THE IMPACT OF LOCAL TAXATION ON PROPERTY PRICES

by

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Abstract

This paper provides empirical evidence on the impact of local taxation on property prices in two French urban areas: Dijon and Besançon, using data on property taxation and real estate transactions over the period 1994-2004. Our empirical methodology pairs transactions in the same spatial environment to estimate the impact of property taxation, controlling the local public spending effect. Spatial differencing and IV method allow us to compare sales across municipalities boundaries and to control for the endogeneity of local taxation and public spending. Our estimation results suggest that local property taxation has the expected negative impact on property prices, but not significant.

Key words: fiscal capitalisation, local taxation, property prices, borders.

JEL classification: H2; R2

Preliminary version. Do not quote.

1 Introduction

Issues surrounding the impact of local taxation and public services are a key concern of a wide literature initiated by Tiebout (1956) where individuals reveal their preferences by "voting with their feet." If citizens are faced with an array of communities that offer different types or levels of public goods and services, then each citizen will choose the community that best satisfies his

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or her own particular demands. Citizens with high demands for public goods will concentrate themselves in communities with high levels of public services and high taxes, while those with low demands will choose other communities with low levels of public services and low taxes. If households are perfectly mobile, Tiebout (1956) argues that an efficient pattern of local services will be attained without intervention of a central government. However, there is no property tax nor capitalization in Tiebout's argument. Further analyses have combined the introduction of a property tax to the key assumptions of Tiebout (perfect mobility across jurisdictions, complete information, numerous jursidictions). In one hand, Oates (1969) and Brueckner (1979) argue that capitalization exist when lower property taxes or better local public services lead to higher house values. On the other hand, Edel and Sclar (1974), Hamilton (1975), Epple, Zelenitz and Visscher (1978) focus on supply responses to rent differentials and predict the disappearance of this capitalization (see Yinger (1982) and Starret (1981) who discuss the validity of land capitalization).

Empirical analyses addressing capitalization of interjusridictional fiscal differentials are numerous. Oates' (1969, 1973) seminal paper found significant capitalization of public services and nearly complete capitalization of property tax rate differentials when using a sample of cities in New Jersey. However, Follain and Malpezzi (1981) conclude that fiscal surplus, i.e. public service expenditures minus taxes per capita, differentials were not capitalized into house values. Further studies have led to diverse results (see e.g. Edel and Sclar, 1974; King, 1977; Rosen and Fullerton, 1977; Wales and Wiens, 1974; Sonstelie and Portney, 1980; Chaudry-Shah, 1989...). Among this large literature, Cushing (1984) is the first to consider that if capitalization of interjurisdictional fiscal differentials occurs, it should be most obvious at the border of two jurisdictions. He then use housing price differentials between adjacent blocks at the border of two jurisdictions to study capitalization in Michigan. His estimation results show more than full capitalization of property tax rate differentials. This methodology was developped by Black (1999), Gibbons and Machin (2003), Fack and Grenet (2006), Duranton, Gobillon et Overman (2006). These first three papers have sought to test the theoretical prediction that housing prices should be higher in districts with good school quality than in districts with lower school quality in the suburbs of Boston (Black, 1999), in England (Gibbons and Machin, 2003) and in Paris (Fack and Grenet, 2006) while Duranton, Gobillon et Overman (2006) study the impact of local taxation on employment growth.

This paper is concerned with providing some empirical evidence on the impact of local taxation on property prices using the above methodolgy. We use data of individual housing which are available for two French urban areas (Dijon and Besançon) for about 10,000 sales of flats and houses and for a period from 1994 to 2004. Once we have identified these transactions we can control the housing characteristics to isolate local property taxes that are time-varying. Our empirical methodology then pairs transactions to estimate the impact of property taxation. Spatial differencing and instrumental variables method allow us to compare sales and to control for the endogeneity of local taxation. Our results suggest that local property taxation has no impact on property prices.

The structure of the paper is as follows. In the next two sections we present the theoretical background and the econometric issues associated with the estimation of such hedonic model. The fourth section presents the data and summary statistics. Methodology is detailed in section 5. Main results arise in section 6. The last section concludes.

2 Theoretical background

We will start here from the simple model of Yinger (1982) when households are assumed to be similar to introduce the capitalization of property rate into house value. When choosing a residential location, we assume that a household considers the property tax rate, t, and the level of local public services per household, G, in each jurisdiction. The amount a household is willing to pay for one unit of housing services depends on the supply of public goods and tax rate in a jurisdiction. As a consequence, the bid function for one unit of housing is given by:

$P = P(G, t)$. Assuming that a house contains H units of housing services, the value of the house to the household may be given by: $V(G, t) = P(G, t)H/r$ with r the discount rate.

