

Capitalization of property taxes in Norway*)

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Abstract

Capitalization of the property tax is of importance both for the financing and control of local governments. We apply a rich dataset of housing transactions and characteristics for three years (1997 to 1999) and combine them with local government level data about property taxation, local services, and community characteristics. The analysis of capitalization faces serious methodological challenges of endogeneity and background factors affecting housing prices and local fiscal decisions. We investigate the relationship between property tax and housing prices using a variety of econometric specifications and using instruments for property taxation. The results indicate that housing prices respond to property taxation and with full capitalization at realistic discount rates. The existence of capitalization effects suggests that housing markets reflect local fiscal conditions and that residential mobility is of importance to understand local government resource use.

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1. Introduction

Capitalization represents a key economic adjustment mechanism of fiscal policy.

Capitalization of taxes and spending affects the tax base and thereby tax revenues, and endogenous tax base determination provides incentives for government behavior. Migration and tax competition influence the social costs of taxation via this mechanism. Capitalization also reflects the working of the housing market.

The interest in the capitalization hypothesis is triggered by the fact that it can be given several economic interpretations. The degree of capitalization determines the incidence of the property tax. Full capitalization implies that current owners bear the entire burden of expected tax liabilities, whereas partial capitalization suggests that some of the burden is passed on to future owners. Capitalization is also considered as empirical support for the underlying mechanisms of the Tiebout-model (Tiebout 1956) where competition and mobility between municipalities lead to efficient resource allocation.

The hypothesis of property tax capitalization was first developed and tested by Oates (1969). He estimated the relationship between the market price of houses and the effective property tax based on data for 53 municipalities in New Jersey, USA. In the analysis he controlled for the variation in municipal services, housing characteristics, and local amenities. Oates finds that the property tax rate has a significantly negative effect on housing prices and that the degree of capitalization is around $\frac{2}{3}$. This must be understood as the partial effect of higher property taxes and does not take into account that higher property tax may improve municipal services. Oates uses school expenditures per pupil as the only indicator of municipal services and finds that higher expenditures have a significantly positive effect on housing prices. If a higher property tax rate is combined with higher levels of school spending, the effects of higher property tax rate and improved services will roughly balance each other out.

The early studies are summarized by Yinger et al. (1988). Basically all studies in this early phase, most using data from the United States and Canada, conclude that property taxes have a negative effect on housing values. Estimates of the degree of capitalization vary widely, but most of them fall in the interval 15 to 65 %. Palmon and Smith (1998) offer a more recent survey and have applied data where there is little variation in service provision and where differences in property tax to a large extent are historically determined. They find support for

full capitalization and conclude that housing market participants rationally discount properties burdened with higher taxes.

The more recent interest in capitalization is motivated by a broader interest in the working of the local political system. These studies in particular have addressed the linkages between housing prices and school attributes, such as Clapp et al. (2008) and Hilber and Mayer (2009). Some of the analyses deal with methodological challenges, notably the endogeneity of local policy characteristics. Black (1999) and Figlio and Lucas (2004) are important methodological contributions using natural experiments to analyze school quality (see Gibbons and Machin, 2003, for overview and own analysis).

The present analysis is motivated by renewed attention to property taxation as local government financing in Norway. The analysis is made possible by a rich dataset of housing transactions during 1997 to 1999 that can be combined with data about local government property taxation. The data cover all local governments with large variation in housing markets, fiscal situation and priority, and community characteristics. Less than half of the local governments have property tax and the variation in the property tax over time is limited by regulations. Since the statistical inference must be based primarily on cross section variation, there are serious methodological challenges of background controls. Since the property tax is voluntary in Norway, the analysis also must address the endogeneity of having property taxes.

We investigate the relationship between property taxation and housing prices using a variety of econometric specifications and using instruments for property taxation. The results indicate that housing prices respond to property taxation and with full capitalization at realistic discount rates. The existence of capitalization effects suggests that housing markets reflect local fiscal conditions and that residential mobility is of importance to understand local government resource use.

Section 2 expands on the motivation of the study, while section 3 addresses methodological challenges and research design. Section 4 presents data and econometric specifications. Section 5 shows and discusses the results. Concluding remarks are offered in section 6.

2. Motivation

The design of tax systems may influence the incentives for government behavior. The broad argument was developed by Brennan and Buchanan (1978, 1980) with the proposition that responsive tax bases may help limit the growth of the public sector in the case of Leviathan governments. Wallis et al. (1994) developed the 'fiscal interest approach' further by combining tax policy and regulation. The basic idea is that public officials prefer policies that relax their budget constraint. Fischel (2001a, 2001b) introduces the concept of 'homevoters', homeowners whose voting is guided by their concern for home values. To protect property values, homevoters will put great pressure on local governments to provide services efficiently. In Fischel's view the homevoter model strengthens the case for viewing the local property tax as a benefit tax. Dehring et al. (2008) presents empirical evidence in support of the homevoter hypothesis.

