Area-Based Property Tax Systems:
Current Practice and Equity Concerns

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Abstract

The area-based property tax has been gaining influence in developing and transitional countries around the world. This report first examines how the area-based tax is administered in thirty-eight countries according to statutes. Area-based assessment is more commonly used in rural areas than urban areas, for land than buildings, and with few adjustments. Over half the countries allow some local control. Next, a case study in Lithuania explores the equity implication of relying on an area-based tax as opposed to an *ad valorem* property tax. Overall, the horizontal and vertical equity of both methods are poor and the level of equity is sensitive to interquartile analysis. The relationships are, however, robust: 1) horizontal and vertical equity for detached housing are better under the area-based than market-based assessment and 2) horizontal and vertical equity for flats are better under market-based than area-based assessment.

This paper is accompanied by a compendium that provides an overview of the countries that currently implement some form of area-based property taxation or that allow for the local option of an area-based property tax. This compendium entitled, *A Compendium of Countries with an Area-Based Property Tax*, is posted on the Lincoln Web site.

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Introduction

Decentralization is a concept that has received much attention and has been advocated by a number of international donor organizations as a means of improving the provision of public goods and services. [Kim, 2008] According to a recent review of the World Bank's operational data base by the Independent Evaluation Group, the Bank committed approximately $32 billion between 1987 and 2006 to 89 countries through 458 programs, projects and grants where decentralization was a major theme or activity. Fiscal decentralization is generally thought to involve the transfer of revenue raising and spending decisions to subnational governments. In designing a system of fiscal decentralization, Litvack, Ahmad and Bird conclude that economic and efficiency concerns suggest that local governments should tax immobile factors such as land and real estate. [Litvack, Ahmad and Bird, 1998, p. 11]

Youngman and Malme [2004] observe that taxes on land and buildings utilize a wide variety of tax bases, including capital value (improvement and unimproved), annual rental value, original purchase price (acquisition value) as well as non-value measures such as area or flat fees. In many respects the choice of the tax base is a function of several criteria including history, culture and administrative simplicity. [de Cesare, 2004]

McCluskey and Bell [2008] provide information on how the property tax is administered in 122 countries. Table 1 provides their summary of property tax practices around the world. According to McCluskey and Bell, fifty-two countries tax capital improved value as the base of their property tax and 16 countries have some form of unimproved capital value as the base of their property tax. In addition, eight countries tax land and improvements separately, while 4 countries tax improvements only. The next most popular approach is the area-based approach used in some form in 44 countries (see footnote 1). Finally, 37 countries rely on annual rental value to determine the base of their property tax, while 6 countries apply a flat rate tax to property.

Table 1: Property Tax Base

Region	Number of Countries	Land Value	Capital Improved Value	Land and Improvements (Separately)	Improvements Only	Annual Rental Value	Area	Flat Rate
Africa	25	1	8	3	4	7	11	6
Caribbean	13	4	4	2	0	8	5	0
Asia	25	2	6	2	0	11	12	0
Oceania	7	6	2	0	0	4	0	0
Western Europe	13	0	9	0	0	6	0	0
Eastern Europe	20	1	6	0	0	0	15	0
Central and South America	16	2	14	1	0	1	1	0
North America	3	0	3	0	0	0	0	0
TOTALS	122	16	52	8	4	37	44	6
Source: McCluskey and Bell, 2008, Table 1.								

McCluskey and Bell identify several regional variations that emerge from the data in Table 1 as well. Of most interest here is the fact that nearly half the countries in Africa and Asia reported in Table 1 rely on some form of area-based tax and three-fourths of the countries in Eastern Europe rely on some form of area-based property tax.

The area-based property tax has been gaining influence in developing and transitional countries around the world. Overall, this version of the property tax generally scores relatively well against commonly accepted criteria for evaluating alternative revenue sources. Specifically, according to Bell and Bowman [Bell and Bowman, 2008, pp. 365-69], an area-based property tax

- Scores well in terms of revenue stability and predictability;
- May not generate adequate revenues to fund locally provided goods and services compared to the ad valorem property tax;
- May be somewhat more neutral than a market value based property tax with regard to the portion of the tax falling on structures;
- May be simpler to administer than a market value based property tax system, even if there is some level of self-assessment involved; and
- May be somewhat equitable from the perspective of the benefit received principle of taxation, while an ad valorem property tax is

generally considered to score better on equity grounds from the perspective of the ability-to-pay principle of taxation.

A summary of the strengths and weaknesses of an area-based property tax, vis-à-vis an ad valorem property tax, are presented in Table 2. The purpose of this paper is to explore in more detail the equity implications of relying on an area-based property tax, vis-à-vis an ad valorem property tax. The next section takes a closer look at how the area-based tax is administered in countries around the world. That is followed by an empirical analysis of available data on the actual implementation of an area-based property tax in one case study country. The final section provides some concluding observations about the administration of an area-based property tax.

Table 2: Evaluation of Two Property Tax Forms Under Traditional Criteria		
Criteria	Area-based Tax	Value-based Tax
Revenue productivity	+, –	+, –
Neutrality	+, –	+, –
Simplicity	+	–
Equity	–	+, –
Source: Bell and Bowman, 2008, Table 12.3, p. 369.		

Area-based Property Taxes: Experiences Around the World

According to the information in our *Compendium of Countries With An Area-Based Property Tax*, thirty-eight countries tax property with some form of area-based valuation method instead of a market-based valuation method.[1] These countries calculate the tax owed by multiplying the measured area of land and buildings by a per unit assessment rate, instead of collecting a percentage of the market value of property as tax. This section explores trends and differences among the designs of area-based tax systems.

Developing and transitioning countries tend to use an area-based tax system. Most of these countries that rely on area-based valuation do not have the administrative capacity to maintain updated cadastres with the information necessary for market valuation or they are in the process of building a cadastre. Some countries lack property markets and others have institutional barriers that obstruct market based valuation. Central and Eastern European countries have used area-based systems while they transition from Communism to a developed property market. Lesotho and Lao do not officially recognize private ownership because all land belongs to the nation. Governments that do not recognize private ownership will not record market values for taxation, even if arms-

[1] The Compendium presents descriptions of area-based property taxes in each of these 38 counties, which are based on our review of their statutes. We did not rely on secondary sources that indicated a country had an area-based property tax. If we did not find a description in statutes (which had been translated to English) we did not include it in our Compendium. As a result there are six countries not included in our Compendium which is less than the 44 listed by McCluskey and Bell. Specifically, we do not include in our Compendium the following countries which are included in McCluskey and Bell – Armenia, Bosnia and Herzegovina, Brunei-Darussalam, China, St. Kitts and Nevis, and Serbia and Montenegro.

length sales occur. Kenya has an informal institution of communal property ownership that does not elicit arms-length prices. Rent control in India distorts market prices such that price does not reflect the property's market value [Rao, 2008]. In circumstances such as these, governments turn to area-based property taxes as a simple, less administratively intensive method of valuation that does not require a well functioning property market.

Countries using area-based assessments of land span five regions: Central and Eastern Europe (Albania, Bulgaria, Croatia, Czech Republic, Hungary, Poland, Romania, Slovakia, and Slovenia), former Soviet Union countries (Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyz Republic, Lithuania, Moldova, Tajikistan, Ukraine, and Uzbekistan), developing countries in Africa (Burundi, Cameroon, Eritrea, Ethiopia, Kenya, Lesotho, Namibia, Nigeria, Rwanda, Tunisia, and Zimbabwe), Asia (India, Israel, Lao), and the Caribbean and Latin America (Chile, Dominica, St. Lucia, St. Vincent & the Grenadines, Trinidad & Tobago).

Area-based and market-based assessment methods differ in terms of their strengths and weaknesses. As argued in the previous section, market-based property tax systems are generally thought to score highest on fairness among different assessment methods because property values reflect ability-to-pay considerations better than an area-based property tax. In addition, Konyimbih argues that

> "The simplicity of this assessment option [area-based] makes it subject to generalization over broad geographical areas. This makes the tax regressive. . . The tax is not related to ability to pay as the same burden falls on the same sized land in the same or prescribed geographical location." (Konyimbih 2000, p. 33)

Similarly, Bird and Slack argue that

> "area-based assessment results in a relatively greater burden on low income taxpayers than high income taxpayers when compared to value-based assessment. The reason is that average household incomes in high value neighborhoods are higher than in low value neighborhoods. A tax on area taxes all properties that are the same size the same amount, whether they are in high income or low income neighborhoods. Similarly, older houses in a bad state of repair but with a large floor area will pay relatively high taxes." (Bird and Slack 2004, p. 30)

Area-based systems, on the other hand, have the advantage of administrative simplicity. Calculating property tax based on area requires only area measurements, thus obviating the need for costly collection and analysis of market data and revaluations. In addition, the measurement of area is more objective than estimations of property market value because assessors make judgments about comparable properties on which to base their estimate of market value. Area-based valuation is therefore less contestable than market-

based valuation. This section provides a comparison of the thirty-eight countries using some form of area-based property tax.

A trade off seems to exist in implementing an area-based valuation method. Area-based systems often use adjustments in order to make the tax fairer. Adjustment factors vary the rates per square meter according to the use of the property, location, soil quality, etc. The adjustment rates apply to groups of properties with the associated characteristic and do not account for individual differences between properties (Bird and Slack 2002). The tax system approaches fairness with narrowly defined adjustment factors because precisely assessed values better approximate market value. Using more narrowly defined adjustments, however, detracts from the main advantages of area-based taxes: administrative simplicity and objectivity. Comparative analysis of the types and number of adjustment factors used by the 38 countries explores the question of how countries balance fairness with ease of administration.

The following discussion draws on the written descriptions by Yuan, Connolly and Bell of how individual countries' property tax systems operate. In three parts, this section identifies common designs among area-based tax systems by amalgamating research on all 38 countries and describing patterns among their legal frameworks. Part one discusses the countries' tax base to understand the types of property most commonly assessed according to area. Part two provides comparative analysis of the adjustments used with the area-based method in order to explore the number and type of adjustment factors most commonly used. Part three discusses the importance of property tax revenue in these countries.

Part One: Tax Base

All thirty-eight countries included in this study tax land with area-based valuation, though the tax base varies. Table 3 displays which countries use an area-based land tax, building tax, or both. All of the countries tax land by area, but only half of the countries tax *all* land according to area. The other half specifies the type of land taxed by the area method. For example, as shown in Table 3, the following countries use area-based assessment for only certain types of land: Dominica taxes land area in one city, Lesotho taxes only rural land, Croatia taxes land area for only idle land, Trinidad and Tobago taxes land area only outside of cities, etc. The table does not display exemptions, only the main categories of land to which the area-based tax apply. Land types excluded from Table 3 merely indicate that the government does not value the land with the area-based method; some of the countries use different valuation methods for the other land.

Eighteen of the countries tax buildings based on area in addition to land. Eleven of those countries use the area valuation method for *all* buildings and the other 7 countries specify types of buildings. These seven countries tend to specify the type of buildings assessed by area according to city or purpose. Like land, buildings not taxed according to the area-based system are not necessarily tax free. Some countries use value-based methods for buildings and area-based methods for land.