Each household has to pay a property tax which is proportionnal to the value of the house, that is $tP(G, t)H/r$. The household's income Y is used to buy a composite consumption good X whose price is unitary, housing services in quantity H with price P and property taxes at rate t. The maximisation's problem of a household is the following:

$$\begin{aligned} & \max_{Z,H,G,t} U(X, H, G) \\ s.t.Y &= X + P(G, t)H[1 + t/r] \end{aligned}$$

To describe the effect of property tax on house values for a given level of public services G^*, we must solve the following equation given by one first-order condition:

$$\frac{\partial Y}{\partial t} = \frac{\partial P}{\partial t} H[1 + t/r] + P(\frac{H}{r}) = \frac{\partial P}{\partial t}(r + t) + P = P'(r + t) + P = 0 \tag{1}$$

with $P' = \frac{\partial P}{\partial t}$ .The solution of this differential equation (1) can be written as:

$$P(G^*, t) = P'H/(r + t) \tag{2}$$

Combining this solution into the equation of the house value, we can derive the capitalization of property tax rate into house values for a given level of public services :

$$V(G^*, t) = P(G^*, t)H/r = P'H/(r + t) \tag{3}$$

If we let the level of public goods supply vary, equation (2) becomes:

$$P(G, t) = rP'(G)/(r + t)$$

where $P'(G)$ describes households' bids for housing services before tax, that is for $t = 0$.

To determine the form of $P'(G)$, we have to compute the housing demand H. We thus have to specify the utility function. Choosing a Cobb-Douglas utility function, we get:

$$U(X, H, G) = \alpha \ln(X) + \beta \ln(H) + \gamma \ln(G)$$

The households' bids function is for every couple (G, t):

$$P(G, t) = \frac{CrG^{\frac{\gamma}{\beta}}}{r + t}$$

where C is a constant of integration. If we assume that housing services are a multiplicative function of housing characteristics, Z_1 to Z_n, the value of a house becomes:

$$V(G, t) = P(G, t)H/r = \left(\frac{CrG^{\frac{\gamma}{\beta}}}{r + t}\right) \prod_{i=1}^{n} Z_i^{a_i}$$

or

$$\ln(V) = \ln(C) + \frac{\gamma}{\beta} \ln(G) - \ln(r + t) + \sum_{i=1}^{n} a_i \ln(Z_i) \tag{4}$$

This relationship (4) describes how the value of a house capitalizes for a given discount rate r, the public services G weighted by their preferences $\frac{\gamma}{\beta}$, property tax t and finally the housing characteristics. Yinger's definition of capitalization when households are assumed similar is thus the following. Local fiscal variables are completely capitalized into house values when the variation in house values within or between the jurisdictions exactly reflects what the households are willing to pay for the different public goods-tax couples in different locations.

3 Econometric issues regarding the estimation of hedonic model

Another important consideration is now how locational effects, positive as well as negative, are capitalized into house values. Can (1992) distinguish between two levels of externalities. The first would capture the neighborhood effects, i.e. the impact of common neighborhood caracteristics on housing prices. The second type of externalities would include the spatial spill-over effects - the adjacency effects- , such as the impact of the prices of neighboring structures on the price of a given one. These effects are not confined into jurisdictions, they can cross over boundaries. As argued by Can (1992), locational effects should require the use of different specifications for the housing price equation. The first one includes neighborhood effects as direct determinants of house values. The resulting model is called the traditional hedonic specification:

$$V = c + \zeta G - \tau t + \sum_{i=1}^{n} a_i Z_i + \eta N + \varepsilon$$

where N are neighborhood characteristics and ε is a vectr of i.i.d. error terms.

The second specification incorporates spatial heterogeneity. Neighborhood are not anymore treated as direct determinants of housing prices but as determinants of spatial drift in the structural parameters. This model is called the spatial expansion specification:

$$V = c + \zeta G - \tau t + \sum_{i=1}^{n} (a_{iO} + a_{k1} N) Z_i + \varepsilon$$

The next two specifications include both neighborhood effects and adjacents effects.

The traditional hedonic autoregressive specification is the following:

$$V = c + \rho WV + \zeta G - \tau t + \sum_{i=1}^{n} a_i Z_i + \eta N + \varepsilon$$

where WV is the spatially lagged dependent variable and ρ her parameter. Finally the last model, the inclusion of the autoresgressive term leads to the spatial expansion autoregressive sepcification:

$$V = c + \rho WV + \zeta G - \tau t + \sum_{i=1}^{n} (a_{iO} + a_{k1} N) Z_i + \varepsilon$$

The incorporation of spatial effects is present into three out of four these model specifications. In the spatial expansion specification, spatial heterogeneity is introduced in the form of varying-parameters. In the traditionnal hedonic autoregressive model, spatial dependence is included using the autoregressive form. Both spatial heterogeneity and dependence are incorporated in the last specification. Tests for spatial effects need to be run to detect the existence of spatial dependence and/or spatial heterogeneity and to choose the right specification. To circumvent these problems associated to spatial effects, we will use an alternative methodology which was first implemented by Cusing (1984) and developed by Black (1999) to test the theoretical prediction that housing prices are influenced by school quality. The main estimation problem is that measuring the effects of school quality on housing prices adress an endogeneity problem since better schools tend to be located in wealthier neighbourhood because of the higher performance of children coming from priviledged families. Black (1999) suggested to compare the prices of houses located on opposite sides of a common elementary school district boundary. She assumes that changes in school quality are discrete at boundaries whereas changes in neighbourhood characteristics are smooth. Shen then relates the differences in mean housing prices located on opposite side of attendance district boundaries to performance in school exam scores. Houses then differ only by the elementary school the child attends. Her sample is a selection of the sales located within 0.15 of a boundary. She finally finds that parents are willing to pay 2.5% more for a 5% increase in test scores.