Recent research has addressed the incentive effects of the property tax. Oates (2001, p. 23) argues that the property tax is visible and transparent and therefore contributes to an awareness of the costs of local public programs. Glaeser (1996) and Hoxby (1999) are important contributions that explicitly model the relationship between property taxation and cost incentives. In both articles the source of the cost problem is a service-producing agency with preferences for high budgetary slack or low effort. Voters cannot observe slack or effort, and consequently they face a moral hazard problem. Assuming that the agency considers the tax rates as fixed, taxation works as a disciplining device if lower costs (less slack or more effort) increase the tax base and thereby relaxes the budget constraint. Hoxby (1999) emphasizes how a local property tax helps solve the underlying information problem. The effort of the school district is indirectly made verifiable because it is capitalized into property values and thereby affects the budget of the school authority. Gordon and Wilson (1999) analyze the incentives for public officials in the context of tax competition with and without property tax.

The empirical literature on capitalization also has contributed to broader discussions of public policy. Capitalization affects distribution policy issues. With full capitalization, any increase in the property tax immediately shows up in the housing price and there is no way to escape them. The loss is equal to the full present value of the future flow of the increased tax. Also assessment reforms have immediate and large effects for housing values. Changes in

assessment and tax rates create capital losses and gains that may be seen unfair with changing ownership. The rise in property taxation with higher school costs in the US provoked 'property tax revolt', best known with Proposition 13 in California (a proposition to hold down assessment). More specifically the capitalization literature has influenced the understanding of housing market regulation. Hamilton (1975) emphasized the strength of the property tax as a benefit tax when combined with fiscal zoning.

Our starting point is Norwegian studies that have shown how local fiscal conditions respond to incentive mechanisms addressed in the theoretical literature. Borge and Rattsø (2008) find that property taxation is associated with lower costs of utility services in Norwegian local governments. Fiva and Rattsø (2006) analyze the choice of having property taxes and identifies a spatial pattern consistent with tax competition. The importance of fiscal competition in Norway has previously been shown by Carlsen, Langset and Rattsø (2005) in an analysis of the relationship between firm mobility and infrastructure fees. Local governments with high firm mobility have lower fee level. The capitalization effect is a possible mechanism explaining the incentive effects documented above and motivates this analysis. Carlsen (2005) examines the effects of local fiscal variables and local economic conditions on migration plans of Norwegian households. His analysis confirms the importance of local services for migration plans and opens up for the possibility of capitalization effect of the services. Related to this paper and using the same housing data Carlsen, Langset, Rattsø and Stambøl (2009) offer a first analysis of capitalization using information from household surveys. Interviews about household satisfaction with local services are used to analyze the relationship between services satisfaction and housing prices. The paper is a response to the literature struggling with input and output measures of services and shows that satisfaction is associated with housing prices. Fiva and Kirkbøen (2011) use housing data for the Oslo districts to analyze the capitalization of school quality with particular emphasis on the identification problem. The publication of school quality indicators are shown to influence housing prices in the short term.

In this paper we offer a broad evaluation of capitalization of property taxation using data about all municipalities and a broad dataset of housing transactions. The existence and degree of capitalization is of importance for tax incidence and taxation as an incentive mechanisms to control local governments.

3. Methodological challenges and research design

The mechanics of capitalization can be understood in a simple framework of household mobility and housing market (see Brueckner, 1982 for a standard setup). Households are assumed to have identical tastes, but different incomes. The stock of housing is given, and the housing value is entirely demand determined.

The individual household derives utility from housing services H , municipal services Q , amenities A , and a numeraire private good X : $U = U(H, Q, A, X)$. In migration equilibrium the household must obtain the (best) utility level of alternative locations corresponding to the income level Y , $U^*(Y)$. The equilibrium condition is:

$$U^*(Y) = U(H, Q, A, Y - R) \quad (1)$$

Here R is the rent for housing H and the bid rent of the household can be defined as:

$$R = R(H, Q, A, Y) \quad (2)$$

The bid rent is increasing with higher housing services, municipal services, amenities and income. The housing value V is the discounted presented value of the excess of the bid rent over the property tax payments T , here using discount rate r and assuming a long time horizon:

$$V = \frac{R(H, Q, A, Y) - T}{r} \quad (3)$$

When the property tax payment is defined by an effective tax rate t and the market value of housing, $T = tV$, we reach the standard expression:

$$V = \frac{R(H, Q, A, Y)}{r + t} \quad (4)$$

The econometric analysis investigates the relationship between the market value of housing H , the property tax payments T (since we do not observe the effective tax rate), the housing characteristics H , the local services Q , the local amenities A , and the private income level Y at the local government level:

$$V = V(T, H, Q, A, Y) \quad (5)$$

Capitalization of property tax into property values means that varying property tax rates across municipalities is a source of differences in house prices. The idea is that mobility contributes to equalization of the after tax unit price of housing. Consider two communities that are equal in all respects, except for the property tax rate. Household are only willing to buy a house in the high tax community if they are compensated by a lower housing price. Full capitalization means that the difference in housing prices equals the present value of anticipated differences in property tax.