Table 3: Tax Base Calculated by Area

			Types of Taxable Property		Local Choice of Base
	Land	Buildings	Land	Buildings	
Albania	Yes	Yes	Agricultural	All	No
Azerbaijan	Yes	No	All	Inventoried value	
Belarus	Yes	No	All	Value based	No
Bulgaria	Yes	Yes	Non-agriculture, non-forest land, and developed agricultural land	All non-agriculture	No
Burundi	Yes	Yes	Undeveloped land in designated municipalities and all developed land	All	No
Cameroon	Yes	Yes	All	All	No
Chile	Yes	Yes	All	All	No
Croatia	Yes	Yes	Idle agricultural land, idle enterprise real estate, and idle construction land; Communal fees on all land;	Vacation house; Communal fees on all buildings	No
Czech Republic	Yes	Yes	All	All	No
Dominica	Yes	Yes	Roseau City	Roseau City	Unavailable
Eritrea	Yes	No	All	N/A	No
Ethiopia	Yes	No	All	N/A	No[1]
Georgia	Yes	No	All	N/A	No
Hungary	Yes	Yes	Unimproved land on plots above the average area	All except Nyíregyháza	Yes
India [3]	Yes	Yes	All	All	Yes
Israel	Yes	Yes	Developed land, occupied undeveloped land, and agricultural land	All	No[2]
Kazakhstan	Yes	No	All	Average annual net book value of the assets	No
Kenya	Yes	No	Registered land [4]	N/A	Yes
Kyrgyz Republic	Yes	No	All	Value based	No
Lao	Yes	No	All	N/A	No
Lesotho	Yes	No	Rural land	N/A	No
Lithuania	Yes	No	All	Non-residential buildings assessed according to market value	No
Moldova	Yes	No	All	N/A	No
Namibia	Yes	Yes	Rural	Rural	Yes
Nigeria	Yes	Yes	All land with buildings valued less than 600 Naira [5]	All valued less than 600 Naira	No[1]
Poland	Yes	Yes	All	All	No
Romania	Yes	No	All	N/A	
Rwanda	Yes	Yes	Undeveloped land	Occupied buildings	No
Saint Lucia	Yes	No	Undeveloped land	Annual rental value	No

	Land	Buildings	Types of Taxable Property		
			Land	Buildings	
Saint Vincent and Grenadines	Yes	No	Undeveloped land outside urban areas	Annual rental value	No
Slovak Republic	Yes	Yes	All non-agriculture	All	No [6]
Slovenia	Yes	No	Developed and undeveloped building land [7]	Type and value of the premises	No
Tajikistan	Yes	Yes	All	All	No
Trinidad and Tobago	Yes	No	Land outside of cities	Annual rental value for property within the city boundary	No
Tunisia	Yes	Yes	Unbuilt land	All	No
Ukraine	Yes	No	All	N/A	No
Uzbekistan	Yes	No	All	Inventory cost or depreciated cost	No
Zimbabwe	Yes	No	Rural land	Value based in urban areas	No

Table 3 Footnotes:
[1] Tax base is determined at state or regional level
[2] Municipalities do not have local choice over the tax base, but they have discretion over measuring the base. Some municipalities include the common area of an apartment building or the internal and external walls. Some municipalities measure only usable space.
[3] All information in the tables is based on the Delhi Municipal Corporation, which has local choice of adjustment factors.
[4] *de facto*, mostly rural areas
[5] Naira is the Nigerian currency
[6] Local entities do not have choice of tax base, but local administrators have discretion in measuring the tax base. Local administrators may choose coefficients that reflect city size and location within the city to assessing buildings. They may also choose to use a geographic coefficient to assess land.
[7] This is the "compensation tax for use of the building land"

Some countries vary internally in their implementation of the area-based tax. Four countries allow local authorities full discretion: Hungary, India, Kenya, and Namibia. All jurisdictions in Hungary choose to use the area method except Nyíregyháza, which uses the market value method to assess the tax base. The 28 states of India choose different methods of property taxation to delegate to the municipalities, and some of those states give discretion to local jurisdictions. Due to the extreme variation, the table only depicts the Delhi Municipal Corporation as an example of area-based property taxation in India. Delhi chooses to assess its property tax base according to area. The local authority councils in Kenya that tax property may choose among three methods of valuation: 1) area-based rating,[2] 2) agriculture rental value 3) unimproved site value rating with the option of including an improvement rating. Councils tend to employ the third option in

[2] Rating is synonymous to tax

municipalities and the first option in rural areas, though some municipalities use the area-based tax. Councils that choose the area rating do not tax buildings; improvements to the land can only be taxed with the value-based option. In Namibia, the local authority councils choose between an area-based tax and a value-based tax. Rural councils tend to use the area-based tax and municipalities tend to use a value-based tax on land and improvements.

Nigeria and Ethiopia authorize state or regional levels of government to choose the tax base. The 36 states of Nigeria choose whether or not to implement a property tax as well as the method of assessment: 1) capital value 2) rental value or 3) spot value (area-based assessment). Most northern states do not tax property due to the lack of administrative capacity. Other states tend to use the rental value in urban areas and the spot value method in rural areas. When using the spot value method, the property must be valued at less than 600 naira by the controlled rent. In Ethiopia, property taxes are managed and collected at the regional level. Each region assesses the property tax base differently.

Israel and Slovak Republic do not offer a choice of tax base to local entities, but they have discretion over measuring the base. In Israel, some municipalities include the common area of an apartment building or the internal and external walls, and some municipalities measure only usable space. In the Slovak Republic, local administrators may choose coefficients that reflect city size and location within the city to assessing buildings. They may also choose to use a geographic coefficient to assess land.

Table 3 shows that all countries tax land outside of cities except Dominica. If nothing else, countries tend to value agricultural and rural land according to area. Statute research did not reveal reasons behind countries' choice of tax base, but the experience of Kenya, a country that allows local choice of valuation method, suggests that rural areas have insufficient administrative capacity to employ a value based method of assessment (Kelly 2000, 43-44). More generally,

> "This assessment option [area-based] finds its major strength in the fact that it is simple to understand and to execute. It does not require complicated methods of calculations and assessments. Further, the collection and assessment costs are usually low and the tax rates can be varied across regions to take account of the holding's location." (Konyimbih, 2000, p. 33)

The review of tax law by Bell, Yuan, and Connolly does not answer the question of whether area-based valuation is easier to administer than market based for all types of property. Bird and Slack (2004) suggest that area-based assessment of single family residential properties is easier and cheaper to administer than value based assessment, but this may not hold true for other types of property (page 31). Table 3 suggests that countries employing area-based valuation on land do not necessarily value buildings according to area. Further research is necessary to explore reasons behind the choice of tax base valuation. Part 2 further explores how the countries employ area-based tax systems.

Part Two: Adjustment Factors

Governments using area-based valuation often make adjustments for varying characteristics of property in order to enhance the fairness of the tax. Area valuations can be adjusted with rate differentials or coefficients of adjustment. Rate differentials are based on categories of characteristics that have different rates for different characteristics. To calculate the tax owed for a parcel of land, the government multiplies the rate (amount per square meter) by the number of square meters the parcel of land covers.

Adjustment coefficients are based on the same concept as rate differentials, *i.e.* variation according to characteristics, but are used differently in calculations. Coefficients for each characteristic act as multipliers to a base value. The base value is the starting value per square meter of land or building, which is multiplied by coefficients representing location, zone, infrastructure, irrigation, etc.

Some countries use both rate differentials and adjustment coefficients in the area-based valuation method. As explained above, governments that use only rate differentials apply various amounts per square meter to the property. Governments that use only adjustment coefficients create a base value, that may vary according to certain criteria, and multiply the base value(s) by coefficients that account for certain characteristics. Without applying rate differentials, the base value multiplied by the coefficients is the "book value" of a property that is multiplied by a flat rate to determine tax liabilities. Governments that also vary this rate use both adjustment coefficients and rate differentials For example, Chile constructs a base value for buildings that varies according to construction quality and type of construction, and multiplies the base value by coefficients for location, use, special construction features, degree of commercialization, and age to calculate the book value. The rate applied to the book value differs according to the value — the rate is higher for the more highly valued property. In addition, agricultural property is taxed at a different rate than non-agricultural property. Chile represents one of the more complex systems, along with Lao, Poland, India, Belarus, and Bulgaria.

The next section displays the frequencies of adjustments, which reflects the administrative complexity and effort at fairness of all area-based tax systems. The frequencies derive from the summary table A-1 included at the end of this document. Table A-1 summarizes the information collected in a separate work, the "Compendium of Countries with an Area-based Property Tax" by Bell, Yuan, and Connolly. Appendix A, included at the end of this document, describes the framework used to summarize the country information included in the compendium as well as the method of counting the frequencies of adjustments presented in the next section.

Frequencies

Appendix Table A-1 includes information on the use of rate differentials and coefficients of adjustments by individual countries. For the purposes of this analysis, a rate

differential applied to land and buildings will count as one rate differential in order to focus on how many considerations are taken into account in the calculations, not how many calculations are made.[3] A comparison of the adjustments made to land and buildings follows.

Total adjustments made, whether in the form of rate differentials or adjustment coefficients, average 5 per country and range from 0 to 30 per country. Figure 1 shows that the most common number of total adjustments countries make is one. Two countries use a flat rate, Dominica and Hungary. The countries that provide localities with the option of using rate differentials, Kenya, Namibia, and Nigeria, are included in Figures 1 and 2 according to the maximum number of rate differentials legally available. Therefore, Figures 1 and 2 may overestimate the number of rate differentials actually used. Similarly, Figures 1 and 2 show the total number of rate differentials available for use in localities in the Czech Republic and does not reflect variations in local choice. Overall, more countries use few differentials and adjustments than a large number.

Figure 1: Histogram of Total Rate Differentials and Adjustment Coefficients
0 Dominica, Hungary
1 Lesotho, Moldova, Namibia, Nigeria, St. Lucia, Slovenia, Trinidad & Tobago, Zimbabwe
2 Burundi, Cameroon, Kenya, St. Vincent & the Grenadines
3 Ethiopia, Lithuania, Rwanda
4 Eritrea, Uzbekistan
5 Albania, Azerbaijan, Israel, Kyrgyz Republic, Romania, Slovakia, Ukraine
6 Georgia
7
8 Czech Republic, Kazakhstan, Tunisia
9 Croatia, Tajikistan
10 Chile, Lao, Poland,
11 India,
12 Belarus
30 Bulgaria

Figure 2 displays the frequency with which countries use numbers of rate differentials. Seventy-one percent of countries use four or less rate differentials. Thirty-six countries use rate differentials and most of the countries rely solely or mostly on rate differentials.

Figure 2: Histogram of Total Rate Differentials
0 Dominica, Hungary
1 Lesotho, Lithuania, Moldova, Namibia, Nigeria, St. Lucia, Slovenia, Trinidad & Tobago, Zimbabwe
2 Bulgaria, Burundi, Chile, Cameroon, Kenya, Poland, St. Vincent & the Grenadines
3 Slovakia, Czech Republic, Ethiopia, India, Rwanda, Tunisia
4 Eritrea, Romania, Uzbekistan

[3] For a fuller discussion of the counting methodology used here see the discussion in Appendix A.

5 Albania, Azerbaijan, Israel, Kyrgyz Republic, Ukraine
6 Tajikistan, Georgia
7 Croatia
8 Kazakhstan
9
10 Lao
11
12 Belarus

Figure 3 shows wide variation among the countries in the use of adjustment coefficients. In fact, only twelve countries use adjustments coefficients and there is wide variation in the number used by individual countries. For example, six of the twelve countries use 3 or fewer coefficients of adjustment; five countries use between 5 and 9 coefficients of adjustment; and one country, Bulgaria, uses 28 coefficients of adjustment. All twelve countries that use adjustment coefficients also use rate differentials.

Figure 3: Histogram of Total Adjustment Coefficients
0 Albania, Azerbaijan, Belarus, Burundi, Cameroon, Dominica, Eritrea, Ethiopia, Hungary, Israel, Kazakhstan, Kenya, Kyrgyz Republic, Lao, Lesotho, Moldova, Namibia, Nigeria, St. Lucia, St. Vincent & the Grenadines, Slovenia, Trinidad & Tobago, Rwanda, Ukraine, Uzbekistan, Zimbabwe,
1 Romania,
2 Croatia, Georgia, Lithuania, Slovakia
3 Tajikistan
4
5 Czech Republic, Tunisia
6
7
8 Poland, Chile
9 India
10
11
28 Bulgaria

Land and Buildings

The seventeen countries that use the area-based method for both land and buildings sometimes use different adjustments for land and buildings. Countries tend to use a larger number of rate differentials for taxing land than buildings. The mean number of rate differentials is 3.08 for land and 2.00 for buildings. The distribution of the number of rate differentials for land is: 25 percent of countries use one or less; 50 percent use 2 or less; and 99 percent use 12 or less. For buildings, 25 percent of countries use 1; 50% use 2 or less; and 99 percent use 5 or less (see Figure 4).

