

# **EQUITY IN PROPERTY TAXATION: A MODEL FOR ESTABLISHING A FAIR PROPERTY TAX SYSTEM**

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This paper reports on a project, which is sponsored by the Brazilian National Council for Scientific and Technological Development, concerned with equity in property taxation. The research is in its early stages but the main objective of the project is the proposal of a model for establishing a fair property taxation system based on real estate market value and a rates structure of property tax related to ability-to-pay. This also requires the definition of a database structure for implementing the proposed property tax system and the methodological and data collection questions associated with this are considered. A critical analysis of the current property tax in a major Brazilian city is undertaken, focusing mainly on aspects related to the property tax assessment and incidence. Methods currently used for estimating market value, sources of data available and property data management are investigated. The final section of the paper outlines an improved property tax system, devised according to the resources available to the local authority.

Keywords: Ability-to-pay, assessment regressivity, property tax, property tax model.

## **INTRODUCTION**

The need to raise revenue by way of taxes to finance public services has been in existence for many centuries. Property taxes, defined as an annual tax on land and buildings, are adopted by 17 out of 22 countries that are members of the Organisation for Economic Co-operation and Development (OECD) and they are the most important source of local revenue in 9 of these countries (Kitchen, 1992). According to the International Association of Assessing Officers (IAAO, 1990), they exist in about 130 countries with varying degrees of importance.

In spite of the desirable characteristics achieved by introducing a tax on property, property taxes are strongly criticised due to inequities frequently present in current systems. This study is concerned with designing an improved property taxation model that adjusts to deal with these inequities. Basically, the model introduces an element to reflect directly the ability-to-pay in the usual systems and suggests some measures to increase the accuracy of the tax base establishment. The model proposed is designed exclusively for the residential market sector. The paper is divided into four main sections. The first section provides a general overview of the study. The second section describes and analyses critically current property tax systems. The third section presents the basic design of a model for taxing residential property. The final section contains a summary of the study.

## CURRENT PROPERTY TAXATION SYSTEMS

### Description

The property tax levy is usually determined by the product of the tax base multiplied by a rate (property tax rate), which defines the proportion of the tax to be collected in relation to the property tax base estimated.

The most widely adopted tax bases are summarised in Table 1. The choice between market value and rental value may not make a big difference (IAAO, 1990), depending mostly on the real estate market performance. However, the viability of adopting site value as the tax base is often debatable due to the lack of market information on site prices. The adoption of market value or rental value as the property tax base requires evidence for open market transactions or rental transactions respectively.

Tax Base	Features of Tax Base	Adopted by
Market Value	<ul style="list-style-type: none"> <li>- elasticity in terms of revenue</li> <li>- need to continually update</li> <li>- deters improvements</li> </ul>	U.K. (domestic rates), Canada, USA, Denmark, Portugal, Netherlands, Japan, Israel, Philippines, Brazil
Rental Value	<ul style="list-style-type: none"> <li>- based on income produced by properties</li> <li>- subject to rental control and subsidised lettings</li> </ul>	Ireland, Nigeria, Malaysia, Singapore, France, Israel
Site Value  (based on the best use of land)	<ul style="list-style-type: none"> <li>- stimulating factor of the best use of land and faster development (in short run)</li> <li>- deters land speculation</li> <li>- unrelated to ability-to-pay</li> <li>- lack of frequent sales of vacant land, mainly in developed areas</li> </ul>	Parts of Australia, Jamaica, New Zealand, South Africa

Table 1- Principal Features of Property Tax Bases

Most assessment for taxation purposes is done by mass-appraisal methods, with the cost and sales comparison approaches being widely used. According to the cost approach, the property market value is established by the mathematical model below. Frequently, estimates are made using tables that show the cost per unit area of constructing various types and styles of building.

$$MY=LV+BV \quad (1)$$

Where MY is market value, LV is land value and BV is building value.

$$LV= ULV \times LA \quad (2)$$

$$BV=UBC \times BA \times (1-D) \quad (3)$$

Where ULV is a typical land value per unit land area [US\$/square foot], LA is land area [square foot], UBC is a typical building cost per unit building area [US\$/square foot], BA is building area [square foot], and D is depreciation factor [%].

The sales comparison approach estimates market value based on the prices of a group of properties that have sold in a period close to the assessment date. A hedonic Multiple Regression Analysis (MRA) is often used to identify the most important factors determining prices and to estimate the value of those properties that have not traded.