We start out with the standard capitalization equation derived from equation (5), now in semi-log form and indexed for local government i ($i=1, \dots, n$) and year t :

$$\log(V_{it}) = \beta_t + \beta_1 T_{it} + \beta_2 Q_{it} + \beta_3 H_{it} + \beta_4 A_{it} + u_{it} \quad (6)$$

where V is the measured market price of house transactions, T is the property tax payments per house, Q a vector describing the provision of municipal services, H a vector describing the standard of the houses in the community (size, number of baths, etc), A a vector of amenities (distance to city center etc) and u an error term.

If the property tax is capitalized into property values, the coefficient β_1 will be negative. The degree of capitalization depends both on the coefficient β_1 and a chosen discount rate. For a given discount rate, the degree of capitalization increases with the absolute value of β_1 (the effect of the property tax rate on property values is larger). And for a given β_1 , the degree of capitalization increases with the discount rate (the present value of future taxes is lower).

Already Oates (1969) recognized that local taxation must be seen in the context of financing local services. The estimation of the capitalization effect of property taxation alone can

underestimate the true effect because service spending financed by the increased property tax may raise housing prices. Net capitalization effect of property taxes must take into account the expansion of services financed by the tax. Taxation and services must be investigated simultaneously. The relationship follows from the local government budget constraint and includes the effect that high housing prices will increase the local tax base and contribute to a lower tax rate and/or better services.

In general it is of great importance that the analysis includes a complete description of municipal services. Leaving out important elements will cause a positive correlation between the property tax rate and the error term. There will be a systematic tendency to underestimate the degree of capitalization since the property tax rate also captures the effect of left out municipal services that have a positive effect on housing prices.¹ Because of the heterogeneity of housing and community characteristics it is also important to have good indicators of housing standard and amenities. We estimate a series of econometric models with different specification and handling of control variables to investigate the robustness of the capitalization effect.

The more recent literature on capitalization is motivated by the role of property taxation for local government fiscal conditions, decision making, and resource use. Housing prices and fiscal conditions must be understood as simultaneously determined when the fiscal priorities of local governments take into account household location decisions. Local governments may choose taxation level and service allocation in response to the migration pattern of households. Municipalities experiencing outmigration and declining house prices may mitigate these problems by lowering taxes and improve services for highly mobile households. Standard OLS estimation will tend to underestimate the capitalization effects of both property tax and services.

The research in this area has increasingly moved to the analysis of services and in particular school quality. The focus has been set to the endogeneity problem that follows when school policies are designed in response to the migration pattern of young families. Outmigration of families may motivate the improvement of school quality and then appear in the data as a

¹ The analysis of Oates (1969) was criticized for using school expenditures per pupil as the only indicator of municipal service provision. In a later analysis (Oates 1973) he included additional indicators. He then found the degree of capitalization to be 100 percent.

negative correlation between housing prices and school quality. Several methodological difficulties appear in this setting. School quality measures may reflect the selection of children to schools as well as the supply of school services. Rich families driving up housing prices may have children that do better at school. The estimated effect of the school quality variable on housing prices also may represent other local amenities that are associated with school quality and are important for housing prices. The rich neighborhood with the good school also may have low crime rates important for housing demand.

The endogeneity argument is of particular relevance in Norway where the property tax is voluntary. We deal with the endogeneity problem by the use of instruments. Two different types of instruments are applied. First, before 1975 the municipalities were separated into towns and rural municipalities and the property tax was compulsory only for towns. Different histories with respect to property taxation may influence later decisions about property tax, but without affecting the housing market several decades later. Second, a substantial literature documents that characteristics of the local political system like party fragmentation, ideology, and female representation in the local council may affect taxation and service allocation. We will argue that these characteristics can be used as instruments in our context since they are unlikely to have a direct effect on the housing market.

4. Data and econometric formulation

The dataset covers housing transactions and with detailed housing characteristics. The analysis is restricted by the availability of data about property taxes (explained below). We have data for annual property tax payment for a standardized house in each municipality for the years 1997-1999.

Statistics Norway has collected information about all house transactions in Norway (except transactions administered by housing cooperatives). The data set provides information about price, building year, square meters, the number of baths and WCs, type of house (detached house, apartment, etc), and distance to the center of the municipality. Compared to most U.S. studies our data set represents an improvement regarding housing characteristics and description of local government services and community characteristics.

The data of housing prices are documented in Appendix 1. In the tables housing prices are grouped by municipal population size and part of the country. We also separate between three types of houses; detached houses, semi-detached or row-houses, and apartments. From 1997 to 1999 the average increase in nominal housing prices was 21-23 percent. By comparison the consumer price index increased by less than 5 percent during the same period, yielding a real housing price growth of 16-18 percent. Housing prices are clearly higher in urban areas (larger municipalities, the capital area) than in rural areas (small municipalities, east inland and the northern part of the country). These differences widened during the period under study as the areas with the highest housing prices at the outset also experienced the highest growth in housing prices.