Gibbons and Machin (2003) estimate the premium attracted by differentials in primary school quality in England from 1996 et 1999. They first build an hedonic property price model. The well-known difficulty of this approach is to specify what to include in the hedonic price function since neighbourhood composition is endogenous in a property value model. To circumvent the problem of simultaneity between property prices and performance, they use instrumental variables for school performance. They isolate schools characteristics - historically determined school-type characteristics - that influence performance but are not affected by local property prices or neighbourhood socio-economic status. They also exploit the co-variation in house prices and school performance within narrowly defined spatial groups. They compute spatially weighted means of the variables in their model at each observation, in which the nearest observation receives the highest weights. Since these means capture general, unobserved, area and amenity impacts on the housing market, centred at the location of the unit of observation, they then transfom the data into deviations from these spatially weighted means. They finally use a weighting function with a bandwith depending on housing density that specifies how rapidly the weights decay with distance. They find that a on percentage point increase in the neighboorhood proportion of children reaching the government-specified target grade pushes up neighboorhood property prices by 0.67%.

The paper by Fack and Grenet (2006) provides empirical evidence on the impact of middle school quality on housing prices in Paris, using data on both school zoning and real estate transactions over the period 1997-2003. Building on Black's approach (1999), they use a matching framework to compare sales across school attendance district boundaries and to deal with the endogeneity of school quality. They use a sample of about 200,000 real estate transactions with their price, their detailed characteristics and their precise geographical location (Lambert grid coordinates). They modify the methodology developed by Black for the two following reasons. First the characteristics of flats do not have the same impact on prices everywhere in Paris. Second the unobservable characteristics that are shared by two houses or flats located on both sides but at opposite ends of the segment of a common boundary are not necessarily the same when this particular border is long. They then adopt a matching framework that compares each transaction with a constructed counterfactual transaction. They also delete the set of boundary fixed effects in the hedonic equation of Black (1999) by restricting a transaction's comparison group to those sales that are located on the other side of the school boundary and within a given radius of that specific sale.The call reference sales all transactions located within a distance 0.20 mile of a school attendance boundary. Every reference sale is associated to a fictive counterfactual sale which is supposed to measure the amount for which the reference transaction would have been sold if it were located in another school zone, everything else being equal. The price of the counterfactual transaction is computed as the weighted geometric mean of the prices of all transactions that took place in the same neighbourhood but in a different school zone. Transactions are finally weighted by the inverse of their distance to the reference transaction to give higher importance to closer sales. They find estimates close to those found on US and UK data (Black, 1999; Gibbons and Machin, 2003): a standard deviation increase in school quality raises prices by about 2%.

Although they study the impact of local taxation on employment growth and not the influence of school quality on housing prices, the methodology used by Duranton, Gobillon et Overman (2006) improve existing methodologies used by Black (1999) and Gibbons and Machin (2003) by correcting for unobserved local effects, unobserved establisment heterogeneity and for the endogeneity of local taxation (instead of school quality). Using plant level data for UK manufacturing establishments, their strategy consists in identifying which pairs of firms are neighbours that lie across jurisdictional boundaries. Because of the spatial correlation in site characteristics, these establishments have very similar unobserved characteristics but face different tax rates. To deal with the existence of of heterogenous establishments, they use the panel dimension of their data to remove establishment and jurisdiction fixed effects. Finally to cicumvent the problem of endogeneity of tax rates to employment and locations decisions, they instrument the levels of local taxation by local political variables. Their first results suggest that local taxation has a negative impact on employment growth.

4 Data and summary statistics

In this section, we present the data. Table 1 provides some descriptive statistics for each variable used.

4.1 Housing prices

Our data on property sales come from the Perval organism which was created by the Notary Chambers in France since all property sales are registered by Notary offices. For each transaction, we have information on the price for which the property was sold (see figure 1), along with her detailed features such as size, number of rooms, date of construction etc. and its precise geographical location. The geographical precision of geocoded data that is Lambert grid coordinates, is of about 10 meters. Our sample is restricted to sales of flats and houses of two urban areas (Dijon and Besançon) between 1994 and 2004. We are left with a sample of around 10,000 transactions. Let us also note that a value added tax on real estate is payable by the seller of a lodging during 5 years after the end of its construction. This tax is based on the selling price at a rate of 19.60%. We then include this tax as an explanatory variable.

