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# THE EFFECTS OF TAX DEDUCTIBILITY ON THE MIX OF PROPERTY TAXES AND USER CHARGES: AN EMPIRICAL ANALYSIS OF THE SPANISH CASE (*)

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**ABSTRACT:**

This paper tests some hypothesis about the determinants of the local tax structure. In particular, we focus on the effects that the property tax deductibility in the national income tax has on the relative use of the property tax and user charges. We deal with the incentive effects that local governments face regarding the different sources of revenue by means of a model in which the local tax structure and the level of public expenditure arise as a result of the maximizing behaviour of local politicians subject to the economic effects of the tax system. We attempt to test the hypothesis developed with data corresponding to a set of Spanish municipalities during the period 1987-9l. We find that tax deductibility provides incentives to raise revenues from the property tax but does not introduce a biass against user charges or in favor of overall spending growth.

**KEY WORDS:** Local government finance, tax deductibility, property tax.

**CODIS JEL:** H71, H23, C51

**RESUM:**

Aquest treball contrasta algunes hipòtesis sobre els determinants de l'estructura fiscal local. En concret, analitza els efectes que la deducció de l'impost sobre la propietat residencial en la base de l'impost sobre la renda té sobre la utilització relativa de taxes i de l'impost sobre la propietat residencial. Els incentius experimentats pels governs locals en relació a la utilització de diferents fonts d'ingressos són analitzats mitjançant un model en el qual l'estructura fiscal i el nivell de despesa pública local sorgeixen com a resultat del comportament maximitzador del polítics locals subjecte als efectes econòmics del sistema fiscal. S'intenten contrastar les hipòtesis desenvolupades amb dades corresponents a la utilització relativa de l'impost sobre la propietat residencial i les taxes d'un conjunt de municipis espanyols durant el període 1987-91. Els resultats de l'anàlisi empírica mostren que la deducció proporciona un incentiu a augmentar els ingressos aconseguits de l'impost sobre la propietat però no introdueix un biaix contra la utilització de taxes o a favor del creixement de la despesa local.

**PARAULES CLAU:** Hisenda local, deducció d'impostos, impost sobre la propietat

**CODIS JEL:** H71, H23, C51

## I. INTRODUCTION

This paper tests some theoretical hypothesis about the tax-setting behaviour of local governments. In particular, we focus on the effects that property tax deductibility in the personal income tax of the central government has on the relative use of the property tax and user charges. We attempt to test this hypothesis with data corresponding to a set of Spanish municipalities during the period 1987-9l.The structure of the work is as follows: in the rest of section I we review some related literature about the topic analysed and explain the basic facts about spanish local public finance that have lead us to the develop this study; in section II we sketch a theoretical model which allows to keep in mind most of the factors introduced up to the moment; in section III we attempt to test the developed hypothesis by means of a panel of data that includes 40 municipalities of more than 10,000 inhabitants in the metropolitan area of Barcelona during the period 1987-91.

### *I.A. Review of the literature:*

The empirical literature on local decision-making consistent with a rational behavior of political agents has been centered almost exclusively in the expenditure side of the budget. Remarkable exceptions to this general tendency are the works of Sjoquist [1981] and of Hettich and Winer [1984 and 1991]. The first two studies, both referred to the USA case, attempt to explain, respectively, the use of the property tax by local governments, and of the personal income tax by the states. The third paper analyzes the mix of tariffs and public debt in the Canadian federal budget during the last years of the XIX century. The investigations of Inman [1985 and 1987] on the fiscal decisions of the big USA cities are also especially remarkable. The work of Inman could be framed in a wider group of studies generated soon after the USA debate about the removal of state and local tax deductibility in the federal income tax. Some outs-

tanding works of this group are: Feldstein and Metcalf [1987], Holtz-Eakin and Rosen [1987 and 1990], Lindsey [1987], and Gade and Adkins [1990].

The theoretical foundations of the literature on the determinants of the local tax structure are less solid and more recent than those that form the basis of the empirical analysis of local public expenditure. In the first case, due to the multidimensionality of the problem, the utilization of the median voter paradigm (Sjoquist [1981]) is not appropiate. Some theoretical works (Hettich and Winer [1988, 1997a, 1997b], Warskett, Winer and Hettich [1998], and Chernick [1992]) base their modelling of tax decisions in recent results of the probabilistic voting literature. In these models the fiscal structure is not determined by the median voter preferences but by a weighting of the preferences of all the population. This will be the option adopted in this study, as will be checked in section II.B.

*I.B. Changes in Spanish local public finance:*

Empirical works on the determinants of local fiscal decisions are practically non-existent in the Spanish case. We could cite as an exception the works of Monasterio and Suárez [1989] and of Bosch and Suárez [1993a, 1993b, 1994). Both works are centered only in the determinants of the size of the local public sector, and not in the use of the different tax sources.

However, most of the debate on Spanish local public finance since the beginning of the eighties has been focused on the revenue field. The discussion has been related to the need of giving sources of revenue to solve the historic scarcity of resources of local governments. Two general solutions have been the increase in the volume of financial aid from the central government and the capacity to decide the tax rates of local taxes up to a certain threshold.

The municipal public finance reform carried out by the Local Government Act of 1988 increased the possibilities of local financial autonomy and modified the structrure of revenue sources with the aim of simplifying the local tax structure in some cases and of enlarging revenue capacity in others. Residential property tax, user charges, local business tax, and local motor vehicle tax are the main tax sources available to Spanish municipal governments, accounting approximately for 1/3, 1/3, 1/5 and 1/10 of total tax receipts. The remaining tax revenue comes from a tax on land value improvements, a tax on building activities, and some other minor taxes. In the early years of democracy, Spanish municipalities did not have any tax-setting power over these revenue sources. In the second half of the eighties they were granted with the power to set the tax rates of the various local taxes up and above a threshold. The Local Government Act of 1988 was the confirmation of this process of tax-power devolution. The tax-setting capacity of Spanish municipalities is now considerable, since the bottom-top tax rate distance allows wide differences in tax liabilities between municipalities (from 200% to 300%, depending on the tax). In addition to this, the top tax rate has not been reached by almost any municipalities (See Solé Vilanova [1990]). The fact that the municipalities can decide to use or not two of the taxes - the tax on land value improvements and the tax on building activities - also contributed to enlarge its tax-setting possibilities. Certainly, all these factors impelled the growth of the public municipal sector. However, the initial optimism has, to a certain extent, disappeared as the main tax sources caused the citizenship's disagreement[1].

Financial aid to the municipalities by the central government also suffered big changes soon after the Local Government Act went into effect. The two main kinds of unconditional aid are a lump-sum grant and the possibility of de-

[1] For example, the many complaints received during the 1991 campaign of the residential property value reassessment postponed the process until 1996 and introduced many doubts about the main role that the property tax should play in the new municipal Spanish public finance.

duction of some local taxes in the central ones. With regard to the grant, the increase of resources has been very large[2]. On the other side, the effect of the introduction of the property tax deductibiliy is more uncertain- although the loss of revenue it supposes to the central government is also large[3]. It should be kept in mind that this type of aid affects directly to the pockets of the citizens, while it affects just indirectly, through a greater tolerance by the taxpayers to the increase in the deductible tax, to the council's budget.

Furthermore, as long as the unconditional grant and the deduction of the property tax are not neutral respect to the municipal tax mix, the changes in unconditional aid introduced at the end of the eighties could have had undesired collateral effects. The first instrument, through the variable fiscal effort, could have stimulated the utilization of taxes over user charges[4]. The deduction of the property tax supposes a similar discrimination concerning non-deductible tax sources. In fact, Solé Vilanova [1992] suggests that the deduction could be one of the causes of the substitution of some user charges (refuse collection and sewerage charges) by increases in the property tax.

Nevertheless, all these statements require an empirical validation. With this objective, this work analyzes the evolution of municipal finance in the pe-

[2] Current grants and tax receipts are approximately 1/3 and 2/3 of total current revenues. The unconditonal grant represents 4/5 of current grant funds. The amount of resources distributed has nearly doubled since those years but its share in the budget has remained roughly the same, given the growth in tax receipts. Also the unconditional grant was institutionalized as a formula grant. This has given more stability to municipal budget-making.