The financing of Norwegian local governments is quite centralized, and the revenues are dominated by block grants and regulated income and wealth taxes (where all local governments apply the maximum rates). The property tax is an important source of marginal revenue under local control and is not included in the tax equalization system. The other local financing instrument with some discretion is a series of fees related to infrastructure services (renovation, sewage etc). We have collected these in a utility charge, which is included as a control variable. Except for the property tax and the utility charge local governments are basically financed by revenue sources regulated by the central government.

The property tax is a voluntary tax for the local governments, and applies to both residential and commercial property. In the period studied the tax is restricted to urban areas and certain facilities, notably hydroelectric power plants.² Power plants and some other facilities can be taxed without taxing residential and commercial property in urban areas. The property tax may vary between 0.2% and 0.7%. The property tax included in this study concerns tax on residential property in urban areas.

Data on residential property taxation cannot be obtained from local government accounts since they do not separate revenues from different types of property. We use property tax payment for a standardized house calculated by Norwegian Household Finances (*Norsk Familieøkonomi*) based on a survey and available for all municipalities for the years 1997 to 1999. In this survey a municipality is classified as having residential property tax if at least 50

² From 2007 property tax can also be levied in non-urban areas.

percent of all properties in the municipality are subject to property tax. Based on this definition, around 15 percent of the municipalities had residential property tax during the period under study (67 in 1997, 60 in 1998, and 65 in 1999). We will investigate the robustness of the results using a broader definition of the property tax available for 1996.

The pool of municipalities with residential property tax is quite stable, 45 municipalities are classified as having property tax each year. The average property tax in 1999 (among the municipalities with property tax) was nearly NOK 1600 per house (about USD 300), varying from NOK 400 to NOK 5250. From 1997 to 1999 the average property tax for a standard house increased by 13 percent among the 45 municipalities with property tax all three years. The main drivers for the increase over time are reassessments and rate increases.

In the empirical analysis residential property tax is captured by two variables. The first is the reported property tax payment for a standardized house as discussed above. As an alternative we also study the differences in housing prices between municipalities with and without property tax. The existence of property taxation is measured by a dummy variable.

Data about municipal services and other characteristics are available from NSD (Norwegian Social Science Data Services) based on data collection by Statistics Norway. We include the coverage rate for the key welfare services run by local governments: Child care, home based care, and nursing home. Child care coverage is calculated for children ages 1-5 years. The coverage for nursing homes are calculated for inhabitants 80 years or more, while the coverage for home based care is calculated for inhabitants 67 years or more. It should be noticed that the coverage rate in primary school is excluded since it is compulsory. We do not have data about quality aspects of the services including school quality. Quality aspects do not necessarily represent permanent characteristics that the housing market will capitalize to much extent.

Whereas the typical U.S. analysis uses data for a cross section of communities within a narrow geographical area that share a common labor market, a Norwegian analysis can rely on data for a larger geographical area comprising several labor markets. The variation is larger, but so is the heterogeneity. Extending the analysis to a larger geographical area and several labor markets makes the estimation of capitalization more challenging as the number of elements in the measurement of amenities will increase substantially. In addition, we must

take into account that the residential property tax is restricted to urban areas and thereby is more widespread in municipalities with large population size and high population density. A large number of controls are included to capture local amenities and the regulation of the property tax. The municipal unemployment rate is included to represent local labor market conditions, while the population size and the settlement pattern of the municipality take account of the restrictions on the use of the property tax. In addition we control for centrality and part of country. Centrality is based on a classification developed by Statistics Norway where the municipalities are divided into 7 groups depending on the travel distance to regional centers with specific functions. Part of country is based on the same classification as in table A1b in appendix 1, and will among other things capture climatic variation across the country.

Finally, it is important to control for housing characteristics that influence the price of each house. We include the following housing characteristics: Age in years, size in m^2 , number of bathrooms (0, 1, 2, and 3 or more), number of WCs (0, 1, 2, and 3 or more), whether a garage is included, and whether it is a single family house (detached house), a semi-detached or row house, or an apartment. After excluding extreme observations with respect to size and price per m^2 , houses built before 1900, and transaction with missing values for some housing characteristics, we are left with a data set of nearly 73,000 housing transactions.

The models are estimated by pooled OLS since the short time series and the stability of the property tax do not allow for municipal effects. It is well known that pooled regressions may underestimate the standard errors and thereby overestimate the t-values. To avoid this problem we report t-values based on clustered standard errors taking into account that error terms from the same municipality are correlated. In the regressions we always include the full set of housing characteristics and year dummies to represent common shocks. Given that the statistical inference must be based on cross section variation, we investigate the robustness of the results using alternative formulations for the structural characteristics capturing labor and housing markets and the difference between urban and rural municipalities. As additional robustness checks we perform year-by-year regressions, exclude small and large municipalities, and estimate separate regressions for the three types of houses. Finally, endogeneity of property taxation and services is investigated by instrument variables.