The property tax rate is simply a mathematical expression of the ratio between the property tax levy and the tax base. Property tax rates can vary even in short time periods (annual periods) according to the revenue need in a community, but in the majority of cases they are uniform for properties classified into the same class (e.g. residential properties). Equation 4 can be used to determine the property tax levy.

$$PTL = TB * R \quad (4)$$

Where PTL is property tax levy [US\$], TB is an estimate of the property tax base [US\$] and R is the property tax rate [%].

Assuming market value as the tax base and 1.2% as the property tax rate for the residential segment, the property tax levy determined for a house with market value estimated in US\$ 150,000.00 would be USA\$ 1,800.00.

Taxes can be used to influence the use of land. For example, in Brazil the property tax rate for undeveloped land is 6%, while for residential properties is 1.2%. The objective is to deter land speculation and stimulate faster land development. Alternatively, uniform rates can be applied for all classes of properties. A graded system with higher rates on sites than on improvements is adopted, for example, in Pittsburgh and Zimbabwe.

In most countries the law requires a reappraisal at specific intervals, which usually vary from 3 to 5 years (IAAO, 1990). However, lack of frequent revaluations is common and can reduce the tax base.

The information not only about liabilities, but also about the attributes of each real estate unit is kept in the real estate cadastre. It should reflect the real conditions of properties and taxpayers. Liability for the payment of property taxes differs in countries. The owner liability is usually combined with the government's right to seize the property and sell it if the tax is not paid in the United States, Canada, and many other countries (IAAO, 1990). Indeed, this right, when exercised, is a good guarantee for enforcing payment.

## CRITICAL ANALYSIS

In the light of the basic requirements used for analysing taxation alternatives, some desirable characteristics of property taxes are summarised below:

- Easy to understand and enforce payment;
- Cheap to collect and administer;
- Difficult to evade; and
- Capable of producing a large and predictable yield.

Due to easy allocation of property taxes to a particular local authority in terms of revenue, property taxes are considered a good alternative for local rating. In addition, the introduction of a tax on property can correct inefficiencies caused by sales taxes, which usually exclude the annual consumption of housing services from their tax base.

A major criticism concerns the relatively higher burden placed on low-income taxpayers. When it occurs, the tax is considered regressive in terms of incidence. Indeed, the most usual tax bases adopted (market values-rental values-site values) are not related directly to ability-to-pay. In general, a good relationship between wealth and real estate holdings seems to exist with ownership being concentrated among high-income groups. However, a number of exceptions to this assumption must be considered in that some low-income families might be exposed to heavy burdens (Aaron, 1975).

A further criticism concerns assessment bias in establishing the property tax base. Assessment bias occurs when some classes of property have a ratio of assessment to value significantly different from the ratio of others in the same taxing jurisdiction (IAAO, 1978). Horizontal inequities are systematic differences in appraisal level between groups of properties being present when persons having similar properties with the same market value pay different taxes due to assessment bias. While vertical inequities are systematic differences in appraisal levels for groups of properties defined by value. A phenomenon frequently observed is that high-value properties tend to be under-appraised relative to low-value properties. When this occurs property taxes are considered regressive in terms of assessment.

According to Paglin and Fogarty (1973), "When properties are initially assessed there is a tendency to understate the true market value of houses in the higher price range relative to houses at the lower end of the price range based on a priori reasoning and statistical analysis support". The individual features of high priced houses in terms of design, decorative details, etc., are not easily plugged into existing mass-appraisal techniques, and tend to be undervalued. In addition, the usual lags between assessments in a dynamic housing market accentuate the initial price-related assessment bias, because low priced and deteriorating structures tend to decline quicker in value than the better ones (Paglin and Fogarty, 1973).

When the cost approach is used for assessing market values, buyers' preferences concerning property types are unlikely to be reflected in construction cost manuals. In addition, they are designed to represent average properties. Consequently biases are likely to occur at the individual property level (Sunderman et al., 1990). Similarly, a typical land value is determined in different neighbourhoods with their boundaries being defined by subjective criteria. Biases- might occur in estimating the land value due to incorrect neighbourhood breakdown and incorrect typical land value attributed to neighbourhoods (Sunderman et al., 1990). Thus, estimates of the market value based on market behaviour seem to be more suitable.