[3] It has to be noted that th property tax deductibility is not the only deduction or credit of local taxes allowed.The local bussiness tax is deductible in the calculation of the personal income base tax or the corporate income tax base, depending on whether the taxpayer is a corporation or not. Also, since the Local Government Act of 1988, the local tax on land value improvements benefits from a 75% tax credit in the personal income tax.

[4] A ¼ of unconditional grant is distributed according to the ratio between real receipts from municipal taxes and potential receipts that the municipality could have reached if the threshold tax rates had been settled. This is called the "fiscal effort" variable. Given that user charges receipts are not included in this calculation, the grant could have provided incentives for its removal. However, it must be noted that the grants' distribution only follows the formula for yearly increments above the status quo (see Solé Vilanova [1990] and [1992]). Considering this effect as negligible we will treat this grant as a pure lump-sum one.

riod 1987-91, focusing in the behavior of the residential property tax and user charges. We should disentangle the variation of the property tax receipts and user charges due to the effects of intergovernmental aid (the incentives to their utilization implicit in the deduction), to the characteristics of the tax that make it more or less desirable that other tax sources (the degree of progressivity, the perception of horizontal inequity, the degree of distortion, or administration costs) or to characteristics of the municipality, which explain the demand of local public services (level of income, or resident population).

## II. A POSITIVE MODEL OF LOCAL TAX STRUCTURE

In this section two different aspects of the determination of local tax structure are discussed. First of all, we pretend to identify the determinants of the desired volume and mix of the local budget at the individual level. In the second place, individual preferences for the tax and local public expenditure levels will be used in section II.B in order to analyze the equilibrium fiscal policy arising from a model of electoral competition. In the developed model the equilibrium fiscal policy does not rely on the preferences of a single individual (i.e. of the median voter) but is a weighting of the preferences of the different individuals/groups. This model is used afterwards in order to analyze the effects of tax exporting, comparing the results obtained to those of the traditional studies on the effect of tax deductibility.

### *II.A. Individual behaviour:*

As a previous step to the study of local fiscal policy determination, in this section we examine individual preferences for the tax system. It is supposed that each individual derives utility from the consumption of a composite private good, $x_i$, housing services $h_i$, and a good provided by the local government, $g_i$ - determined from a function like $g_i=N^{-a}.g$, where $N$ is the population of the mu-

nicipality and $g$ is the quantity of local good. If $a = 0$, then the local good is a pure public good, while if $a = 1$ it is a pure private one - each consumer gets a share $1/N$. The after tax prices of the $x$ and $h$ goods are $p_x$ and $p_h$ , $y_i$ is personal income net of taxation and transfers of higher levels of government, and $T$ is a local head tax. Two are the main characteristics of this kind of tax: it is a lump sum tax -therefore, the resulting excess burden is zero-, and the tax liability is the same for each individual. We consider producer prices constant, taking the value of one. Therefore, consumer prices are $p_x=1+t_x$ and $p_h=1+ d.t_h$ , where $t_x$ and $t_h$ are effective ad-valorem tax rates,and $d$ is the property tax share borne by the individual after the deduction in the central personal income tax, where $d =1-t_i$ and $t_i$ is the individual's marginal income tax rate.

Consider the election of tax and expenditure levels by each individual. Could the individual impose her will, she will choose a vector of tax rates and a level of expenditure to maximize her utility, subject to the local government budget constraint and her private good demand functions. We could define the indirect utility function as:

$$V(p_x , p_h , y - T, g) = V(1 + t_x , 1 + d.t_h , y - T) + v(g) \qquad [1]$$

The local govenment budget constraint could be spelled as:

$$G = c.N^{-a}.g = t_x . X + t_h .H + T.N + S \qquad [2]$$

where $X$ and $H$ are the overall tax bases of the jurisdiction, $c$ is the unit cost of provision and $S$ the unconditional aid received by the local government. The problem of the individual is the maximization of [1] subject to [2]. Since the budget of the local government is balanced, just three of the four fiscal parameters ($t_x$ ,$t_h$ ,$T$ and $g$) constitute possibilities of free election for the individual. In our case the tax rates that burdens the two private goods ($t_x$ y $t_h$ ) and the head tax ($T$) are selected as decision parameters, with public expenditure simply adjusting so that the budget is balanced. The first order conditions for the solution of this problem [Solé Ollé [1996)] lead to the following expression:

$$\frac{m_x.c.N^{-a}}{1+J_x.\Psi_x}=\frac{m_h.dc.N^{-a}}{1+J_h.\Psi_h}=m_T.c.N^{-a}=\frac{V_g}{V_y} \qquad [3]$$

To reach this result we have used the properties of the utility function: $V_x = -a\ .x$ and $V_h=-a.h$, where $a=V_y$ is the marginal utility of income, and have also forgotten cross-price effects. We have named the tax-shares of the individual in the head tax and in the taxes $x$ and $h$ as $m_T=1/N$, $m_x=x/X$, and $m_h=h/H$; own-price elasticities of the $X$ and $H$ bases as $Y_x$ and $Y_h$, and effective tax rates as a share in after-tax prices as $J_x=t_x/(1+t_x)$ and $J_h=dt_h/(1+dt_h)$.

The left part of expression [3] could be interpreted as the marginal cost of provision of an unit of local public service in case of being financed by each of the three tax sources available to the local government, while the right part of the expression could be interpreted as the marginal benefit of the local public service. That is to say, optimal effective tax rates for a given individual are those for which the cost of an additional unit of provision is equal for the different tax sources and is simultaneously equal to the public expenditure marginal benefit. We could see, starting from expression [3], how the marginal cost of local service provision relies on two different groups of factors. A first type of determinants gathers supply factors: the unit cost of service production ($c$), the degree of publicity of the service ($a$) and the population of the jurisdiction ($N$). A second type of determinants of the marginal cost of provision depends on the characteristics of the tax system available to the local government: the share of the individual in the tax base ($m$), the percentage of the tax deductible in the tax of a higher level of government ($d$), the own-price elasticity of the tax base ($Y$), and the degree of utilization of this tax ($J$)[5]. In the case of the head tax, the marginal cost of public services depends only on the unit cost of provision, on

[5] In this case, given that the studied taxes are local, the distortion includes the effects of the tax on the interjurisdictional mobility of the tax base. That is to say, besides the reduction in the consumption of the taxed good, the elasticity of the tax base has also in bill the consumption

the congestion parameter and on the population of the jurisdiction. The tax-share is in this case *1/N* and the distortion provoked by the tax is zero, thus the marginal cost does not rely on the level of the effective tax rate neither on the level of service provision to finance. These considerations imply, for example, that although a low income individual could prefer the property tax over a head tax as a mean to finance the local government (given that for she $d(h/H)<(1/N)$), as the level of provision of the service to finance grows she could accept the utilization of the head tax if the distortion provoked by the property tax is large enough.

The existing empirical literature on the estimation of local services demand (Barr and Davies [1966], Borcheding and Deacon [1972], and Bergstrom and Goodman [1973]) does not consider the possibility of financing local services by means of distortionary taxation[6]. The assumption of the tax base totally fixed is not consistent with the non-zero price-elasticities observed in empirical studies of taxed goods demand. This means that the taxes used in the practice are distorting, but that these distorting effects do not play any role in the underlying model of collective decision-making.The assumption of a fixed tax base could be justified resorting to the argument that considers the individuals "myopic" concerning the effects of local tax policies; that is to say, that they do not perceive appropriately the effects of tax rates on the demands of the taxed goods.Therefore, although they react to the fiscal incentive as consumers, they do not keep that in mind when playing in the political market. However, an im-

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that quits being carried out in the jurisdiction in order to be carried out in neighboring jurisdictions.

[6] These are just the pioneer works in the extensive field of research on the estimation of local public goods demand. The interested reader could find theoretical revisions of the material in: Inman [1979, 1987], Rubinfeld [1987], and Wildasin [1986 and 1987]. The significance of the tax distortions in the design of the tax system has been rigorously analysed by the optimal tax theory literature, starting from the work of Diamond and Mirrlees [1971]. For an attempt to connect the normative approach and the empirical studies on local public goods demand see Wildasin [1988 and 1989].

portant argument in favor of the introduction of distorting taxes exists in the model. In the specification of our model, the individual decides simultaneously the optimal level of service provision and tax rates. In this model, to difference of other studies, each individual's share in the payment is not considered exogenous, but comes determined by the same optimization process by which the individual decides the level of service provision. The factor that allows to join these two decisions are the distortions provoked by the different tax sources. Observe that if none of the taxes are distorting the marginal costs of financing by means of different sources will be constant and equal to the share of the individual in the cost of provision of a unit of service. In this case, the equilibrium reached by the individual will consist in a given level of provision financed with a single tax, regardless of the desired level of expenditure.