Figure 4: Land and Buildings

Rate Differentials Land

	Percentiles	Smallest		
1%	0	0		
5%	0	0		
10%	1	0	Obs	38
25%	1	1	Sum of Wgt.	38
50%	2		Mean	3.078947
		Largest	Std. Dev.	2.695157
75%	5	6		
90%	6	8	Variance	7.263869
95%	10	10	Skewness	1.493257
99%	12	12	Kurtosis	5.198577

Rate Differentials Buildings

	Percentiles	Smallest		
1%	0	0		
5%	0	0		
10%	0	1	Obs	17
25%	1	1	Sum of Wgt.	17
50%	2		Mean	2
		Largest	Std. Dev.	1.414214
75%	3	3		
90%	4	4	Variance	2
95%	5	4	Skewness	.5466517
99%	5	5	Kurtosis	2.523438

Adjustment Coefficients Land

	Percentiles	Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	38
25%	0	0	Sum of Wgt.	38
50%	0		Mean	1.052632
		Largest	Std. Dev.	2.481797
75%	1	3		
90%	3	6	Variance	6.159317
95%	9	9	Skewness	2.852571
99%	11	11	Kurtosis	10.56901

Adjustment Coefficients Buildings

	Percentiles	Smallest		
1%	0	0		
5%	0	0		
10%	0	0	Obs	17
25%	0	0	Sum of Wgt.	17
50%	2		Mean	3.352941
		Largest	Std. Dev.	5.968052
75%	3	5		
90%	9	7	Variance	35.61765
95%	24	9	Skewness	2.644565

99%	24	24	Kurtosis	9.629196

Countries tend to use more adjustment coefficients to value buildings than land. The mean number of coefficient adjustments is .97 for land and 3.058 for buildings. The distribution of coefficient adjustments for land is: 50 percent of countries use zero; 75 percent of countries use one or less; and 99 percent of countries use 11or less. For buildings, 25 percent use zero; 50 percent use two or less; 75 percent use 3 or less; and 99% use 24 or less (see Figure 4).[4]

Common Factors

Table A-1 displays categories of the common adjustment factors found among the countries using the area-based method. Of the 36 countries using rate differentials, 27 vary rates according to "Use of Property" and 17 vary rates according to "Districts, municipalities, neighborhoods." The rest of the categories in order of frequency include: "Other" (17), "Land Quality" (12), "Urban/Rural" (10), "Graduated size, levels, or values" (12), "Developed/Undeveloped" (4), and "Proximity to infrastructure or amenities" (4). It appears that few countries differentiate according to "Proximity to infrastructure or amenities" because this characteristic is likely incorporated in "Districts, municipalities, neighborhoods" or "Urban/Rural" for many countries. Another characteristic incorporated into those two categories is population density.

Of the 12 countries using adjustment coefficients, 10 specify coefficients in "Other," 7 use coefficients for "Location," and 5 use coefficients for "Zone."

The descriptive analysis of adjustment factors used by the countries revealed a few important points. First, countries tend to use a small number of adjustments, which suggests that most countries using the area-based method do so for administrative simplicity. Second, most countries use rate differentials instead of adjustment coefficients and of the countries using coefficients, all use rate differentials. Third, countries using the area-based method for land do not use the method as widely for buildings. Finally, countries tend to use a larger number of rate differentials for taxing land than buildings and a larger number of adjustment coefficients for taxing buildings than land.

Part Three: Property Taxes and Local Government

Property taxes have historically been a local tax because immovable property cannot be moved in response to the tax and services funded by the local government usually benefit property values (Bird and Slack 2004). Property taxes could provide an important source of revenue for local governments in developing and transitioning countries if two conditions are met: 1) the property tax constitutes a significant percentage of local

[4] Bulgaria is an extreme outlier. Excluding Bulgaria lowers the means, especially for the adjustment coefficients: Total rate differentials and adjustment coefficients, the mean lowers from 5.24 to 4.57; For Adjustment coefficients for land, the mean lowers from 1.05 to .78l; For adjustment coefficients for buildings, the mean lowers from3.35 to 2.06; and for total adjustment coefficients, the mean lowers from 1.97 to 1.27.

government revenue and 2) the local government has control over property taxation. Local control over property taxes determines the extent to which a country effectively decentralizes governance, a process that enhances government accountability to taxpayers (Franzsen and McCluskey 2005). Local control over local expenditure could lead to better services (Bird and Slack 2004).

Developing and transition countries have constraints that present different problems in implementing the property tax than developed countries, such as low administrative capacity, high tax evasion, distorted markets, and in some cases, government leaseholds instead of ownership. This study did not rigorously explore the connection between these constraints and the country's choice of tax base valuation. The authors found preliminary evidence that administrative simplicity is an important characteristic of the area-based method. In the compendium that reviews tax law of countries that use area-based valuation, administrative capacity appears to be an important issue in implementing the property tax and may explain why market valuation is underutilized. As discussed in Part 1, area-based valuation is most commonly used on land in rural areas, especially when local or regional governments exercise choice in valuation of the tax base such as Kenya and Nigeria because rural areas have less administrative capacity. Area-based valuation can also be useful to centralized governments. Tunisia changed the tax base from rental value to value based on the size of a housing unit to achieve one of the major goals of Tunisia's tax reform in 1997: to standardize and simplify the taxation of housing units.

Difficulty in implementing the property tax is not the only issue with important implications for decentralization. Local government dependence on property taxes as a source of revenue varies based on a number of factors: other revenues available (such as intergovernmental transfers), expenditure responsibilities, local autonomy over property taxation, the size and growth of the tax base, and willingness and ability to enforce the tax (Bird and Slack 2002). Information regarding the importance of property taxes to local government revenue and extent of control over the taxation process for the countries using area-based land taxes is displayed in Table 4.

Table 4: Local Government

	Property Tax as Percent of Local Revenue	Intergovernmental grants as Percent of Local Revenue	Local Government Sets Rates	Local Government Administers Tax	Local Government Retains All
Albania			Yes [1]	Yes	Yes
Azerbaijan			No	Yes	Yes
Belarus	9.16% [3]		No [2]	No	No
Bulgaria	20.13%	69.72%		Yes	Yes
Burundi					
Cameroon			No	No	No
Chile	21.94% [4]	28.74%	No	No	No
Croatia	3.54% [5]	12.23%	Yes [1]	Yes	
Czech Republic	1.45% [6]	39.91%	No	No	
Dominica	40.00%			Yes	
Eritrea			No	No	
Ethiopia			No [2]		
Georgia	11.12%	27.99%	Yes [1]	Yes	Yes
Hungary	4.53% [7]	48.09%	Yes [1]	Yes	
India	36% to 57%		Yes [1]	Yes	
Israel	39.19%	42.10%	Yes [1]	Yes	
Kazakhstan	5.91% [8]	43.03%	Yes [1]	Yes	
Kenya	15.56% [9]	32.79%	Yes [10]	Yes [10]	Yes
Kyrgyz Republic	7.79%	45.84%	No	No	No
Lao			No	Yes	No
Lesotho			No	No [11]	
Lithuania	4.09% [12]	57.93%	Yes [1]	No	
Moldova	4.88%	45.25%	Yes [1]	Yes	
Namibia	30.00%		Yes	Yes	
Nigeria			No [2]	No	Yes
Poland	9.43% [13]	49.69%	Yes [1]	Yes	Yes
Romania		8.90%	No	Yes	
Rwanda			Yes	Yes	
Saint Lucia			No	No	
Saint Vincent and Grenadines				No	No
Slovak Republic	6.44% [14]	34.67%	No	Yes	
Slovenia	7.23%	47.44%	Yes	Yes	Yes
Tajikistan	2.29%	-- [15]	No [16]	Yes	No
Trinidad and Tobago			No	Yes	No
Tunisia	32.4% [17]		No	No	
Ukraine	2.28% [18]	47.86%	No	No	No
Uzbekistan			Yes [1]	No [19]	
Zimbabwe			Yes	Yes	

Table 4 Footnotes:
[1] The local government can set rates within limits set by the central government
[2] Rates determined at state or regional level
[3] Belarus –30 percent (Bell *et al*)
[4] Chile – 35 percent (Bell *et al*)
[5] Croatia – Total property tax revenues are calculated based on revenues from vacation house tax, uncultivated agricultural land tax, unused enterprise real estate tax, unused construction land tax, communal fees and charges (Bell *et al*)
[6] Czech Republic – 3.6 percent (Bell *et al*)
[7] Hungary – 13.6 percent of local revenue for building tax, plot tax, and communal tax, and includes other local taxes such as tourism tax (Bird and Slack 2004)
[8] Kazakhstan – 14 percent includes land tax, property tax on legal and physical entities, and means of transportation (Bell *et al*)
[9] Kenya – 22 percent on average, ranging from 6 to 35 percent (Bell *et al*)
[10] Kenya – Legislation authorizes local governments to set rates and administer the tax, but in practice only urban areas administer the tax. The central government administers the tax in rural areas (Bell *et al*).
[11] Lesotho – supervised by the District
[12] Lithuania – 10 percent in 2005 (Bell *et al*) [13] Poland – 13.9 percent (Bell *et al*)
[14] Slovak – 11.42 percent (Bell *et al*)
[15] IMF reported that the amount of intergovernmental grants is negligible
[16] Tajikistan –The central government sets the rates for the land tax. Local authorities determine the rates for the building tax
[17] Tunisia – 27 percent in 2000 (Bell *et al*)
[18] Ukraine – Land tax accounted for 9 percent of total local revenue in 2002
[19] Local governments set the land tax rates for legal entities annually while the rates for physical entities are established by the enactment of the President of the Republic of Uzbekistan.

The first two columns in Table 4 depict the level of local government reliance on property taxes and intergovernmental grants. Most of the reported percentages of local government revenue are sourced from the IMF *Government Finance Statistics Yearbook*. These statistics are problematic in a couple of ways. Not all local governments report revenue statistics; the IMF publishes available information. Second, the IMF aggregates taxes on immovable property, net wealth, estate, inheritance and gift taxes, taxes on financial and capital transactions, non-recurrent taxes on property, and other recurrent taxes on property (IMF 2001). For the purposes of this analysis, only the revenue from taxes on immovable property is of interest. Footnotes to the table offer different figures from other sources. Even with more detailed figures, comparison of the fiscal importance of property taxes across countries is difficult because of the different tax bases and non-comparable government structures (Almy 2001).

Bahl (2001) calculated the sub-national property tax as a share of sub-national revenue for 24 developing countries using the IMF *Government Finance Statistics Yearbook* in 2001 and found that property taxes constituted 19.1 percent of local government revenue in developing countries, compared to 8.8 percent in 20 transition countries, and 17.9 percent in 16 OECD countries. The percentage of local revenue derived from the

property tax averages 12 percent for the 20 area-based countries for which we have IMF data.[5] These figures provide limited insight considering the problematic nature of the statistics. Despite the limitations in the data, a consistent pattern emerges: property taxes in Eastern and Central European countries tend to constitute less than 10 percent of local government revenue. The tendency for these countries to receive a substantial portion of local revenue from intergovernmental grants suggests limited effective decentralization.

Bird and Slack (2004) argue that "the level, design, and control of property taxation are thus, in many countries, critical elements in effective decentralization policy" (page 1). Local governments in twelve of the 38 countries have no control over property taxation in terms of setting rates, administering and collecting the tax, and retaining all the revenue from the property tax. The remaining countries with relevant information have control over at least one of those categories. Fifteen countries allow local jurisdictions to choose the tax rate within a range set by the central government. Fourteen of the 19 Central and Eastern European countries allow some level of control at the local level according to Table 4, suggesting a degree of effective decentralization exists over the small funds derived from the property tax.

Almy (2001) argues that a property tax with area as the tax base is not able to reflect growth and development as effectively as a market-value base and that in countries that retain area-based taxes the potential for substantial revenues from property taxes will remain low. Almy advises governments to measure the cost of administration against the tax yield to prevent cases where the administrative costs are a substantial portion of or greater than the revenue raised. The development of a new cadastre and valuation system has to be cost-effective as an investment in receiving higher revenue.

Case Study[6]

Our case study for this project is the country of Lithuania. Lithuania gained independence from the Soviet Union in 1991 and joined NATO and the EU in 2004. Lithuania has made tremendous progress in organizing its real property information since 1991. In 1992, a computer based land parcels registration system – the Temporary Register of Land Cadastre – was developed and implemented. In 1997, the Law on Real Property Register was adopted and provided for the development of a unified land and other real property register and the establishment of the State Land Cadastre and Register – which became the State Enterprise Centre of Registers in 2003. By 1998 a fully computerized real property registration system that linked land parcels, buildings, and the cadastre geographical information system into one unified system was developed and implemented. Currently, the Lithuanian real property cadastre and register system is:

[5] Excluding India and Israel.

[6] Information in this section comes from Aleksiene and Bagdonavicius [2008] and Yuan, Connolly and Bell [2008].

