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Introducing local property tax for fiscal decentralization and local authority autonomy

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ABSTRACT

Charles Tiebout (1956), in his work “A Pure Theory of Local Expenditures”, provides a vision of the workings of the local public sector, acknowledging many similarities to the features of a competitive market, however omitting any references to local taxation. Contrary to other researchers’ claim that the Tiebout model and the theory of fiscal decentralization are by no means synonymous, this paper aims to expand Tiebout’s theory, by adding the local property tax in the context, introducing a fair, ad valorem property taxation system based on the automated assessment of the value of real estate properties within the boundaries of local authorities. Computer Assisted Mass Appraisal methodology integrated with Remote Sensing technology and GIS analysis is applied to local authorities’ property registries and cadastral data, building a spatial relational database and providing data to be statistically processed through Multiple Regression Analysis modeling. The proposed scheme accomplishes economy of scale using CAMA procedures on one hand, but also succeeds in making local authorities self-sufficient through a decentralized, fair, locally calibrated property taxation model, providing rational income administration.

Keywords: Fiscal Autonomy, AVM, CAMA, Local Authority, Local Property Tax

1. FISCAL AUTONOMY

The question of fiscal independence in local authorities has been receiving economists’ attention for many years. Feng et al (2013) extensively assess the different ways in which theories on fiscal independence of local authorities have been mutating over the years. Mutation of these theories can be corresponded to the first generation local authority theories, the common theme is the local authority’s dependence on the federal government. Proponents of the first generation theories believed that the local authorities were an appendage of the local government and, as such, their primary role was to actualize the policies of the federal government. Thus, the federal governments articulated the policies and provided the local authorities with the necessary fiscal instruments to objectify those policies. These theories primarily arose because of the perception that local authorities lacked the means to gain fiscal independence from the federal government (Feng et al, 2013).

The emergence of the second generation theorists not only challenged the view that local authorities lacked the capacity to gain fiscal autonomy, but they also suggested strategies that local authorities could use to gain fiscal autonomy and become self-serving governments. Therefore, proponents of this argument cautioned against centralization of power at the federal government level and urged policymakers and legislators to increase the responsibilities and powers accorded to local authorities (Feng et al, 2013). They, therefore, advocated for enactment of laws that would give local authorities the means necessary for them to generate their funds, become fiscally independent, and implement their development agendas.

1.1 Tiebout’s Theory

Charles Mills Tiebout (1924-1968) was one of the staunchest supporters of the second generation local authority theories. Tiebout believed that the local authorities can gain fiscal independence by generating their revenues, providing services, and attracting consumers to their jurisdictions because of the perception that fiscal independence would enable some local authorities to gain superiority over other local authorities.

In 1956, in his treatise titled “A Pure Theory of Local Expenditures”, Tiebout propounded a theory for the enhancement of fiscal independence in local authorities, where he argued that local authorities can enhance their fiscal independence through the optimal use of public funds in the provision of public goods. Contrary to the views of leading economists, Tiebout propounded a model in which he argued that local governments could determine and compute the optimal community demand for public goods and use those figures to not only allocate the funds necessary for the provision of public goods to such a community size, but to also tax the community so as to guarantee the optimal use of public funds. On the basis of these arguments, Tiebout advocated for the development of a local government framework of public finance in which consumers are compelled to reveal their preference so that the government can satisfy them in the same optimal manner in which the private sector does in respect of private goods and the local government can tax them accordingly. However, several economists criticized Tiebout’s contentions on the ground that they do not account for certain factors that might affect the consumer-voter’s choice of a location. Miller and Tabb (1973) argued that Tiebout’s argument on the influence of externalities is flawed because it completely ignores the important role that externalities play in the consumption and production of public goods.

Although Miller and Tabb (1973) contentions on the influence of externalities on the consumer-voters’ decisions is full of merit, this paper argues that it is indeed possible for local authorities to develop systems for influencing the consumer-voters’ choice of location. It argues that a local authority can use property taxes as avenues for revenue generation. It argues that local authorities can achieve this through the use of zoning laws and methodological frameworks that can accurately compute properties’ taxable values.

1.2 The Role of Local Property Tax

While Tiebout states in his theory that a tax system would enable the local government to replenish the funds expended in the provision of public goods, the theory does not go deep to identify the nature of tax regime that would be effective in replenishing the expended funds. The debate surrounding the effectiveness of taxation as an avenue for raising public funds is something that has led to divisions among economists. On one hand, there are economists who argue that local authorities’ taxation on the local residents’ income or property will only result in mass capitalexodus and occasion a decline in the local authorities’ tax base. These economists point to states like Boston illustrations for dangers associated with the use of taxation as an avenue for raising funds. Boston imposed high property taxes on high income neighborhoods and watched in horror as dwellers in those neighborhoods sold their homes and moved to other states with lower property taxes. In the meantime, the individuals who purchased these properties in Boston circumvented the high property taxes by developing apartments that would house large numbers of low income earners. The outcome was a dip in the area’s property value and a subsequent dip in the local authority’s tax base. Other economists point out as well that it is easy for wealthy residents to migrate to other states when a local authority attempts to impose taxes on their income. In such a scenario, the high income residents sell their properties and move to other areas, leading to the dwindling in the revenues that the local authority draws from taxes.