This could be easily seen from the graphic representation of the model. In figure 1 we present the level and mix of the equilibrium budget for a hypothetical individual. We name *Cx*, *Ch* and *CT* the marginal cost of provision of a unit of public expenditure financed by the taxes *X* and *H*, and the head tax, respectively. *B* indicates the marginal benefit of the local public expenditure. The aggregate marginal cost function (*CA*) is obtained as the horizontal sum of the marginal cost functions of each one of the tax sources[7]. The intersection between *CA* and *B*, locus where *Cx=Ch=CT*, determines the optimal volume of local public expenditure (*G*).The share of each one of the taxes in the revenue

[7] The marginal cost and benefit functions represented are lineal; this is only to simplify the understanding of the graph. Note also that in order to carry out the graphic analysis the variables used are the receipts but not the tax rates. This solution is adopted in order to facilitate the graphic analysis and because it is the option used subsequently in the empirical analysis, as long as it has been impossible to obtain data on the effective tax rates. The utilization of the receipts instead of effective tax rates introduce a small modification in the model. The receipts are equal to the tax rate multiplied by the tax base. As we have seen previously, the marginal cost valued at a given level of the tax rate is growing with the percentage that this represents in the after-tax price. Therefore, the tax rate needed to obtain a given level of revenue is smaller the wider the tax base. This implies that taxes with wider bases will have a marginal cost function that will grow less markedly upon the increase in the receipts.

budget is determined by the intersection of the different marginal cost functions and the equilibrium level of marginal benefit. *Rx, Rh* and *RT* indicate the receipts of the three tax sources.The budget equilibrium condition requires $Rx+Rh+RT=R=G$.

Note how in the example of the figure 1 the tax with a lesser marginal cost at a zero level of receipts is the property tax (*H*), while the source with a higher marginal cost in this point is the head tax (*T*). When tax rates are zero, the only difference between the marginal cost of the two taxes comes from the differences in tax shares that the individual experiences for each source. Given that the two taxes, *X* and *H* could hardly be more regressive than a head tax, we infer that the graph represents a low income individual's optimal budget.

However, given the growing marginal costs of the *H* tax, it soon quits being the better tax for our individual. From the point where the marginal cost of *X* and *H* are equal, the marginal cost function of the *H* tax grows faster than the one of the *X* tax. From this point, the individual prefers to finance additional increases of local public expenditure by means of the two taxes, with a growing share of the *H* tax in the marginal increments of expenditure. Later on something similar occurs with the head tax. From a certain point, this tax presents a marginal cost lower to the aggregate marginal cost function. Once this point has been reached, the increases in public expenditure will be financed only with this tax source. This is due to the stability of the head tax marginal cost, given its absolutely non-distorting character. Note in the graph how the aggregate marginal cost function has a flater slope than those of each tax, being more horizontal as the number of sources available to the local government increases. Given the positive slopes of the marginal cost functions, the diversification of tax sources allows to reduce the cost of financing increases in the local expenditure budget.

The effects of residential property tax deductibility on the level and mix of the local budget are showed in figure 2. The property tax marginal cost function moves downwards until *Chd*.This is due to two factors: in first place, the burden of the tax borne by the individual decreases in the percentage of deduction; in second place, the deduction contributes to reduce the distortionary character of the tax due to its effect on the $\vartheta$ parameter of expression [3]. These two factors make the marginal cost of the *H* tax be lower than the one of the *X* tax at higher levels of receipts with regard to the situation without deduction. It could be observed in figure 2 how the *X* tax begins to be used at higher levels of expenditure. This makes the aggregate marginal cost function also more horizontal. However, it could be checked how still in the case of the deduction it could be necessary to resort to the head tax to finance high levels of expenditure. Although the deduction still stimulates the increase of the utilization of the deductible tax, it does not mean (in the example of the figure 2) an increase of local public expenditure. The only effect of the deduction is in this case the substitution of part of the receipts of the head tax (from *RT* to *Rtd*) by higher receipts of the property tax (from *Rh* to *Rhd*).

This result contrasts with the conventional vision of the effects of tax burden exporting to the non-residents in the jurisdiction on the level of local public expenditure. With few exceptions, the literature on tax exporting gets a clear conclusion: by transfering a share of the local public burden to the non residents, tax exporting stimulates higher levels of expenditure (Bird and Slack [1983], Hogan and Shelton [1973], Ladd [1975], Oates [1972] and Zimmerman [1983]). This conclusion is valid if the local government had only one tax source available in order to finance its expenditure. In this case, the deduction moves to a reduction of the marginal cost of local public service provision and therefore stimulates the growth of the local public expenditure depending only on the price elasticity of its demand.

This conclusion has been criticized by some authors (Wildasin [1988 and 1989]). From the results of the developed model it could be checked that, if the local government had various tax sources at its disposal, the deduction could stimulate the growth of public expenditure only in some particular cases. If the deductible tax is the tax utilized in the margin -or if the deduction converts it in the tax used in the margin - the export of part of the burden of this tax will decrease directly the marginal cost of public expenditure and will in fact stimulate the growth of expenditure. On the other hand, if the deductible tax is not the tax used in the margin, the effect of the deduction on local public expenditure will rely on the characteristics of the tax used in the margin. If this tax is absolutely non distorting - as in the case of the head tax shown in figure 1 - public expenditure would not be stimulated at all and the deduction will only mean a substitution between tax sources. If the tax utilized in the margin is distorting, tax exporting will stimulate local expenditure, but not in the margin. The stimulus comes from the minor necessity that, given the increase of the receipts of the deductible tax, the local government has of exploiting the distorting taxes in the margin so intensively in order to finance public expenditure increases. The fact that the marginal cost function of this revenue source has a positive slope means that the deduction will move downwards the aggregate marginal cost[8].

[8] It still exists another way by which the deduction of a tax -or the export of the tax burden in general- could come to affect local public expenditure. If the income-elasticity of local publics goods is positive, then the transfer of the tax burden to the non residents could stimulate the public expenditure. If the income-elasticity is small or the exportable tax represents a reduced share of individual income this effect will be also less important. It should be kept in mind that the gain in real income of some individuals due to tax exporting represents a loss for others. In the case of classical tax exporting the harmed are the individuals of other jurisdictions. In the case of tax deductibility, the harmed are all the taxpayers of the country and not only the residents in other jurisdictions. In absence of any hypothesis on the road utilized by the higher level of government in order to finance the cost of the deduction it is not possible to determine the sign of the income effects. See Buchanan and Pauly [1967] for a discussion of the balanced budget incidence of deductibility; see Morgan and Mutti [1983] for a balanced budget measurement of personal tax exporting in the case of USA states. However, the income effect is not quantitatively significant; for example, Gramlich [1985] calculates the magnitude of the income effect of the deductibillity of USA state and local taxes to be between

The effects of lump sum grants also result somewhat different in this model than in the conventional model of demand of local public goods. Although the income effect of lump sum grants does not change, the fact that the marginal cost of receipts has a positive slope adds another possible via of influence of grants on public expenditure.The grant (or any another local source of revenue, considered as exogenously determined) reduces the use of other distorting sources of revenue. The smaller is the overall quantity to finance the smaller is the aggregate marginal cost.Given that the desired level of public expenditure relies on the marginal cost of obtaining public revenues, its reduction causes an increase on expenditure higher than the usual income effect. That is to say, intergovernmenal grants do not solve financial inadequacies of local governments just because they give them additional resources, but because the share of grant devoted to the reduction of taxation implies a decrease of the marginal cost of public funds and, therefore an additional increase in the provision level of local public services. According to some authors (Hamilton [1983], Wildasin [1984]), this could contribute to explain the socalled "flypaper effect"; that is to say, the reason why, in most empirical studies, the stimulative effects of lump sum grants on local public expenditure are higher than those of private income.

