MPRA

Local policy, income, and housing prices

Göbel, Jürgen

28 February 2009

Local Policy, Income, and Housing Prices

Jürgen Göbel

juergen.goebel9@googlemail.com

28.02.2009

Abstract

In a local economy, the citizens can react on local policy by exit. Exit induces a shift in the housing demand. The local policy may thus capitalize into the housing prices. However, the citizens encounter specific coordination problems on the housing market. Therefore, it may be asked how effective their exit option is. To answer this question, we work with a sample of 234 U.S. counties, from 2002 and 2003. Our empirical analysis shows that the property tax revenue is the local fiscal variable which has the strongest connection with the housing prices. In contradiction to the general theory, this connection is positive and indirect. The essential element within this connection is the personal income.

1   Local Policy and Modes of Reaction

There are two basic modes in which a citizen can react on local policy: 'voice' and 'exit'. We may find various reasons why the voice mode would lead to inefficient outcomes. One major reason is that it pays off to vote strategically. Thus, a citizen does not reveal her true preferences. Another major reason is that the aggregation of individual votes induces deficiencies. As Arrow (1951) showed, no aggregation can altogether satisfy the following five axioms: unanimity, nondictatorship, transitivity, unrestricted domain, independence of irrelevant alternatives.[1] Hence, we will ask under which conditions the exit mode leads to superior outcomes.

---

[1]For a further discussion, see Mueller (2003), chapter 24.

Tiebout (1956) outlined a model in which a citizen can choose her preferred package of local policy, by exit. In this model, each local government offers a special, fixed package of public goods. It charges its local residents with a head tax. Each government seeks to maximize its own profit. This means that it minimizes its costs for local public goods per resident. Depending on the current number of residents, it will promote entry or exit. Thus, the competition between local governments takes up two functions: First, it makes the citizens reveal their true preferences. Second, it constrains the local governments in their profits. Nevertheless, there exist six conditions to reach an efficient total outcome:

1. the range of policy offerings spans the full range of the citizens' respective preferences;

2. there are no economies of scale or minimum lots in the production of public goods;

3. the citizens have perfect information about the local policies;

4. the citizens are perfectly mobilie;

5. there are no spillovers;

6. a citizen's income does not depend on where she resides.

In this equilibrium, the citizens are thus sorted into local groups of equal preferences and equal incomes. However, we may state that the conditions are extremely rigorous. Basically, they describe a nonspatial world.[2] A spatial world, by contrast, tends to deviate from these conditions (especially from 4 to 6). Here, the housing market plays a key role in the supply of and demand for local policy. As we are going to see, housing has some special characteristics. Due to these characteristics, a housing market tends to incur inefficiencies. Such inefficiencies may transmit to the market for local policy.

2 Special Characteristics of Housing

Housing has five characteristics which make it play a special role in a local economy. First, housing is immobile. It is fixed to a special site. The site makes it unique. Second, housing is durable. It may offer utility for a longer period. The period can be extended by maintenance work. Third, housing is heterogeneous. It has particularly many features. Some of them cannot

---

[2]For an introductory discussion, see Mueller (2003), chapter 9.

be replicated. The number of possible combinations goes beyond an agent's power of imagination. Fourth, housing is prone to externalities. It is a rather inflexible element of a greater system. Externalities can arise in the form of: pollution, noise, disease infection, visual aspects, and so on. And fifth, housing is very costly. It normally claims a major share of a user's life-time income. Moreover, a user may develop various forms of housing specific capital which gets lost if she leaves.[3]

These special characteristics induce various coordination problems. The key problem is that the 'fair' value of a housing can only be appraised. There are three different appraisal approaches: First, the sales comparison approach. The value of a housing is appraised in comparison to the sales price of similar objects. Additions and deductions are made with respect to the differences. Second, the cost approach. The value is appraised by the costs it would take to reproduce or to replace the housing. Reproduction refers to a housing with the same material characteristics. Replacement refers to a housing which offers the same utility. Third, the income capitalization approach. The value is appraised by the capital inflows and outflows that a housing generates as an investment object. For an owner-occupied object, a potential rent has to be included. - Each of these appraisal approaches has its specific limits and drawbacks.[4] They may lead to significant deviations in their results for one and the same object. The fair value thus remains quite uncertain. Moreover, the relevant data may change intensively. The fair value thus tends to fluctuate a lot. But, the market participants can hardly perceive and hardly adapt to the fluctuations. As a result, inefficiencies may arise in form of: insolvency, abandonment, homelessness, discrimination, congestion, and so on.