On the other hand, there is a group of economists arguing that it is possible for local authorities to use high taxes as a sustainable source of public funds. These economists argue that such an outcome is possible when the local authorities use zoning laws to increase the wealthy owners’ switching costs in the aftermath of the introduction of a high property tax regime. Fischel (2013), one of the chief proponents of the use of taxation as an avenue for revenue generation, contends that it is possible for local authorities to derive sustainable sources of funds from high property tax. He also argues that the main factor that led to the failure of the Boston property tax regime is the fact that the local authority did not introduce a policy that made it expensive for the wealthy residents to move to other states and that it is only through the imposition of such restrictions that the local authorities can prevent the deadweight taxation loss that arises after the imposition of high property taxes. According to Fischel (2013), the deadweight taxation loss denotes the economic loss that the local authority suffers either as a consequence of the use of the available land in an inefficient way or as a consequence of the movement of economic activities to regions with low tax regimes, as well as zoning laws are the most effective means of eliminating deadweight taxation loss because they make it uneconomical for the targets of the high property taxes to move to a new state. If a state imposes high property taxes on neighborhoods with wealthy homeowners and imposes zoning laws that restrict conversion of those properties into apartments that would house the poor, the wealthy landowners will be forced to either look for other wealthy buyers to purchase their property or significantly reduce the cost of their property so as to enable property buyers to offset the high taxation regime. Similarly, an individual purchasing the property will do so with the knowledge that the zoning regime prevents him from using the property in a less efficient way (Fischel, 2013). Thus, a zoning law will be instrumental in ensuring that the

local authority maintains the income levels in the affected neighborhoods even after raising the property taxes and that the tax-owing landowners don't view the law as mere ink on paper.

The effectiveness of zoning laws in preventing a dip in the value of properties as a consequence of taxation has also been affirmed by studies on how land policies can act as an incentive for influencing land-use patterns. Lewis and Plantinga (2007), in their study, conducted an analysis on how land policies can become an effective tool for influencing landowners to spatially configure their properties so as to achieve positive environmental outcomes, since private landowners are generally reluctant to coordinate their land-use decisions to achieve a greater good in terms of overall value of their properties or the general quality of the environment in which they live. According to Lewis and Plantinga (2007), land-use policies can provide an incentive for private landowners to develop a system for effectively coordinating their decisions so as to achieve certain predetermined outcomes that will improve the overall value of their properties. When one relates this argument to the issue of local property taxes, it becomes clear that zoning laws can become an avenue that local authorities can exploit for ensuring that the value of their tax base does not dip. In fact, the zoning laws can be the vehicle to improve the value of the properties within a local authority. The local authorities can design these zoning laws in a manner that encourages spatial configuration of private landowners' decision-making and ensure that they use their properties in a manner that will improve their value in the long-term. Thus, the local authority will benefit immensely from the general improvement in the value of the properties subject to the high taxation regime.

2. FISCAL POLICY ON REAL ESTATE IN EUROPE

2.1 Real Estate taxation in Europe

According to a UIPI (International Union of Property Owners) research, Real Estate taxation in Europe can be organized into six major categories, differing from country to country in terms of quantity of taxes and participation to the GDP, as seen on figure 1. For example, in the UK taxation is considered high with a percentage of 11,6% on total taxation and 4,2% on GDP, while on the other hand, in the Czech Republic it is considerably lower with a percentage of 1,1% on total taxation and 0,4% on GDP.