5. Capitalization effects

The results of the first pooled regressions for the dataset covering 1997-1999 are presented in Table 1. The table shows the results for taxes and services and community characteristics. Descriptive statistics for these explanatory variables are reported in appendix table A2. As stated above, we always include the full set of housing characteristics and include time dummies to take into account common shocks. Appendix table A3 documents that the housing characteristics come out with reasonable effects. Housing prices increase with size, the number of bathrooms, and the number of WCs, and decreases with age and distance to the center of the municipality. The housing price is higher if a garage is part of the property.

Table 1 about here

The point of departure is model A that concentrates on the effect of the yearly property tax payment for a standardized house. The negative sign of the coefficient is consistent with the capitalization hypothesis, but the effect is far from significant. In model B we include the full set of community characteristics; population size, share of population living in rural areas, the unemployment rate, and dummy variables for centrality and part of country. All the structural variables are of importance. Housing prices are increasing with population size and decreasing with the unemployment rate and the share of the population in rural areas.³ The quantitative effect of the property tax variable is nearly doubled compared to model A. The estimate is -0.051 and highly significant.

In model C we include the utility charge and local government services. Housing prices increase with child care coverage, and this is the only additional variable that comes out as significant with the expected sign. Coverage in home based care for the elderly comes out with a significantly negative effect, while nursing home coverage and the utility charge have no effect on housing prices. The quantitative effect of the property tax was expected to increase with the control for local government services since in model B the property tax variable also may pick of effects of services with a positive effect on property prices. But this

³ The centrality dummies are statistically significant at the 1 percent level and the part of country dummies at the 2 percent level.

is not the case; the estimated effect of the property tax is of the same magnitude and significance as in model B. This may reflect that three of the four variables are either insignificant or of the opposite sign. However, the same holds true in model D where only child care coverage is included.

The annual property tax payment is replaced by a dummy formulation in models E and F. The alternative formulation confirms that property tax has a negative effect on housing prices, and the estimated coefficients indicate that municipalities with residential property tax have 6-7 percent lower housing prices. Also with this formulation child care coverage has a significantly positive effect on property values, and in this case the service control contributes to a slightly stronger property tax effect.

The degree of capitalization depends on the estimated property tax effect and the discount rate. The estimates indicate that an increase in annual property tax payment by NOK 1000 will reduce housing prices by 5 percent. For the average housing price in the sample of NOK 1 million this represent a price reduction of NOK 50,000. It follows that the estimated property tax effect is consistent with full capitalization with a discount rate of 2 percent. The dummy formulation of the property implies that the price of the average house is NOK 70,000 lower in municipalities with property tax. Given an average annual property tax payment of NOK 1350, this estimate is consistent with full capitalization with a discount rate of 1.9 percent. It is reassuring that two formulations yield similar results. Since the estimates are based on real housing prices and real property tax payments, it is natural to interpret the calculated discount rates as claims on the real interest rate. According to Statistics Norway, the average real interest rate on bank deposits during the period under study was 2.1 percent. The finding of Do and Sirmans (1994) is that homebuyers in the US county of San Diego in 1989 used a nominal discount rate of 4 percent for capitalization of taxes.

Full capitalization of the property tax is consistent with recent US studies (Palmon and Smith, 1998). The main explanation for partly capitalization is related to expectations (see Yinger et al., 1988). Full capitalization implies that property tax changes are understood as permanent. Capitalization reflects differences across different housing markets. Tax differences are then expected to be permanent. Partial capitalization may reflect the expectation that tax differences will disappear. The results above indicate that property taxes in Norway immediately are reflected at housing markets and are expected to persist.

Child care coverage has a consistent positive impact on housing prices, while no such effect can be found for elderly care. This finding may reflect that families with children below school age have high mobility and that child care coverage is important for their choice of municipality. The estimated coefficients indicate that an increase in child care coverage by 10 percentage points is associated with a housing price increase of around 3 percent.

Table 2 about here

Year by year regressions are shown in table 2 where the point of departure is models D and F in table 1. We only report results for property tax and child care coverage. For the main estimation period 1997-1999 both property tax variables come out with a negative and significant effect in all three years. Child care coverage comes out as highly significant in 1997 and 1998. The estimated coefficients are substantially lower in 1999, but they are still statistically significant at the 10 percent level.

The main analysis is based on a narrow definition of residential property tax where it is required that at least 50 percent of all residential property is taxed. In the 1996 survey no such threshold was imposed. Then 126 municipalities were classified as having residential property tax, compared to 60-70 in 1997-1999. We investigate the robustness of the results by estimating models on data for 1996 using the broader property tax definition. The results are reported in column E in table 2, and indicate that the two definitions of residential property tax yield very similar results. The property tax variables based on the broader definitions are highly significant in the 1996 analysis and the quantitative effects are of roughly the same order as in the main analysis for 1997-1999.

Table 3 about here

The population size of the municipalities is important, since the property tax has not been available for small local governments with limited urban population. In addition the working of the housing market may differ between small municipalities in rural areas and larger municipalities in urban areas. As documented in the appendix table A1, both the level and growth of housing prices are lower in rural areas. The many small municipalities also have few housing transactions. We investigate the possible importance of these factors by excluding

municipalities below 5000, 10,000, and 20,000 inhabitants respectively, and also by excluding the three largest cities Oslo, Bergen, and Trondheim. As shown in Table 3, the size of the capitalization effects for both property tax payments and the existence of property taxation are not much affected by the exclusion of small municipalities or the exclusion of the largest cities. However, the quantitative impact of child care coverage on housing prices increases with population size. This may reflect that higher female work participation and higher wage levels in urban areas increase the consumer valuation of child care.