3   Housing Policy and Capitalization

Due to the (inherent) coordination problems on the housing market, it can be expedient that the government intervenes. An intervention may be focused on the supply side, the demand side, or the price. In many cases, a government needs some specific information to contrive the right form of intervention. It therefore seems expedient to assign the respective responsabilities to a lower level within the public sector. Overall, we can distinguish five types of housing market interventions: First, zoning: The government stipulates rules on the site, the structure, and the housing activities. Such policy intents to internalize externalities. Second, housing development: The

---

[3]For a further discussion, see O'Sullivan (2003), chapter 13.

[4]For a further discussion, see Lusht (1997).

government subsidizes housing construction, on certain conditions. The conditions can be put on the site or the structure. The intention is to increase or upgrade the supply of housing. Third, housing assistance: The government offers financial aid to specific groups of housing demanders. This aid can be in the form of: rent grants, ownership grants, mortgage programs, and so on. Each form intents to strengthen specific groups on the demand side of the market. Fourth, public housing: The government itself enters the market with some special supply. This may follow the intention to put downward pressure on the prices, or to guarantee some affordable housing to a specific group of demanders. And fifth, rent control: The government stipulates a certain rent level or rent growth. It thus may intent to push the whole market into a specific direction.[5]

Good housing policy thus improves the coordination on the housing market. However, any local policy may affect the local housing price. Citizens may react on it by entry or exit. Such a reaction increases the housing demand in the region of entry and the housing supply in the region of exit. Normally, citizens are 'pulled' by local services and 'pushed' by local contributions. Hence, local public expenditure capitalizes positively into the local housing values and local public revenue negatively. The degree of capitalization depends on the efficiency of the corresponding local policy. The housing price may thus not only serve as an indicator for scarcities on the housing market but also for inefficiencies on the market for local public goods.

4   How to Measure Capitalization

A standard method to meausre capitalization follows the hedonic approach. This approach considers housing as a bundle of utility generating characteristics. Each of these characteristics has an implicit price. The market price of housing is the sum of all its implicit prices. The implicit prices determine the market price; not the other way round.

A salient study on the capitalization of local fiscal policy was made by Oates (1969). He set up an estimation equation in which the median housing value depends on the effective property tax rate and the annual expenditures on education per pupil. The control variables referred to the number of rooms, the age of the houses, the family income, and the poverty line. To run the estimation, Oates took a sample of 53 municipalities in New Jersey (U.S.A.), 1959-61. To avoid any possible bias from simultaneity, he used the 2SLS method. He thus got the following results: The property taxes

---

[5]For a general discussion of housing policy, see O'Sullivan (2003), chapters 14-16; for the role of property taxation, see Netzer (1966), Hamilton (1975).

capitalize negatively into the housing value, the expenditures on education positively. In a direct comparison of the coeffcient values, it could be said that the expenditures on education nearly compensate for the property taxes. Oates regarded all his results as quite robust.

Oates' study launched an extensive discussion on the right estimation model. In particular, the discussion dealt with the following possible aspects of capitalization:

- Pollakowski (1973): Some other local fiscal variables are highly correlated with the property taxes, the expenditures on education, and the housing value.

- Pollakowski (1973): The average family or household income is highly correlated with the fiscal variables and the housing value.

- Edel and Sclar (1974): At least in the long run, the local policy adapts to the total demand. Such adaptation reduces capitalization effects.

- Church (1974): Administrative procedures have an important impact on the capitalization effects.

- Wales and Wiens (1974): The effective property tax rate contains the housing value in its denominator. As an explanatory variable, it induces spurious correlation.

- King (1977): Capitalization effects rather depend on what the potential housing demander perceive than on how the local policy really is.

- Rosen and Fullerton (1977): Public expenditure variables describe the input for public goods; but the demanders are more interested in the output.