Local authorities in many countries (both developed and developing) admit meeting difficulties in establishing the real market value or rental values, even when MRA is used. The poor access to sale or rental prices and the omission of important variables can lead to wrong conclusions in terms of value estimates. After applying any technique for estimating the tax base, a statistical analysis of the degree of assessment accuracy should be performed. It is aimed at measuring two primary aspects of mass-appraisal accuracy-level and uniformity (IAAO, 1990). Appraisal level refers to the

overall ratio at which properties are appraised in relation to sale prices, while appraisal uniformity is related to the fair and equitable treatment of individual properties. Properties have to be appraised equitably within groups (such as property type, neighbourhoods, age, and so forth) and between groups, with each one being appraised at the same level, or ratio, to market value (IAAO, 1990).

## IMPROVING PROPERTY TAXES

**Proposing a Model** Certain elements need to be explained.

**Property Tax Levy:** Similar to current property tax systems, the property tax levy is resulting from property tax base multiplied by a property tax rate.

**Property Tax Base:** The decision between market value or rental value as the property tax base should be undertaken considering basically the ownership tenure and the accessibility to reliable information on open market or rental transactions.

If there is a high degree of ownership and there is considerable evidence for open market transactions, market value should be adopted as the tax base. Alternatively, rental value should be adopted when these conditions are not satisfied. In any case, the sales comparison approach is the method suggested for estimating the tax base. The process to be developed is described below:

a. Preparing the data collection. The data collection must represent all types of residential properties existent in the local authority examined. Possibly, several sub-classes of residential properties may be identified, such as bungalows, detached houses, flats, etc. Statistical information on the property population tenure by sub-class and neighbourhood would be helpful to select a representative sample for estimating market values.

Similar to any valuation work, some key attributes must be selected to represent the physical characteristics of properties, their neighbourhood, and some economic indicators. The group of variables selected may vary according to property sub-classes.

b. Data collection. In many countries, there is a central register of title deeds containing information on sales prices, date and conditions. The majority of information existent there may be unreliable. The valuer must identify, according to real estate market performance, which information can be used as evidence for open market transactions. A comparison between offering prices, announced in advertisements, and prices declared in the registers might be useful for selecting reliable information. As a result of the bargaining power, a small difference between them is expected.

c. Valuation model. The use of Multiple Regression Analysis (MRA) is recommended due to its relatively easy application and good performance when compared with other valuation methods. A regression model is produced using sale prices as the dependent variable. When the attributes supposed to determinate market value are significant different between sub-groups of properties, the generation of a particular model for each sub-group is evident. For example, a specific regression model should be generated for residential flats and another for houses. The analysis of the model with better performance in estimating sales prices (or rental values) follows the basic statistical analysis of regression models.

d. Testing for vertical and horizontal assessment equity. Tests for assessment equity consist of an analysis of the valuation performance, where estimates of market values are compared with the market values themselves. As there is no evidence for the 'real market value', sales prices are used for representing them. The estimates of market value are frequently denominated as 'assessed value', being defined as the actual basis on which the property tax levy is allocated among property owners (IAAO, 1990). There are many models for testing the vertical assessment equity in property taxes (Paglin and Fogarty, 1973; IAAO, 1978; Cheng, 1974; and Sunderman et al., 1990). While, a pure measure of horizontal inequity is the standard error of assessed values divided by the mean assessed value (see Paglin and Fogarty, 1973).

e. Adjusting for assessment inequities. Since property taxation systems often contain both vertical inequities and horizontal inequities, some methods of adjusting for them by applying equalisation factors are addressed in Birch et al. (1990;1995) by the Smoothed Method and Vertical Horizontal Appraisal Adjustment System (VHAAS). They reduce the effect of the inequity, but eliminate neither the need to make long-run corrections nor its causes. In both methods, properties are divided into groups according to their assessed values (estimates of market values) and multipliers of assessed values to sale prices (NS) ratios are defined for each group. The aim is to adjust groups so that the median NS ratios are constant reducing inequities.

Property Tax Rate: A method for producing a rates structure for property tax, in order to fairly distribute the tax burden among different income groups is presented. Estimates of market values, taxpayers' income and the revenue need for a community are used to define property tax rates that vary according to income class. The aim is to achieve an approximately neutral incidence of the property tax in relation to income.