4.2 The French local taxation

France is usually considered as a unitary country even if the different layers of local governments actually have a large fiscal autonomy. The structure of local governments is broadly four tiers. The lowest tier of local governments is made up of 36,600 municipalities and 13,000 groups of municipalities. The middle-tier is made up with 96 departments. Finally, 22 regions are at the highest level of local government. Local revenue sources mainly come from local taxes (54%), grants (23%) and borrowing (10%). Each level of local government sets its own tax rate on a common tax base for a large range of local direct taxes, which account for 75 per cent of local tax revenues. Local authorities have considerable latitude in choosing tax rates of these four taxes. Calling “local tax varying power” the proportion of local resources represented by tax revenue

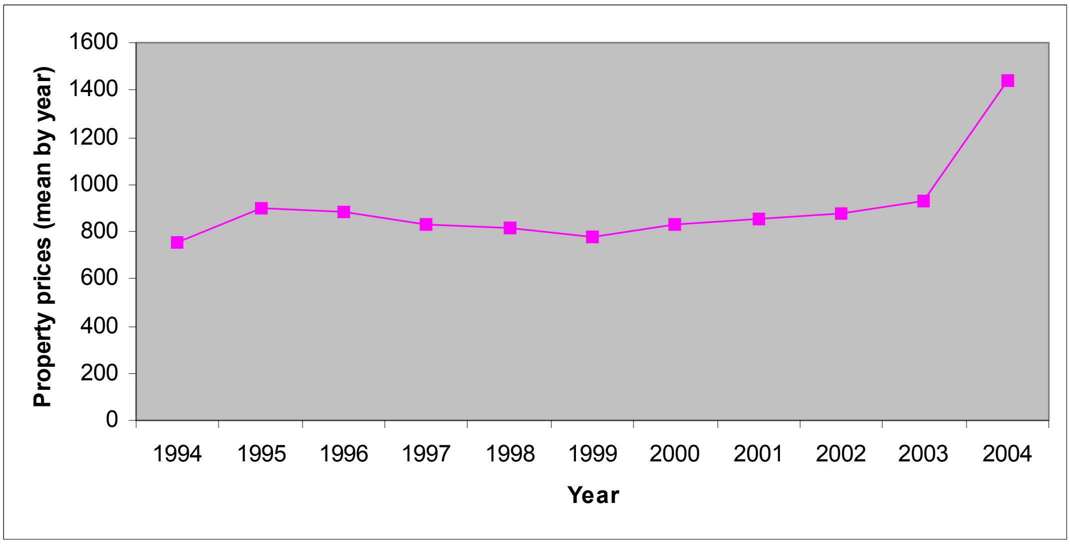

Figure 1: Property prices per square meter

over which local authorities have some control, France is the second country in the European Union with the higher tax autonomy (54 %) compared with 20 % in Germany which is a federal country or Spain (35 %) which is getting closer of a federal country, the UK being at 14 %.

There are two local taxes which are both based on the property's theoretical rental value according to the local land registry. Property tax (”taxe foncière”) is payable by the owner while a housing tax ("taxe d'habitation") is payable by the occupier. Property tax is made up of two parts: a tax rate which applies to the buildings ("taxe foncière sur le bâti") and a tax rate that applies to land that belong to owners property (“taxe foncière sur le non bâti”). These are the different rates which apply to the buildings and to the land that belong to your property. New buildings and new renovations are exempt from tax for two years. The taxes are not applicable to buildings used for agricultural purposes or where the premises are used exclusively for farming, business or student lodgings. People over 75 and those with disability pensions are also exempt and discounts may be available for people over 65 on low incomes.

The local business tax (the so-called ”Taxe Professionnelle”) is the remaining and major source of tax revenue for local governments since it accounts for approximately 45 percent of revenue from direct local taxes. Its tax base is mainly made up of capital goods and is based on the rental value of buildings and the rental value of equipment.

Although collected centrally these taxes are distributed to local jusridictions and are used to finance local public services such as rubbish collection, street cleaning, schools and other community facilities as well as the administration of these services.

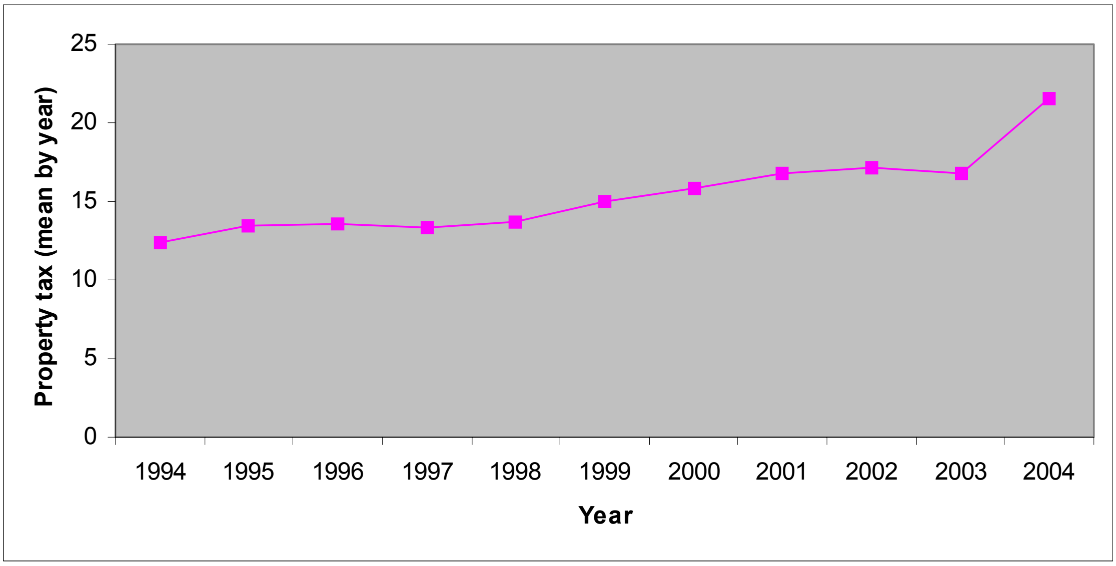

Figure 2: Property tax rate (%)