Table 4 about here

The dataset consists of different types of houses, and the capitalization may vary between housing types. The analysis covers detached houses, semi-detached houses, and apartments. Table 4 reports separate regressions for the three housing types to investigate the robustness. The sign and significance of the property tax variables and child coverage are largely consistent across housing types. The only exception is that the property tax dummy becomes insignificant for apartments. There is a tendency that the capitalization effects of property taxes and child care coverage are weaker for apartments than for houses.

If fiscal variables are set to influence the mobility of households, we expect underestimation of property tax and child care coverage with standard OLS. The reason is that municipalities experiencing outmigration and declining house prices will tend to have low property taxes and high child care coverage to reduce outmigration. We investigate this simultaneity problem by the use of instruments for property taxation and child care coverage.

Our choice of instruments is guided by historical regulations of the property tax and by earlier literature on political determinants of taxes and service provision. First, before 1975 the municipalities were separated into towns and rural municipalities with different legal regulations. The property tax was (since 1911) compulsory for towns, but not for rural municipalities. It is likely that the historical differences may have persistent effects. Towns may find it difficult to abolish a tax they have relied on for a long time, and in rural municipalities there may be severe political resistance against proposals to introduce a new tax. On the other hand, the historical differences in property tax regulation are unlikely to have a direct effect on the housing market. A town-dummy is used as instrument as applied by Fiva and Rønning (2008).

Second, we draw on earlier empirical studies investigating how taxes and services are affected by political variables. The Norwegian studies by Borge and Rattsø (2005) and Fiva and Rattsø (2007) analyze the determinants of property taxation. They find that the choice of having property tax, as well as property tax payment for a standardized house, is affected party fragmentation and socialist influence. We use a Herfindahl-index of (inverse) party fragmentation and the share of socialist representatives in the local council as instruments.⁴ Moreover, Svaleryd (2009) investigates whether the degree of female representation in Swedish local councils affects local public expenditure patterns. She finds that increased female representation increases spending on child care and education. The Swedish evidence motivates us to use the share of female representatives in the local council as instrument, and in particular we expect it to be a proper instrument for child care coverage. We will in general argue that the political variables are unlikely to have any direct impact on the housing market given the large number of community characteristics included as controls.

Table 5 about here

The first stage regressions are reported in table 5 and confirm that the instruments are relevant determinants of property tax and child care coverage. The town dummy, the Herfindahl-index, and the share of socialists in the local council come out as a significant in the property tax equations and with the expected signs. Consistent with the experience from Sweden, child care coverage increases with the share of female representatives in the local council. Child care coverage also is significantly affected by characteristics of the local party system. Less party fragmentation is associated with higher child care coverage, while a higher share of socialists (a bit surprisingly) has the opposite effect.

Table 6 about here

Table 6 reports the second stage regressions for the two specifications of the property tax variable. It appears that the two formulations yield similar results. The yearly property tax payment comes out as negative and significant in model A and the same is the case for the

⁴ Borge and Rattsø (2005) and Fiva and Rattsø (2007) also find that municipal revenues in terms of grants and income tax revenue sharing has a negative effect on the probability of having property tax as well as property tax payment. When included in the instrument set, this variable turned out to be insignificant in the first stage regressions.

property tax dummy in model B. Moreover, child care coverage is positive and significant in both models. The qualitative results are the same as with OLS, but as expected the quantitative effects increases with 2SLS. The estimates of the property tax variables are nearly doubled, while the estimates of child care coverage are more than doubled. The higher point estimates indicate that standard OLS underestimates the capitalization effect. We conclude that the instrument estimation support our interpretation of full property tax capitalization in this dataset.

6. Concluding remarks

The analysis above indicates full capitalization of property taxation in pooled regression analysis covering about 73,000 housing transactions and 435 municipalities during 1997 to 1999 in Norway. The statistical inference is based on cross section differences, since property taxes do not change much over time. We have investigated alternative econometric specifications to check the robustness of the result with respect to controls and have estimated the capitalization effect with instruments for property taxes.

Further improvements of this analysis basically depend on data availability. It is expected that local government accounts will give a better description of property taxes and quality of public services in Norway. If this will be the case we can take benefit of changes in the financing of the local governments as natural experiments in future analysis.