- Goodman (1983): Capitalization effects stem from inside and from outside of the region.

The discussion has shown that a measurement of capitalization encounters problems which may restrict the explanatory power of the results, considerably. Let us recapitulate some of these inherent problems.[6]

A first group deals with the choice of the explained variable. In a governmental region, there may exist various housing prices. Each housing price

---

[6]See also Oates (1973), Bloom/ Ladd/ Yinger (1983), Quigley (1985), Hoyt/ Rosenthal (1997), Hoxby (1999), Guilfoyle (2000), Hwang/ Quigley (2006).

reflects a certain segment of the housing market. The segments may be affected by the local policy in different ways. Thus: Which housing price is the most representative for the local policy?

A second group of inherent problems deals with the choice of the explaining variables. Various aspects of local policy may affect the housing prices. Some of these aspects can be measured in monetary units. Still, two question arise: How do the citizens perceive these values? What do the citizens relate these values to in their judgements? Other aspects of local policy cannot be measured in monetary units: Here, the question arises: How can these aspects be integrated into the estimation of the housing price? Dummy variables may appear as very restrictive solutions. Anyway, each aspect of local policy may have a specific time perspective. Thus: How long does it take until a certain policy measure capitalizes into the housing price? Moreover, the causal relationship needs not necessarily be uni-directional.

A third group of inerent problems relates to the control variables. There may exist many other determinants of housing prices than local policy. But, these other determinant may still be related to the local policy. Moreover, they may be interrelated. Thus: How can all these relationships be reconciled with the estimation model? An estimation model follows the task to explain as much of the variation in the housing price as possible. The regression coefficient of a local policy variable depends on the total explanatory power of the regression. Thus: How can a regression coefficient be interpreted as an indicator for the degree of capitalization?

A fourth and final group of inherent problems refers to the choice of the sample. Each sample bases on a specific market concept. The key question is: Does this concept conform to the theoretical and practical requirements implied by the issue? One requirement is that the sample delimit the relevant housing market. Due to the heterogeneity of housing markets, this may appear as particularly difficult. Another requirement is that the environment of the sample objects do not contain disturbances. Such disturbances could exist in any form of hidden market imperfections. And finally, the sample should cover the whole range of determinants. The determinants of housing prices tend to form an interdependent system.

5 The Data

Data which nicely conform to our requirements have been produced by the U.S. Bureau of the Census. The Bureau has generated these data within two distinctive survey programs: the 'American Community Survey (ACS)' and the 'Census of Governments (CoG)'.

Above all, the ACS includes a broad range of variables on demography, income, and housing in U.S. counties. A survey has been made each year since 1999. Starting with 2006, each survey is supposed to cover every U.S. county with a population of 65,000 or more. For 1999 to 2005, the survey covers most counties with a population of 250,000 or more, plus several selected smaller ones. The results from these years are extended by extrapolations. Nonetheless, the data can be regarded as highly reliable.

The CoG seeks to include all local government financial activities in the U.S.A. A survey has been made in five-years intervals since 1957. The survey for the fiscal year 2001-02 covers a total of 87,525 local governments. The governments are of five distinctive types: county (3,043), municipality (19,429), township (16,504), school district (13,506), and special district (35,052). The Bureau aggregates the results for each government according to its county region. County regions are the main local geographical units in the U.S.A. The aggregation thus allows to compare and combine various local variables.

6   Descriptive Statistics

A housing price is the price which an agent pays for the right to consume services from a respective housing object. Since housing offers heterogeneous services, housing prices may vary a lot. Nevertheless, housing prices may also have common determinants. Some of these determinants can be defined by a governmental region. In one such region, each housing is subject to common rules or political interventions, for instance. It thus can make sense to describe the housing prices by statistical measures which refer to specific regions.

There are two basic modes in which an agent can get the right to consume services form a given housing object: purchase and rent. Under very restrictive conditions, the purchasing price is the net present value of all rent payments. However, many violations of these conditions may appear on a housing market, such as: information asymmetry, risk inclination, or discrimination in regulation. Then, the purchasing price and the rent diverge. Hence, a housing market may split into two submarkets: one for purchase, the other for rent.

