan area in terms of both land area and population, which is still growing; and Highland, located in the mountains on the West Virginia border, is Virginia’s least-populous county and has experienced long-term population loss.

That earlier work explores the implications of changing to a land value tax in much the same way as England and Zhao’s study of Dover, New Hampshire. Unlike the situation they describe in Dover, however, our analyses show residential properties are the biggest winners in all three Virginia case study areas if the existing property tax is replaced by one taxing land more heavily. Our Highland County simulations show a 72 percent aggregate property tax decline for residential properties in the county seat of Monterey and a 54 percent drop for residential properties with up to 20 acres of land. Similarly, our simulations show an 11 percent tax reduction for single-family residential properties in urban areas of Chesterfield and a 20 percent reduction in aggregate property taxes for single-family residential properties in Roanoke (Bowman and Bell, 2004, pp. 45–6). As England and Zhao point out, however, there are significant variations across individual properties within each property class.

For Roanoke, we replicate the England–Zhao analysis to relate changes in property tax liabilities for individual properties to assessed values, which they argue are good proxies for permanent income. In addition, we relate—at the census tract level—increases and decreases in property tax liabilities to current income and, thus, consider the within-class distributional consequences of moving to a land-only tax against this income measure. The following section briefly describes the Roanoke tax base. Our empirical analyses follow, starting with comparison of Roanoke and Dover using the England and Zhao approach and continuing with tax change analysis enriched by use of socio-economic data by census tract.

**Roanoke Tax Base Profile**

The city of Roanoke performs property assessments with city staff, using computerized records and valuation software to provide annual reassessment rather than the maximum two-year cycle set by the state for cities of its size. State assessment–sales ratio studies show that the city achieves good assessment results. For our study year, 2003, the average assessment level for single-family residential urban properties is 84.5 percent of market value (i.e., sale price), the coefficient of dispersion (CD) is 7.91, and the price-related differential (PRD) is 1.01 (Virginia Department of Taxation, 2005, p. 13). The CD and PRD are measures of assessment uniformity, which is more important for equity than the absolute assessment level. The CD measures the uniformity of assessment levels across individual properties (CD = 0 shows perfect uniformity) and the PRD tests for systematic bias in favor of either high- or low-value properties (PRD = 1.0 indicates lack of any bias). The Roanoke results for each measure are well within the guidelines set by the International Association of Assessing Officers, or IAAO (Eckert, 1990, pp. 534–40).

The tax year 2003 Roanoke database contains information for 45,046 parcels.

---

7 The pattern of tax increases and decreases is the same for other variants of the split-rate approach, but the amounts are smaller if some tax on improvements is retained.
after deleting 448 parcels for which no land values are shown. These include 2,283—just over five percent—whose class codes identify them as exempt from real property taxation. Deleting these leaves 42,763 taxable parcels available for analysis.

Table 1 summarizes the distribution of parcels and values by use class. Roanoke identifies four broad classes of real property: vacant land, 8,288 taxable parcels; single–family residential, 28,680 taxable parcels; multi–family residential, 3,140 taxable parcels; and commercial and industrial, 2,655 taxable parcels. Thus, there are 34,475 developed taxable properties in Roanoke, compared to just 8,475 total developed taxable properties in Dover, New Hampshire (England and Zhao, 2005, Table 4, p. 252).

Not surprisingly, the classes’ respective shares of parcels in Table 1 differ from their shares of assessed value in Table 2. While vacant land 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 2). Single–family residential properties also are less significant in terms of value than in terms of sheer numbers (58.2 percent of assessed value versus 67.1 percent of taxable parcels). Both the other classes have value shares that are disproportionately large in relation to the number of properties. The difference is comparatively small