We will focus on Property tax (PT) wich applies to the buildings, since both taxes are based on the property's theoretical rental value.[1] Fiscal data come from the Direction Générale des Collectivités Locales (DGCL, Ministère de l'Intérieur).

Figure 2 clearly reveals that the evolution of the property prices almost matches the one of property tax rates. Table 1 provides some descriptive statistics for each fiscal variable used.

Variable	N	Mean	Std Dev	Minimum	Maximum
Property tax (%)	13577	16.049	5.817	1.000	34.770
Prop. Prices (psm)	13577	873.172	566.217	0.213	4380.15
Living space (sm)	10362	94.106	44.856	8.000	602.000
GardenSize	10362	5.733	13.789	0.000	588.086
Rooms number	10362	4.242	1.806	0.000	17.000

Table 1: Descriptive statistics

[1] The property tax base is composed of half property's theoretical rental value while the housing tax base is the whole one.

5 The methodology

In a first step we implement a classical hedonic model (Rosen, 1974; Rosenthal 1974; Sheppard, 1999). In order to estimate the impact of local taxation on property value taking into account the possible endogeneity of the local tax rate and the amount of local public spending, we estimate a "spatial difference" model very close to the one of Fack and Grenet (2007), using IV method.

5.1 The hedonic function model

In this section, we present the empirical framework used to estimate the impact of local taxation on housing prices. We then use a simple hedonic model (see the survey of Sheppard, 1999). The standard hedonic housing price function relates the sale price of a transaction to her geographical location and her own characteristics such as the number of rooms, the date of construction etc. Each coefficient can then be interpreted as a measure of the marginal purchaser's willingness to pay for every characteristic.All the transactions observed at different period in both urban areas are therefore comparable. In order to pool all transactions, whatever their type, we introduce a dummy variable for flats.

Our basic hedonic model takes the following semi-log functional form:

$$\begin{aligned} \ln p_{i,m,t} &= \beta S_i + \delta Room_i + \eta Tconst_i + \gamma VAT + \varphi GS_i + \\ &\quad [\beta_F S_i + \delta_F Room_i + \eta_F Bdate_i + \gamma_F VAT_i + \varphi_F GS_i] \times F_i \\ &\quad + \alpha + \rho_m PS_{i,m} + \pi \ln \tau_{i,m,t} + \eta_t T_i + \theta F_i + \epsilon_{i,m,t} \end{aligned} \tag{5}$$

where $p_{i,m,t}$ is the price per square meter of the housing good i, observed in the municipality m at period t. $PS_{i,m}$ is the amount of public spending made by the municipality m where i is localized. Municipal public spending are introduced to control the counterpart of local taxation especially the quantity of public services provided locally. We also introduce a trend variable (T_i) in order to control the global evolution on the housing market. $\tau_{m,t}$ is the municipal local tax rate observed the year of the transaction. F_i is a dummy variable taking the value 1 if i is a flat. S_i is the living space of the housing good and GS_i is the size of its garden weighted by the living space, taking the value zero when there is no garden. $Room_i$ is the number of rooms weighted by the living space. $Tconst_i$ is a set of dummies defining the date when i was built; $Tconst1$ takes the value one when the transaction was built before 1850, $Tconst2$ when it was built between 1850 and 1913, $Tconst3$ between 1914 and 1947, $Tconst4$ between 1948 and 1969,

$Tconst5$ between 1970 and 1980, $Tconst6$ between 1981 and 1991. $Tconst7$ takes the value one when the transaction was built after 1992 and is not new when the transaction occurs, $Tconst8$ when was built after 1992 and is new when the transaction occurs. VAT_i is the value added tax on real estate.