COUNTRY	1965	1975	1985	1990	1995	2000	2005	2006	2007	2008	COUNTRY	1965	1975	1985	1990	1995	2000	2005	2006	2007	2008
AUSTRIA*	1,3	1,1	1,0	1,1	0,6	0,6	0,6	0,6	0,6	0,5	AUSTRIA*	4,0	3,1	2,4	2,7	1,5	1,3	1,3	1,4	1,4	1,3
BELGIUM	1,2	1,1	1,1	1,4	1,5	1,9	2,1	2,3	2,2	2,2	BELGIUM	3,7	2,9	2,5	3,4	3,4	4,2	4,8	5,1	5,1	5,0
CZECH REPUBLIC					0,5	0,5	0,4	0,4	0,4	0,4	CZECH REPUBLIC				1,4	1,4	1,2	1,2	1,2	1,2	1,1
DENMARK*	2,4	2,3	2,0	1,9	1,7	1,6	1,9	1,9	1,9	2,0	DENMARK*	8,0	6,1	4,3	4,2	3,5	3,2	3,7	3,8	3,8	4,1
FRANCE*	1,5	1,8	2,5	2,7	2,9	3,1	3,4	3,5	3,5	3,4	FRANCE*	4,3	5,1	5,8	6,3	6,7	7,0	7,8	7,9	8,0	7,8
GERMANY	1,8	1,3	1,1	1,2	1,0	0,8	0,9	0,9	0,9	0,9	GERMANY	5,8	3,9	3,0	3,4	2,8	2,3	2,5	2,5	2,5	2,3
GREECE*	1,7	1,9	0,7	1,2	1,2	2,1	1,3	1,4	1,4	1,5	GREECE*	9,7	9,7	2,7	4,6	4,1	6,2	4,2	4,3	4,4	4,6
IRELAND	3,8	2,8	1,4	1,5	1,5	1,7	2,4	2,9	2,5	1,8	IRELAND	15,1	9,7	4,0	4,7	4,5	5,5	7,9	9,0	8,2	6,4
ITALY	1,8	0,8	0,8	0,9	2,3	2,0	2,0	2,1	2,1	1,9	ITALY	7,2	3,3	2,5	2,3	5,6	4,6	5,0	5,0	4,9	4,3
NORWAY	0,9	0,9	0,8	1,2	1,1	1,0	1,1	1,2	1,2	1,2	NORWAY	3,1	2,3	1,9	2,9	2,8	2,3	2,6	2,7	2,8	2,7
POLAND					1,0	1,2	1,3	1,3	1,2	1,2	POLAND				2,8	3,5	4,0	3,7	3,4	3,6	3,6
PORTUGAL	0,8	0,5	0,5	0,7	0,9	1,2	1,2	1,2	1,4	1,3	PORTUGAL	5,0	2,5	1,9	2,7	3,0	3,5	3,5	3,6	3,8	3,6
SLOVENIA					0,6	0,7	0,6	0,6	0,6	0,6	SLOVENIA				1,4	1,7	1,5	1,6	1,6	1,6	1,6
SPAIN*	0,9	1,2	1,6	1,8	1,8	2,2	3,1	3,2	3,0	2,3	SPAIN*	6,4	6,3	5,9	5,5	5,5	6,4	8,6	8,8	8,1	6,8
SWEDEN	0,6	0,5	1,1	1,8	1,3	1,8	1,4	1,4	1,2	1,1	SWEDEN	1,8	1,1	2,3	3,5	2,7	3,4	3,0	3,0	2,4	2,3
SWITZERLAND	1,7	1,9	2,4	2,3	2,3	2,8	2,3	2,4	2,3	2,2	SWITZERLAND	9,9	8,0	9,3	8,9	8,2	9,3	8,0	8,0	7,9	7,5
UNITED KINGDOM	4,4	4,4	4,4	2,9	3,4	4,2	4,3	4,5	4,5	4,2	UNITED KINGDOM	14,5	12,7	12,0	8,2	10,0	11,6	12,0	12,3	12,6	11,6
AVERAGE:	1,8	1,6	1,5	1,6	1,5	1,7	1,8	1,9	1,8	1,7	AVERAGE:	7,0	5,5	4,3	4,5	4,1	4,6	4,8	4,9	4,8	4,5

Figure 1: Real Estate taxation as a GDP and as a total taxation percentage (UIPI, 2010)

Real Estate taxation categories are:

- Housing Taxation, on the indirect profit of a person staying in his own property, not paying rent. In Belgium it is as high as 40%-50%, while in Czech Republic it is as low as 0,4%-1,1%.
- Annual Ownership Taxation, calculated differently in every country, mainly with a scalable percentage according to the property's value, but also with a fixed percentage independently of the value, usually taking into consideration social criteria and low-income individuals.
- Inheritance Taxation, effective in most countries, usually calculated according to the property's value, imposing different tax coefficients depending to the relationship degree as seen in figure 2. In countries like Germany & Portugal it is not differentiated from ownership taxation, in contrast to countries like Sweden & Austria not imposing such a tax, while in France the coefficient is as high as 40%-60%.

- Donation Taxation, respectively to the inheritance taxation, imposed with lower coefficients though, as for example in the UK with a 40% inheritance taxation and no donation taxation at all as seen in figure 2.