*II.B. Collective behaviour*

Given the diversity of preferences among individuals, local communities should be capable to reach a single solution concerning the fiscal politicy to adopt. It does not exist, however, any agreement on the correct specification of a decision-making model at the local level. This paper models the budget decisions of local communities as the result of a process of electoral competition

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2.5% and 1% of family income depending on the marginal tax income tax rate being 50% or 20% , and with a share of the deductible taxes in family income of a 5%. In the Spanish case, the same marginal tax rates applied to the residential property tax deduction (considering pro-

between political parties. Some empirical works on local finance have used as a theoretical basis the better known result of the formal political theory: the median voter theorem, attributed to Hotelling [1929] and Downs [1957]. In the representative democracy model of Downs the political preferences of voters are represented along a single ideological left-to-right dimension. It is supposed that each voter has a unimodal distribution of preferences concerning this dimension. In these circumstances, if all the voters vote, and they vote for the candidate whose platform is next to the policy that maximizes their utility, both candidates will be allocated in the position preferred by the median voter. However, the assumptions of this model are not very realistic and the consequences of its abandonment radical. But maybe the most serious problem of this kind of models arises as the number of dimensions where the candidates could compete increases. In this case, "the equilibrium disappears and with him the predictive power of the econometric models that used this concept of equilibrium" (Mueller [1989, pp.196])[9]. The practical solution adopted by the theoretical and empirical work on the determinants of public expenditure and revenue is usually the simplification of the problem, reducing the different political dimensions to one[10].

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perty tax receipts a 1% of family income) would represent between 0.5 and 0.1% of family income.

[9] Some authors have tried to extend the result of the median voter model to a multidimensional space (See, for example, Plott [1967] and Davis, DeGroot and Hinich [1972]). These works gives "generalized median voter theorems", establishing the existence of equilibrium in elections with two political parties at median locations defined in unidimensional subsets of the political space, whenever certain assumptions are satisfied about the preferences of voters. Unfortunately, "the assumptions used in order to demonstrate the existence of equilibrium are extremely restrictive, so restrictive that we expect that they will be hardly ever completed" (Feldman and Lee [1988, p. 205]).

[10] This is, for example, the tactics of Meltzer and Richard [1981 and 1983]; they assume that redistributive politics is carried out through only two instruments: a lump sum subsidy that benefits all the individuals and a proportional income tax. Given the budget constraint, the election of the tax rate determines the quantity of the lump sum subsidy. Therefore the problem is unidimensional and, in equilibrium, the combination subsidy-tax favored by the mediam voter is elected. However, this assumption reduces the capacity of adaptation of Meltzer and Richard's model to the different empirical phenomenons related to the issue of redistri-

In the model developed in section II.A, the simultaneous determination of public expenditure and tax rates of three sources (*X*, *H* yand the capitation tax, *T*) makes the dimension of our problem three. The preferences of the median voter would determine the equilibrium fiscal policy only in very particular situations. Therefore, the spatial deterministic voting model is not suitable for our empirical purposes. With the goal of avoiding the necessary restrictive assumptions in order to demonstrate the existence of equilibrium in models of deterministic voting, some authors have began to utilize probabilistic models of elections, in which the individuals vote according with a probability function based on their preferences, and the political parties maximize the expected number of votes.[11]

Suppose that the two political parties that compete for local office [the party now in the government (*g*) and the challenger (*o*)] choose their strategies in a situation of uncertainty. The voters form expectations on their utility under the victory of each of the two candidates.We can write, therefore, the utility that

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bution.Their work is only able to explain the causes of vertical redistribution (from rich to poor or vice versa) but is not able to approach the problem of horizontal redistribution; it could not give any evidence about the hypothesis according to which the redistribution is produced in favor of the middle class and in detriment of the tails of the distribution, well-known like the "law of Director" (Stigler [1970], Tullock [1971]). A model that has as variables of election by the political parties the net fiscal balances (taxation less transfers) of the N individuals of a community would have a dimension N-1; for this type of models it does not exist a equilibrium in a deterministic spatial model of political competition (Coughlin [1986], Flowers [1981]). Another possible via it of simplification is that adopted by Sjoquist [1981] in his analysis of the utilization of the property tax by USA local governments: he considers as exogenous one of the dimensions - in this case the local public expenditure - arguing that its determination is totally independent of the tax-setting process. In this case, with only two tax sources and the level of expenditure constant, the budget constraint reduces the problem to one dimension. However, the adoption of this type of solution carries out an important problem: the median voter model becomes an "artifact" (Hinich [1977]).

[11] The first probabilistic voting models were used in order to study the effects of the abstentions on the equilibrium in the spatial deterministic model (see, for example: Hinich, Ledyard and Ordeshook [1972] and McKelvey [1975]). Other probabilistic models of bipartisan competition without abstentions are: Hinich [1977], Coughlin [1986 and 1992], Coughlin and Nitzan [1981a], Lindbeck and Weibull [1988], and Feldman and Lee [1988]. In most of these works, the equilibrium results are obtained without carrying out the restrictive assumptions of the deterministic model.

a voter gets from the victory of each of the two candidates as $U_i(p_g)$ and $U_i(p_o)$, where $p_g$ and $p_o$ are the electoral platforms of the two parties. We could introduce uncertainty in the model supposing the existence of other individual factors, not related directly with the fiscal policy platform of each party, that rely on the ideological identification of each individual, on personal characteristics of the candidates, on historical factors, or on other dimensions that could appear as important during an electoral campaign. These factors remain included in a reservation utility level, named $e_i$.The term $e_i$ could be understood as the expected loss of utility because of the fiscal policy that is necessary so that a given individual changes her vote. These terms, that vary from individual to individual, are not known with certainty by the politicians. It is supposed that the parties infer them from a density function $f_i(e)$ (and its corresponding distribution function, $F_i(e)$). In this case, the probability that a given individual votes for the party in office will be $P_i^{\,g}\ (p_g, p_o)=1$ if $U_i(p_o).- U_i(p_g) < e_i$ and $P_i^{\,g}\ (p_g, p_o)=0$ otherwise.

Each political party chooses its electoral platform with the objective of maximizing the expected margin of victory, ignoring the impact that its election will have on the performance in future elections. The solution of the problem for the party in office could be represented, in the concrete case of the model developed in section II.A, as the maximization of the following expression:

$$\underset{t_x^g, t_h^g, T^g}{Max} \sum_{i=1}^{N} \left\{ 1 - F_i \left[ V_i \left( 1 + t_x^g, 1 + d_i . t_h^g, y_i - T_i^g, \frac{\left[ t_x^g . X + t_h^g . H \right]}{c . N^{-a}} \right) \right.\right.$$

$$\left.\left. - V_i \left( 1 + t_x^o, 1 + d_i . t_h^o, y_i - T_i^o, \frac{\left[ t_x^o . X + t_h^o . H \right]}{c . N^{-a}} \right) \right] \right\} \qquad [4]$$

The formulation of the problem is exactly simetric for the challenger. It could be demonstrated (Lindbeck and Weibull [1988], Coughlin, Mueller and Murrell [1990a]) that, whenever the distribution function satisfies certain properties, the simultaneous solution of this problem by the two candidates forms a

Nash equilibrium in which the platforms of the two parties have to be the same[12]. Then, from the first order conditions of [4] the next expression follows (see Solé Ollé [1996]):

$$\frac{c.N^{-a}\sum_{i=1}^{N} f(b_i).m_{xi}}{1+J_x.\Psi_x} = \frac{c.N^{-a}\sum_{i=1}^{N} f(b_i).d_i.m_{hi}}{1+J_h.\Psi_h} = c.N^{-a}\sum_{i=1}^{N} f(b_i).m_{Ti} = \sum_{i=1}^{N} f(b_i)\ \frac{V_{gi}}{V_{yi}} \quad [5]$$

Where $b_i$ is the mean of function $F_i(e)$, that is, $b_i$ is the "expected reservation utility level" or "expected partisan bias" for each individual. The conclusion obtained from the results of this model of bipartisan competition is simple and easily understandable: each party acts as if it maximizes an objective function that is a weighted sum of utilities of all the citizens. The equilibrium in this multidimiensional context is not located at the ideal point of the median voter, but in a weighted mean. The weights received by each individual depend inversely on her expected bias in favor of one or the other party. In equilibrium, both parties will favor the voters whose partisan biases are minor -for which $f(b_i)$ is greater-. That is to say, redistributive politics will tend to equalize the yields obtanined from the benefits distributed to the different individuals; with this purpose in mind, politicians will both worry about the loss of utility for the individual because of the budget decisions and about the probability that the voter would be induced to change her vote. In this model, the voters that determine the fiscal policy are then the marginal or swing voters.

