IFAU - OFFICE OF LABOUR
MARKET POLICY EVALUATION

Individual demand for local public schooling: Evidence from Swedish survey data

Åsa Ahlin, Eva Johansson

WORKING PAPER 2001:1

Individual demand for local public schooling: Evidence from Swedish survey data

by

Åsa Ahlin and Eva Johansson*

2001-02-19

Abstract

In this paper we investigate the demand for local public school expenditures in Sweden using survey data, a method previously never applied to Swedish data. We compare our results to those of earlier US studies, where the same method is used in a different institutional setup. Estimating a linear demand specification, we find that demand is inelastic with respect to income and taxprice, much in line with previous Swedish findings in a median voter framework. Estimation of a log-linear demand specification indicates that the elasticities of demand for schooling are higher in Sweden than in the US. Testing the hypothesis that municipal employees tend to have a higher demand for public spending than others, we conclude that income, as well as taxprice and grants, enters the demand function differently for the two groups of employees.

* Åsa Ahlin, Department of Economics, Uppsala University, Box 513, SE-751 20 Uppsala, Sweden, email: asa.ahlin@nek.uu.se; Eva Johansson, Department of Economics, Uppsala University and Office of Labour Market Policy Evaluation (IFAU), Box 513, SE-751 20 Uppsala, Sweden, email: eva.johansson@ifau.uu.se. We thank Sören Blomquist, Matz Dahlberg, Peter Fredriksson, Henrik Jordahl, Jørn Rattsø, Andreas Westermark, an anonymous referee, as well as seminar participants at Uppsala University, at the 2000 EPCS Conference in Siena, at the 56th Congress of the IIPF in Sevilla, and at the Nordic Conference on Local Public Finance in Copenhagen for helpful comments.

Table of contents

1 Introduction

Publicly provided education has traditionally been an essential building stone of the Swedish welfare society. As for many other publicly provided services in Sweden, the local governments are responsible for supplying primary and upper secondary schooling. Evaluating the efficiency of local public provision of schooling is an issue of central concern, not least since spending on schools constitutes the largest single item of Swedish local government expenditures. However, the task is problematic, since there is no market in which individuals' demand can be observed. Estimating individuals' preferences and their corresponding income and taxprice elasticities is a necessary first step towards an evaluation of local public sector efficiency.

The purpose of this paper is to use survey data – a method never previously applied to Sweden – in order to investigate the demand for schooling. In particular, we will (i) estimate the income and taxprice elasticities and (ii) examine whether municipal employees – because of their high stake in municipal spending on schools – have significantly higher demand for local public school expenditures than others. Finally, we will (iii) provide a comparative perspective by relating our estimates to two kinds of earlier studies.

First, we will put our findings in relation to comparable US studies, which employ survey data to estimate demand for local public school expenditures in an institutional environment different from the Swedish one. These include Bergstrom, Rubinfeld & Shapiro (1982), Gramlich & Rubinfeld (1982a), Rubinfeld, Shapiro & Roberts (1987), Bergstrom, Roberts, Rubinfeld & Shapiro (1988) and Rubinfeld & Shapiro (1989).[1] Do the elasticities differ between the two countries, and if so, in what way? In addition, we will discuss our results in relation to studies that utilize alternative methods to estimate the demand for publicly provided local goods in a Swedish setting. Aronsson & Wikström (1996) and Dahlberg & Jacob (2000) use the median voter model, while Boije (1997) applies the hedonic method. All methods have their weaknesses, but taken together they will hopefully give us a better understanding of the demand for publicly provided services at the local level in Sweden.

[1] Survey data has also been applied by Preston & Ridge (1995) on UK data, by Rongen (1995) on Norwegian data, by Shapiro & Papadakis (1993) on Australian data and by Schokkaert (1987) on Belgian data.

We use data from 1991, the year when the responsibility for providing primary and upper secondary education[2] was decentralized to the local level. At this time, the share of pupils attending private schools was negligible. Despite decentralization, the provision of a minimum standard of education to all – irrespective of income or residence – remained a national policy objective. This was to be achieved through a grant system, with the aim of canceling out differences in per capita costs across municipalities due to factors such as geographic location or demographics. Despite this, the variation in local per capita spending on schools has been significant, warranting an investigation of the preferences for local public school expenditures.