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Table 1: Pooled regression results, 1997-1999

	A	B	C	D	E	F
<i>Taxes and services</i>						
Property tax (1000 NOK)	-0.027 (-0.94)	-0.051 (-4.50)	-0.051 (-4.88)	-0.051 (-4.84)		
Property tax dummy					-0.064 (-3.37)	-0.069 (-3.88)
Utility charge (1000 NOK)			0.0001 (0.03)			
Child care, coverage			0.278 (3.43)	0.276 (3.49)		0.302 (3.57)
Home based care, coverage			-0.453 (-5.31)			
Nursing homes, coverage			-0.024 (-0.20)			
<i>Community characteristics</i>						
Population size (log)		0.130 (14.47)	0.121 (12.76)	0.119 (13.12)	0.138 (13.56)	0.126 (13.20)
Share of population living in rural areas		-0.304 (-5.74)	-0.292 (-5.70)	-0.312 (-6.32)	-0.263 (-4.78)	-0.274 (-5.48)
Unemployment rate		-8.75 (-8.76)	-7.42 (-8.01)	-8.27 (-8.50)	-8.98 (-9.05)	-8.38 (-8.47)
Housing characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Centrality	No	Yes	Yes	Yes	Yes	Yes
Part of country	No	Yes	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes
Number of municipalities	435	435	434	435	435	435
Number of obs	72,991	72,991	72,981	72,991	72,991	72,991
R ²	0.401	0.631	0.635	0.633	0,630	0.632

Note: The dependent variable is the log of the housing price. T-values based on clustered standard errors (at the municipal level) in parentheses.

Table 2: Year-by-year regressions

	A	B	C	D	E
Property tax (1000 NOK)	-0.051 (-4.84)	-0.046 (-3.31)	-0.056 (-4.38)	-0.051 (-4.55)	-0.032 (-3.10)
Child care, coverage	0.276 (3.49)	0.311 (3.75)	0.344 (4.06)	0.170 (1.80)	0.324 (3.71)
R ²	0.633	0.612	0.631	0.654	0.587
Property tax dummy	-0.069 (-3.88)	-0.049 (-2.20)	-0.075 (-3.26)	-0.087 (-3.78)	-0.049 (-2.65)
Child care, coverage	0.302 (3.57)	0.322 (3.69)	0.381 (4.22)	0.192 (1.93)	0.344 (3.71)
R ²	0.632	0.610	0.630	0.653	0.586
Community characteristics	Yes	Yes	Yes	Yes	Yes
Housing characteristics	Yes	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes	Yes
Estimation period	1997-99	1997	1998	1999	1996
Number of municipalities	435	420	426	427	410
Number of obs	72,991	25,993	25,593	21,405	20,008

Note: The dependent variable is the log of the housing price. T-values based on clustered standard errors (at the municipal level) in parentheses. Community characteristics include population size, settlement pattern, rate of unemployment, and dummies for centrality and part of country.

Table 3: Pooled regression results, investigating population size

	All	Above 5000	Above 10,000	Above 20,000	Excluding 3 largest cities
Property tax (1000 NOK)	-0.051 (-4.84)	-0.056 (-5.14)	-0.057 (-5.02)	-0.058 (-5.25)	-0.046 (-4.15)
Child care, coverage	0.276 (3.49)	0.259 (2.79)	0.366 (3.24)	0.600 (5.00)	0.272 (3.33)
R ²	0.633	0.618	0.615	0.631	0.623
Property tax dummy	-0.069 (-3.88)	-0.075 (-3.93)	-0.074 (-3.46)	-0.067 (-2.75)	-0.068 (-3.28)
Child care, coverage	0.302 (3.57)	0.293 (2.94)	0.397 (3.25)	0.547 (3.65)	0.268 (3.15)
R ²	0.632	0.616	0.613	0.628	0.622
Community characteristics	Yes	Yes	Yes	Yes	Yes
Housing characteristics	Yes	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes	Yes
Estimation period	1997-99	1997-99	1997-99	1997-99	1997-99
Number of municipalities	435	190	99	41	434
Number of obs	72,991	67,578	59,582	45,920	57,025

Note: The dependent variable is the log of the housing price. T-values based on clustered standard errors (at the municipal level) in parentheses. Community characteristics include population size, settlement pattern, rate of unemployment, and dummies for centrality and part of country.

Table 4: Pooled regression results, different types of houses

	All houses	Detached	Semi- detached	Apartment
Property tax (1000 NOK)	-0.051 (-4.84)	-0.067 (-5.46)	-0.059 (-4.38)	-0.037 (-4.63)
Child care, coverage	0.276 (3.49)	0.351 (4.11)	0.405 (3.62)	0.212 (2.42)
R ²	0.633	0.671	0.623	0.665
Property tax dummy	-0.069 (-3.88)	-0.099 (-4.62)	-0.073 (-2.95)	-0.027 (-1.59)
Child care, coverage	0.302 (3.57)	0.373 (4.15)	0.425 (3.50)	0.222 (2.26)
R ²	0.632	0.670	0.602	0.663
Community characteristics	Yes	Yes	Yes	Yes
Housing characteristics	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes
Estimation period	1997-99	1997-99	1997-99	1997-99
Number of municipalities	435	435	300	243
Number of obs	72,991	40,110	13,885	18,996

Note: The dependent variable is the log of the housing price. T-values based on clustered standard errors (at the municipal level) in parentheses. Community characteristics include population size, settlement pattern, rate of unemployment, and dummies for centrality and part of country.