Table 1 presents some statistical measures of the housing prices in U.S. counties, in 2002 and 2003. As we can see, the housing value variables (HSVALL, HSVALM, HSVALU) highly differ from the housing rent variables (RENTCM, RENTGM). The housing values are more dispersed and less symmetric. They increased more from 2002 to 2003. Moreover, HSVALL is

less symmetric than HSVALU. RENTCM and RENTGM show very similar distributions.

variable	mean	std. dev.	skewn.	J.-Bera
HSVALL02	126767	66591	1.878	370
HSVALM02	172595	91255	1.913	343
HSVALU02	244671	130008	1.813	249
RENTCM02	623.85	173.44	0.943	51.0
RENTGM02	711.85	163.36	0.976	56.2
HSVALL03	140797	79273	1.705	235
HSVALM03	191668	106134	1.707	213
HSVALU03	270519	146860	1.643	177
RENTCM03	642.98	174.70	0.721	21.0
RENTGM03	737.25	169.12	0.714	20.4

Table 1: Housing prices: 2002 and 2003

Housing is especially characterized by its costs. The costs are higher and more diverse than those of other goods. Since housing may include a quasi infinite amount of services, we consider it as a superior good. Thus, the demand for housing must positively depend on the income over the whole domain. Next, the question arises: Which is the relevant single unit of housing demand? Individuals may want to share their housing consumption with others. Therefore, the relevant income may be found between the individual and its household. Table 2 presents some statistical measures on the incomes on our field of examination. We can see that the household median income (HHMINC) has nearly double the size of the per capita income (PCINC). Moreover, HHMINC is somewhat more dispersed and less symmetric. It increased less from 2002 to 2003. Thus, it seems that the average household size decreased.

variable	mean	std. dev.	skewn.	J.-Bera
PCINC02	24673	5228	0.507	12.8
HHMINC02	48821	11984	0.798	25.6
PCINC03	25045	5196	0.603	19.1
HHMINC03	49208	12135	0.821	27.7

Table 2: Average Income: 2002 and 2003

Potentially, any aspect of local policy may capitalize into the housing prices. Our central question is: To what degree does local policy affect the housing supply and demand. The monetary positions of a government are

recorded in its budget. The fiscal budget is supposed to reflect the essence of its policy. Table 3 presents some selected statistical information about local fiscal budgets in the U.S.A. in the fiscal year 2001/02. The fiscal values refer to the total budget size (b) or to the county's population size (p). In particular, we can see the following: The two major sources of local public revenue are intergovernmental transfers (IGMREV) and property taxation (PPTAX). Together, they amount to nearly two thirds of the total budget size. In relation to the total budget size, the revenue from both sources is very equally and symmetrically distributed. By contrast, IGMREV02c is particularly dispersed and nonsymmetric. The highest share of the total revenue is spent on education. On average, EDUCAT02b amounts to more than 40%. As a special feature, this variable is skewed to the left. EDUCAT02p is, however, skewed to the right and somewhat less symmetric. Relatively little money is spent on housing development (HSDEV). There seem to be some few counties which spend clearly more, at least in per capita terms.

variable	mean	std. dev.	skewn.	J.-Bera
IGMREV02p	1.294	0.5923	1.96	649
IGMREV02b	0.345	0.1033	0.24	2.33
PPTAX02p	1.044	0.4434	1.07	64.7
PPTAX02b	0.291	0.1207	0.64	15.7
EDUCAT02p	1.533	0.358	0.23	21.7
EDUCAT02b	0.412	0.108	-0.48	9.04
HSDEV02p	0.099	0.081	2.12	550
HSDEV02b	0.025	0.016	1.03	68.2

Table 3: Local fiscal variables: 2002

7 Regressions

We can check to what degree a fiscal variable may capitalize into the housing prices by simple regression. Based on our sample, we regress each housing price variable on each fiscal variable. It turns out that the strongest connections are those between the property tax revenue per capita (PPTAX02p) and the housing prices in 2003. The major results of the respective regressions are shown by table 4.