COUNTRY	CHILDREN		SPOUSES		BROTHERS		STRANGERS	
	RATES	FIRST/LAST BRACKET	RATE	FIRST/LAST BRACKET	RATE	FIRST/LAST BRACKET	RATE	FIRST/LAST BRACKET
AUSTRIA	0%	Total	0%	Total	0%	Total	0%	Total
BELGIUM ¹⁰	3-30%	50.000€ 500.000€	3-30%	50.000€ 500.000€	20-65%	12.500€ 250.000€	40-80%	50.000€ 175.000€
BULGARIA	0%	Total	0%	Total	0,4-0,8%	128.205€ ¹¹	3,3-6,6%	128.205€
CYPRUS	0%	Total	0%	Total	0%	Total	0%	Total
CZECH REP.	0%	Total	0,5-0,81%	41.070€ 410.680€ ¹²	1,5-2,32%	41.070€ 410.680€	3,5-6,8%	41.070€ 410.680€
DENMARK ¹³	0-15%	34.055€ ¹⁴	0%	Total	15%+25%	34.055€	15%+25%	34.055€
FRANCE	5-40%	7.953€ 1.779.029	0%	Total	35-45%	24.069€	60%	Total
GERMANY	7-30% ¹⁵	75.000€ 26.000.000€	7-30%	75.000€ 26.000.000€	15-43%	75.000€ 26.000.000€	30-50%	6.000.000€
GREECE	0-10% ¹⁶	150.000€ 600.000€	0-10%	150.000€ 600.000€	0-20%	30.000€ 300.000€	0-40%	6.000€ 267.000€
IRELAND ¹⁷	0-25%	332.084€	0%	Total	0-25%	33.208€	0-25%	16.604€
ITALY	4%	1.000.000€	4%	1.000.000€	6%	100.000€	6-8%	Total
NORWAY	0-10%	58.750€ ¹⁸	0%	Total	0-15%	58.750€	0-15%	58.750€
POLAND	0-7%	2.409€ ¹⁹ 5.139€	0-7%	2.409€ 5.139€	0-7%	2.409€ 5.139€	0-12%	1.225€ 5.139€
PORTUGAL ²⁰	0%	Total	0%	Total	10%	10.000€	10%	Total
SLOVENIA	0%	Total	0%	Total	5-14%	10.000€	12-39%	10.000€
SPAIN ²¹	7-32%	50.000€ 800.000€	7-32%	50.000€ 800.000€	7-32%	50.000€ 800.000€	14-64%	50.000€ 800.000€
SWEDEN	0%	Total	0%	Total	0%	Total	0%	Total
SWITZERLAND	0%	Total	0%	Total	Cantonal	Cantonal	Cantonal	Cantonal
UN. KINGDOM ²²	0-40%	367.058€	0%	Total	0-40%	367.058€	0-40%	367.058€

Figure 2: Inheritance and Donation taxation in Europe (UIPI, 2010)

- Transfer taxation, valid in all countries and calculated usually on the sales price, where available. Maximum coefficient is imposed in Belgium & France (up to 12%), while in Greece from 10% was recently reduced to 3%.
- Value added taxation, considerably different in all countries, imposed in cases of new buildings, restorations, sales or even on lease income as seen in figure 3. The maximum coefficient is imposed in Sweden (25%) & Greece (23%) and the minimum in Switzerland (7,6%)

COUNTRY	CONSTRUCTION	RENOVATION	TRANSACTIONS (from constructors)	RENTAL INCOME
AUSTRIA	20%	20%	-	10% (residential) 20% (commercial)
BELGIUM	21%	6%	21% (New buildings)	21% ¹¹⁵
BULGARIA	20%	20%	20% (New buildings)	20% ¹¹⁶
CYPRUS	15%	15%	15%	-
CZECH REP.	10-20% ¹¹⁷	10%	10% (New buildings)	-
DENMARK	25%	25%	-	25% (optional for commercial property if tenants pay VAT)
FRANCE	19,6%	5,5% ¹¹⁸	19,6%	-
GERMANY	19%	19%	-	19% (commercial)
GREECE	23%	23%	23% (New buildings) ¹¹⁹	-
IRELAND	13,5%	13,5%	13,5%	-
ITALY	10%	10%	10%	-
NORWAY	25%	25%	-	25% (optional for commercial property if tenants pay VAT)
POLAND	22%	7-22%	7% for residential property 22% for commercial property	22% (only for commercial property)
PORTUGAL	23%	23%	-	-
SLOVENIA	20%	No information	20%	20% (only for commercial property)
SPAIN	4-8-18% ¹²⁰	8-18% ¹²¹	18%	18% (only for premises)
SWEDEN	25%	25%	-	-
SWITZERLAND	8%	8%	-	8% (optional)
UNIT. KINGDOM	17,5%	5%	-	-

Figure 3: VAT on real Estate in Europe (UIPI, 2010)

The most common problem of Real Property taxation is the type of value on which the tax is imposed, varying from Market Values to predefined Taxable Values.

2.2 Necessity to evolve Real Estate taxation systems

In Greece for example (Labropoulos, 2012), since property sales' data is not public (known only to the seller & the buyer), taxation is usually imposed on a so called "objective" value, calculated since 1985 via a semi-sophisticated "Real Estate Values Objective Calculation System" (figure 4). It is a zoning system where each neighborhood is assigned a base value, by a committee of officials in the Ministry of Economics, this value corresponding to /sq.m. value of new 1st floor apartments. Various simple coefficients (floor, age etc) produce the final value using 21 different forms, each for every different kind of property. The structure and operation of the system is very simple and doesn't simulate the market in any way, while furthermore it should be updated every 2 years but last update was made at 01.03.2007. The result is that each update of the system disturbs and intervenes to the market's equilibrium, is a tool for practicing land policy and introduces great political cost since it affects about 40 different property taxes and dues in Greece.