In this model, the comparative statics of the tax deductibility provision are not yet the same than those predicted in section II.A. It is still true that deductiblity reduces the property tax burden borne by residents. However, now the introduction of the deduction also causes an exogenous redistributive shock.

[12] Lindbeck and Weibull [1988] demonstrate the existence of equilibrium whenever the density function is unimodal, symmetrical and translate; that is to say, that the function has a single maximum, that $f_i(x_i)=f_i(-x_i)$, and that $f_i(x_i)=f(x+b_i)$. Given the symmetry of the density function, $b_i$ is at the same time the expected mean and median for the term $e_i$, named by the

That means that after the deduction the net pattern of incidence of the deductible tax has changed. Suppose, for example, that the residential property tax liability grows and population weights decrease with income level[13]. Let's suppose now that the deductibility provision is introduced. Because of that, the net property tax incidence pattern becomes more regressive. This pulls politicians out of the redistributive equilibrium. To maximize electoral support they have to change the tax mix against the property tax. However, to reduce the bud-get share of the property tax this redistributive effect should be greater than the traditional incentive effect. If the population weights would increase with income level, the redistributive and the incentive effect will work in the same direction: increasing the use of the residential property tax.

Traditional empirical works on the effect of tax deductibility on the utilization of the different tax sources and on local public expenditure tend to introduce some proxy of the average $d$effect. However, they forget the redistributive effect, possibly a significant feature of tax deductibility. Therefore, we will introduce in the empirical analysis of section III a measure of the inequality of the income distribution and of the redistributive shock caused by the introduction of the deduction. However, as we have explained, we could not make any prediction on the sign of these variables. If population weights decrease with income we must expect that municipalities with a more unequal income distribution would use the property tax more and user charges less, while the intro-

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authors as "expected partisan bias" in favor of the party in office for the individual *i*. The logit and probit density functions satisfie these properties.

[13] Residential property tax incidence is a problem for which the economical literature does not have a unique answer; for some authors, the tax is regressive (it is the denominated "traditional vision", that considers that the tax is borne in proportion to housing consumption - see Netzer [1966] and Musgrave [1974]), while for others is progressive (it is the denominated "new vision", that considers that the tax is borne by capital owners in all the economy - see Mieszkowski [1974]). The results of the new vision are based on the development of general equilibrium models; although this is surely the correct form of keeping in mind the economical effects of the tax system, its utility in the modelling of redistributive politics issues is not

duction of the deduction will cause two effects of opposite sign: a positive incentive effect and a negative redistributive effect. If population weights increase with the income level municipalities must utilize user charges more than property taxes, and the introduction of the deductibility must provoke two positive effects on the relative use of the property tax.

## III. EMPIRICAL ANALYSIS

### *III.A. Econometric especification*

The objective of this section is the specification of an empirical model of local fiscal decision-making that will allow us to test the different behavioural hypothesis derived from the comparative static properties of the model developed in section II.

The random variables to study are the property tax (*P*), user charges (*U*), and total current revenue(*R*) accrued to Spanish municipal goverments. The user charge variable includes the sewerage charge, the refuse collection charge, the price of water delivery and some other minor charges. The item total current revenue includes property tax and user charges receipts, and also the receipts from the local business tax, local motor vehicle tax, tax on land value improvements, other minor taxes, and current grants.

The election of property tax and user charges in order to carry out the empirical analysis is based on two fundamental reasons. First, the principal hypothesis to be tested centers in the property tax: the property tax deductibility is the feature that will allow us to analyze the incentive effects of higher level tax dispositions on the local tax and expenditure decisions. Although, and as we have yet noted, there are other tax credit and deductibility provisions in the Spanish case, the property tax deductibility is the only one that provides us

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so clear: the common opinion in the various empirical papers of this kind is that the residential property tax is regressive or, at least, it is perceived as regressive by the individuals.

enough municipal variability to perform an accurate test[14]. Second, the redistributive conflict at the municipal level is focused on the mix between these two revenue instruments. The refuse collection charge, the sewerage charge, and in some cases the price of water delivery have been items of revenue whose presumed regressivity have been sometimes alleged by party politicians and citizens.

The data used in order to carry out the analysis come from 40 municipalities of more than 10,000 inhabitants belonging to the area surrounding Barcelona during the period 1987-91. Although the readiness of the data has been the key for the election of the set of municipalities, the presence of sufficient variation in the tax variables is a desirable characteristic of our data set. It should be noted that this group of municipalities shows, for the period under the study, one of the most dynamic fiscal behaviours among all the Spanish municipalities. For this same reason, the conclusions of the study can be extended to the remainder of Spanish municipalities only with much caution. Equally, the selected years cover a period in which a big change in the Spanish municipal public finance occurred: it went into effect the Local Municipal Act of 1988. Although this fact hinders the econometric analysis to carry out, it allows us to examine a natural experiment in order to analyze the effect of the introduction of the property tax deductibility.

With the aim of taking the size of the analyzed municipalities in consideration, the (*P*, *U* and *R*) are divided by the resident population of the municipality (*P/N* and *U/N*). Also, in a second specification, *P* and *U* are expressed as their share in total current municipal revenue (*P/R* and *U/R*).

[14] Note, for example, that the 75% tax credit of the local tax on land value improvements is common to all the municipalities; the deductibility of the local business tax in the corporate tax is made also at the common proportional tax rate of 35% and, of course, only operates if the business has profits. The lack of cross-section variability, thus, precludes any empirical analysis that relies in those sources of taxation. This does not mean, of course, that there are not important incentive effect at work in these cases.

The developed hypothesis suggests that the use of a revenue source relies on the possibility of exporting part of its burden to the no residents or to residents in the municipality whose perception of the burden or whose participation in the local political process is smaller. Following this argument we could think that *P/N* and *U/N* could be higher in municipalities with higher: share of commercial or industrial property (Inman [1988]), share of rental housing, or share of second homes. None of these variables are available for all the years of the studied period, and therefore they will not be included in the model. As it will be shown later on, the econometric model will try to solve the omission of these variables.

The property tax exporting possibilities of a municipality depend to a great extent on the effective tax share borne in the margin by each resident as a consequence of their possibility of deduction. We consider that 1990 is the first year of property tax deductibility by residential property owners in the taxable income of the personal income tax of the central government[15]. We proceed to calculate the average effective marginal share of the property tax ($d^n$). The construction of $d^n$ is carried out starting from aggregate municipal information on the taxable income distribution of each municipality. We have information on the taxable income and on the number of taxpayers for the groups of taxpayers with taxable income from 0 to 0.5 million pta., from 0.5 to 1.5, from 1.5 to 3, and with more than 3 million pta. With this information, $d^n$ is calculated for

[15] This possibility was in fact introduced by the Local Government Act of 1988; after this year, the owners could deduct the residential property tax paid on occupied housing, second houses and also vacated houses. The last two possibilities have been removed in 1995. Owners of rental housing and business could deduct the tax before 1988. That means that the deductibility was already permitted in the 1988 income tax filling procedures. However, as the local council uses to pass yearly tax changes about three months before the beginning of the fiscal year (September-October) and the Local Government Act was passed on December of 1988, the local tax rates for 1989 were already in effect and local governments had to wait until next year to change its fiscal policy. Thus, the reaction of local governments to the simuly provided by the introducction of the property tax deductibility could not took place before fiscal year 1990.

the years 1990 and 1991. The value of $d^n$ for the years 1987, 88 and 89 is one; that is to say, given that the property tax was not deductible yet, the resident population borne in the margin a 100% of its tax burden.