It turns out that PPTAX02p is positively related to the housing prices; which contradicts the general theoretical expectations. This fiscal variable can explain between 17% and 29% of the variations in the housing prices. The R-squared value for the upper quartile housing values (HSVALU03) is clearly higher than the one for the lower quartile (HSVALL03). The Jarque-Bera

values describe the distributions of the residuals. We can state that those of the housing values are even less symmetric than those of the housing rents. Actually, a scatter diagram shows that there exist some outliers on both sides of the regression line. The RESET values do not indicate misspecification for any of these regressions.

	(1)	(2)	(3)	(4)	(5)
c	62676	79735	110775	424.12	523.34
	(5.18)	(5.0)	(5.06)	(17.1)	(21.8)
PPTAX02p	74797	107169	152946	209.55	204.81
	(7.02)	(7.63)	(7.93)	(9.57)	(9.70)
R-squ.	0.175	0.20	0.213	0.283	0.288
J.-Bera	346	344	289	47.6	41.7
RESET	0.09	0.28	0.27	0.68	0.44

Table 4: Simple regressions: housing prices in 2003 on property tax

Only based on these simple regressions, we cannot say much about which role property taxes actually play in the determination of housing prices. The housing prices may be connected with many other factors. The factors may be connected with each other. Connection does not necessarily imply determination. Hence, to learn more about the actual role of property taxes, we use some specific strategy to construct multiple regressions. First, we regress each housing price on the whole available set of potential determinants. Then, we eliminate each regressor that appears as unstable or redundant. We repeat the two steps until we get estimating equations which contain only stable and non-redundant regressors. Table 5 shows such equations.

There remain three regressors in each equation. Each includes the share of foreign born in the population (FGBORN02) and the share of households with a income from self-employment (SFEMPL03). The first variable reaches higher t-values than the second. The highest t-values, however, are reached by the third regressor. In the equations (1) to (4), it is the per capita income (PCINC03). In the equation (5), it is the median household income (HHMINC03). Each coefficient has a positive sign. Together, the regressors can explain between 70% and 81% of the variation of each housing price.

	(1)	(2)	(3)	(4)	(5)
c	-177802	-236646	-328746	-99.007	-93.655
	(-11.3)	(-11.5)	(-11.8)	(-3.27)	(-3.81)
FGBORN03	376598	518239	705286	785.77	636.63
	(10.6)	(11.2)	(11.2)	(11.5)	(10.3)
SFEMPL03	849936	1016567	1307460	1193.4	830.44
	(8.29)	(7.60)	(7.18)	(6.05)	(4.69)
PCINC03	7.1306	10.101	14.743	0.0206	
	(12.3)	(13.4)	(14.4)	(18.5)	
HHMINC03					0.0097
					(22.3)
adj. R-squ.	0.706	0.720	0.730	0.775	0.807

Table 5: Multiple regressions: housing prices on stable and non-redundant variables: OLS

PPTAX02p appears as an unstable or redundant regressor for the housing prices. To understand why, we seek to explain the determination of PPTAX02p, itself. For this, we construct a multiple regression of this variable in the same way as of the housing prices. The respective results are shown by table 6.

Out of our whole set of regressors, two appear as stable and non-redundant: the local public expenditure on education per capita (EDUCAT02p) and the per capita income (PCINC02). The latter regressor is even somewhat more significant than the first. Both have positive signs. Together, they can explain 62% of the variation of PPTAX02p.

	(6)
c	-0.93288
	(-9.06)
EDUCAT02p	0.49719
	(9.58)
PCINC02	0.00005
	(13.9)
adj. R-squ.	0.620

Table 6: Multiple regression: PPTAX02p on stable and non-redundant variables: OLS

Next, we seek to assess the power of this estimation with respect to the housing prices. For this, we regress each housing price on the respective

fitted values (f). The results are shown by table 7. In each estimating equation, the coefficient of PPTAX02pf is positive and highly significant. The regressor can explain between 36% and 51% of the housing price's variation. The regressions of the housing values perform worse in the Jarque-Bera test and in the RESET than those of the housing rents. One reason is that they have insignificant constants (c). Nevertheless, all five simple regressions reveal strong connections between the per capita income (PCINC02), the local public expenditure for education (EDUCAT02p), the property tax (PPTAX02p), and the housing prices.