---

**TABLE 1**

<table>
<thead>
<tr>
<th>Property Type (and Class)</th>
<th>Parcels</th>
<th>Total Assessed Value (Millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vacant (class 100)</td>
<td>8,288</td>
<td>$132.0</td>
</tr>
<tr>
<td></td>
<td>(19.4%)</td>
<td>$130.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$1.7</td>
</tr>
<tr>
<td>Single–Family Residential (class 200)</td>
<td>28,680</td>
<td>$2,690.2</td>
</tr>
<tr>
<td></td>
<td>(67.1%)</td>
<td>$463.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$2,226.4</td>
</tr>
<tr>
<td>Multi–Family Residential (class 300)</td>
<td>3,140</td>
<td>$441.7</td>
</tr>
<tr>
<td></td>
<td>(7.3%)</td>
<td>$57.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$384.5</td>
</tr>
<tr>
<td>Commercial &amp; Industrial (class 400)</td>
<td>2,655</td>
<td>$1,359.7</td>
</tr>
<tr>
<td></td>
<td>(6.2%)</td>
<td>$342.3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$1,017.4</td>
</tr>
<tr>
<td>Total</td>
<td>42,763</td>
<td>$4,623.6</td>
</tr>
<tr>
<td></td>
<td>(100.0%)</td>
<td>$993.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$3,629.9</td>
</tr>
</tbody>
</table>

* Based on 42,763 taxable parcels for which land values were provided. Detail may not add to totals due to rounding.

Source: Authors’ calculations from Roanoke real property tax database for 2003.

---

**TABLE 2**

<table>
<thead>
<tr>
<th>Property Class</th>
<th>Across Property Classes</th>
<th>Within Classes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Land</td>
</tr>
<tr>
<td>Vacant</td>
<td>2.9</td>
<td>13.1</td>
</tr>
<tr>
<td>S–F Res</td>
<td>58.2</td>
<td>46.7</td>
</tr>
<tr>
<td>M–F Res</td>
<td>9.6</td>
<td>5.8</td>
</tr>
<tr>
<td>C&amp;I</td>
<td>29.4</td>
<td>34.4</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

* Based on 42,763 taxable parcels for which land values were provided. Detail may not add to totals due to rounding.

Source: Authors’ calculations from Roanoke real property tax database for 2003.
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 C&I share of assessed value is nearly five times its share of taxable parcels.

**Similarities and Differences between Dover and Roanoke**

First we compare Roanoke to Dover following the England–Zhao analysis. The same tax change might have different distributional consequences in two cities for two basic reasons:8

1. The two jurisdictions might differ in the types of properties that comprise their property tax base—e.g., the relative importance of commercial and industrial properties might vary across jurisdictions.

2. Within a given class of property, Dover and Roanoke might differ in the value ratios for individual parcels. This difference could be a result of two potential causes:
   i. The two jurisdictions might differ in the density of development and/or mix of property uses, so that one might have more land per parcel than the other.
   ii. The two jurisdictions might differ in how they determine land value for tax purposes, with one systematically placing a higher weight on land.

As already noted, Roanoke has more than four times as many developed taxable parcels as Dover (see Table 3). The relative shares of different land uses are difficult to compare directly because of different classifications, but the commercial and industrial share of developed properties is about twice as large in Roanoke as in Dover. Similarly, single–family houses seem to be a larger share of developed properties in Roanoke. Thus, differing tax base composition in Roanoke and Dover might contribute to their different distributional consequences in moving from the existing uniform property tax to one taxing land more heavily.

In addition, properties are systematically less valuable in Roanoke than in Dover and the mean value ratios (improvement value over land value) in Roanoke are significantly higher for all land uses than in Dover.9 For example, single–family homes in Dover have a mean value ratio of 1.88, while the ratio for Roanoke is 5.99. If land is valued accurately in both places (addressed below), the much higher ratio of improvements value to land value in Roanoke suggests more intensive land use there. The coefficient of variation for the value ratios of single–family homes in Roanoke (0.71) is much higher than the comparable figure for Dover (0.42), indicating considerably more variation in the value ratio across single–family homes in Roanoke.