- Unified in the sense that information about real properties, as well as rights and values, is accumulated in a single institution and a single system;
- Centralized in the sense that there is a central data bank for the entire country, and only data from the central data bank have legal status;
- Digitalized so that cadastre and legal data, including graphical and descriptive information, cover the whole country and only this digital data have legal force and can provide data services, or e-services, on line;
- Multipurpose in that it is used for ownership rights guaranty, taxation, valuation and market investigation; and
- Self financing, full cost recovery from fees for services rendered paid by clients [Aleksiene and Bagdonavicius, pp. 416-17].

Separate property taxes on land and buildings were introduced respectively in 1992 by the Law on Land Tax and in 1994 by the Law on Immovable Property Tax of Enterprises and Organizations. Both taxes were area-based with certain market adjustments until January 1, 2006, when the new Law on Immovable Property Tax replaced the old building tax with a market value-based tax. The adoption of a land tax based on market value is under consideration by policymakers.

All privately owned land in Lithuania is subject to the land tax. Taxpayers are owners of private land, including both individuals and legal entities. The tax base is the taxable value of land, based on area and value per hectare assessed in accordance with the Land Evaluation Methodology established by the central government, and with adjustments by region and degree of urbanization.

Exempt from the land tax is forest land, land owned by the state or municipalities, land used for public roads, land owned by foreign embassies, and land under historical and cultural monuments. Exemptions are also available for landowners who are disabled, old-age pensioners and minors, provided that at the beginning of the taxation period, no persons in the families are capable of work and provided that the size of the land plot does not exceed the tax exempt area of land established by local government councils. Although local governments cannot change the tax rate, they are authorized to grant additional exemptions to property owners within their jurisdiction. The low level of revenue from the land tax is due in part to the widespread use of exemptions by municipalities.

The tax on immovable property is a tax on buildings used for commercial activity. Residential buildings are not currently taxed. It has greater potential for generating revenue than the land tax. In 2005 before the switch to market-based assessment, the tax on immovable property accounted for 10.6 percent of local tax revenue while the land tax brought in 1.8 percent of local tax revenue. Reform of the tax in 2006 introduced changes to taxpayers, tax base, tax rates, and method of assessment. For example, the taxpayer was limited to corporate property owners before 2006. The new law requires that individuals are also liable for tax due on their property.

Before 2006, the tax base was the taxable value of the property based on replacement value adjusted by location coefficients. Deducting depreciation from the construction costs of the property determined the replacement value. Starting from January 1, 2006, the tax is based on market value of the property as estimated from mass valuation of property.

The old law fixed the rate at one percent, but the new law gives local governments the right to lower the rate within the range of 0.3 to one percent.

Exempt from the tax are residential buildings that are not used for commercial purposes including "structures for dwelling purposes, gardens, garages, homesteads, greenhouses, *etc.*," buildings used for science, religion, recreation, fish, farming, and engineering structures, buildings owned by the state or municipalities, buildings owned by foreign embassies, buildings owned by religious, charitable, educational, social care, and other public organizations, buildings used for cemeteries, for the disabled, for environmental protection and fire prevention, for companies registered in free economic zones, agriculture, and insolvent companies. Municipalities may grant additional exemptions at the expense of their own budget (Bell, Yuan, and Connolly 2008; Malme and Youngman 2008, 9 and 12).

The new law provides taxpayers with the right to challenge the valuation of their property to the State Enterprise Centre of Registers, which has set up the Appeals Investigation Commission to handle complaints. Further appeals can be filed with the Commission of Administrative Disputes or the County Administrative Court. Final appeal can be made to the Supreme Administrative Court.

The Data

The State Enterprise Centre of Registers collects property valuation data for the country of Lithuania. The Centre of Registers maintains the Real Property Register information system that combines cadastral geographic information with registration data of land parcels and buildings into a central electronic database. As providers of information, the Centre cooperates with Surveyors, who are providers and users, as well as the other users of the information: the Ministry of Finance, the State Tax Inspectorate, notaries, Central Mortgage Office, State Construction Inspectorate, and the National Land Service. The central database links to basic information such as population, legal entities, address, mortgage, cultural heritage, the Forest Cadastre and Cadastre of Protected Areas. Eleven branch offices spanning the entire country conduct valuations for the mass appraisal system integrated with the register and cadastres.

The government of Lithuania is currently in the process of transitioning from an area-based tax to a market based tax for both land and buildings. For land, the government published market values in 2003 from the first mass valuation of land conducted in 2002. The values were not embraced by the general population, thereby preventing the government from applying the market-based land values to taxation. Since 2003, the

Centre of Registers has annually performed mass valuation of land based on the market as of July 1 each year in anticipation of a market-based land tax. In addition, land is valued based on area and coefficients of adjustment for location for taxation purposes.

The Centre of Registers conducted the first experimental mass valuation of buildings in 2003. Real property was revalued in 2005 and annual mass valuation of buildings began in 2006.

We obtained data on area-based assessed values for land and buildings for residential properties that actually sold in two Lithuanian communities during the third quarter of 2005 (July, August and September). In addition, we obtained data on market based assessed values for land and buildings for residential properties that actually sold in the same two Lithuanian communities during the third quarter of 2006. One community is a large urban municipality, Šiaulių m. sav. with a population of 133,883, and the other, Vilkaviškio r. sav., is a rural municipality with a population of 50,242. Šiaulių m. sav. contains 42,672 flats, 5,872 houses, and 1,516 parts of houses within its boundary. Vilkaviškio r. sav. contains 6,520 flats, 10,187 houses, and 747 parts of houses in its boundary. [Lithuania Statistical Department, Population and Housing Census 2001].

The raw data file on residential sales for 2005 and 2006 is divided into two worksheets – one worksheet has data on flats and one has data on detached single family residential sales. The worksheet for flats has 1,078 rows of data while the worksheet for detached single family residential properties has 1,456 rows of data. A few adjustments to the data file were made in preparation for analysis. The adjustments described below apply to both the detached housing and flats. Adjustments specific to each category are discussed in following sections.

The observations in each worksheet of the data file are residential properties that actually sold during the period examined. Each property that sold has a unique identification number. However, a number of rows are listed for each property that sold so that one observation (one property that sold) may include data in several of rows. For flats, most sales include just one row of information, although some (47) have more than one row of information varying from 2 to 5. For the detached single family residential properties the number of rows varies from 2 to 17. Typically, for a detached single family residential property that sold there will be one line for the land area that sold, another line for the household building (or living house), garage, cellar, and yard constructions which include such things as fences and wells.

For our empirical analysis we want to compare the sales price of an individual property with the total assessed value (land and buildings) for that property. In determining the total assessed values for the properties that sold it is important to recognize that at times only a portion of a property sold; the whole property did not sell. For example, in Šiaulių city municipality, property 264829 consists of two elements – land and one structure. The building area is 122 square meters and the land area is 0.09 square hectares. The recorded sale was for 50 percent of the building area and 48.6 percent of the land area. Therefore, to calculate the assessed value to compare with the actual sales price, we

multiply the total assessed value of the building and the land by the share of the property acquired in the sale.

Detached Residential Properties

An issue specific to detached residential properties arose when the land component of the property was listed in one jurisdiction and the building component of the property was listed in another jurisdiction. For example, in 2005, there were three entries for the rural municipality with the ID number 274006. The data file indicated there were three items sold for this property, but they were listed in two separate places with one item in one settlement and two items in another settlement. All three of the items sold were listed as being in the municipality of Vilkaviškio r. sav., but two of the items sold were listed as being in the settlement of SB "Rūta" while the third item sold was listed as being in the settlement of Vilkaviškis. The one item listed alone was land while the two items listed together were buildings. It seemed that land was in one settlement and buildings in another.

The same issue existed among the 2006 rural detached household properties. The rural municipality included five detached residential properties with similar characteristics. Four of these properties listed 2 items sold and then listed the land and buildings separately with each being in a different settlement. The final property listed 3 items sold and listed land only in one settlement and 2 structures separately in another settlement.

These properties are gardening associations and thus transcend settlements, though they exist within the boundaries of a town municipality. The gardening associations do not have an address, so valuers check other parameters of the contract. Since these properties represent different entities than all other data, they were deleted from the data set. See Appendix B for a list of deleted detached household properties for 2006.

A different issue arose in the urban municipality data for 2006: there were two detached residential sales that listed multiple items sold, but the data file only included one data item for each. Specifically, property 433342 indicated two items sold but only one was listed and property 420022 listed 9 items sold, but only one was included in the data set. These two properties were deleted.

Once properties with missing or questionable data were deleted from the data set, the data were sorted by municipality and by year to form four separate worksheets – one each for the rural municipality for 2005 and 2006 and for the urban municipality for 2005 and 2006. The 2005 worksheets compare actual sales prices to assessed values based on area and the 2006 worksheets compare actual sales prices to assessed values based on market values.

The final step in preparing the data for the statistical analysis described in the section, “Empirical Analysis,” is to consolidate each property into one row of data. Since the land value is typically provided on one line, this entailed adding the various lines with values for buildings and structures to get one consolidated building/structures value.

Adding the portion of land value and the building/structures values that actually sold together produces an estimate of the total assessed value for the property that actually sold. The number of detached residential properties actually sold in the rural community was 55 in 2005 and 57 in 2006. The number of properties actually sold in the urban municipality was 105 in 2005 and 96 in 2006.

Flats

For each property, the data on flats provides the zone number, municipality region, property ID, and year of sale, in addition to other information about the property (see Appendix D and E for listings of variables). With this information, four worksheets were created just like detached housing for properties in the urban region of Šiaulių city municipality sold in 2005, urban properties in the Šiaulių city municipality sold in 2006, rural properties in the Vilkaviškio region municipality sold in 2005, and rural properties in the Vilkaviškio region municipality sold in 2006. As for detached housing, the assessed values of the urban and rural properties sold in 2005 were estimated based on area. The assessed values of the urban and rural properties sold in 2006 were estimated based on market information. Since these are flats, only assessed values for buildings are included in the data set.

The initial data provided the total sale price for each property. Some properties sold only a portion of the total property as indicated in the initial data by a percentage titled "Part Sold." For the sale price to be comparable to the assessed value, we multiplied the assessed value by the percentage of the part sold. In the instance of multiple structures, each structure had a corresponding percentage of the part sold. Before adding the estimated values of each structure of the property as described above, the value for each structure was multiplied by the percentage of part sold.

An issue with these data was that the "Acquired area" divided by the "Total area" should equal the Part Sold value, but they differed for some properties. For these properties, the data indicated that they sold part of the property by providing a value less than one as "Part Sold," but the calculation of Acquired area divided by Total area equaled one, which indicated the entire property was sold. In these cases, we used the values less than one. The only case where the Acquired area divided by the Total area produced a value less than one while Part Sold provided a value of one was property ID 421295. For this property, we used the value less than one.

As displayed in Appendix C, the following properties were deleted for missing data: 256336, 281766, 425733, 443739, and 658119. Property ID 265037 was deleted because it had an extremely high assessment sales ratio of 7,974 percent.

The column "Market value (2005); MV (2006)" in the initial data set provided assessed values. We created a column titled the "Value of buildings actually sold" computed according to the following description. As discussed above, if the property consisted of more structures than just the flat, the data was initially separated into pieces, such as flat and storage structure or household building or stable or yard construction. The same

property ID links multiple construction pieces of a property. The data initially presented the estimated value of each structure on the property separately. The estimated values of each structure were added and combined on one row for each property for a total estimated value of the building. Most properties had only a flat; 47 of 1003 properties included auxiliary structures in addition to the flats. Most of the 47 properties consisted of one flat and one auxiliary structure. After the consolidations, there were 440 flats that sold in the urban municipality in 2005, and 470 in 2006. Not surprisingly, there were only 46 flats that sold in the rural area in 2005 and 47 in 2006.

Empirical Analysis

The purpose of this project is to explore the implications of an area-based tax for the horizontal and vertical equity of the property tax. We approach this challenge by calculating for each jurisdiction for each year measures of horizontal equity reflected in the coefficient of dispersion (CD), and vertical equity reflected in the price related differential (PRD). The coefficient of dispersion provides a measure of assessment uniformity that is independent of the level of assessments and permits direct comparison between two groups of properties [Eckert, p. 534]. As for vertical equity, assessments are considered *regressive* if high-value properties are under assessed relative to low-value properties and *progressive* if high-value properties are relatively over assessed relative to low-valued properties. The price-related differential is a statistic for measuring assessment regressivity or progressivity [Eckert, p. 539].