The paper is organized as follows. In the next section we present the theoretical model. In section 3, we describe and discuss the data. Section 4 reports and interprets the results, while section 5 extends the analysis by testing for differences in demand between public and private employees. In section 6, finally, we compare our results with those of earlier US and Swedish studies. Section 7 concludes.

2 A Model of the Demand for Schooling

2.1 Theoretical model

Assume that the individual (i) receives utility from private consumption (C_i) and publicly provided education, measured by per capita spending on primary and upper secondary education (G_i) in i's home municipality. The individual maximizes the following utility function

$$U_i = U(C_i, G_i) \tag{1}$$

subject to her private budget constraint

$$C_i = (1 - t_i) y_i \tag{2}$$

[2] The primary education is compulsory, and covers the first to the ninth grade. In 1991, the upper secondary school comprised two to three years of theoretical or vocational education.

as well as to the municipal budget constraint [3]

$$N_i G_i = t_i N_i y_i + N_i S_i \qquad (3)$$

where t_i denotes the local tax rate, N_i the population in the municipality, $\bar{y}_i$ the municipality mean income and S_i the per capita central government grants targeted to schools in *i*'s home municipality. In equation (3) we see that an increase in the individual's own income has the same effect as an increase in grants to the municipality. In reality, individuals are much more likely to be aware of their own income than of the true size of intergovernmental grants. This gives a budget-maximizing bureaucrat the opportunity to raise public spending more than the citizens would like when grants from the central government increase. This phenomenon is named the flypaper effect in the literature, referring to the tendency for "money to stick where it hits".[4] Bergström, Dahlberg & Johansson (1998) also find different parameters on private income and grants when investigating the demand for municipal labor in Sweden. This suggests that (3) is only a special case, where the individual correctly perceives the municipal budget constraint. In the spirit of Filimon, Romer & Rosenthal (1982), we take this into account by including a term that captures the individual's degree of grant illusion, ρ_i.[5] Thus, the individual's *perceived* municipal budget constraint, entering *i*'s utility maximization problem alongside the private budget constraint, is

$$N_i G_i = t_i N_i y_i + N_i (1 - \rho_i) S_i \qquad (3')$$

where $\rho_i = 0$ is the special case of no grant illusion, as specified in (3), while $\rho_i = 1$ indicates that the citizen does not recognize any grants to education.

[3] In order to simplify the utility maximization problem, we assume that the municipalities' only responsibility is to provide schooling, which results in a more comprised budget constraint than in reality.

[4] See, e.g., Bradford & Oates (1971) for an early discussion of the flypaper effect.

[5] Unlike Filimon *et al.* (1982), however, we assume there is no tax illusion. Also, models describing the flypaper effect usually include a local bureaucrat who has potential gains of keeping citizens unaware of the true level of intergovernmental grants. In this paper, we are using individual data and are interested in how individuals' demands are affected by their income and their perceived level of intergovernmental grants. Hence, the grant illusion term in our model could be interpreted as the citizens' impression of flypaper effects, i.e. a grant perception parameter.

$0 < \rho_i < 1$ implies that the individual underestimates the actual amount of intergovernmental grants (an alternative interpretation is that the individual discounts some of the grants as being the politicians money).

For simplicity, we set $\phi_i = (1 - \rho_i)$, and assume that all individuals have the same perception of external grants, so that $\phi_i = \phi$, *all i*. Inserting (3') into (2) consequently yields

$$C_i + \tau_i G_i = y_i + \phi \tau_i S_i \tag{4}$$

From equation (4) we can see that the price for schooling will be given by the individual's taxprice, $\tau_i = y_i / \overline{y}_i$, and that the individual's income will consist of two terms; personal income and the individual's perceived share of public income, $\phi \tau_i S_i$. If there is grant illusion, an increase in the individual's income will have different effects on the demand for spending, depending on whether the increase originates from more grants or a higher personal income. In section 4, we will test whether this is the case.

Inserting (4) into (1) and assuming a specific functional form for the utility function, we can derive a demand equation. In consideration of the comparative perspective we want to pursue later on, we will use two different specifications. First, a log-linear demand specification will be utilized since this type of specification is typically used in comparable American studies. In addition, we will estimate a linear formulation that facilitates comparisons with some of the Swedish studies as well as provides a test of how sensitive the results are to the model specification.