	(1)	(2)	(3)	(4)	(5)
c	-2600.3	-7527.5	-13795	270.59	377.85
	(0.84)	(-0.44)	(0.55)	(10.7)	(15.4)
PPTAX02pf	137295	190717	272214	356.54	344.11
	(11.6)	(12.3)	(13.0)	(15.6)	(15.5)
R-squ.	0.368	0.396	0.421	0.510	0.507
J.-Bera	361	367	309	30.0	19.7
RESET	1.14	3.39	4.82	0.01	0.08

Table 7: Simple regressions: housing prices in 2003 on fitted property tax

We finally seek to assess how PCINC02 and PPTAX02p jointly affect the housing prices. Our previous analysis confirms the suspicion that the two variables may induce simultaneous equation bias. Therefore, we need to use an estimation technique which allows to circumvent such bias. The 2SLS is one technique with this property; it has become a standard.[7] We follow this standard. As a special instrument, we take EDUCAT02p. The results of the 2SLS regressions are shown by table 8.

In the regressions of the housing values, the coefficients of PPTAX02p are only significant on a 10%-level. In the regressions of the housing rents, they are insignificant. In comparison to our OLS results from table 5, the t-values of all the other regressors become lower, especially those of PCINC03 and HHMINC03. Except for the constant terms, each significant coefficient is positive. Thus, there is no change of sign. The results are quite stable. However, the 2SLS estimating equations explain less of the variation in the housing prices than the respective OLS equations.

---

[7]For an explanation of the 2SLS estimation technique, see Greene (2000), chapter 16.

	(1)	(2)	(3)	(4)	(5)
c	-172796	-229492	-317989	-93.788	103.20
	(-10.4)	(-10.6)	(-10.7)	(-3.03)	(3.86)
PPTAX02p	31491.9	44996.0	67668.6	32.827	-48.347
	(1.66)	(1.82)	(1.99)	(0.93)	(-1.37)
FGBORN03	350625	481128	649476	758.69	688.35
	(8.79)	(9.24)	(9.10)	(10.2)	(9.58)
SFEMPL03	954613	1166132	1532388	1302.5	688.35
	(7.73)	(7.23)	(6.93)	(5.64)	(3.24)
PCINC03	5.2645	7.4344	10.7335	0.0186	
	(4.13)	(4.47)	(4.70)	(7.83)	
HHMINC03					0.0107
					(11.9)
adj. R-squ.	0.684	0.699	0.705	0.773	0.788

Table 8: Multiple regressions: housing prices in 2003 on PPTAX02p, PCINC03, and others: 2SLS

8 Summary and Concluding Remarks

In the real world, citizens may encounter severe problems, if they seek to react on local policy by exit. Many of these problems may arise due to the housing market. Housing has five special characteristics which make the coordination of supply and demand more difficult. A local government could help to lower the difficulties. However, it may have some special interest in the housing market outcomes.

If citizens react on local policy by exit, the housing demand shifts. In theory, an increase in local public expenditures increases the local housing demand; and an increase in local public revenues decreases it. Local fiscal policy thus capitalizes into the housing prices. However, real capitalization effects are difficult to measure. Difficulties arise with respect to each basic component of an estimation: the housing price as explained variable, the fiscal policy as explaining variable, the control variables, and the sample.

In this study, we develop a new approach to estimate real capitalization effects. We take particular care of interdependency, redundancy, and stability. We work with a sample of 234 larger U.S. counties, from 2002 and 2003. Five distinctive housing prices are considered. The fiscal variables are expressed in relation to the total size of the local population and to the total size of the local fiscal budget. Special attention is paid to the local average income. Our major results are as follows:

Out of all available fiscal variables, the property tax revenue per capita has the strongest connection with the housing prices. In contradiction to what the theory predicts, this connection is positive. Moreover, it seems to be rather indirect. Based on the OLS method, the property tax revenue per capita appears as a redundant regressor. Three other variables turn out to be dominant: the share of foreign born in the population, the share of households with a income from self-employment, and the local average income. In a next step, the local average income and the local public expenditure on education per capita turn out to be the dominant regressors of the property tax revenue per capita. Thus, the local average income seems to be the key factor in the connection between the property tax revenue and the housing prices. To estimate the joint effects of property taxes and income on housing prices, we use the 2SLS method. This method allows us to account for the interdependencies. As a result, the property taxes get only slightly significant in three out of five cases. The income gets significant in each case; but the level is lower than in the OLS regressions, without the property taxes.