For each of the eight worksheets we calculated a column entitled "Assessment sales ratio." For each property in each worksheet, the assessment sales ratio was computed by dividing the assessed value of the property that sold by the actual sales price. The assessment sales ratios were used to calculate the coefficient of dispersion and the price-related differentials. In Table 5 we report the maximum, minimum, average, and median of the assessment sales ratios for detached residential properties and in Table 6 we report similar information for flats.

Table 5: Detached Residential Properties

	Area Based Assessments 2005		Value Based Assessments 2006	
	Rural	Urban	Rural	Urban
Maximum	887.9%	790.7%	931.4%	1386.2%
Minimum	20.5%	0.3%	5.9%	14.2%
Average	162.6%	107.1%	213.4%	226.0%
Median	140.1%	76.8%	139.6%	107.0%
CD	53.9	83.6	101.1	146.8
PRD	1.62	1.38	2.48	2.37
Number of Sales	55	105	57	95

Table 6: Flats

	Area Based Assessment 2005		Value Based Assessment 2006	
	Rural	Urban	Rural	Urban
Maximum	1580.0%	1642.2%	948.2%	1286.5%
Minimum	13.5%	9.3%	20.6%	5.2%
Average	239.7%	179.1%	149.8%	115.1%
Median	137.8%	110.2%	122.4%	83.9%
CD	106.19	85.98	70.08	58.36
PRD	1.70	1.62	1.63	1.46
Number of Sales	45	427	45	466

The data in Tables 5 and 6 document extreme variations in assessment sales ratios for all years for both area-based and market-based assessments for both detached residential properties and flats. Average and median ratios are large and substantially different providing further evidence of the extreme range in ratios across properties in all groups. These extreme variations across all groups raise questions about the reliability of sales and/or assessed value data for many of the properties that actually sold.

The next step in the process of calculating the coefficient of dispersion was to generate a new column titled "Assessment sales ratio minus median Assessment Sales ratio." The data in this column was generated by subtracting the median assessment sales ratio for each group from the individual values in the "assessment sales ratio" column. We then took the absolute value of these differences for each property in each worksheet. We calculated the sum of all the absolute values of these differences and refer to the sum as "the sum of difference." We divided this total by the total number of properties to determine an average absolute difference. The coefficient of dispersion is calculated by dividing the average difference by the median assessment sales ratio.

The coefficients of dispersion measuring horizontal equity for detached residential properties are reported in Table 5 and for flats in Table 6. The International Association of Assessing Officers has defined 3 standards for coefficients of dispersion for residential properties. Specifically, for new and generally homogeneous residential properties the coefficient of dispersion should be 10 percent or less. For older heterogeneous residential areas the coefficient of dispersion should be 15 percent or less. Finally, for residential properties in rural areas the coefficient of dispersion should be 20 percent or less. We see from the tables that the coefficients of dispersion are generally very high, ranging from 53.9 in the rural municipality in 2005 to 146.8 in the urban municipality in 2006. In other words, on average, individual properties can be expected to deviate from the median by 53.9 percent and 146.8 percent. Coefficients of dispersion at these levels indicate substantial variation in assessment sales ratios across properties and a serious lack of uniformity in the administration of the property tax.

Under the area-based tax in effect in 2005, the coefficients of dispersion are higher for flats than they are for detached houses in both the urban and rural municipalities. As we

move to assessed values based on market data in 2006, we see that uniformity of assessments deteriorates for detached residential properties in both urban and rural municipalities as the coefficients of dispersion increase significantly, but uniformity is substantially improved with market valuations for flats in both urban and rural municipalities as the coefficients of dispersion drop significantly.

The other dimension of equity that is of concern is vertical equity. In order to calculate the price related differential we first sum sales prices and assessed values for each group of properties to calculate an aggregate assessed value and an aggregate sales price. We then divide the aggregated assessed values by the aggregated sale price of all the properties that sold to determine an aggregate assessment sales ratio. We then divide the mean by the aggregate ratio to obtain the price related differential. These data are reported in Table 5 for detached residential properties and in Table 6 for flats.

From Tables 5 and 6 we see that all PRDs for detached residential properties and flats are outside the acceptable range of .97 to 1.03 defined by the International Association of Assessing Officers. In each case the PRD suggests regressivity in assessments. The PRD for detached housing deteriorates for both the urban and rural municipality in 2006 under the market based assessments compared with 2005 area-based assessments. Table 6 indicates that the PRD for flats is outside the acceptable range in 2005 and 2006 for both the urban and rural municipality. Unlike detached properties, the PRD for flats improves marginally for both the urban and rural municipality under the market based assessments compared to the area-based assessments.

For detached residential properties the coefficient of dispersion and the price related differential are higher for both the rural and urban municipality under the value based assessment than the area-based assessment. This suggests that both horizontal and vertical equity are less uniform under the value based assessment than under the area-based assessment. Alternatively, for flats, both horizontal and vertical equity seem to improve in both urban and rural municipalities when moving from area-based assessments to value based assessments.

A number of caveats suggest that these numbers should be interpreted with caution. For example, Lithuania only taxes land and commercial buildings, but the data set includes information on land and untaxed residential buildings. Due to limited resources, it is possible that the "assessed" values for sold residential buildings may have received less attention than the data and analysis undertaken for taxable buildings or for the anticipated value-based tax on land. The value-based property tax on commercial property, which has been subject to substantial scrutiny through an intensive appeal process, would presumably provide for a reliable and consistent base except for the fact that replacement value, not area, was in prior use.

If more attention is given to valuing land for tax purposes, since it is actually subject to property taxation, we would want to compare the assessed value of land to the actual sales price of land to obtain our measures of assessment quality. This hypothesis cannot be tested with this data set because the sales data in our data set provide a price for the

entire property, land and buildings combined. Also, the data set is composed of developed properties, not vacant land. Therefore, the sale price of the land cannot be isolated to compare to the assessed value of the land.

Other issues such as market dynamics, data issues, and non-arms length sales undermine the reliability of these results as well.[7] First, the dynamics of the market as Lithuania transitions from state ownership to private ownership create an environment where IAAO standards cannot be met. Lithuania gained independence in 1990 after 50 years of Soviet rule and immediately began privatizing and restoring ownership rights. Lithuania has made a great deal of progress since 1990 due to a well-planned transition period that made use of vouchers as a substitute for cash until 1996. [Aleksiene and Bagdonavicius 2008] Most property in Lithuania has been privatized since that time, but the real estate market is not yet stable and mature. The market continues to actively change and lack coherence because the land reform is not fully complete. The property market is inactive for properties with certain purposes of use, such as industry and commerce, and the rental market is underdeveloped.

Second, as highlighted by the centre of Registers, several weaknesses in the methodology and data collection threaten the quality of the data. The methodology lacks qualitative attributes to account for the following types of land plots: recreation areas, areas with communications, zones affected by pollution, and possibilities or limitations of land use. The methodology also lacks qualitative attributes to account for building depreciation and the quality of building repair or decoration. Other threats to data quality occur when GIS information is incomprehensive, when transaction prices are misreported, when land is sold with buildings, when several buildings or several land plots are sold together, when real property is sold with movable property, and when the purpose of use is incorrectly classified.

Developing market values when the property data is limited to the "legal" data in the Register can be difficult. There sometimes is voluminous data on the physical characteristics of buildings, but those data do not seem to include qualitative and other attributes that affect value. In addition, while the file sent includes several columns regarding various characteristics of the building (e.g., wall material, heating, water supply, gas, cellar, number of rooms, number of floors) many of the cells are empty. If mistakes are found in the property attributes during the appeal process for the Immovable Property Tax, the property owner has to submit corrections to the Register for recording, and over time this will improve the accuracy of high-values properties, but not under-valued ones. The improvement through the appeal process over time is also limited to buildings used for commercial activity since the immovable property tax does not apply to residential buildings. The Registers still includes a great deal of property data from the past when markets did not exist, and this is recognized by the Register's valuation staff.

[7] Most of these caveats are based on e-mail communications with representatives of the State Enterprise Centre of Registers.

Filling out the columns in the data set provided is certainly necessary, but not sufficient, to estimate market value of buildings. For example, it would be useful to know the condition of the building as well. Additional information often collected and used to value buildings includes number of bedrooms as well as number of bathrooms, as well as information about a kitchen. Once the characteristics of the building are listed, the quality of construction as well as the interior and exterior condition of the building is also vital in determining market value. Finally, market value of a building is influenced by the characteristics of the neighborhood it is in. For example, is there a pleasant view from the building? Is there a lot of traffic? What is the nature of the road it is on? Is the neighborhood declining or is it being upgraded? In order to produce an estimate of market value for buildings that do not sell, it is important to have as much information on attributes that influence value beyond the first, necessary, step of listing the characteristics of building. Better information results in better estimates of market value which improves the equity of the tax and promotes revenue enhancement.

In an effort to verify data reliability, the centre of Registers identified some unreliable transactions in 1998-2000. Flats priced less than LTL305 per square meter or more than LTL 3,387 per square meter in the Lazdynai District in Vilnius are dismissed as unreliable because the centre of Registers recognized that these prices are not typical for that area. The extent to which verification occurs systematically is unknown.

Most important to data interpretation, the extent to which only "arms-length" transactions exist in the data appears suspect. The raw data set includes all sales that took place regardless of any special circumstances that might have existed. Properties were deleted from the initial data set that the surveyors and government agencies identified as agreements, acceptance-assignment certificates, sold by a debtor, or sold in an auction (see appendix C). These transactions are not considered arms-length according to the definition in the following discussion. The centre of Registers makes an effort to identify non arms-length transactions, but the data likely includes transactions among relatives, trading properties, or other circumstances where the price does not represent the market after such efforts because the market is still in the early stages of development.

Statistics for the data set that omits the non arms-length transaction are presented in Tables 5 and 6, differing in only tenths of a point compared to the data before exclusion. The analysis of horizontal and vertical equity in terms of IAAO standards was robust.

The issue of arms-length transactions is particularly important for two reasons. First, in calculating assessment sales ratios, the sales price may not reflect true market value because of special circumstances. In such situations, these sales should not be included in an assessment sales ratio study. Second, the assessments made for 2006 are based on market information. If some of that information does not accurately reflect true market conditions, the resulting assessments will be distorted and not reflect true market values. Specifically,

> "It is important to know whether the transaction was arm's length . . . or resulted from foreclosure, condemnation, or other circumstances in which price was not

representative of the market. … Transactions that are not clearly arm's length should be coded so that they are not used in ratio studies or the appraisal process . . ." [Eckert, p. 27]

It is imperative that sales be screened to identify sales that are not indicative of market value. Such screening must take place for sales used in both assessment sales ratio studies and the assessment process. In general, sales fall into seven categories:

1. Market value sales which include all single-parcel sales that appear to be arm's length.
2. Multiple parcel sales which can be arm's length.
3. Non-arm's length sales which should not be used in ratio studies or assessments because the sale involves court action; involves charitable, religious or educational institutions; involves a financial institution in the transaction; is between relatives or corporate affiliates; is to change or correct a title or deed; is an estate sale; involves personal property; or other factors which cause the sale to not reflect true market values.
4. Are partial interest sales which require special analysis to determine if they are open-market sales or if they involve related parties.
5. Land contracts which are installment sales.
6. Trades which include other items of real or personal property as a portion of the sales price.
7. Outliers which are properties with very high or low sales ratios. [Eckert, pp. 136-7]

If the sales are not screened to omit such observations, the resulting assessment sales ratios and resulting assessments will be distorted and are not reliable measures of assessment quality or market values. Property record cards for individual properties should be expanded to include the types of information described above so that all non-arms-length sales can be weeded out of the data before any empirical analysis is conducted.

In such circumstances, which we believe apply in Lithuania at this point in their development of an active real estate market, one must compensate by omitting some of the outliers. According to Bell and Bowman, some states in the U.S. calculate measures of assessment uniformity based on the interquartile deviation, which essentially looks at the middle 50 percent of assessment sales ratios to calculate measures of assessment quality. [Bell and Bowman, 1991, p. 350] They conclude that it may be valid to use the middle 50 percent of assessment sales ratios to measure assessment quality if there is a valid reason for ignoring the observed assessment sales ratios that are in the high and low tails of the distribution. [Bell and Bowman, 1991, p. 358] We believe this is the case for Lithuania since the raw data used in our initial analysis did not identify arm's length transactions and all sales are included in the analysis.