2.1.1 Log-linear demand specification

In the log-linear case individual *i*'s demand for local public school spending, G_i^*, is given by

$$\ln G_i^* = \beta_0 + \beta_1 \ln(y_i + \phi \tau_i S_i) + \beta_2 \ln \tau_i + \sum_{j=3}^{J} \beta_j x_{ij} - \ln \varepsilon_i \tag{5}$$

where the definition of the taxprice and the individual's income is defined as in (4). Furthermore, x_i is a $J \times 1$ vector of socio-economic variables, β a vector of parameters to be estimated, and $\ln \varepsilon_i$ is an independently and identically distributed random variable.

A method to identify and test the flypaper effect, used by, e.g., Preston & Ridge (1995), is to linearize (5). This yields the following equation that can be estimated:

$$\ln G_i^* \approx \beta_0 + \beta_1 \ln y_i + \beta_1 \phi \frac{\tau_i S_i}{y_i} + \beta_2 \ln \tau_i + \sum_{j=3}^{J} \beta_j x_{ij} - \ln \varepsilon_i \qquad (5')$$

In equation (5'), we see that the two parts making up the individual's income are estimated as separate terms. Testing for the flypaper effect is the same as testing the hypothesis that $\phi = 1$ (i.e. $\rho = 0$), or that $\beta_1 = \beta_1 \phi$. Furthermore, using this demand specification the income and taxprice elasticities are represented by β_1 and β_2, respectively, which makes them easy to calculate.

2.1.2 Linear demand specification

The linear model is derived by assuming a specific form of the utility function[6], in which case we reach the following demand equation:

$$G_i^* = \beta_0 + \beta_1 (y_i + \phi \tau_i S_i) + \beta_2 \tau_i + \sum_{j=3}^{J} \beta_j x_{ij} - \varepsilon_i \qquad (6)$$

with the same definitions of taxprice, income and socio-economic variables as in the log-linear specification. Again, we identify the grant illusion parameter by separating the second term, which gives

$$G_i^* = \beta_0 + \beta_1 y_i + \beta_1 \phi \tau_i S_i + \beta_2 \tau_i + \sum_{j=3}^{J} \beta_j x_{ij} - \varepsilon_i \qquad (6')$$

[6] This type of utility function is the same as used in the labor supply literature by, e.g., Hausman (1980). See Dahlberg & Jacob (2000) for the formula.

In this type of demand specification, the income- and price elasticities are given by

$$\eta_y = \beta_1 \frac{\bar{y}_i}{\bar{G}_i} \tag{7a}$$

$$\eta_\tau = \beta_2 \frac{\bar{\tau}_i}{\bar{G}_i} \tag{7b}$$

2.2 Estimation method [7]

In our data, we do not observe G_i^* directly. What we do observe is whether individuals are satisfied with the home municipality's efforts, or if they want the municipality to spend more or less than at present. Combined with information about the actual level of spending, we can estimate individuals' preferences using an ordered logit model. Next, we will describe how this is done.

Let us, for simplicity, assume that we have the following simple log-linear demand specification

$$\ln G_i^* = \beta_0 + \sum_{k=1}^{K} \beta_k z_{ik} - \ln \varepsilon_i \tag{8}$$

where z_i is a vector of regressors.

Let G_i denote actual spending in the municipality where i lives. Assume that individuals will express dissatisfaction with the level of public spending if G_i deviates from G_i^* with a sufficiently large fraction, which we denote δ. Hence, individuals will answer "increase spending" if $G_i^* > \delta G_i$, "satisfied" if $G_i/\delta \leq G_i^* \leq \delta G_i$ and "decrease spending" if $G_i^* < G_i/\delta$.

[7] The estimation method used in this paper is the same method as was proposed and used by Bergstrom *et al.* (1982).

Inserting this into (8) and rearranging gives:

”increase spending” if

$$\ln \varepsilon_i < \beta_0 + \sum_{k=1}^{K} \beta_k z_{ik} - \ln \delta - \ln G_i \qquad (9)$$

”decrease spending ” if

$$\ln \varepsilon_i > \beta_0 + \sum_{k=1}^{K} \beta_k z_{ik} + \ln \delta - \ln G_i \qquad (10)$$

”satisfied” if

$$\beta_0 + \sum_{k=1}^{K} \beta_k z_{ik} - \ln \delta - \ln G_i \le \ln \varepsilon_i \le \beta_0 + \sum_{k=1}^{K} \beta_k z_{ik} + \ln \delta - \ln G_i \qquad (11)$$