This notion gets additional support from considering assessed values and value ratios. The final column in Table 3 reports correlations between mean total parcel assessed values and mean value ratios for properties within each land use class. The correlation coefficients for single–family residences in Dover and Roanoke are, respectively, 0.4789 and –0.006. In other words, there is no discernible relationship between total assessed value and the value ratio of residential properties in Roanoke, while there is a moderately strong relationship in Dover. Using total

---

8 We thank one of the referees for suggesting this summary.

9 Industrial property is a possible exception; Roanoke data place commercial and industrial properties in one class.
assessed value as a proxy for permanent income, the positive correlation for Dover supports the England–Zhao finding of regressive tax changes: For households with higher incomes, improvements are a higher percentage of total property value, which means larger tax cuts if the property tax becomes a land value tax.

Finally, the mean value ratio for commercial and industrial property in Roanoke is about 30 percent less than the mean value ratio for single–family homes. Alternatively, the mean value ratios for commercial and industrial property in Dover are between 26 and 163 percent higher than the mean value ratio for single–family properties. Such between-class differences contribute to the overall conclusion that land–use intensity in the two cities differs significantly.

A final factor that might explain differences between the cities is how the value

### Table 3

<table>
<thead>
<tr>
<th>Land Use Category</th>
<th>Parcels (Percent of Total)</th>
<th>Mean Total Assessed Value (Std. deviation)</th>
<th>Mean Value Ratio (CV)*</th>
<th>Correlation Coefficient**</th>
</tr>
</thead>
<tbody>
<tr>
<td>All developed parcels</td>
<td>8,475 (100.0%)</td>
<td>$214,842 ($424,806)</td>
<td>2.07 (1.74)</td>
<td>0.2846</td>
</tr>
<tr>
<td>Condominiums</td>
<td>849 (10.0%)</td>
<td>$134,373 ($59,485)</td>
<td>3.68 (0.66)</td>
<td>-0.2076</td>
</tr>
<tr>
<td>Single–family homes</td>
<td>5,250 (61.9%)</td>
<td>$198,170 ($86,142)</td>
<td>1.88 (0.42)</td>
<td>0.4789</td>
</tr>
<tr>
<td>Small rentals</td>
<td>982 (11.6%)</td>
<td>$228,580 ($85,735)</td>
<td>2.14 (0.36)</td>
<td>0.6745</td>
</tr>
<tr>
<td>Large rentals</td>
<td>41 (0.5%)</td>
<td>$1,367,538 ($1,985,693)</td>
<td>4.34 (0.42)</td>
<td>0.3193</td>
</tr>
<tr>
<td>Small commercial</td>
<td>224 (2.6%)</td>
<td>$325,480 ($355,415)</td>
<td>2.37 (0.69)</td>
<td>0.2690</td>
</tr>
<tr>
<td>Large commercial</td>
<td>94 (1.1%)</td>
<td>$669,375 ($1,266,095)</td>
<td>2.73 (0.81)</td>
<td>0.2733</td>
</tr>
<tr>
<td>Industrial</td>
<td>15 (0.2%)</td>
<td>$837,786 ($2,343,502)</td>
<td>4.95 (3.50)</td>
<td>0.4150</td>
</tr>
</tbody>
</table>

*The value ratio of a parcel is its assessed building value divided by assessed land value; CV is the coefficient of variation.

**The reported correlation coefficient is between total assessed value and the value ratio for all parcels within a land use category.

Source: Roanoke statistics are from authors’ calculations; Dover data are from England and Zhao (2005).
of land is assessed. Brunori and Carr (2002) identify 29 states that are legally required to value land and improvements separately. Virginia is one of those states, but New Hampshire is not. However, according to Brunori and Carr (p. 16):

The New Hampshire Constitution, statutes, and reported judicial decisions do not address the issue of valuing land and improvements for property tax purposes. Notwithstanding the lack of legal guidance, all six New Hampshire municipalities (Concord, Nashua, Conway, Berlin, Hanover, Keene) that were surveyed valued land and improvements separately. And all six municipalities notified the property owners of the separate valuation.