In response to these issues, we recalculate all of the statistics after omitting extreme outliers on both the high and low side of the urban data. Too few observations in the

rural data sets preclude this type of analysis because we would not have sufficient observations to calculate reliable measures of assessment quality. Following Bell and Bowman [1991], we use the middle 50 percent of assessment sales ratios in each urban data set to re-compute the coefficient of dispersion and price related differential for each of the data sets as displayed in Table 7. We also recalculate the measures of assessment quality using 75 percent, 80 percent, and 90 percent of the assessment sales ratios.[8]

[8] When the total number of property sales was an odd number, we could not omit the precise number of observations to obtain the middle 50, 75, 80 or 90 percent. We rounded to the nearest whole number. For example the total number of urban detached residential property sales in 2005 was 105. Obtaining the middle 50 percent required omission of 26.25 of lowest and 26.25 of the highest observations; we omitted 26 of the lowest observations and 26 of the highest observations.

Table 7: Sensitivity Analysis of Urban Assessment-Sales Ratio Data

	Interquartile				Middle 75 Percent				Middle 80 Percent				Middle 90 Percent			
	Houses		Flats		Houses		Flats		Houses		Flats		Houses		Flats	
	Area Based	Value Based	Area Based	Value Based	Area Based	Value Based	Area Based	Value Based	Area Based	Value Based	Area Based	Value Based	Area Based	Value Based	Area Based	Value Based
	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006	2005	2006
Maximum	1.13	2.08	1.98	1.15	1.90	4.15	2.97	1.76	2.19	6.00	3.48	2.04	3.41	10.81	5.54	2.66
Minimum	0.45	0.70	0.89	0.69	0.28	0.50	0.74	0.60	0.24	0.35	0.71	0.57	0.18	0.29	0.54	0.47
Average	0.77	1.24	1.21	0.87	0.82	1.45	1.35	0.92	0.84	1.57	1.39	0.94	0.91	1.80	1.51	1.00
Median	0.77	1.07	1.10	0.84	0.77	1.07	1.10	0.84	0.77	1.07	1.10	0.84	0.77	1.07	1.10	0.84
CD	23.25	28.57	19.68	12.59	39.54	58.48	37.69	23.93	45.14	74.13	41.94	27.19	58.75	0.98	55.91	36.41
PRD	1.01	1.06	1.06	1.02	1.01	1.33	1.19	1.08	1.04	1.53	1.22	1.10	1.17	1.77	1.35	1.18
Number of Sales	53	47	213	232	79	71	321	350	85	79	341	372	95	85	385	420

Comparison of 50 Percent Reduced Data to Full Data

With a narrower range of assessment sales ratios, the coefficient of dispersion is much smaller for all urban data sets than in Tables 5 and 6. To provide a point of comparison, all values of the coefficient of dispersion in this model would generally be considered acceptable when compared to jurisdictions in the U.S. For example, a recent study of assessment outcomes in Pennsylvania for residential properties found that only 10 of 67 counties met the IAAO standards. Nearly a third of the counties fell into the "Extremely Poor" category with coefficients of dispersions ranging from 20.6 to 56.3, and an average coefficient of dispersion of 33.9. [Downing, 2004] Comparison between the U.S. and Lithuania should be regarded as tenuous given that Lithuania's property market is in the early stages of development. The comparison serves as calibration.

Consistent with Table 5, the coefficient of dispersion for market-based urban detached housing was larger than that of area-based detached housing. In other words, the horizontal equity of detached housing becomes less uniform moving from area-based to market based assessments, consistent with the findings from the full data set. From Table 5 to Table 7, the market based coefficient of dispersion decreased more than area-based (81 percent decrease versus a 72 percent decrease), resulting in a closer gap between area and market based coefficients in Table 7 than in Table 5 (23.25 and 28.57 versus 83.6 and 146.8). The omission of outliers had a larger effect on the market-based coefficient of dispersion than area-based. This could simply reflect the fact that unscreened sales, which include sales that are not reflective of actual market conditions, are being used in the modeling process that generates market based assessments.

For flats, the omission of outliers decreased the coefficients of dispersion such that the market based coefficient was smaller (12.59) than the area-based coefficient (19.68) as in the full data set (58.36 and 85.98). In other words, the horizontal equity of flats becomes more uniform when shifting from area-based assessment to market based assessment, and the coefficient of dispersion falls within the target range from the IAAO. The market based and area-based coefficients declined similarly, by 78.4 percent and 77.1 percent respectively. The smaller coefficients of dispersion in the inter-quartile range show that as outliers are omitted, the horizontal equity becomes more uniform.

The price related differentials changed drastically when calculated from the middle 50 percent of the data instead of the full data set. The PRD for urban area-based detached residential properties dropped from 1.38 to 1.01 into the acceptable range in the reduced data set. The PRD for market based detached residential properties dropped from extremely regressive to slightly regressive: 2.37 to 1.06. The PRDs in Tables 5 and 7 show that the area-based assessment sales ratios are consistently less regressive than the value based assessment sales ratios.

The interquartile PRD for urban flats assessed by area in 2005 dropped to 1.06 from 1.62 in the full data set, as displayed in Tables 6 and 7. The PRD for urban market based flats dropped from outside the acceptable range under the full data set into the acceptable

range defined by IAAO, 1.46 to 1.02. For flats, the area-based assessment sales ratios are consistently more regressive than the value based ratios.

Sensitivity Testing of Results with Omitted Observations

The relationship between the coefficients of dispersion for area-based assessments and market based assessments of detached housing was robust: the market based assessment consistently had a higher CD than the area-based assessment in the sensitivity analysis. Alternately, the area-based assessment for flats consistently had a higher CD than the market based assessment. The relationships appear to be robust.

The relationships between the market based and area-based PRD for detached housing as well as for flats also appear to be robust. In the full data set, the market based assessment of detached housing had a higher PRD than the area-based assessment. This relationship remained consistent in all levels of omission. Likewise, the area-based assessment of flats in the full data set consistently had a higher PRD than the market based assessments. The relationships appear to be robust.

Overall, the values of coefficients of dispersion and price related differentials are sensitive to different levels of omission while the values of price related differentials are more robust. The relationships, however, between the area-based assessments and value based assessments are robust for both the horizontal and vertical measure of equity.

Conclusion

A critical element in any fiscal decentralization strategy is the need for local governments to have their own source of revenue controlled by local officials. After a review of the potential strengths and weaknesses of various tax instruments from the perspective of local governments, Bahl concludes that "The *property tax* is a most appropriate source of local government revenue, and it is a revenue source used by local governments in most countries in the world." [Bahl, 1999]

The issue then becomes how a country implements and administers a property tax. This is an important policy issue because the basis of the tax determines the distribution of the tax burden amongst all tax payers. There are basically two alternative approaches to assessing property for tax purposes – an area-based assessment and a value based assessment. The purpose of this paper is to explore in more detail the equity implications of relying on an area-based property tax, vis-à-vis an ad valorem property tax.

We look at actual residential property sales in two municipalities in Lithuania and compare the sales price to assessed values. In 2005, the assessed values were based on the area of the land and buildings with various adjustments for location and other factors that might affect market value. In 2006 the assessed values were based on market estimates of the value of land and buildings. This allows us to compare directly the

equity of the administration of the property tax under an area-based and value based property tax.

We look at two dimensions of equity. First, we consider horizontal equity which looks at how diverse the relationship between assessed value and sales price is across individual properties – detached single family homes and flats in one urban and one rural municipality. Second, we look at the vertical equity of the valuation process under each different type of property tax.

Based on the analysis of the full data set received from Lithuania, for both rural and urban municipalities and detached single family residential properties and flats, it appears that according to traditional measures of horizontal and vertical equity both the area-based and market based assessments in Lithuania would not come close to satisfying the generally accepted standards of assessment issued by the IAAO. Specifically, for detached residential properties the coefficient of dispersion, our measure of horizontal equity, increases from 53.9 percent for the rural municipality in 2005 under area-based assessments to 101.1 in 2006 under value based assessments. Similarly, the coefficient of dispersion for detached residential properties in the urban municipality increases from 83.6 percent under areas based assessments in 2005 to 146.8 percent under market based assessments in 2006. Horizontal equity in the assessment of detached residential properties is poor under area-based assessments and gets worse under value based assessments.

The story is somewhat different for flats, however. Flats in the urban municipality have a coefficient of dispersion of 85.98 percent in 2005 under area-based assessments, but the coefficient of dispersions improves to 58.36 in 2006 under value based assessments. Similar results are found for flats in rural areas where the coefficient of dispersion decreases from 106.19 in 2005 under area-based assessments to 70.08 in 2006 under value based assessments.

Overall, horizontal equity seems to be rather poor in Lithuania under the area-based and value based assessments. This could reflect the dynamic undeveloped market, lack of qualitative attributes for certain types of land and buildings, misreporting and other data collection issues, and reliance on sales that might be considered inappropriate for assessment sales ratio studies or assessments in the US. Lithuania makes effort to identify non arms-length transactions, but given the transitioning dynamic of the market from state ownership to private ownership, all non arms-length transactions are likely not identified.

To test this hypothesis, we recalculated our measures of horizontal equity on a reduced data set that eliminated the extreme assessment sales ratios from both ends of the distribution. When only the middle 50 percent of assessment sales ratios are used to calculate measures of horizontal equity the results are more consistent with the experience of local governments in the US. Specifically, the coefficient of dispersion for detached residential properties is 23.3 in 2005 under area-based assessments and increases slightly to 29.6 in 2006 under value based assessments. Similarly, the

coefficient of dispersion for flats falls from 20.3 in 2005 under area-based assessments to 12.8 in 2006 under value based assessments.

We also recalculated the measures of vertical equity with the middle 50 percent of assessment sales ratios and found the price related differential to be either within IAAO standards or slightly regressive. The PRD for detached residential properties is 1.01 in 2005 under area-based assessments and increases slightly to 1.07 in 2006 under value based assessments. The PRD for flats falls from 1.07 in 2005 under area-based assessments to 1.01 in 2006 under value based assessments.

Lithuania has gone further than most transition countries in building a comprehensive data base on real property. They have also made more progress than most in moving from area-based taxes to a property tax based on market values. They attempt to weed out sales that are non-arms-length, but analysis suggests that not all such transactions are identified. As a result, the assessment sales ratios and the assessed values computed with these data do not accurately reflect assessment quality and true market values. However, when outliers are omitted the measures of assessment quality tend to fall in the acceptable range specified by the IAAO. Based on these results, we can conclude that in urban areas horizontal and vertical equity decline somewhat moving from area to market based assessments for detached single family residential homes. Alternatively, in urban areas horizontal and vertical equity improve for flats moving from area to market based assessments. For detached single family residential properties the results could be influenced by the fact that non-arms-length sales have been used to calibrate the statistical model used to estimate market values for assessment purposes.

Further research should explore if equity and efficiency are trade-offs in area-based systems which make adjustments to reflect market pressures. To explore this question, case studies should compare the equity and efficiency of countries that use a low number of adjustments to countries that use a high number of adjustments. In addition, case studies of countries that use rate differentials for land and buildings could further explore differences between using the area-based method for land versus buildings.

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Appendix A

Data on rate differentials and adjustment coefficients are presented in Table A-1. Based on descriptions of rate differentials and adjustment coefficients for the 38 countries that use area-based land taxation in the Compendium by Yuan, Connolly and Bell, categories in Table A-1 were constructed to facilitate comparison across countries. Some countries adjust according to characteristics not included in the categories and are listed in the column labeled "Other" as rate differentials or adjustment coefficients.

The categories require some explanation. Countries that differentiate rates according to "Use of Property" apply different rates to residential property than non-residential property, or agricultural and non-agricultural land, for example. The choices for "Use of Property" vary among countries and those choices are not provided in Table A-1. For example, the Compendium shows that Azerbaijan applies a different rate to land used for agricultural purposes than non-agricultural purposes, which is represented in Table A-1 as "land" in the column, "Use of Property."[9] Table A-1 also reflects that Eritrea differentiates rates for land devoted to traditional farming and land devoted to commercial farming. Table A-1 represents this information with the word "land" in the column "Use of Property," appearing the same as Azerbaijan. The table shows that both Azerbaijan and Eritrea differentiate according to Use of Property, but one would need to refer to the Compendium to see how each country implements such differentiation.