Overall, it can be concluded that exit was a rather uneffective mode to react on local policy in the U.S.A., in 2002 and 2003. The local fiscal variable which had the strongest connection with the housing prices was the property tax revenue per capita. However, the sign of this connection was opposite to the general theoretical prediction. Other reasons to exit were much stronger than fiscal policy, especially: the form of employment, the citizenship, and the personal income. There were two dominant factors which related to the property tax revenue per capita: the local public expenditure on education per capita and the average personal income. These two positive relationships may justify the imposition of property taxes. However, these are only rough guidelines for the choice of a local policy instrument. Two central issues still remain rather unclear: How does the property tax affect the coordination problems on the housing market? To what degree do citizens accept the property tax? Further research is needed, especially with respect to the voice mode of reaction.

References

Bloom, Howard S./ Ladd, Helen F./ Yinger, John (1983): "Are Property Taxes Capitalized into House Values?" in: Zodrow, G. R. (ed.): "Local Provision of Public Services: The Tiebout-Model after Twenty-Five Years," Academic Press, ch. 7, 145-63.

Church, Albert M. (1974): "Capitalization of the Effective Property Tax

Rate on Single Family Residences," National Tax Journal, 27(1), 113-22.

Edel, Matthew/ Sclar, Elliott (1974): "Taxes, Spending, and Property Values: Supply Adjustment in a Tiebout-Oates Model," Journal of Political Economy, 82(5), 941-54.

Goodman, Allen C. (1983): "Capitalization of Property Tax Differentials Within and Among Municipalities," Land Economics, 59(2), 211-9.

Greene, William H. (2000): "Econometric Analysis," Prentice Hall.

Gronberg, Timothy J. (1979): "The Interaction of Markets in Housing and Local Public Goods: A Simultaneous Equations Approach," Southern Economic Journal, 39(10), 445-59.

Guilfoyle, Jeffrey P. (2000): "The Effect of Property Taxes on Home Values," Journal of Real Estate Literature, 8(2), 111-27.

Hamilton, Bruce W. (1975): "Zoning and Property Taxation in a System of Local Governments," Urban Studies, 12(2), 205-11.

Hoxby, Caroline M. (1999): "The productivity of schools and other local public goods producers," Journal of Public Economics, 74, 1-30.

Hoyt, William H./ Rosenthal, Stuart S. (1997): "Household Location and Tiebout: Do Families Sort According to Preferences for Locational Amenities?" Journal of Urban Economics, 42, 159-78.

Hwang, Min/ Quigley, John M. (2006): "Economic Fundamentals in Local Housing Markets: Evidence from U.S. Metropolitan Regions," Journal of Regional Science, 46(3), 425-53.

King, A. Thomas (1977): "Estimating Property Tax Capitalization: A Critical Comment," Journal of Political Economy, 85(2), 425-31.

Lusht, Kenneth M. (1997): "Real estate valuation: principles and applications," Irwin.

Mueller, Dennis C. (2003): "Public Choice III," Cambridge University Press.

Netzer, Dick (1966): "Economics of the property tax," Washington, D.C.

15

Oates, Wallace E. (1969): "The Effects of Property Taxes and Local Public Spending on Property Values: An Empirical Study of Tax Capitalization and the Tiebout Hypothesis," Journal of Political Economy, 77, 957-71.

Oates, Wallace E. (1973): "The Effects of Property Taxes and Local Public Spending on Property Values: A Reply and Yet Further Results," Journal of Political Economy, 81(4), 1004-8.

O'Sullivan, Arthur (2003): "Urban Economics," McGraw-Hill.

Pollakowski, Henry O. (1973): "The Effects of Property Taxes and Local Public Spending on Property Values: A Comment and Further Results," Journal of Political Economy, 81, 994-1003.

Quigley, John M. (1985): "Consumer choice of dwelling, neighborhood and public services," Regional Science and Urban Economics, 15, 41-63.