The proposed method is defined and illustrated with a small set of fictitious properties. The example intends to compare a usual property tax system (traditional system), which defines an uniform rate of 1.2% for residential properties, with a system that establishes progressive rates in terms of taxpayers income. The example assumes the existence of only six properties in the local authority 'A', with their market values and the annual net income of the taxpayers known. Table 2 gives the cited information and the tax incidence in relation to income.

Tax-payer	Annual Net of Income(I) [US \$]	Market Value (MV) [US \$]	Traditional System	
			Tax Levy [US \$]	Tax Levy / I [%]
1	6,000	12,023.00	144.28	2.40
2	12,000	21,671.00	260.05	2.17
3	60,000	85,117.00	1,021.40	1.70
4	120,000	153,423.00	1,841.08	1.53
5	360,000	390,342.00	4,684.10	1.30
6	600,000	602,583.00	7,231.00	1.21
Sum:	1158,000	1,265,159.00	15,181.91	-----
Mean:	193,000	210,859.80	2,530.32	1.72

Table 2- Basic Information on Local Authority' A'

According to Table 2, the total revenue raised from the property tax is US\$15,181.91. The tax incidence is regressive with high incidence placed on low- income families.

The move to the proposed improved method involves the following steps.

Step 1. Classify taxpayers into income classes and estimate the mean of each income group. Other descriptive statistics, such as the mode or median, could be defined instead of the mean.

Statistics from the census might be useful to allocate taxpayers into income classes. A classification to represent income classes in authority' A' is shown in Table 3. The mean of annual net income for each income group defined is also presented.

Step 2. Establish a regression model for estimating market values in terms of taxpayers' income.

The statistical model that better describes the observed relationship between market value and the annual net of income, for the given example, is described below.

$$\log MV = 2.00 + 0.85 \log I + U_i \text{ (or } MV = 7.389 \times I^{0.85}) \quad (5)$$

Where MV is market value [US\$]; I is the annual net income [US\$] and  $U_i$  is the error of estimate.

Step 3. Define the mean incidence of the property tax levy in relation to taxpayers' income. It is the ratio of the total tax revenue need to the sum of the taxpayers' Income.

$$K = \text{SUM (PTL )} / \text{SUM (I)} \quad (6)$$

Where K is the mean incidence of the property tax, PTL is the property tax levy [US\$], and I is the annual net income [US\$].

The same revenue raised by the traditional system is considered. The total revenue expected (the sum of the property tax levy) and the sum of income in the local authority examined are drawn from Table 2.

$$K_{\text{FOR LOCAL AUTHORITY "A"}} = \frac{US\$15,181.90}{US\$1,158,000.00} = 0.01311$$

"K" ratio represents how much taxpayers pay on average in relation to their personal annual net income.

Step 4. Define an equation to determine rates for each income class.

Equation (7) can be used to estimate the property tax levy for any taxpayer.

$$PTL = MV * R \quad (7)$$

Where PTL is the property tax levy [US\$], MV is market value [US\$], and R is the property tax rate [%]. On the other hand, equation (8) can also be used to estimate the property tax levy for a neutral tax incidence on average.

$$PTL = K * I \quad (8)$$

Where K is the mean incidence (determined previously) and I is the annual net income [US\$]. If market values depends on taxpayers' income, as demonstrated in equation (5), and K is defined equalising eqns (7) and (8) and solving for R yields:

$$R = \frac{(I) * K}{MV} \quad (9)$$

Where R is the property tax rate. The following is an equation achieved when K and the model for estimating market values (eqn 5) are substituted in equation (9).

$$R = \frac{0.01311 * (I)}{7.389 * (I)^{0.85}} \quad (10)$$

Rates for the property tax are defined when attributing values to (I) in equation (10). In this example the mean of annual net income is used to establish rates for the property tax. The results are presented in Table 3.

Income Classes	Annual Net of Income (I) [US \$]	Mean of (I) [US\$]	Rates [%]
A	less than 6,000	4,800	0.63
B	from 6,000 to 9,600	7,800	0.68
C	from 9,600 to 14,400	12,000	0.73
D	from 14,400 to 19,600	16,800	0.76
E	from 19,600 to 31,200	25,200	0.81
F	from 31,200 to 48,000	39,600	0.87
G	from 48,000 to 72,000	60,000	0.92
H	from 72,000 to 144,000	108,000	1.01
I	from 144,000 to 360,000	252,000	1.15
J	from 360,000 to 720,000	540,000	1.28
K	over 720,000	1,000,000	1.41

Table 3 -Income Classes

A comparative analysis of the property tax incidence in the traditional and proposed system can be carried out in local authority' A'. Statistical errors in models of estimating market values as a function of income are expected. Consequently, the revenue to be raised by the proposed system is not that one supposed to be collected.