5.2 The spatial difference framework

Our methodology is very similar to the Fack and Grenet (2007) one. The transformation is a spatial difference leading to control the location specific effect. This methodology aims to compare each transaction to any other transaction that is located very closely and therefore shares the same environment. Each transaction is matched with close transactions. For each transactions with housing transactions located within a distance which will be described later, we construct a "conterfactual" sale. This conterfactual transaction is the weighted mean of the prices and characteristics of all the transactions that took place within this distance, during the same year and concerning the same type of housing good (house or flat). For each variable X_i characterizing the transaction i, we calculate the conterfactual variable by the following transformation:

$$\widetilde{X_i} = \frac{1}{\sum_j \frac{1}{d_{i,j}}} \sum_j \frac{1}{d_{i,j}} X_j$$

Where j are all transactions that took place within the defined distance from the transaction i, the same year and for the same kind of housing good. $d_{i,j}$ is the euclidean distance between i and j. Our observations thus become difference between characteristics of transaction i and its conterfactual. The equation (5) becomes the following:

$$\begin{aligned}
\ln p_{i,m,t} - \ln \widetilde{p}_{i,m,t} \quad = \quad & \alpha + \rho_m(PS_{i,m} - \widetilde{PS}_{i,m}) + \pi(\ln \tau_{i,m,t} - \ln \widetilde{\tau}_{i,m,t}) \\
& +\beta(S_i - \widetilde{S}_i) + \delta(Room_i - \widetilde{Room}_i) + \eta(Tconst_i - \widetilde{Tconst}_i) \\
& +\gamma(VAT_i - \widetilde{VAT}_i) + \varphi(GS_i - \widetilde{GS}_i) \\
& +[\beta_F(S_i - \widetilde{S}_i) + \delta_F(Room_i - \widetilde{Room}_i) + \eta_F(Tconst_i - \widetilde{Tconst}_i) \\
& +\gamma_F(VAT_i - \widetilde{VAT}_i) + \varphi_F(GS_i - \widetilde{GS}_i] \times F_i \\
& +(\epsilon_{i,m,t} - \widetilde{\epsilon}_{i,m,t}) \qquad (6)
\end{aligned}$$

As transactions are matched by year and type of housing good, it makes no sense to keep estimating coefficients for the trend variable and for the flat dummy alone. Nevertheless, since the market of houses and the one of flats are not the same and do not behave in the same way, the good characteristics interacting with this dummy are still necessary.

Each parameter measures exactly the effect of differences in characteristics between transaction i and all transactions j weighted by the distance, in the same spatial environment, except municipal policies. We now must describe our criterion to decide which transactions j are chosen to build the conterfactual variables. Our data are located in large urban area, including urban and suburban environments, and the latter is lesser dense. In order to consider that the local amenity accessibility is more sensitive to the distance in a very dense context than in a lesser one, and in order not to give too much weight of the urban transactions, we have chosen a maximum distance that depends on municipal population density where each transaction takes place. We therefore build the conterfactual by considering all transactions within the distance threshold from i, $\overline{d}$, defined by:

$$\overline{d} = \frac{d_{\min}}{((density\ mun_i + density\ mun_j)/2)/density\ city\ center}$$

where $density\ mun_i$ and $density\ mun_j$ are the population density in the municipality where the transaction i and the transaction j takes place. $density\ city\ center$, the density of the city center, is introduced in order to take into account that our observations are localized in two different urban areas: Dijon and Besançon. $d_{\min}$ is introduced for transactions in the city center, since otherwise $\overline{d}$ would be equal to 1. We also set a $d_{\max}$, for transactions taking place in not very dense municipalities. The larger $d_{\min}$, the larger weight is given to the transactions occurring in the denser municipalities, i. e. close to the city center. Conversely, the larger $d_{\max}$, the larger weight is given to non dense municipalities.

Finally, all the transactions j from a distance smaller than $\overline{d}$ of transactions i, will be used to calculate the conterfactual characteristics.

6 Results

To control the impact of the distance threshold, we estimate the equation (6) for two $d_{\max}$: 1,000 and 2,000 meters. In the latter case more transactions in the suburban are introduced in the data. In order not to give too much weight to the more central transactions, the $d_{\min}$ is quite small and always the same: 100 meters. The following ma

We first present the estimation results of equation (6) in table 2 for $d_{\max}$ equals to 1,000. Since local property taxation and public spending may be endogenous, IV method is used in columns 2, but as shown by the test, the exogeneity of these variables can not be rejected.

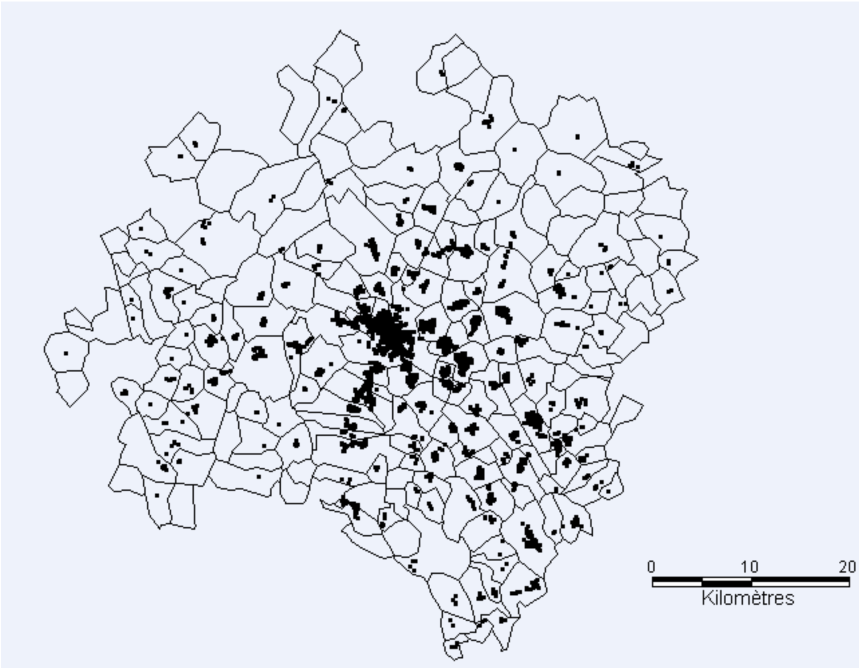

Figure 3: Transaction location in the Dijon's urban area (dmax=2,000 km).