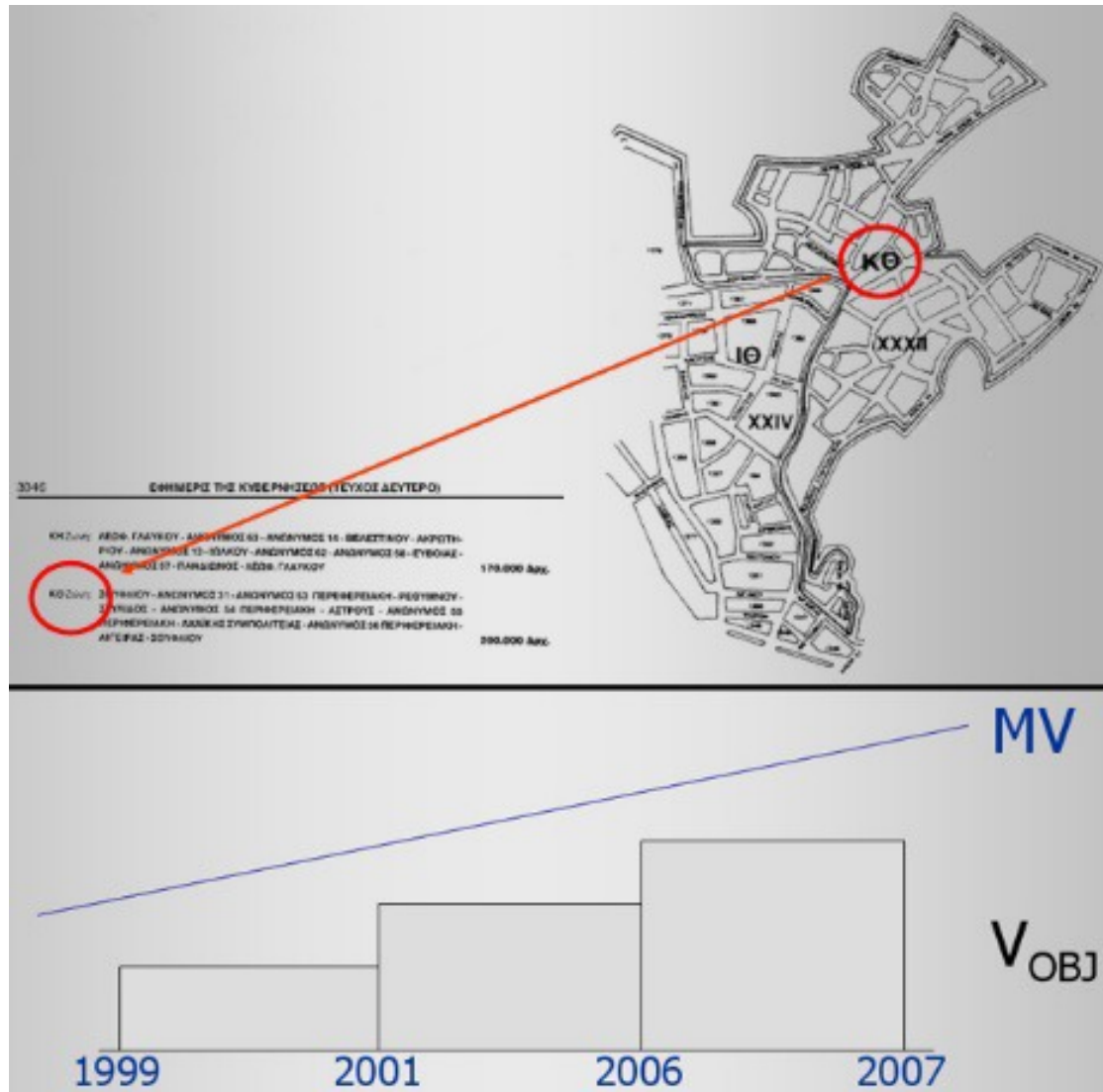


Figure 4: Operation and updating of the "Real Estate Values Objective Calculation System" (Labropoulos et al, 2007)

As a result, taxpayers don't feel the fairness and equity which every massive taxation system should provide, each forthcoming update causes a great deal of reactions, so most of the times it is cancelled.

It is obvious that the existing system should be replaced by one with minimum authorities' intervention, contemporary & state-of-the-art, self-calibrating, fair and equitable system.

3. MASS APPRAISAL SYSTEMS, TECHNIQUES AND METHODOLOGIES

There are several mass appraisal methodologies that local authorities can utilize for the accurate computation of properties' taxable values. Some of them are already widely being used, while others are until now experimental and remain subject to research.