England and Zhao recognize that reasonable simulation of the impact of changing from the existing property tax, with a single tax rate for land and improvements to one that taxes these components at different rates depends on how well land values are determined. Residential property assessments in Dover generally are uniform and, therefore, of good quality, as they are for Roanoke. However, the evidence pertains to improved property values, not the land component separately.

Addressing this concern, England and Zhao conclude that in New Hampshire “… land value assessments reported by tax assessors do reflect market conditions to some degree and, hence, could be used to approximate the market value of land parcels in each locality” (p. 250). This conclusion results from analysis of data from 235 localities, regressing assessed land value on a set of factors that previous research in urban economics suggests influence land values. The adjusted–$R^2$ for this statewide cross–section regression is 0.3018. They do not address how land values are estimated in New Hampshire generally and Dover in particular.

In contrast to the lack of information on how Dover land values are estimated, we have analyzed how Roanoke determines land value for tax purposes (Bell and Bowman, 2008). This work gives us a level of comfort with the Roanoke land values.

The city relies primarily on the abstraction method, in which land is the residual of total parcel value less the depreciated value of improvements (Bell and Bowman, 2006). Additionally, we have compared the city’s land value estimates to baseline estimates using the contribution value notion of value. The city’s own estimates of land value place land at an average of 18 percent of total value for improved residential parcels, while the independent, external baseline estimates result in a 22 percent land share. While clearly not identical, these two estimates are in the same range.

To gauge the similarities or differences for individual properties in the two sets of land values for Roanoke, we calculate a coefficient of dispersion (CD). CDs typically result from ratio studies that relate assessed value to sale price (AV/SP) for each property in a sample of sold properties, but sales of improved residential properties, but sales of improved residential

---

10 Information for Roanoke is given in the discussion of the Roanoke data; performance in Dover is comparable. For 2002, the England–Zhao study year, average residential assessed value is 91 percent of market value, the coefficient of dispersion (CD) is 9.70, and the price–related differential (PRD) is 1.01 (City of Dover, 2005, p. 3).

11 Bell and Bowman (2008); this study analyzes assessed values for the land component of improved residential parcels in two cities (Baltimore, Maryland, and Roanoke, Virginia) and one county (Lucas (Toledo), Ohio) selected to represent three common approaches to deriving such values. Local values are compared to independently generated baseline values resulting from consistent application of the contribution value approach to the three study areas. This approach employs non–linear multiple regression analysis to determine the independent contributions to value made by various attributes of both land and improvements.

12 Mean value ratios based on the baseline estimates of land value would be lower than those based on Roanoke’s estimates, but still well above those in Dover.
properties provide no sale prices specifically for the land component. We use the independent baseline value estimates in lieu of sale prices and calculate ratios of local land value to baseline value (LV/BV) for each residential property; a very low CD value would indicate a close match between local and baseline land values. The resulting CD for Roanoke residential land values is 32; while this indicates greater differences between the two sets of land values than one might wish, it is not out of line with CDs often found for improved properties.

Another standard measure of assessment performance, the price–related differential (PRD), tests for systematic bias in the valuation of high– or low–value properties. It is of special interest if one wants to draw conclusions about the regressivity of property tax change using assessed value as the proxy for permanent income in the manner of England and Zhao because it provides information on whether, or to what extent, there is a systematic bias for high– or low–value properties in land value estimates. The PRD also is derived from assessment ratios (LV/BV, here) for individual properties; the PRD for Roanoke was just 1.0227, within the IAAO limits of acceptability (Eckert, 1990, p. 540).\[13\]