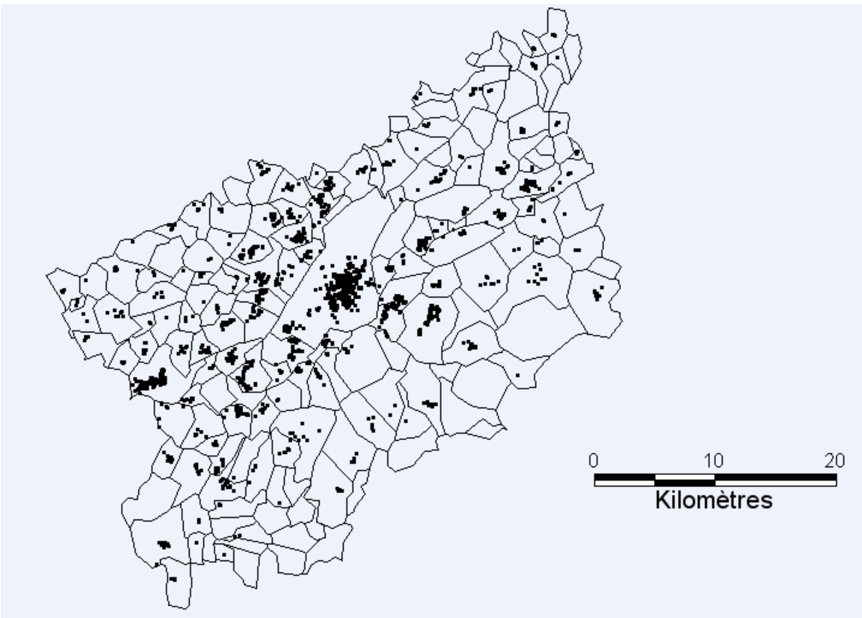

Figure 4: Transaction location in the Besançon's urban area (dmax=2,000 km)

Variables	(1)		(2)	
Estimation method	OLS		IV	
Property tax	-0.07663	(-0.87)	-0.1306	(-1.11)
Local Public Spending	0.00531	(0.24)	0.00741	(0.28)
Living space	-0.00111**	(-9.11)	-0.00111**	(-9.11)
Rooms numb/size	5.978**	(14.25)	5.987**	(14.26)
Timeconst1	-0.2149**	(-11.20)	-0.2148**	(-11.19)
Timeconst2	-0.234**	(-13.68)	-0.234**	(-13.66)
Timeconst3	-0.206**	(-9.19)	-0.206**	(-9.18)
Timeconst4	-0.1067**	(-7.37)	-0.1067**	(-7.37)
Timeconst6	0.0292*	(2.20)	0.0292**	(2.42)
Timeconst7	0.0579**	(2.67)	0.0581**	(2.67)
Timeconst8	0.1116**	(2.53)	0.1118**	(2.54)
Real estate VAT	-0.0057**	(-3.87)	-0.0057**	(-3.88)
Garden size	0.0044**	(14.52)	0.00444**	(14.48)
Living space*Df	0.00141**	(6.41)	0.00141**	(6.41)
Rooms number*Df	-3.6103**	(-6.28)	-3.6171**	(-6.29)
Timeconst1*Df	0.2078**	(7.44)	0.2077**	(7.44)
Timeconst2*Df	0.2126**	(8.63)	0.2124**	(8.62)
Timeconst3*Df	0.1665**	(5.60)	0.1664**	(5.60)
Timeconst4*Df	0.05729**	(2.67)	0.0574**	(2.67)
Timeconst6*Df	0.0954**	(3.34)	0.0956**	(3.34)
Timeconst7*Df	0.2774**	(7.47)	0.2772**	(7.46)
Timeconst8*Df	0.0676	(1.01)	0.0675	(1.00)
Real estate VAT*Df	0.00517	(1.30)	0.00519	(1.31)
Garden size*Df	0.0083	(0.32)	0.0083	(0.32)
Intercept	0.00407	(1.02)	0.00407	(1.02)
Adj. R^2	0.1775		0.1776	

Dependent variable: sale price per square meter. Number of observations: 6,528. ** : significant at 1%, * : significant at 5%. T-values in parentheses.