3.1 Multiple Regression Analysis (MRA)

Regression analysis is a statistical modeling technique widely used to investigate the relationship between a dependent variable (i.e. property value) and two or more independent variables (i.e. property characteristics) and finally to predict property values based on statistically significant property characteristics. Although MRA was reported to have been used before the 19th century, the first bibliographical references are about Legendre A.M., in 1805 and Gauss C.F., in 1809, both used in astronomy (Labropoulos, 2013).

3.2 Hedonic Pricing Method

The hedonic pricing method or hedonic regression is mainly used in the housing market for real estate valuation purposes. Originally it was developed in order to specify the effect of environmental attributes to a property's value, but it can be used to identify the effect of factors as property and neighborhood characteristics as well, separately or jointly, to Real Estate values.

3.3 Ordinary / Linear Least Squares Approach (OLS / LLS)

OLS is an example of hedonic model that has been extensively utilized in the US, the UK and Australia in the mass appraisal of property values for taxation purposes. Under OLS, property price is the dependent variable, while location factors and property attributes are categorized as the independent variables (Sipan, et al., 2012).

3.4 Geographically Weighted Regression (GWR)

GWR is another hedonic model commonly utilized in the valuation of properties subject to taxation. GWR model utilizes location coordinates as the platform for the determination of local weights of the identified dependent and independent variables. One of the main advantages of the GWR technique is that it has a high degree of accuracy because its computation incorporates important location attributes through the use of the longitudinal and latitudinal coordinate weights (Sipan, et al., 2012).

3.5 Artificial Neural Networks (ANN)

ANN is a highly sophisticated modelling technique being developed as a result of research performed in the field of artificial intelligence, which allows to project functions of high level of complexity. Artificial neural networks may be applied in many fields of human activity, in all cases where solutions concerning prediction, classification or control should be found, thus it started being used for real estate valuation in the nineties (Wilkowski, 2006).

3.6 Multi-Criteria Decision Analysis (MCDA)

Using MCDA all properties on one housing market (including recently sold ones) are evaluated against a set of criteria (characteristics) important for the market. A multicriteria method is used to evaluate overall quality of each property on this basis (Moshkovich et al, 2011)

3.7 Automatic Valuation Models (AVMs)

AVMs have been utilized extensively in the valuation of properties, being valuation models that rely on statistical variables to determine the property value and eliminate the need for subjective interpretations of property value. Having a confidence level of $\pm 15\%$ of the property actual value, is very important for the credibility and acceptance of the system. Furthermore, the system relies on indexation to update the value of a property on the basis of changes in trends in the areas where the property is located. Additionally AVMs accurately compute property values through the use of multiple regression analysis. The regression model draws the property value from the value of a list of properties in the area under review and mixes the computed values with other variables that will have a direct influence on the value of each property.

3.8 Computer Assisted Mass Appraisals (CAMA)

Last but not least, Mass Appraisal is the process of valuing a group of properties as of a given date using common data, standardized methods, and statistical testing. The general goal of Mass Appraisals is the efficient and fair taxation of every property within certain administrative boundaries mainly for fiscal purposes. Within a Mass Appraisals procedure, a valuation model is created capable to simulate the demand-supply function of the market in a wider area for groups of properties rather than of individual properties. Quality control of the accuracy and cohesion of these appraisals is usually done through statistic methodology. Due to the volume of properties involved in Mass Appraisals it is imperative to preserve the fair and equitable feeling in the outcome of taxation (IAAO, 1990). Though Mass Appraisals have been used before 1900 in the US, the first attempts to computerized this procedure were made in 1950-1960 when the first computers appeared enabling Computer Assisted Mass Appraisals (CAMA), procedure that has been organized and systemized in 1980-1990 with the appearance of personal computers (Labropoulos, 2013)

3.9 The proposed model of local property valuation

Local CAMA systems area mainly developed for fiscal / taxation purposes, aiming to a more rational real estate taxation system, designed for decentralized operation with various levels of access, security and functionality. Local authorities tend to have a better knowledge and understanding of local land-use & urban planning parameters than central governments (figure 5), as well of proprietary issues keeping local land registries, of operational procedures in their legal, technical & financial aspects and of an overall fiscal administration, and that is why the proposed CAMA operation on a local authority level seems like a promising idea. Whatsoever, technically, taxation systems are always designed on a local authority level, although they are administrated on a centralized general government level.



Figure 5: Fully documented properties in Chalandri municipality in Greece on a local authority level (Labropoulos, 2012)

Developing a CAMA system locally would enable its operation in two levels:

- The traditional role of mass valuation and property value prediction, though with significantly higher adjustment due to the more homogeneous area it would cover, as well as due to the better knowledge of the study area by its administrators. Additionally such a system could serve as a market analysis tool, a reference base for market values, a valuation tool for big private or public real estate portfolios, a powerful development tool used for expropriations, land-exchange, development projects etc (figure 6).