The "Urban/Rural" category applies different rates to land and buildings located in urban areas and rural areas. Some countries such as Eritrea and Uzbekistan treat the category as a binary urban/rural distinction and others like Tunisia treat urbanity as a spectrum by varying rates according to high, medium, or low urbanity. While these countries treat urban and rural areas slightly differently, they are represented identically in Table A-1 with the word "land" in the column "Urban/Rural." A country that differentiates agriculture vs. non-agriculture in "Use of Property" was not double-counted in "Urban/Rural" because all categories represent distinct differentiations. The category, "Districts, Municipalities, and Neighborhoods," differentiates rates according to zones within a country. For example, Albania categorizes districts into four zones and applies a different rate to each zone. In Kazakhstan[10] and Tajikistan, tax rates vary by municipality. Romania has a different rate for different neighborhood zones within built-up areas (i.e. location within the *intravilan*).[11]

Some countries designate different rates for developed land than undeveloped land in addition to the other categories. It is not the same as an urban/rural distinction. For example, Belarus falls in the "Developed/Undeveloped" category and the Urban/Rural category because it differentiates between different stages of development on a land

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[9] Please refer to the Compendium by Yuan, Connolly and Bell for the choices of the rate differentials for each country. This information is not captured by Table A-1.

[10] Kazakhstan provides a good example of zoning that appears partly based on urbanity, but should not be counted as having both a rate differential for zoning and a rate differential for urban/rural.

[11] Romania provides a good example that counts zoning and urban/rural as two distinct rate differentials.

parcel as well as proximity to populated areas. Countries also differentiate according to "Land Quality" as measured by fertility or soil quality, like Georgia. The category, "Graduated size or levels," applies to situations where different rates apply to different size categories of land. For example, in Cameroon, land less than 400 square meters is taxed at 5,000 F.CFA per square meter; land between 401 and 1,000 square meters is taxed at 10,000 F.CFA per square meter, etc. Alternatively, multi-level buildings in Rwanda are taxed at 50 percent less for the first floor, 75 percent less for the second level and upwards until the reduction reaches 100 percent. In the Slovak Republic, the basic tax rate increases by SKK 0.75 per square meter for each floor above ground level.

"Proximity to infrastructure or amenities" is a distinct category for some countries, like Belarus, where rates differ according to the property's proximity to infrastructure, described in the text of the Compendium as "access to the plot of land." Similarly, rates differ according to the property's proximity to a road in Lao, whether in urban or rural areas. Kenya differentiates according to the property's proximity to amenities because properties on Mombasa Island pay a higher rate than those on the mainland, thus considering the island an amenity.

In sum, the most common rate differentials countries legally provide include: Use of Property, Urban/Rural, Districts/Municipalities/Neighborhoods, Developed/Undeveloped, Land Quality, Graduated Size/Levels/Values, Proximity to infrastructure or amenities, and Other.

Countries use fewer common adjustment coefficients, so Table A-1 includes only three columns. Descriptions of most countries using adjustment coefficients frequently listed "Location," and "Zone" as a coefficient without providing a more specific explanation. The "Other" category includes any other adjustment coefficient used by the country. Reference documents summarized in the Compendium usually provided vague descriptions of adjustment coefficients, with the exception of Bulgaria. The information presented in Table A-1 allows for comparison of the types of rate differentials and adjustment coefficients different countries use.

Counting Method

In addition to qualitative comparison, Table A-1 facilitates the counting of adjustments different countries make, which are summarized in Part 2 of the paper. In order to count as one, an adjustment coefficient or rate differential must have mutually exclusive options. Multiple layers of mutually exclusive options can occur. For example, Azerbaijan differentiates between agricultural and non-agricultural land. Agricultural and non-agricultural land are two mutually exclusive options, therefore "Use of Property" counts as one rate differential. The government further differentiates the purpose of non-agricultural land into two mutually exclusive options: 1) land used for industrial or commercial purposes and 2) land used for housing purposes. The sub-category, "Purpose of non-agricultural land" is counted as a second rate differential for Azerbaijan. The same logic applies to a third differential, "Purpose of agricultural land." Composite measures are counted differently. Composite measures have options that are not

mutually exclusive, therefore only the sub-categories of the composite measure are counted, not the composite measure itself. Further explanation of composite measures in an example follows.

Bulgaria has the most intricate system of adjustment coefficients and serves here as an example for explaining the method of counting the information represented in Table A-1. Only part of Bulgaria's system will be fully explained, the formula for valuing Bulgaria's land. The explanation begins with Bulgaria's formula and a description of how this information is captured in Table A-1 followed by the counting method.

The Bulgarian government determines the assessed value of land with the following components: the base tax value per square meter (BV), location (Cl), infrastructure (Ci), spatial development zone (Cz), building development (Cd), and the value of improvements (VI).[12] The assessed value is calculated in leva by the formula of leva values and coefficients: BV x Cl x Ci x Cz x Cd + VI.[13] The Compendium explains that the base tax value (BV) begins at BGN .80 per square meter for land and adjusts upward based on proximity to cities. The value increases by 10 percent for land located within 20 km from grade zero or one settlements and by 5 percent for land located within 15 km from grade two settlements, and so on. Since the base value adjusts according to proximity to cities, it is considered an adjustment coefficient called "Grades of proximity to cities," in Table A-1 in the column "Other" under "Land and Buildings". The coefficient for location is represented by the word "land" in the column "Location." The coefficient for infrastructure is a composite variable as described below and is represented by running water, sewer system, electric power supply, and street network in the column "Other" in the list for "Land and Buildings." The coefficient for spatial development zone is represented by the word "Land" in the column "Zone," the coefficient for building development is listed in the column "Other" under "Land," and the coefficient for the value of improvements is listed in the column "Other" under "Land and Buildings."

The following description explains how the information in the formula is counted as adjustment coefficients in Table A-1. The adjustment for the base tax value, "Grades of proximity to cities," counts as one coefficient as does the coefficient of location. The coefficient of infrastructure (Ci) is counted differently because it is a composite measure.

Composite measures are counted differently than non-composite measures as described above. Bulgaria's coefficient of infrastructure that adjusts for the availability of running water, sewer system, electric power supply, and a street network, is a composite measure because the options for infrastructure are not mutually exclusive. Running water is a sub-category of infrastructure with two mutually exclusive options: with or without. Each

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[12] The description of Bulgaria's adjustment coefficients in Yuan, Connolly and Bell lists surface area as a coefficient. For the purposes of this analysis, surface area is considered redundant to considering the tax system as area-based. For all countries, surface area is not counted as an adjustment coefficient.

[13] Before adding the value of improvements, the government multiplies the other coefficients by the surface area.

sub-category (running water, sewer system, electric power supply, and street network) counts as an adjustment coefficient. The composite measure, infrastructure, does not count as an additional adjustment coefficient because it does not adjust for any additional consideration when calculating the value of land. A total of four adjustment coefficients are counted for infrastructure.

The coefficient of spatial-development zone is not a composite measure because it has mutually exclusive categories: the central zone, manufacturing zone, and farmsteads relative to any other zone. Because land can only exist in one of the zones, the spatial development zone category is counted as one adjustment coefficient. Likewise, the coefficient for building development and the value of improvements are each counted as one. In total, Bulgaria uses 9 adjustment coefficients to calculate the value of land: Grades in the Base Value (1); Location (1); Infrastructure (4); Spatial Development Zone (1); Building Development (1); value of improvements (1).[14] After calculating the book value according to the base value multiplied by all the coefficients of adjustment as well as the surface area, the rate of 1.5 per 1,000 BLG of the book value comprises the total tax owed. According to the rule of mutual exclusivity, rate differentials tend to deal with sub-categories slightly differently than adjustment coefficient categories.

Analogous to Azerbaijan, Lao categorizes land into three mutually exclusive categories: Construction land, Agriculture land, and Other land. This category for use of land counts as one rate differential designated "Use of Property" in Table A-1. In addition, a sub-category specifies the type of construction for which the land is used. The category, "sub-category for construction land use" counts as an additional rate differential because it has mutually exclusive options: construction of dwelling, factory and production site, commerce or services, or vacant land. Other examples include Azerbaijan, Israel, Kyrgyz Republic, etc.

The counting method runs the risk of undercounting due to a lack of information. Based on sometimes vague legal documents or summaries of legal documents, the Compendium by Yuan, Connolly and Bell may not include all descriptions of sub-categories. Table A-1 represents our best effort to categorize how countries administer an area-based property tax using the typology described above and the information in the Compendium by Yuan, Connolly and Bell. These various approaches to administering the area-based tax are summarized in the text of the paper.

[14] Bulgaria uses two additional adjustment coefficients to assess the value of agricultural land: the type of agricultural land use and irrigation. The number of adjustment coefficients used by Bulgaria for land totals eleven.

Table A-1: Area-based Adjustments

	Rate Differentials								Adjustment Coefficients		
		Tax Zones									
	Use of Property	Urban/ Rural	Districts, Municipal-ities, Neighbor-hoods	Developed/ Undeveloped	Land Quality	Graduated size, levels, or values	Proximity to infra-structure or amenities	Other	Location	Zone	Other
Albania	Buildings	No	Buildings and Land	No	Land	No	No	Buildings: 1)Pre-1993 vs. post-1993 residential buildings 2) trade and services/other	No	No	No
Azerbaijan	Land	No	Land	No	Land	No	No	Land: 1) Purpose of non-agriculture 2) Purpose of agriculture	No	No	No
Belarus	Land	Land	Land	Land	Land	No	Land	Land: 1) population size 2) architectural/ historical value, 3) state of the environment 4) cultural facilities 5) services 6) plots exceeding land allotment standards	No	No	No

	Rate Differentials								Adjustment Coefficients		
		Tax Zones									
	Use of Property	Urban/ Rural	Districts, Municipal-ities, Neighbor-hoods	Developed/ Undeveloped	Land Quality	Graduated size, levels, or values	Proximity to infra-structure or amenities	Other	Location	Zone	Other
Bulgaria	Land and Buildings	No	No	No	No	Land and Buildings	No	No	Land[1]	Land and Buildings	Land: 1) building development 2) land use 3) irrigation. Buildings: 4) structure material 5) Type of Item 6) residential 7) flat vs. house, 8) height, 9) wear and tear, 10) period of right to use, 11) within development limits, 12) country house sub-grades, 13) Purpose of building 14) favorable 15) manufacturing v. farm, 16) height location, 17) physical condition 18) period of the right 19) telephone communications 20) central heating and hot-water supply, Land and Buildings : 21) running water, 22) sewer system, 23) electric power supply, 24) street network 25) value of improvements 26) Grades of proximity to cities
Burundi	No	No	Land	Land	No	No	No	No	No	No	No
Cameroon	No	No	No	Land	No	Land and Buildings	No	No	No	No	No
Chile	Land and Buildings	No	No	No	No	Land and Buildings [2]	No	No	Land and Buildings	Land	Land and Buildings 1) 12 Use classes Buildings: 2) construction type 3) construction quality 4) special construction features, 5) degree of commercialization, 6) age

	Rate Differentials								Adjustment Coefficients		
		Tax Zones									
	Use of Property	Urban/ Rural	Districts, Municipal-ities, Neighbor-hoods	Developed/ Undeveloped	Land Quality	Graduated size, levels, or values	Proximity to infra-structure or amenities	Other	Location	Zone	Other
Croatia	Land and Buildings [3]	No	No	No	No	No	No	Buildings: 1) Age of Structure; 2) condition of infrastructure. Land: 3) class 4) land type 5) crops; Land and Buildings: 6) location	No	Land and Buildings [4]	Land and Buildings: Communal fees: 1) Use.
Czech Republic	Land and Buildings	No	No	Land[5]	No	Buildings	No	No	Buildings	No	Buildings: 1) building type; Land: 2) use 3) soil class Buildings and Land: 4) size of the city;
Dominica	No	No	No	No	No	No	No	No	No	No	No
Eritrea	Land	Land	No	No	No	No	No	Land: 1) location 2) type of investment	No	No	No
Ethiopia [6]	Land [7]	No	No	No	Land [7]	Land [7]	No	No	No	No	No
Georgia	Land	No	Land	No	Land	No	No	Land: Perennial vs. haymaking 2) cultivated or not 3) meadow or pasture	Land	Land	No
Hungary	No	No	No	No	No	No	No	No	No	No	No
India [8]	Land and Buildings	Land and Buildings	Land and Buildings	No	No	No	No	No	No	No	Land and Buildings: 1) portion of covered area 2) fixed unit area value 3) type of construction 4) use 5) age 6) occupancy status 7) structure 8) flat factor (up to 100 sq.m.) 9) portion of vacant area