Empirical Analysis

To begin comparing Roanoke and Dover, we replicate England and Zhao’s approach with Roanoke data. Table 4 reproduces their data for Dover single–family residences and provides comparable data for Roanoke. The simulations for each city compare the existing property tax to one taxing only land while raising the same total revenue. The 2003 Roanoke nominal property tax rate was $1.21 per $100 of assessed value; applied to both land and improvements assessed values, it generated total property tax liabilities of $55.9 million. In the limiting case of a zero rate on improvements, the land rate required to raise the same total revenue is $5.6303 per $100 of assessed land value. Our simulations use these rates; the same pattern, although not the magnitude, of distributional consequences would emerge with any revenue–neutral set of land and improvements tax rates. So that signs properly indicate a tax increase or decrease, the dollar change in property tax liability is land tax liability (0.056303 times the assessed land value) minus liability for the existing tax (0.0121 times the assessed value of land and improvements).

Tax exemptions and credits are not considered; comparing gross assessed values under traditional property taxation and land value taxation allows a clearer focus on their differences. Moreover, following a major tax change of the sort considered here, reconsideration of property tax relief policies (local–option in Virginia) seems likely. 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, which are not known in advance. Nor can it take into account land value changes that might well occur when division of parcel value between land and improvements affects tax liability and invites closer scrutiny of this division.

Table 4 shows the fundamental basis for England and Zhao’s conclusion that changing to a pure land value tax would be regressive in Dover: For the lowest, middle, and highest home value groups the respective average tax changes are $+638, $+311, and $–138. Moreover, their respective percentages of homes with tax increases are 99 percent, 80 percent, and 26 percent.

\[13\] Roanoke is the only one of our three case study locations for which the PRD meets IAAO standards (Bell and Bowman, 2008).
By contrast, in Roanoke all three single-family home value groups show a property tax drop in moving from the existing tax to one on just land. The tax-change statistics in Table 4 result from arraying the 26,680 parcels by total assessed and using the spreadsheet’s statistical functions to find the median, mean, and so on, for each of the three value groups. The median drop in tax liability ranges from $338 (mean drop of $321) for the highest-valued 30 percent of homes to $152 (mean drop of $128) in the lowest-valued 30 percent of homes; citywide, the median tax reduction is $225. At first blush, the figures seem to suggest that scrapping the existing property tax in favor of one taxing only land would benefit higher-value properties more than lower-value properties, but closer consideration of the data reveals otherwise. For this purpose, we express the dollar change in property tax liability as a percentage of liability under the existing tax. Median percentage tax reduction varies inversely with total assessed value: 22 percent for the highest-value group, 23 percent for the middle group, and 29 percent for the lowest-value group; citywide, the median tax reduction is 24 percent. Also, the highest-value group has a larger share of properties experiencing property tax increases (22 percent) than either the lowest-value properties (18 percent) or the middle group (8 percent); citywide, the tax increases for 15.2 percent of homes.

Additional Evidence for Roanoke: Census Tract Income Data

England and Zhao, and our replication of their work, draw conclusions about regressivity using assessed values of improved residential properties as proxies for permanent income. To gain more insight into the pattern of tax changes in Roanoke, we explore tax changes at the
census tract level, tapping into decennial census data for the city’s 23 census tracts. These data enable us to consider, for the first time in such analysis, how such factors as current income of residents and age and size of housing units are related to tax changes.14 As already noted, lower property taxes for single–family residential property would result from replacing the existing property tax with a land tax. Citywide, the median reduction for tax year 2003 is 24.2 percent and the mean reduction is 20.7 percent (Table 4). Among the 23 census tracts, the median tax change ranges from –56.4 percent to +6.9 percent; the change is negative in 21 of the 23 tracts, and the median change is –26.9 percent (see Appendix).

For this analysis, we use four income–related variables for the census tracts: average income per capita (PCInc); median family income (MFamInc); percentage of families below federal government poverty thresholds (Pov%Fam); and percentage of the overall population (individuals) below poverty thresholds (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 lower and they are negative, as higher income levels go with lower poverty rates; coefficients for various pairings of income and poverty measures range from –0.6631 to –0.7019.