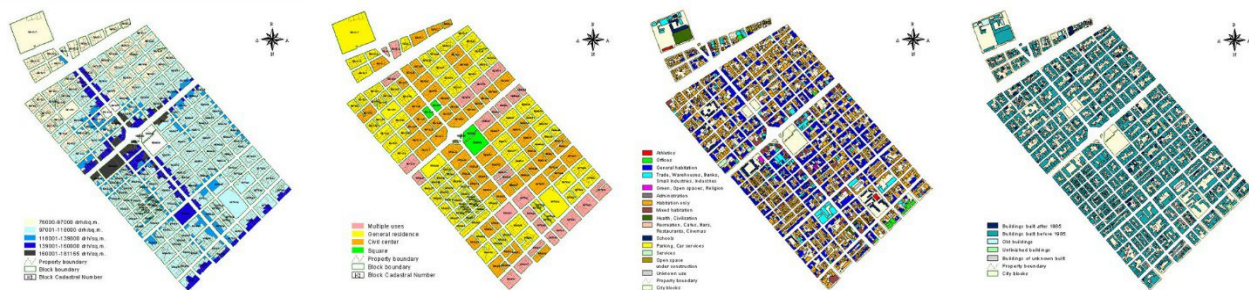


Figure 6: Property values' distribution, planned & existing land-use and age of buildings in Kallithea municipality in Greece (Labropoulos et al, 2000)

- The reverse role by exploiting all other non-value data of the system. All the cadastral, urban planning, land-registry, land-use, building terms & conditions, public transportation, public utilities, traffic regulation, illegal constructions etc info usually inserted in GIS format in a CAMA system constitute an excellent tool for local authorities administration, public works programming, malfunctions reporting, new building permits administration, future city plan expansions etc. providing a Land Policy tool, connected to social, economic & geographical criteria (figure 7)

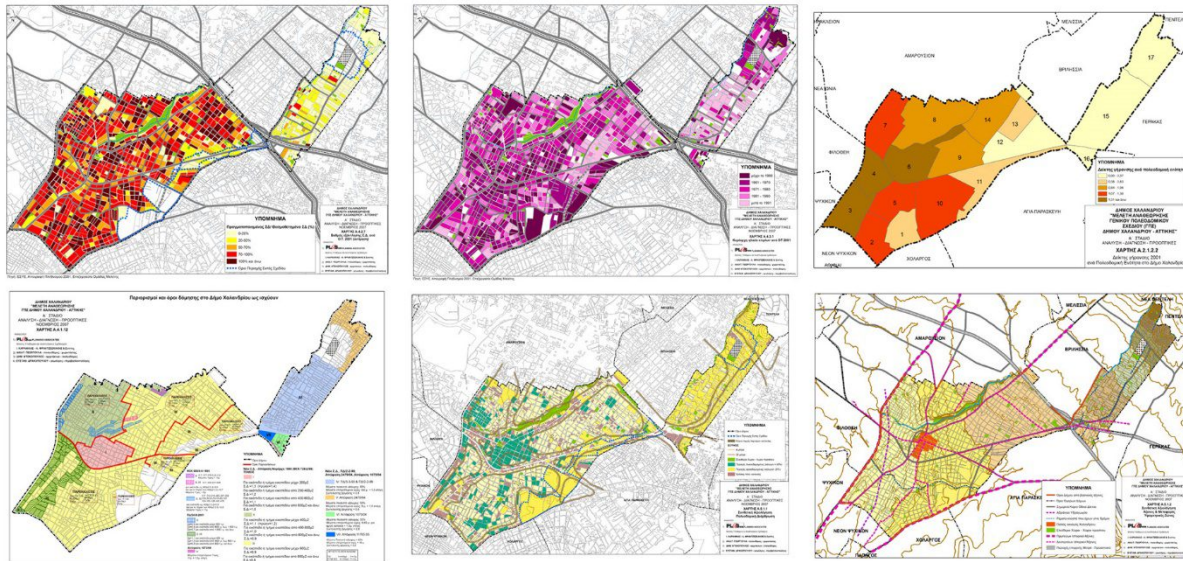


Figure 7: exploitable GIS data within the (GIS integrated) CAMA system (Labropoulos, 2013)

The interaction between the (GIS integrated) CAMA system and the GIS registration, management & administration platform of a local authority can be mutually beneficiary, in terms of better monitoring the adjustment of values, of precisely defining neighborhoods, of spotting 'anomalies' of the system and generally of deeply understanding its structure and operation, in order to produce a fair and equitable local taxation system.