Table 5: IV, first stage regressions

	Property tax	Property tax dummy	Child care coverage
Town	0.567 (3.93)	0.334 (3.87)	0.022 (1.19)
Herfindahl index	-2.11 (-2.12)	-1.27 (-2.82)	0.449 (3.69)
Share of socialists in the local council	0.927 (1.89)	0.829 (3.39)	-0.174 (-2.97)
Share of female representatives in the local council	-0.075 (-0.09)	0.382 (0.89)	0.354 (3.78)
Community characteristics	Yes	Yes	Yes
Housing characteristics	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes
Estimation period	1997-99	1997-99	1997-99
Number of municipalities	435	435	435
Number of obs	72,991	72,991	72,991
R ²	0.463	0.550	0.482

Note: T-values based on clustered standard errors (at the municipal level) in parentheses. Community characteristics include population size, settlement pattern, rate of unemployment, and dummies for centrality and part of country.

Table 6: IV, second stage regressions

	A	B
Property tax (1000 NOK)	-0.090 (-2.38)	
Property tax dummy		-0.128 (-2.17)
Child care, coverage	0.798 (3.23)	0.878 (3.41)
Community characteristics	Yes	Yes
Housing characteristics	Yes	Yes
Time dummies	Yes	Yes
Estimation period	1997-99	1997-99
Number of municipalities	435	435
Number of obs	72,991	72,991
R ²	0.625	0.623

Note: The dependent variable is the log of the housing price. T-values based on clustered standard errors (at the municipal level) in parentheses. Community characteristics include population size, settlement pattern, rate of unemployment, and dummies for centrality and part of country.

Appendix 1. Housing prices by municipal population size and part of country

Table A1.a: Housing prices (in NOK 1000) 1997 and 1999, grouped by municipal population size

Population	Detached		Semi-det./Row		Apartments	
	1997	1999	1997	1999	1997	1999
Below 5,000	595	686	598	674	543	678
5,000 – 10,000	716	859	633	709	643	827
10,000 – 20,000	893	1094	732	928	680	942
20,000 – 50,000	989	1222	821	1022	798	1018
50,000 and above	1445	1791	1070	1305	927	1155
All houses	987	1204	895	1085	872	1074

Note: The figures are based on data for 32,857 housing transactions in 1997 and 25,971 housing transactions in 1999.

Table A1.b: Housing prices (in NOK 1000) 1997 and 1999, grouped by part of the country

Part of the country	Detached		Semi-det./Row		Apartments	
	1997	1999	1997	1999	1997	1999
The capital area	1378	1726	1152	1479	957	1251
East inland	673	775	651	762	716	808
East coast	885	1092	683	870	702	851
South	948	1166	772	960	738	997
West	882	1066	810	970	703	944
Middle	837	944	823	991	781	957
North	802	886	798	829	818	949
All houses	987	1204	895	1085	872	1074

Note: The figures are based on data for 32,857 housing transactions in 1997 and 25,971 housing transactions in 1999.

Appendix 2. Property tax, services, and community characteristics

Table A2: Description and summary statistics for property tax, services, and community characteristics, municipal level 1997-1999, amounts in NOK

Variable	Description	Mean (st.dev.)
Property tax	Annual property tax for a standardized house, fixed 1997 prices deflated by the CPI.	206 (575)
Property tax dummy	A dummy variable that equals if the municipality has residential property tax.	0.151 (0.36)
Utility charge	Annul charge for garbage collection, water and sewage, and chimney sweep, fixed 1997 prices deflated by the CPI.	6085 (1647)
Child care, coverage	Children in child care as share of children 1-5 years.	0.637 (0.12)
Home based care, coverage	Users of home based care as share of population 67 years and above.	0.217 (1.00)
Nursing homes, coverage	Residents in nursing homes as share of population 80 years and above.	0.263 (1.04)
Population size	Total population, January 1	10,382
Share of population living in rural areas	The share of the population living in rural areas, based on Census data from 1990.	0.550 (0.29)
Unemployment rate	The number of fully unemployed people as share of the labor force.	0.027 (0.014)

Appendix 3. Estimated effects of housing characteristics

Table A3: The effects of housing characteristics

	Model D Table 2
Distance to center (3-8 km)	-0.079 (-12.55)
Distance to center (more than 8 km)	-0.233 (-20.03)
Age	-0.012 (-20.24)
Age squared	0.0001 (17.61)
Size (m ²)	0.0069 (6.75)
Size squared	-9.77x10 ⁻⁶ (-5.35)
Garage	0.093 (10.37)
1 bathroom	0.199 (7.50)
2 bathrooms	0.236 (8.49)
3 or more bathrooms	0.269 (9.19)
1 WC	0.123 (3.58)
2 WCs	0.212 (6.13)
3 or more WCs	0.276 (7.71)
Semi-detached or row house	-0.034 (-1.89)
Apartment	0.014 (0.53)

Note: The dependent variable is the log of the housing price. T-values based on clustered standard errors (at the municipal level) in parentheses.