The first step for the construction of $d^n$ is the calculation of the first deductible pta. marginal tax rate ($t_{iM}$) for each one of the taxable income groups in each municipality. This is done by matching each group with its marginal income tax rate according to the 1990 and 1991 scales.With this information we obtain the value of $d$ for each group ($i$) and municipality ($M$) as: $d_{iM}=1-t_{iM}$ . The second step to carry out is the calculation of $d^n$ as an average of the several $d_{iM}$ weighted by the relative frequency of resident population in each one of the groups. In order to carry out this calculation we use the four groups cited plus an additional group that corresponds to the population without tax liability, whose marginal income tax rate is zero.The reason for the inclusion of this last group is the fact that all the population of the municipality with right to vote enters in the politicians objective function. The expression used is the following:

$$d^n = \left[ \frac{N_M - \sum_{1to4} n_{iM}}{N_M} \right] + \sum_{1to4} \left[ (1 - t_{iM}) \left( \frac{n_{iM}}{N_M} \right) \right] \qquad [6]$$

where $n_{iM}$ is the number of taxpayers in the group $i$ in the municipality $M$, while $N_M$ is the resident population of the municipality.

This approach to the measuremet of the effect of the deduction on the effective burden share has been utilized by several authors in the analysis of the USA tax deductibilty (Inman [1988] and Gade and Adkins [1990]). However, other authors calculate $d^n$ starting from individual tax data (see Lindsey [1987] and Feldstein and Metcalf [1988]). Given the difficulty of this last approach, the first possibility has been used in this paper[16].

[16] This methodology seems more suitable in the Spanish case than in the previous USA studies. The reason is that in the Spanish case the residential property tax deduction is allowed to

With the aim of testing the local govenment redistributive politics hypothesis we must develop a measure of the distribution of individuals by income groups for each municipality, as well as a measure of the pattern of tax incidence for each of the taxes. Some empirical papers treat the income distribution of each municipality including as variables the share of individuals in some income percentils. For example, Inman [1988] includes as a variable pretending to measure the influence of high/low income individuals, the share of individuals whose income is higher/lower than the 75/25% of the national income. In our case, besides of having available information on the number of income tax payers by income group, we also have information on the distribution of taxable income by groups. With the purpose of using all the available information, we have constructed a synthetic index. Concentrating all the income distribution in a single value has a drawback: if the redistributive pattern implicit in the local tax policy is non-monotonic - that is to say, if it does not distribute from rich to poor or vice versa, but follows, for example, Director's law - it is then possible that our index is not well devised. Nevertheless, it will be difficult to find non-monotonic redistributive patterns given the revenue sources analysed (property tax and user charges). The synthetic index calculated is the index of Fisher- $\Gamma_M(Y)$ -, that indicates us the degree of skewness of the income distribution. The expression used for their calculation is the following:

$$\Gamma_M(Y) = \frac{y_M{}^3\left(\frac{N_M - \sum_{1to4} n_{iM}}{N_M}\right) + \sum_{1to4}\left[(y_M - y_{iM})^3\left(\frac{n_{iM}}{N_M}\right)\right]}{V_M(y)} \qquad [7]$$

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all taxpayers. In the USA case the deductibility could only be used by the taxpayers whose itemized deductions overcome the standard deduction. The share of itemizing taxpayers is quite small and concentrates in high income levels. The calculation of an indicator of $d^m$ for the local USA governments requires an estimate of the share of itemizing taxpayers by income group. The maximum level of detail of this information is at the state level. This implies that the same value is used for every local government of the same state. For an analysis of the main features of USA tax deductibility see, for example: Noto and Zimmerman [1983 and 1984], Oakland [1986], and Kenyon [1986 and 1989].

where $y_M$ is taxable income per capita in the municipality, $y_{iM}$ is taxable income per taxpayer in each one of the four groups of income, and $V_M(y)$ is the variance of the income distribution in the municipality, calculated by means of a similar procedure to that described for the index of Fisher.

The calculation of a property tax incidence measure presents more difficulties. It has not been possible, due to data limitations, to calculate an incidence measure for this tax at the municipal level. To solve this we have introduced a proxy of the main distributive shock that could have experienced this tax in the period of study. It is supposed that, to a great extent, the variation in the pattern of property tax incidence during the period of study depends basically on two factors: the external distributive shock caused by the introduction of the deductibility of this tax, and the increasing dispersion between the fiscally assessed property values (named "valor catastral") and the market values of property. This second factor relies on the time period elapsed between property value assessments. The first of the factors will be approached using a synthetic index of distribution of the effective after deduction property tax share, $d^n$. Also in this case the Fisher's index of skewness for this variable is calculated -$G(d)$-, using an expression similar to [7]. Given that this variable falls monotonically with income, the utilization of a single value does not involve any problem.

The second factor is introduced into the model by the calculation of the ratio of assessed value and market value of property (*av/v*). It is supposed that as this ratio decreases it increases the difference between the ratios corresponding to high market value lots against those corresponding to low market value ones, with the corresponding increases in the regressivity of the property tax[17]. However, the utilization of this proxy is a very imprecise form of keeping in mind the effect of the property tax regressivity increase due to the no-realization

[17] Although this has not been demonstrated yet, see the article on "Catastro" journal: "Market valuet and assessed value in the big Spanish cities" [1992] for empirical evidence of differences in the assessment ratios between districts of a same city.

of periodic assessment campaigns. This is due to the fact that as time elapses between assessment campaigns not only vertical equity of the tax worsens, but also probably horizontal equity is affected. This could also be a factor that works against the utilization of the property tax. Therefore, the variable (*av/v*) could gather the effects of the regressivity increase but also the effects owed to the increase in taxpayer perceived tax unfariness. The possible biases caused by the omission of other structural factors that determine the incidence of the property tax could be handled with of the utilization of a appropriate method of estimation, as will be shown.

We have also included in the model the ratio of housing market value and municipal family income. This variable tries to reflect the effect of relative base size on the use of the tax. We show in the section II how the slope of a tax marginal cost was minor how much greater it was the size of its base relative to the other tax base available to the other government. Family income pretends to pick up the size of those other bases as, for example, number of motor vehicles or local business activity.

The remaining of variables are included in the model basically to account for its direct effects on local public services demand. These variables are: family income per capita (*Y*), resident population of the municipality (*N*), current lump sum grants per capita (*S*), and other exogenous revenue gotten by the municipality (*M*). We have considered exogenous those revenue sources that do not affect the process of political calculation carried out by the municipal government because their receipts depend basically on factors related with the economical structure of the municipality or their burden is not perceptible by the citizens. All revenue sources other than the residential property tax, user

charges, the motor vehicle tax and the local business taxes (included in the variable "all current revenue") are included in this category[18].

The model to be estimated could be expressed as a part of a structural model of three equations, where the endogenous variables are $p_{jt}$ (accrued residential property tax receipts, per capita - $P_{jt}/N_{jt}$ - or as a ratio over total current tax revenue, $P_{jt}/R_{jt}$), $u_{jt}$ (accrued user charge receipts, also per capita - $U_{jt}/N_{jt}$ - or as a ratio over total current tax revenue - $U_{jt}/R_{jt}$), and $r_{jt}$ (accrued total current revenues per capita, $R_{jt}/N_{jt}$).

$$p_{jt} = a_0 + a_1.\, d^n_{jt} + a_2.\Gamma(Y)_{jt} + a_3.\Gamma(d)_{jt} + a_4.(av/v)_{jt} + a_5.(v/y)_{jt} + a_6.r_{jt} + J_j + T_t + e_{jt}$$

$$u_{jt} = b_0 + b_1.\, d^n_{jt} + b_2.\Gamma(Y)_{jt} + b_3.\Gamma(d)_{jt} + b_4.(av/v)_{jt} + b_5.(v/y)_{jt} + b_6.r_{jt} + J_j^{*} + T^{*}_t + e^{*}_{jt}$$

$$r_{jt} = g_0 + g_1.y_{jt} + g_2.N_{jt} + g_3.S_{jt} + g_4.M_{jt} + g_5.i_{jt} + g_6.tx_{jt} + J_j^{**} + T_t^{**} + e^{**}_{jt}$$

where $j$ indicates municipality and $t$ year, and $J_j$, $J_j^{*}$, $J_j^{**}$ and $Tj$, $Tj^{*}$, $Tj^{**}$ represent respectively municipality and time especiffic effects for each equation. The estimation of the fixed effects model by three stage least squares (*3SLQ*) will give us consistent estimates of the parameters whenever the individual effects are correlated with the explanatory variables included in the equation (Mundlak [1978]). Municipal fixed effects represent specific circumstances of each municipality that stay relatively constant during the analysed period: characteristics

[18] The data used in order to estimate the model has been obtained from various statistical sources.The data on income tax and taxpayers by income group is from the Tax Statistics Office, Ministry of Economics and Finance. The data on municipal family income (*Y*) has been obtained from Arcarons et alt. [1991]: "Estimation of family income of counties and municipalities of Catalunya." The data on property tax receipts, of housing assessed values are from the Center for Catastral Cooperation and Tax Administration": "Real Estate Tax. Urban real estate", from various years; the remaining budgetary data is from yearly surveys of the Service of Economical Municipal Information of the Diputación of Barcelona. The data on price per square metre of housing on sale has been obtained from the market studies of Tecnigrama, for the various years under study.

of the local political market, specific differences in the cost of local public services, or in our case structural possibilities of tax exporting. The estimation of the model with a cross-section of data would require the introduction in the model of variables accounting for all those three sets of structural factors. Otherwise, if these were correlated with the variables included in the model, the obtained parameters would be inconsistent (Holtz-Eakin [1986]). That is to say, the use of fixed effects will lessen the problem of the low quality of the information available in the Spanish case in order to estimate this type of models.