Rosen, Harvey S./ Fullerton, David S. (1977): "A Note on Local Tax Rates, Public Benefit Levels, and Property Value," Journal of Political Economy, 85(2), 433-40.

Tiebout, Charles M. (1956): "A Pure Theory of Local Expenditures," Journal of Political Economy, 64(5), 416-24.

U.S. Bureau of the Census (2004): "Compendium of Public Employment: 2002," 3, Washington, D.C.

U.S. Bureau of the Census (2005)] "Compendium of Government Finances: 2002," 4(5), Washington, D.C.

U.S. Bureau of the Census (2006): "2002 American Community Survey," Washington, D.C.

U.S. Bureau of the Census (2006): "2003 American Community Survey," Washington, D.C.

Wales, T. J./ Wiens, E. G. (1974): "Capitalization of Residential Property Taxes: An Empirical Study," Review of Economics and Statistics, 56(3), 329-33.

appendix

List of Empirical Variables

AVTRT	workers 16 years and over who did not work at home: average travel time to work
BACHPL	population 25 and over: percent bachelors degree or higher
BELPOV	population for whom poverty status is determined: percent income in the past 12 months below poverty level
CUCHAR	current charges
DEBTSV	total government debt services
DETDHS	housing units: percent detached
DSHS	housing units: density per acre of land
DSPOP	population: density per acre of land
EDUCAT	expenditure: educational sevices: education
FGBORN	population: percent foreign born
FINADM	expenditure: government administration: financial administration
HEALTH	expenditure: social sevice and income maintenance: health
HHMINC	household median income
HHWMIN	total households: percent with one or more people under 18 years
HHWSEN	total households: percent with one or more people 65 years and over
HIEMPL	population 16 years and over: usually worked 35 or more hours per week, 50 to 52 weeks per year
HIGHW	expenditure: transportation: highways
HSAGE	median age of housing structure
HSDEBT	specified owner-occupied housing units: percent with a mortgage contract to purchase, or simlar debt
HSDEVM	expenditure: housing and community development
HSVALL	specified owner-occupied housing units: lower value quartile (1)
HSVALM	specified owner-occupied housing units: median value (2)
HSVALU	specified owner-occupied housing units: upper value quartile (3)

IGMREV	total intergovernmental revenue
INTRST	total households: percent with interest, dividends, or net rental income
LABFC	total population: percent in labor force
MDNRR	median number of rooms
MINOR	total population: percent of people under 18
MVSMCT	population 5 years plus: percent moved within same county within last 5 years
MV1DCT	population 1 year and over: different house 1 year ago in the same county
NUSCIT	population: percent not a U.S. citizen
OCC1PS	occupied housing units: percent 1-person household
OCCDUR	owner occupied housing: median duration of occupancy
ONEPHH	total households: percent of one-person households
OSCREV	total general revenue from own sources
OTHADM	expenditure: other government administration
OTHTAX	revenue from other taxes
OWNOCC	occupied housing units: percent owner occupied
PCINC	total population: per capita income
POLICE	expenditure: public safety: police protection
PPTAX	total property tax revenue (6)
PUBASS	total households: percent with public assistance income
RECRTN	expenditure: environment and housing: parks and recreation
REINC	specified renter-occupied housing units paying cash rent: median gross rent as a percentage of household income
RENTCM	specified renter-occupied housing units paying cash rent: median contract rent (4)
RENTGM	specified renter-occupied housing units paying cash rent: median gross rent (5)
RETIRE	total households: percent with retirement income
RM3OL	housing units: percent 3 rooms or less
SFEMPL	total households: percent with self-employment income
SMHS5Y	population 5 years plus: percent have lived in the same house for 5 years

TLDEBT	total government indebtness
TLEXPD	total expenditure
TLREV	total revenue
TLTAX	total tax revenue
UNEMPL	population in labor force: percent unemployed
UTREV	utility revenue
VACHS	housing units: percent vacant
WGSAL	total households: percent with wage or salary income
WHITE	total population: percent of white population
WKCTRSD	workers 16 years and over: worked in the county of residence
WKPBTRP	workers 16 years and over: percent used public transportation
WKWALK	workers 16 years and over: percent walked