The ratio of the revenue desired (US\$ 15,181.90) to the achieved one (US\$ 14,774.60) must be applied in the rates defined by the proposed system for adjusting them in

order to get the desired revenue. In Table 5, the adjusted rates are presented and the property tax incidence can be compared in both systems.

Tax-payer	Annual net of Income (I) [US \$]	Market Value (MV) [US\$]	Traditional System Rate = 1.2%		Proposed System	
			TL [US\$]	TI/I [%]	Rates [%]	TL [US \$]
1	6,000	12,023	144.28	2.40	0.68	81.76
2	12,000	21,671	260.05	2.17	0.73	158.20
3	60,000	85,117	1,021.40	1.70	0.92	783.08
4	120,000	153,423	1,841.08	1.53	1.01	1,549.57
5	360,000	390,342	4,684.10	1.30	1.15	4,488.93
6	600,000	602,583	7,231.00	1.21	1.28	7,713.06
SUM:	1158,000	1,265,159	15,181.91	-----	-----	14,774.60
MEAN:	193,000	210,859.83	2,530.32	1.72	0.96	2,462.43

Table 4 -Comparing the Systems: Traditional and Proposed

Taxpayer	Rates [%]	TL [US \$]	TL/I [%]
1	0.70	84.01	1.40
2	0.75	162.56	1.36
3	0.95	804.66	1.34
4	1.04	1,592.29	1.33
5	1.18	4,612.69	1.28
6	1.32	7,925.70	1.32
SUM:	-----	15189.9	-----
MEAN:	0.99	2,530.32	1.34

Table 5 - Adjusted Proposed System

As it can be observed in Table 5, the system proposed is able to move towards an almost neutral incidence of the property tax in terms of income. Of course, the model is supposed to adjust the tax incidence just on average and according to a general model that describes the relationship between assessed values and income.

### IMPLEMENTATION ISSUES

As with any other property tax system, a real estate cadastre containing records on all properties is necessary. The cadastre should contain basically three groups of information. The first group should record information on tax liability, such as taxpayer's name, their annual net income and eventual debits. The next group could record the attributes considered for estimating market values, or rental values. The principal characteristics of the properties for each sub-group of residential properties must be defined considering financial and administrative resources. However, the attributes selected to integrate the real estate cadastre must be enough to estimate accurately market value. The last group should contain records on sales prices of properties with transaction prices known.

## **SUMMARY**

Property taxation is one of the most important options for funding local services. In spite of the desirable characteristics achieved by introducing a tax on property, property taxes are strongly criticised due to inequities frequently present in current systems. The proposed model for taxing residential property might be considered as an improved system that is able to adjust inequities already identified in current systems adopted by various countries.

## **REFERENCES**

- Aaron, H. J. (1975) *Who pays the property tax? a new view*. Washington, D.C: The Brookings Institution.
- Birch, J. W., Sunderman, M. A. and Hamilton, T. W. (1990) Adjusting for vertical inequity in property assessment. *Property Tax Journal*, **9**(3), 197-211.
- Birch, J. W. and Sunderman, M. A. (1995) Equalizing property appraisals to market: comparing old and new methods. *Assessment Journal*, **2**(2), 47-53.
- Cheng, P. L. (1974) Property taxation: assessment performance, and its measurement. *Public Finance*, **XXIX**, 268- 284.
- International Association of Assessing Officers - IAAO (1978) *Improving real property assessment: a reference manual*. USA: IAAO.
- (1990) *Property appraisal and assessment administration*. In: Joseph K. Eckert (Eds.), USA: IAAO.
- Kitchen, H. M. (1992) Property taxation in Canada. *Canadian Paper No. 92*, CTF- Canadian Tax Foundation.
- Paglin, M. and Fogarty, M. (1973) Equity and the property tax: a new conceptual focus, *National Tax Journal*, **25**(4), 557-565.
- Sunderman, M. A., Birch, J. W., Cannaday, R. E. and Hamilton, T. W. (1990) Testing for vertical inequity in property tax systems. *Journal of Real Estate Research*, **5**(3), 319-334.