	Rate Differentials								Adjustment Coefficients		
		Tax Zones									
	Use of Property	Urban/ Rural	Districts, Municipal-ities, Neighbor-hoods	Developed/ Undeveloped	Land Quality	Graduated size, levels, or values	Proximity to infra-structure or amenities	Other	Location	Zone	Other
Israel	Land and Buildings	No	Land and Buildings	No	No	No	No	Land and Buildings: 1) Age of structure 2) non-residential sub-categories 3) type of property	No	No	No
Kazakhstan	Land	Land	Land	No	Land	Land	No	Land: 1) Agriculture type of area, 2) Industrial quality score 3) parking lots, filling stations, or open-air markets	No	No	No
Kenya [9]	No	No	Land	No	No	No	Land [10]	No	No	No	No
Kyrgyz Republic	Land	No	Land	No	Land	No	Land	Land: 1) sub category of use for non-agricultural land	No	No	No
Lao	Land	No	Land[11]	No	Land	No	Land	Land: 1) Sub-categories for construction land use 2) subcategory for agriculture land type 3) irrigated 4) single or double 5) orchard type 6) type of upland	No	No	No
Lesotho	Land	No	No	No	No	No	No	No	No	No	No
Lithuania	Land	No	No	No	No	No	No	No	Land	No	Land: 1) degree of urbanization
Moldova	Land	No	No	No	No	No	No	No	No	No	No
Namibia	Land and Buildings [12]	No	No	No	No	No	No	No	No	No	No

	Rate Differentials								Adjustment Coefficients		
		Tax Zones									
	Use of Property	Urban/ Rural	Districts, Municipal-ities, Neighbor-hoods	Developed/ Undeveloped	Land Quality	Graduated size, levels, or values	Proximity to infra-structure or amenities	Other	Location	Zone	Other
Nigeria	No	No	No	No	No	No	No	Buildings: 1) construction materials of building [13]	No	No	No
Poland	Land and Buildings	No	No	No	No	No	No	Land: 1) forest land with/without a management plan	No	Land	Buildings: 1) story height 2) depreciation; Land: Agriculture: 3) soil quality 4) usage class, 5) type of land, Forest: 6) fertility 7) tree species
Romania	Land	Land	Land	No	No	No	No	Land: 1) Agricultural use subcategories	Land [14]	No	No
Rwanda	Land and Buildings	Land and Buildings	No	No	No	Land and Buildings	No	No	No	No	No
Saint Lucia	No	No	No	No	No	Land	No	No	No	No	No
Saint Vincent and Grenadines	No	No	Land	No	No	Land	No	No	No	No	No
Slovak Republic	Land and Buildings	No	No	No	Land	Buildings	No	No	Buildings	No	Land and Buildings: 1) city size
Slovenia	No	No	Land [15]	No	No	No	No	No	No	No	No
Tajikistan	Land	Land and Buildings	Land	No	Land	Land	No	Land: 1) environmental aspects	No	No	Buildings: 1) or useable area multiply by coefficient of 1.25 2) floor levels/basement/attic 3) type of structure
Trinidad and Tobago	No	No	No	No	No	Land	No	No	No	No	No

	Rate Differentials								Adjustment Coefficients		
		Tax Zones									
	Use of Property	Urban/ Rural	Districts, Municipal-ities, Neighbor-hoods	Developed/ Undeveloped	Land Quality	Graduated size, levels, or values	Proximity to infra-structure or amenities	Other	Location	Zone	Other
Tunisia	Buildings	Land	No	No	No	No	No	Buildings: 1) (Residential) availability of services	No	No	Building: 1) quality of houses in neighborhood 2) type of non-residential building 3) nature of non-residential structure 4) number of services 5) depreciation
Ukraine	Land	Land	Land	No	Land	No	No	Land: 1) Agricultural use subcategory	No	No	No
Uzbekistan	Land	Land	Land	No	Land [16]	No	No	No	No	No	No
Zimbabwe	No	No	No	No	No	No	No	Land: 1) services provided	No	No	No

Table A-1 Footnotes:

[1] Bulgaria - Buildings are not included in the location category because the location measure for buildings is a composite measure. The adjustment coefficients "Location" and "Individual Characteristics" for buildings are composed of sub-categories of adjustment coefficients and do not count as an additional coefficient. Therefore, while they are listed in the text as two adjustment coefficients, they are not counted in the table in addition to the sub-categories. Only the sub-coefficients are included.

[2] Chile - Graduated values of residential property

[3] Croatia - the five different taxes are considered as a rate differential in this table: each tax with a different rate is charged for different land uses(i.e. vacation house, uncultivated agricutlural land, etc.)

[4] Croatia Communal fees

[5] Czech Republic - Plots suitable for development are taxed differently if developed vs. undeveloped[6] Ethiopia - Each region in Ethiopia assesses and taxes land differently

[7] Ethiopia - only one region in the country differentiates by this category

[8] India - The information in this table is based on the Delhi Municipal Corporation only[9] Kenya - Many rural areas use a flate rate, as as is the case of all countries, this table includes the rate differentials and adjustment coefficients legally

[10] Kenya - Properties located on Mombasa pay a higher rate than those on the mainland Lao - For agriculture, this category refers to regions designated as plains or mountains

[12] Namibia - Local governments can choose to use uniform rates or to differentiate rates by use

[13] Nigeria - Local governments can choose to differentiate rates according to construction materials or choose a flat rate

[14] Romania - Agricultural land only - the rank of locality is a coefficient used in assessing agricultural lands

[15] Slovenia - The assumption that rates vary by municipality because each has full autonomy to choose rates is considered a rate differential.

[16] Uzbekistan - If the owner worsens the land quality, then the owner wil lpay a higher rate than owners with the same quality of land due to natural causes

Appendix B – Detached Property Deletions

ID Number	Settlement	Item Sold	Zone
414416	Vilkaviškis	Land	56.1
414416	SB "Ranetas"	Buildings	56.1
422325	Vilkaviškis	Land	56.1
422325	SB "Saulėtekis"	Buildings	56.1
422325	SB "Saulėtekis"	Buildings	56.1
425413	Vilkaviškis	Land	56.1
425413	SB "Berželis"	Buildings	56.1
	Mažieji		
430865	Būdežeriai	Land	56.12
430865	SB "Paskenduolė"	Buildings	56.12
	Mažieji		
437622	Būdežeriai	Land	56.12
437622	SB "Pasaga"	Buildings	56.12

Appendix C – Omissions

ID Number	Settlement	Item Sold	Zone	Type of Transaction	Missing dat
254615	_iauliai	Residential Flat	44.21	Sold by debtor	
255257	_iauliai	Residential Flat	44.24	Sold by debtor	
256336	_iauliai	Residential Flat	44.7	Sold by debtor	♉
263998	_iauliai	Residential Flat	44.21	Sold by debtor	
264309	_iauliai	Residential Flat	44.22	Sold by debtor	
265037	_iauliai	Residential Flat	44.24	Purchase	♉
265303	_iauliai	Residential Flat	44.12	Sold by debtor	
270494	_iauliai	Residential Flat	44.21	Sold by debtor	
270619	_iauliai	Residential Flat	44.6	Sold in auction	
275226	_iauliai	Residential Flat	44.7	Sold by debtor	
277198	_iauliai	Residential Flat	44.7	Sold by debtor	
278072	_iauliai	Residential Flat	44.21	Sold by debtor	
281766	_iauliai	Residential Flat	44.8	Sold in auction	♉
283974	_iauliai	Residential Flat	44.13	Sold in auction	
286483	_iauliai	Residential Flat	44.24	Sold by debtor	
287067	_iauliai	Residential Flat	44.21	Sold by debtor	
328409	Augalai	Residential Flat	56.12	Sold in auction	
411282	_iauliai	Residential Flat	44.21	Sold by debtor	
418323	_iauliai	Residential Flat	44.24	Sold in auction	
425733	_iauliai	Residential Flat	44.7	Sold by debtor	♉
427439	_iauliai	Detached housing	44.7	Sold by debtor	
433861	_iauliai	Residential Flat	44.24	Agreement	
435835	_iauliai	Residential Flat	44.6	Acceptance-assignm certificat	
443739	_iauliai	Residential Flat	44.22	Sold in auction	♉
454507	Pae_eriai	Residential Flat	56.2	Sold by debtor	
649406	_iauliai	Residential Flat	44.6	Agreement	
658119	_iauliai	Non-residential auxilliary buildin	44.6	Agreement	♉

Appendix D – Variable List for Detached Housing*

Raw Data File	Urban and Rural 2005	Urban and Rural 2006
Zone	Zone	Zone
Municipality	Municipality	Municipality
Part of municipality	Part of municipality	Part of municipality
Settlement	Settlement	Settlement
ID of document	ID of document	ID of document
Number of sold items	Number of sold items	Number of sold items
Year of sales	Year of sales	Year of sales
Month of sales	Month of sales	Month of sales
The sold part	The sold part	The sold part
Total area	Total area	Total area
Acquired area	Acquired area	Acquired area
The amount of cubic meters	The amount of cubic meters	The amount of cubic meters
Mass valuation land value	Mass valuation land value	Mass valuation land value "Mass value of vand actually sold"**
Nominal land value	Nominal land value	Nominal land value
Index nominal land value	Index nominal land value	Index nominal land value
	"Indexed nominal value of land actually sold"	
Market value (2005); MV value (2006)	Market value (2005); MV value (2006)	Market value (2005); MV value (2006)
	"Assessed value of buildings actually sold"	"Mass value of buildings actuall sold"
Replacement value	Replacement value	Replacement value
Sale price of the household. Lt	Sale price of the household. Lt	Sale price of the household. Lt
	"Total assessed value"	"Total assessed value"
	"Assessment sales ratio"	"Assessment sales ratio"
	"Assessment sales ratio minus th median A/S ratio"	"Assessment sales ratio minus the median A/S ratio"
	"Absolute value of differences"	"Absolute value of difference"

* The raw data included variables not used in the analysis. Some variables were omitted for providing extraneous data: Street, Cadastral Code, Cadastral Block, and Depreciation. Other variables were omitted for not providing useful information once property parts were combined into one property: Name of the building, Type of use of the building and land, Wall material, Heating, Water supply, Gas, Cellar, Number of rooms, Number of floors, How much construction is finished, Year of renovation, date of construction, and Sewerage.

** The authors constructed the variables in quotations.

Appendix E – Variable List for Flats[†]

Raw Data File	Urban and Rural 2005	Urban and Rural 2006
Zone	Zone	Zone
Municipality	Municipality	Municipality
Part of municipality	Part of municipality	Part of municipality
Settlement	Settlement	Settlement
Street	Street	Street
House Number	House Number	House Number
ID of document	ID of document	ID of document
Year of sales	Year of sales	Year of sales
Month of sales	Month of sales	Month of sales
Number of sold items	Number of sold items	Number of sold items
The sold part	The sold part	The sold part
Total area	Total area	Total area
Acquired area	Acquired area	Acquired area
The amount of cubic meters	The amount of cubic meters	The amount of cubic meters
Market value (2005); MV valu (2006)	Market value (2005); MV valu (2006)	Market value (2005); MV value (2006)
	"Assessed Value of buildings actually sold"	"Market Value of buildings actua sold"
Replacement value	Replacement value	Replacement value
Sale price of the household	Sale price of the household	Sale price of the household
	"Assessment sales ratio"	"Assessment sales ratio"
	"Assessment sales ratio minus median A/s ratio"	"Assessment sales ratio minus median A/s ratio"
	"Absolute value of differences"	"Absolute value of differences"

† The raw data included variables not used in the analysis. Some variables were omitted for providing extraneous data: Depreciation. Other variables were omitted for not providing useful information once property parts were combined into one property: Type of use of the building, Type of the building, Wall material, Heating, Water supply, Gas, Cellar, Number of flats, Number of rooms, Floor, Number of floors, How much construction is finished, Year of renovation, Date of construction, and Sewerage.

‡The authors constructed the variables in quotations.