Table 2: Estimation results of the hedonic model in spatial differences 100/1,000

Columns 1 and 2 in table 2 show that property tax rates seem to have no significant impact on the property prices (per square meter). Using IV method, property taxation and public spending are not shown to be endogenous, results in column (1) and in column (2) are therefore very identical.[2] On the side of the housing characteristics, we first observe that, in the whole sample of transactions, the size of the property has a negative impact on the sale price (per square meter), although the room number weighted by the property size has a positive coefficient suggesting that this characteristic increase the sale price. This outcome does not hold anymore in the flat case,since the coefficient of the room number is negative and the size has a positive effect. The garden size also increases the sale price in the houses and flats' case. We obtain significant coefficients for the date of construction showing that older properties are less expensive than the more recent one. However this is not true for the flats that have been constructed before the mid twenteen century. Finally the real estate value added tax has a negative impact on the lodging prices.

Table 3 presents the same estimation results for equation (6), with a maximum threshold equals to 2000 meters. In column 2, only the property tax rate is considered as endogenous, as in a previous step (results are not shown here but are available on request), where the public spending and the tax rate were both considered as endogenous, the exogeneity of the public spending could not be rejected[3]

[2] Exogeneity is not rejected for the property tax rate (p.value=0.468) and for the local public spending (p.value=0.9357 when these variables are instrumented (in column (2)), by the housing tax, the public founds transfering from the national State to municipality ("Dotation Globale de Fonctionnement") and the local public investments. When regressing the instruments on the residual, they are all rejected at 10%.

[3] Exogeneity is rejected (p.value=0.0331) for the property tax rate. In column (2), the property tax is instrumented by the housing tax, the public founds transfering from the national State to municipality ("Dotation Globale de Fonctionnement") and the local public investments. When regressing the instruments on the residual, they are all rejected at 10%.

Variables	(1)		(2)	
Estimation method	OLS		IV	
Property tax	0.0345	(0.75)	-0.0760	(-1.10)
Public Spending	-0.0097	(-0.67)	0.001344	(0.09)
Living space	-0.000963**	(-8.07)	-0.0010**	(-8.09)
Rooms numb/size	6.4447**	(15.72)	6.457**	(15.74)
Timeconst1	-0.2191**	(-11.80)	-0.218**	(-11.71)
Timeconst2	-0.2424**	(-14.87)	-0.2407**	(-14.73)
Timeconst3	-0.2073**	(-9.66)	-0.2076**	(-9.67)
Timeconst4	-0.1037**	(-7.15)	-0.1038**	(-7.15)
Timeconst6	0.0288*	(2.21)	0.0285*	(2.18)
Timeconst7	0.0450*	(2.12)	0.0448*	(2.11)
Timeconst8	0.0783	(1.82)	0.0793	(1.84)
Real estate VAT	-0.0052**	(-3.61)	-0.0052**	(-3.62)
Garden size	0.00363**	(13.39)	0.00367**	(13.50)
Living space*Df	0.00125**	(5.67)	0.00125**	(5.67)
Rooms number*Df	-4.0744**	(-7.11)	-4.0890**	(-7.13)
Timeconst1*Df	0.2126**	(7.66)	0.2113**	(7.61)
Timeconst2*Df	0.2220**	(9.14)	0.2203**	(9.06)
Timeconst3*Df	0.1675**	(5.74)	0.1678**	(5.75)
Timeconst4*Df	0.0546*	(2.52)	0.0546*	(2.52)
Timeconst6*Df	0.0964**	(3.35)	0.0968**	(3.36)
Timeconst7*Df	0.2903**	(7.79)	0.2905**	(7.79)
Timeconst8*Df	0.1009	(1.50)	0.0999	(1.49)
Real estate VAT*Df	0.0042	(1.06)	0.0043	(1.06)
Garden size*Df	0.00905	(0.34)	0.00901	(0.34)
Intercept	0.0051	(1.31)	0.00516	(1.31)
Adj. R^2	0.175		0.175	

Dependent variable: sale price per square meter. Number of observations: 6,904. **: significant at 1% ; *: significant at 5%. T-values in parentheses.

Table 3: Estimation results of the hedonic model in spatial differences 100/2,000

Let us first comment the result associated with the property tax. We can note that distance threshold does not affect the results for property tax rate; property taxation still has not significant impact on transactions' prices. The local public spending has not significant effect neither.

On the side of the housing characteristics, results are very similar to estimations with the previous data. In the house case, the size of the property has a negative impact on the sale price (per square meter). This relationship does not still hold in the flat case. The rooms number weighted by the property size increases the sale price in the house case. This outcome is completely reversed in the flat case since it takes a negative and significant coefficient. We still find that the garden size increases the sale price in the house case. The real estate value added tax still has the expected negative impact on the lodging prices. On the side of the date of construction variables, we obtain significant coefficients for the date of construction showing that older properties are less expensive than the more recent one. However this is not true for the older flats.

7 Conclusion

The aim of this paper was to provide empirical evidence on the impact of local taxation on property prices, controlling by the amount of local public spending, in two French urban areas: Dijon and Besançon, using data on property taxation and real estate transactions over the period 1994-2004. We use an empirical methodology that allows us to compare sales with the same spatial environment and we also control for the endogeneity of local taxation and public spending. We find that property taxation has a negative but not significant impact on transactions' prices.

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