Our analysis of tax changes also employs seven housing statistics (listed in Table 5) along with the four income and poverty measures. Housing condition could be a proxy for wealth and/or permanent income, but it might also be important in understanding the differences in value ratios across properties and census tracts; the seven housing variables describe the

<table>
<thead>
<tr>
<th>Variable Definition</th>
<th>Variable Name</th>
<th>Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per capita money income</td>
<td>PCInc</td>
<td>0.8048</td>
</tr>
<tr>
<td>Median family income</td>
<td>MFamInc</td>
<td>0.8495</td>
</tr>
<tr>
<td>Poverty rate for families</td>
<td>Pov%Fam</td>
<td>–0.7931</td>
</tr>
<tr>
<td>Poverty rate for individuals</td>
<td>Pov%Pop</td>
<td>–0.7462</td>
</tr>
<tr>
<td>Housing units per square mile</td>
<td>HU/sqmi</td>
<td>–0.2814</td>
</tr>
<tr>
<td>Median number of rooms per housing unit</td>
<td>MedRms</td>
<td>0.4874</td>
</tr>
<tr>
<td>Percentage of housing units built since 1990</td>
<td>BltPost90</td>
<td>0.1738</td>
</tr>
<tr>
<td>Percentage of housing units built before 1940</td>
<td>BltPre40</td>
<td>–0.3599</td>
</tr>
<tr>
<td>Percentage of housing units with more than one person per room</td>
<td>%&gt;1/Rm</td>
<td>–0.5964</td>
</tr>
<tr>
<td>Occupancy rate for housing units</td>
<td>Occ%</td>
<td>0.6087</td>
</tr>
<tr>
<td>Percentage of occupied housing units that are owner–occupied</td>
<td>OwnOcc</td>
<td>0.4557</td>
</tr>
</tbody>
</table>

Source: Authors’ calculations; residential tax change computed from city’s property database; other variables are from the Census Bureau’s American FactFinder. Correlation coefficients are those given by the “CORREL” function in Excel, and are of the Pearson type, rather than Spearman rank correlations.

14 While there are definite advantages in being able to link some property tax information to census tract data, the match is not precise. Census tract data are group averages—single figures for fairly large but varying numbers of people and/or housing units (see Appendix)—rather than measures pertaining to individual households. Property tax data pertain to individual parcels (property tax changes are parcel medians for each of the 23 census tracts). Parcel assessed values are estimates, although imperfect, of permanent income for individual households.
character and condition of the housing stock in each census tract. Table 5 reports correlations between tax change and (1) each of the income and poverty measures and (2) each of the housing variables using data for the 23 Roanoke census tracts. The measure of tax change for a census tract is the median percentage change in property tax liability for single-family residences in that tract when moving from the existing uniform property tax to one taxing only land (MTxCh%).

The highest correlations between tax change (MTxCh%) and other variables are for the income measures (Table 5): 0.8495 for median family income (MFam-Inc) and 0.8048 for per capita income (PCInc). Thus, residential properties in census tracts with higher median family or per capita incomes tend to experience greater increases (or smaller decreases) in their property tax liabilities under a land value tax. Consistent with this, correlations between the two poverty measures and the change in residential tax liability also are large, but negative: –0.7931 for the family poverty rate (Pov%Fam) and –0.7462 for the individual poverty rate (Pov%Pop). In other words, residential properties in census tracts with relatively high proportions of families and individuals living below official poverty lines experience smaller increases (or larger decreases) in property tax liabilities under a land value tax.

Correlation results for housing–stock variables seem consistent with those for income and poverty measures. Larger property tax increases or smaller decreases are associated with larger homes, newer homes, homes in areas with higher occupancy rates, and homes in areas with higher homeownership rates (i.e., correlations between these variables and tax change are positive). Larger decreases (smaller increases) in property tax occur in areas where housing development is more dense (more units per acre), where homes are older, and where housing is crowded (more than one person per room), as shown by the negative correlations.