According to Dimopoulos et al (2014), this system provides a source for a more vigorous objective and cost effective solutions to compare and value properties because it offers the most current and up to date information that is available for those who are interested in assessing property values. Thus, CAMA is a powerful tool that can be used to gain information required and when it is needed. Hence, it can assist assessors to prepare value estimates for a large number of properties, on a yearly basis, and at a given point in time during the past years to handle the logistic challenge that is presented by the task of property valuation. Its use allows for the application of a systemic approach of appraisal to groups of properties at a given date through the use of standardized procedures and statistical testing and analysis methods. The use of CAMA ensures the performance of annual mass valuation and assists in updating property values at the same time on a large number of objects by using common valuation models and ensuring accuracy.

4. CONCLUSIONS

Property taxation can indeed become a revenue generation avenue that local authorities can use to buttress their fiscal autonomy and generate income with two conditions. Zoning laws should be implemented that would prevent landowners from moving to other jurisdictions or using their properties in less efficient ways, as well as valuation models should be developed that will be able to effectively and accurately compute the taxable value of properties subject to taxation. The application of hedonic or mass appraisal techniques like AVM, multiple regression analysis, OLS, and GWR can aid local authorities not only in the generation of income, but also in ensuring that the tax levied on landowners is fair and accurate, something that will lead to increased satisfaction among taxpayers and this will, in turn, improve their willingness to pay the taxes.

REFERENCES

- [1] Benjamin, J., Guttery, R., & Sirmans, C. 2004. Mass appraisal: An introduction to multiple regression analysis for real estate valuation. *Journal of Real Estate Practice and Education*, 7 (1), 65-77.
- [2] Budzyński T., Wilkowski W., 2006, Application of Artificial Neural Networks for Real Estate Valuation, XXIII FIG Congress: Shaping the Change, Munich, Germany, October 8-13, 2006
- [3] Dimopoulos T., Labropoulos T., & Hadjimitsis D. 2014. Comparative analysis of property taxation policies within Greece & Cyprus, evaluating the use of GIS, CAMA & Remote Sensing techniques, SPIE 9229, Second International Conference on Remote Sensing and Geoinformation of the Environment, Conference Proceedings, 2014
- [4] Eckert J. (editor), Gloudemans R., Almy R. (senior editors), "Property Appraisal and Assessment Administration", The International Association of Assessing Officers (ISBN: 088329-081-2), 1990
- [5] Feng, X., Ljungwall, C., Guo, S., & Wu, A. 2013. Fiscal Federalism: a refined theory and its application in the Chinese context. *Journal of Contemporary China*, 22 (85), 573-593.
- [6] Fischel, W. 2013. Fiscal zoning and economists' views of the property tax. *Lincoln Institute of Land Policy Working Paper*, 1-24.
- [7] Labropoulos T., Zentelis P., 2007, "Real Estate in Greece: Taxation-Valuation-Development-Management", FIG Working Week and XXX General Assembly in Hong Kong SAR, China, May 13-17, 2007
- [8] Labropoulos T., 2012, "Towards an integrated GIS & CAMA system for residential property taxation in Greece", *Proceedings of the FIG Commission 9 - Study Group 9.1.2 "International Workshop on Mass Appraisals"*, Neapolis University Pafos, Cyprus, 14-16/09/2012
- [9] Labropoulos T., 2013, "Computer Assisted Mass Appraisals for residential properties in Greece", PhD Thesis, National Technical University of Athens, Greece
- [10] Lewis, D., & Plantinga, A. 2007. Policies for habitat fragmentation: Combining econometrics with GIS-based landscape simulations. *Land Economics*, 83 (2), 109-127.
- [11] Miller, S., & Tabb, W. 1973. A new look at a pure theory of local expenditures. *National Tax Journal*, 26 (2), 161-176.
- [12] Moore, W. 2006. Performance comparison of automated valuation models. *Journal of Property Tax Assessment & Administration*, 3 (1), 43-60.
- [13] Moshkovich, H.M., Gomes L.F.A.M., Mechitov A.I., 2011, An integrated multicriteria decision-making approach to reale state evaluation: case of the todim method. *Pesqui. Oper.* [online]. 2011, vol.31, n.1, pp. 03-20. ISSN 0101-7438.
- [14] Sipan, I., Ali, H., Ismail, S., & Abdullah, S. 2012. GIS-based mass appraisal model for equity and uniformity of rating assessment. *UTM-IBIMA International Real Estate Conference*, 1-16.
- [15] Tiebout, C. 1956. A pure theory of local expenditures. *The Journal of Political Economy*, 65 (5), 416-424.
- [16] Vappas T., "A comparative study on real estate property taxation in Europe", UIPI publication *Taxation in Europe 2010*, 2010
- [17] Zentelis N., Labropoulos A., Zentelis P., "Development of an Urban Information System based on Cadastral data", *Proceedings of the 4th Annual URISA & IAAO Integrating GIS & CAMA Conference*, Miami Beach, Florida, April 16-19, 2000
- [18] Zentelis, P. 2007. Development of a CAMA system for urban property in Greece based on Cadastral data. *Journal of Property Tax Assessment & Administration*, 23-40.