This is not, however, the only advantage of the use of panel data in our case. Another advantage is the increase of the degrees of freedom of the model. The number of observations is 200 (40 municipalities during 5 years); this allows us to estimate the model without having to provide information of a greater number of municipalities. The third advantage lies in the possibility of working jointly with cross-section and time-series variation. The model uses several variables built from income indicators - $d^n$, and $G(Y)$, $G(d)$ - Because of that, the probability that we meet with a multicollinearity problem is quite high. That is to say, given the structure of the problem to study it was possible that with a cross-section we would not have been able to separate one effect from the other. For example, using a panel of data, and taking advantage of the fact that property tax deductibility comes into effect in 1990, we manage to give to the variables $d^n$ and $y$ a very different look - the first is equal to one for all the municipalities in 1989, and to a value less than one in 1990, different for each municipality; the second has a different value for all the municipalities in the two years-. Something similar occurs with the variables $G(Y)$ and $G(d)$ - the second raises from 0 in 1989 for all the municipalities, to a positive different value in 1990-. In a cross section for the years 1990 and 1991 the variables $d^n$ and $y$, and $G(Y)$ and $G(d)$ would be highly correlated.

*III.B. Econometric results*

Given the incompletness of the model in its structural form we have not tried the estimation of the $r_{jt}$ equation. Instead, we carry out, first, the estimation of the three equations in a reduced form, obtained from the substitution of $r_{jt}$ in the equations of $p_{jt}$ and $u_{jt}$ (table 1) and, second, the estimation of the structural equations of $p_{jt}$ and $u_{jt}$ (table 2). The reduced form of the model has been estimated by a "seemingly unrelated equations" (*SURE*) model, with the aim of keeping in mind the shocks common to the three equations. In a conventional model this would not have been necessary, since it is well known that when the explanatory variables are the same in the different equations the combined estimate does not give any efficiency gain in the parameter estimates over the ordinary least squares estimation of each equation. However, this is not so in a fixed effects model (Hsiao [1986], p.103). The two equations in the structural form are jointly estimated by means of *3SLQ*, using the exogenous variables of the $r_{jt}$ structural equation as instruments. We have enough available instruments ($y_{jt}$, $S_{jt}$, $N_{jt}$ and $M_{jt}$,) given that the only endogenous explanatory variable in the $p_{jt}$ and $u_{jt}$ equations is $r_{jt}$.

The explanatory capacity is quite good in most of the estimated equations, with adjusted $R^2$ over 0.5. The hypothesis of different intercepts for each municipality is accepted at the 99% confidence level. Also the hypothesis of correlation of the fixed effects with the variables of the model is accepted at the 99% confidence level (the Hausman Test is overcomed in the different equations, refusing the utilization of a random effects model in all of them).

It could be checked how the deduction has a significant effect on the use of the property tax. The sign of the $d^n$ variable is, as we expected, negative in the equations whit *P* as left hand variable. Given the mean values of $d^n$ and *p*, the effective share elasticity of property tax receipts is approximately one. Overall tax receipts also respond with the expected sign to deductibility. However,

given that the parameter is estimated very imprecisely (it is significant only at the 85% confidence level) it would result rash to conclude that the deduction has stimulated the growth of municipal public expenditure and not just a substitution between revenue sources. Even if we could accept this result, the parameter estimate for the $d^m$ variable in the model in the reduced form is higher in the property tax equation than in the user charges one. Given that the parameter in the use charge equation is not significant, other revenue sources not directly analysed by the model (motor vehicle and local bussines taxes) should have suffered a reduction in their usage because of the property tax deduction. If that is the case, the deduction could not be blamed of the removal of some user charges: maybe the answer lies in administrative cost factors (see Solé Vilanova [1992]) that have not been possible to consider in the model. The different estimates carried out give partial evidence about the redistributive politics hypothesis developed in section II.B. The skewness of income distribution -$\Gamma_M(Y)$ - is significant in the three equations in reduced form and in all of the structural form equations to exception of the property tax share equation ($p=P/R$). A greater income skewness implies a minor utilization of user charges and a greater utilization of residential property tax. The effect on the total tax receipts is also positive, although not significant. This seems to suggest that local governments have a pattern of wheights falling with income level. The results obtained for the property tax incidence variable are less clear. They present a significant and positive parameter in the reduced form equations *p* and *r*.The parameter from the *u* equation also results positive although not significant. This result means that, in spite of the fact that the local governments use a wheighting pattern falling with income, the property tax regressivity increase has provoked an additional increase of its utilization.

The ratio of assessed values and market values of housing (*av/v*) results significant in most of the equations. Its signs are the expected: as the bias in-

creases, the use of the property tax decreases and the utilization of user charges and other tax sources included in the variable *r* increases. Note how in this case, the pattern obtained is very similar to that for the income distribution variable: property tax and user charges appear as substitutes. The variable of relative base size (*v/y*) is significant in every *p* equation and has the expected sign in the *u* equation. That is to say, a higher relative property tax base implies a greater utilization of the residential property tax and (with some caution) a minor utilization of user charges. However, given that this variable is not significant in the *r* equation, one could expect a substitution between sources (motor vehicle and local business taxes) as the distoritonary effect of increases in the property tax increases.

For the remaining variables of the model, included as determinants of the level of desired provision of local public services the results are as follows: family income -*Y*- is significant and with the positive expected sign in the *p* and *r* equations. The negative sign in the *u* equation is not significant but still is quite surprising. A possible interpretation is that user charges are a relatively inferior revenue source. Population does not result significant in any of the equations. Current lump-sum transfers have the expected positive sign in the *r* equation and the estimated parameter implie that of each 1,000 pesetas received by the local government 718 become a current revenue increase. It seems, therefore, that the relevance of the "flypaper effect" can be rejected in this case. The difference between both quantities does not mean a reduction of user charges or property tax: other taxes (or maybe a reduction in debt finance) would be benefited. It can also be noted that exogeous revenues have an effect on current revenue less stimulant than intergovernmental grants, but they are not translated to a reduction of the property tax and user charges receipts.

Finally, we should highlight the outputs of the *r* variable in the structural model. This variable is significant in the share equations, but not in the per ca-

pita receipts equation. The parameter is negative in all the equations, indicating that both residential property tax and user charges are relatively inferior sources of revenue; that is to say, that their relative (significant at 99% level) and absolute usage (without being significant) are reduced as the size of the municipal public sector increases. These results are coherent with the parameters obtained for the variable family income per capita in the reduced form of the model.

## IV. FINAL REMARKS

This paper analyses the impact of various factors on the local tax mix determination. The empirical results obtained for the Spanish case suggest that local governments react to the stimuli provided by tax exporting possibilities. The incentive effect of the deductibility provokes an increase in the use of the property tax but it seems not explain the substitution of user charges. The results also show how local governments tend to distribute the net tax burden in order to improve its reelection chances. User charges are used more intensively in communities with a more unequal income distribution and the opposite happens with the residential property tax. The results show how the redistributive effect of the deductibility provokes an increase in the property tax use but does not affect user charges use. We could conclude, therefore that, although user charges are similar to a head tax in their distributive incidence, there must be other characteristic features of that revenue source that make increase its marginal cost function.