CONCLUDING COMMENTS

Roanoke recently was given authority by the Virginia General Assembly to impose a split–rate property tax but so far it has not pursued this alternative. Initial reallocation of tax burdens associated with such tax reform there favor residential properties in general and low–income residents in particular. This is in stark contrast to findings by England and Zhao for Dover, New Hampshire, where changing to a land tax increases residential property taxes overall and changes within the residential class are regressive.

These different results reflect the different characters of the two cities. This paper presents data and analyses that reveal important differences between Dover and Roanoke in property tax base composition. Roanoke has characteristics of older central cities and Dover is more like a bedroom community to Boston. As a result, there are substantial differences in the intensity of land use; for example, in Dover, improvements account for less than twice as much value as land per residential parcel, while in Roanoke improvements account for six times as much as land. In addition, the within–class variation in the land share of value for single–family residential properties in Roanoke is much higher than it is in Dover. Beyond this, we know less about how land values are determined in Dover than is known for Roanoke; substantial differences in valuation approach could help explain some of the difference in value ratios.

In contemplating changing the traditional property tax to some form of land tax—whether pure, with a zero rate on

---

15 The Appendix provides data on the magnitude and variability across census tracts for several variables.
improvements, or a less extreme split–rate variant—it is important that policy makers consider how the change would affect the distribution of property tax burdens. It is unfortunate there is so little information on the matter. Findings for the cities of Roanoke, Virginia, and Dover, New Hampshire, paint very different pictures of winners and losers. They suggest that the distributional implications of changing to a land tax depend critically upon intensity of development and property tax base composition.

Finally, analysis of the distributional consequences of moving from a property tax that applies equally to land and improvements to one that falls more heavily on land is typically limited to looking at reallocation of tax liabilities across and within various land use classes. As the character of the community considering such a change varies—rural and urban, central cities, urban counties, suburban and ex–urban communities, etc.—the analysis needs to be expanded. Extending analysis of such property tax changes to consider current incomes of residents can provide useful additional insights. We have made a first effort at this using census tracts as the unit of analysis. Results of those analyses for Roanoke are consistent with our findings using the approach England and Zhao applied in Dover. Still, it is difficult to draw firm conclusions from the information available from these two case study cities, given the very different findings for them. However, it seems it might be particularly appropriate for older central cities to look into some form of land value tax. To the extent Roanoke is typical of such cities, this tax reform should be more politically feasible in such jurisdictions than in others because of the beneficial changes for homeowners/voters; this could enable such cities to gain the beneficial effects of greater tax neutrality suggested by the Oates and Schwab (1997) analysis of Pittsburgh’s split–rate tax.

Acknowledgments

Analysis of Roanoke and two other Virginia localities reported here was supported by the Lincoln Institute of Land Policy. We thank National Tax Journal editor Therese J. McGuire and two anonymous referees for valuable comments on earlier versions of this paper.

REFERENCES

Bahl, Roy W.

Bahl, Roy W., and Johannes F. Linn.

Bell, Michael E., John H. Bowman, and Jerome C. German.

Bell, Michael E., and John H. Bowman.

Bell, Michael E., and John H. Bowman.


The data in the table above show a good deal of variation among the 23 Roanoke census tracts for many variables. For instance:

- The land share of total assessed value ranges from 13 percent to 30 percent, averaging 20 percent.
- Aggregate property tax liabilities for single-family residential properties under the existing tax range from $9,198 to $4.6 million and average $1.4 million.
- Tax changes from converting the property tax to a tax on only land value average a drop of about 27 percent but range from a drop of 56 percent to an increase of 7 percent.
- The owner-occupancy rate for occupied housing units ranges from 5 percent to 74 percent and averages 53 percent.
- Median family income ranges from $14,500 to $93,900 and averages $38,400.
- The percentage of families in poverty ranges from 2 percent to 39 percent and averages 15 percent.

Standard deviations generally are large in relation to mean values, another indication of the variation across census tracts. This is particularly true for the poverty rates, but also for the percentage change in aggregate single-family property tax liabilities.