The reasons could be many, but it should be kept in mind that the *u* variable gather togheter a great diversity of charges and prices. As each of these sources is earmarked to finance a specific expenditure program, the local government capacity to increase the payments is severily limited by the taxpayers' perception of the unit cost of the particular service to finance. Even accepting that it is very difficult for the citisenship to be aware of local public service

provision costs (Bradford, Malt and Oates [1969]), voters may have in their minds some kind of connection between the charge payment and the cost of the expenditure program that it is earmarked to. That is to say, even if in many of those sources we can not speak strictly about prices charged for local public services, their treatment as a poll tax may be an oversimplification. It should be remembered also that the increase in the use of the *u* variable comes greatly determined in the long run by the possibility of introducing new charges. We think this could help also to explain the reason of the inferior character of this figure found in the empirical analysis.

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## APPENDIX 1:

Figure 1

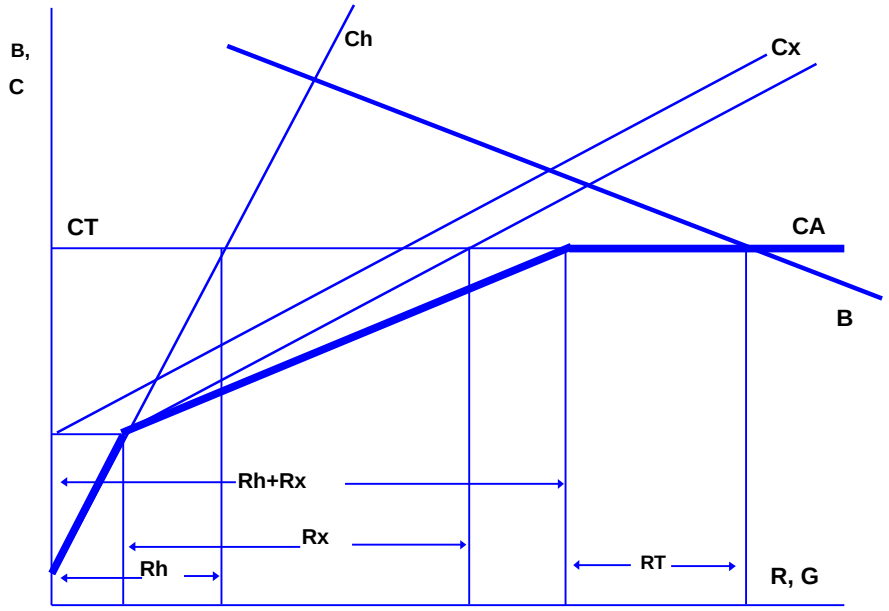
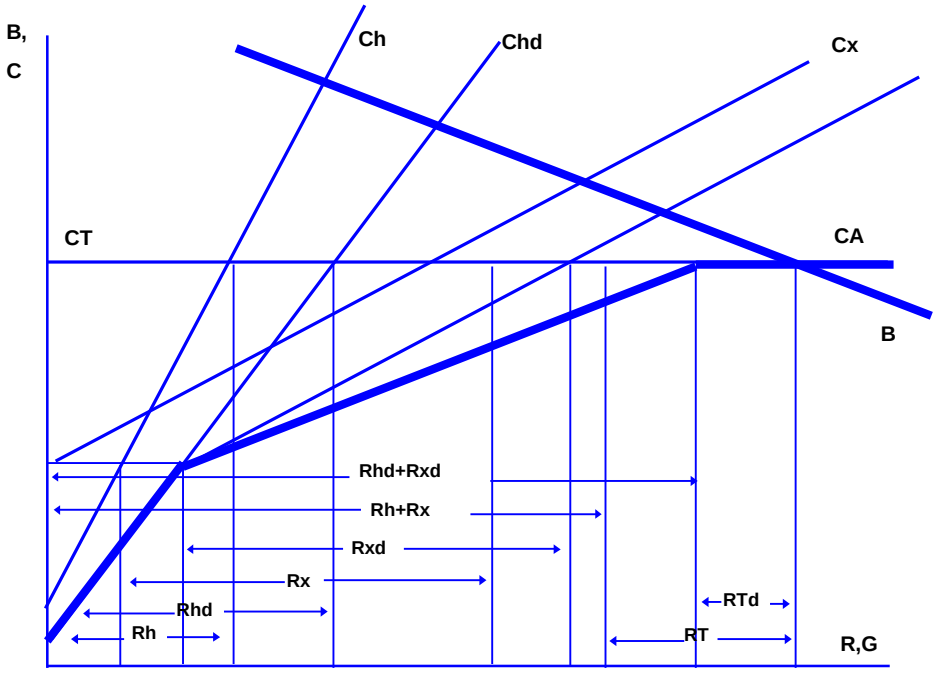



Figure 2



APPENDIX 2:

| **Table 1. Estimation of the reduced form model (Property tax, User charges and Current revenue)** | | | |
|---|---|---|---|
| *SURE-Fixed effects (200 obs.)* | | | |
| *Variable* | *p=P/N* | *u=U/N* | *r=R/N* |
| $d^n$ | -7.693,62 | 944,39 | -2.335,81 |
| | (-2,425)** | (0,177) | (-1,366) |
| *G(Y)* | 543,41 | -1.402,43 | 81,44 |
| | (2,822)*** | (-4,342)*** | (0,784) |
| *G(d)* | 1.136,20 | -697,99 | 618,51 |
| | (2,824)*** | (1,035) | (2,852)*** |
| *av/v* | 33,41 | -23,92 | -56,44 |
| | (-4,591)*** | (1,989)** | (1,438)+ |
| *v/y* | 1.277,37 | -464,42 | -2,545 |
| | (5,357)*** | (-1,162) | (0,0019) |
| *Y* | 4,11 | -4,14 | 20,54 |
| | (2,133)** | (-1,281) | (1,980)** |
| *N* | -33,22 | 29,19 | 286,88 |
| | (-0,346) | (-0,181) | (0,554) |
| *S* | 23,14 | 238,81 | 718,62 |
| | (0,631) | (3,886)*** | (3,638)*** |
| *M* | 1,41 | 20,62 | 260,95 |
| | (0,093) | (0,816) | (3,214)*** |
| *Log-likel.F.* | -3.708,07 | | |
| *adj.- $R^2$* | 0,789 | 0,502 | 0,743 |
| *F-est. (C vs. $C_i$)* | 8,270*** | 11,115*** | 3,99*** |
| *$X^2$-Hausman (f.e. vs r.e.)* | 44,507*** | 1.117,2*** | 88,55*** |

Terms in brackets are *t*-statistics values
*** indicates a parameter significant at the 99% confidence level
** indicates a parameter significant at the 95% confidence level
* indicates a parameter significant at the 90% confidence level

| **Table 2. Estimation of the structural form model (Property tax and User charges)** | | | | |
|---|---|---|---|---|
| *3SLQ-Fixed effects (200 obs)* | | | | |
| *Variable* | *p=P/R* | *u=U/R* | *p=P/N* | *u=U/N* |
| $d^n$ | -0,319<br>(-2,634)*** | -0,055<br>(-0,279) | -6,212<br>(-1,576) | -1.850,83<br>(-0,244) |
| *G(Y)* | 0,0046<br>(0,777) | -0,0285<br>(-3,025)*** | 480,94<br>(2,579)** | -1.320,45<br>(-3,681)*** |
| *G(d)* | 0,0347<br>(1,984)** | 0,0334<br>(1,151) | 715,28<br>(1,245) | 1.462,03<br>(1,323) |
| *a v/v* | 0,0013<br>(-4,758)*** | -0,00071<br>(1,636)* | 38,092<br>(-4,424)*** | -32,129<br>(1,939)* |
| *v/y* | 0,0286<br>(3,973)*** | -0,0123<br>(-1,043) | 1,346<br>(5,759)*** | -0,517<br>(-1,151) |
| *r=R/N* | -0,0066<br>(-2,868)*** | -0,0081<br>(-2,115)** | 72,921<br>(0,965) | -124,81<br>(-0,858) |
| $R^2$ | 0,531 | 0,419 | 0,612 | 0,533 |

Terms in brackets are *t*-statistics values
*** indicates a parameter significant at the 99% confidence level
** indicates a parameter significant at the 95% confidence level
* indicates a parameter significant at the 90% confidence level