If we assume that $\ln \varepsilon_i$ follows a logistic distribution with zero mean and variance σ_ε^2, $ln \varepsilon_i / \sigma$ will have a logistic distribution with zero mean and unit variance. Knowing this, we can rewrite (9) – (11) in terms of the likelihood for each outcome:

$$F\left(\frac{\beta_0}{\sigma} + \sum_{k=1}^{K} \frac{\beta_k}{\sigma} z_{ik} - \frac{1}{\sigma} \ln \delta - \frac{1}{\sigma} \ln G_i \right) \qquad (9')$$

$$1 - F\left(\frac{\beta_0}{\sigma} + \sum_{k=1}^{K} \frac{\beta_k}{\sigma} z_{ik} + \frac{1}{\sigma} \ln \delta - \frac{1}{\sigma} \ln G_i \right) \qquad (10')$$

$$F\left(\frac{\beta_0}{\sigma} + \sum_{k=1}^{K} \frac{\beta_k}{\sigma} z_{ik} + \frac{1}{\sigma} \ln \delta - \frac{1}{\sigma} \ln G_i \right) - F\left(\frac{\beta_0}{\sigma} + \sum_{k=1}^{K} \frac{\beta_k}{\sigma} z_{ik} - \frac{1}{\sigma} \ln \delta - \frac{1}{\sigma} \ln G_i \right) \qquad (11')$$

where $F(\cdot)$ denotes the cumulative distribution function.

The likelihood function to be maximized is then given by

$$\prod_{\in more} F\left(\frac{\beta_0}{\sigma}+\sum_{k=1}^{K}\frac{\beta_k}{\sigma}z_{ik}-\frac{1}{\sigma}\ln\delta-\frac{1}{\sigma}\ln G_i\right)\times$$
$$\times\prod_{\in less}\left(1-F\left(\frac{\beta_0}{\sigma}+\sum_{k=1}^{K}\frac{\beta_k}{\sigma}z_{ik}+\frac{1}{\sigma}\ln\delta-\frac{1}{\sigma}\ln G_i\right)\right)\times$$
$$\times\prod_{\in same}\left(\begin{array}{l}F\left(\frac{\beta_0}{\sigma}+\sum_{k=1}^{K}\frac{\beta_k}{\sigma}z_{ik}+\frac{1}{\sigma}\ln\delta-\frac{1}{\sigma}\ln G_i\right)-\\ F\left(\frac{\beta_0}{\sigma}+\sum_{k=1}^{K}\frac{\beta_k}{\sigma}z_{ik}-\frac{1}{\sigma}\ln\delta-\frac{1}{\sigma}\ln G_i\right)\end{array}\right) \qquad (12)$$

Estimation of an ordered logit model yields the coefficients (β_k/σ) and ($1/\sigma$), from which the elasticities of interest, β_k, can be obtained. The estimation process also produces two "intercept terms", in which the threshold value is included; ($\beta_0/\sigma + ln\,\delta/\sigma$) and ($\beta_0/\sigma - ln\,\delta/\sigma$).

If we instead have a linear demand specification, we proceed in the same way; that is, we combine the actual spending level in the home municipality with the answers given in the survey in order to identify the individuals' demand and elasticities. More specifically, an individual is assumed to answer "increase spending" if $G_i^* > G_i + \delta$, "satisfied" if $G_i - \delta \geq G_i^* \geq G_i + \delta$, and "decrease spending" if $G_i^* < G_i - \delta$. [8]

3 Data

In this study we combine survey data from the Local Citizen Survey[9] with municipal data. The survey consists of data on 7550 individuals living in 28

[8] Notice that the interpretation of δ differs from above; there it was a proportion now it is a sum. In order to get a comparative expression summarize δ and G_i and divide by G_i.

[9] The principal investigator was Folke Johansson at the Department of Political Science, Göteborg University. The data set is handled and distributed by the Swedish Social Science Data Service (SSD) at Göteborg University. A detailed description of the sample procedure and construction of the survey is available in Johansson, Lorentzon & Strömberg (1993).

Swedish municipalities.[10] It includes information on individual specific characteristics such as the respondents' age, sex, income, type of employment and presence of children in the family. After deleting observations where we have missing values on at least one of the variables of interest, we are left with 2298 observations[11]. The respondents are asked about their preferences for publicly provided local services. More specifically, they are asked the following question:

(Q1) On this card are shown certain things for which the municipalities are responsible. Please indicate for each and every one of them whether you feel that it is urgent that your municipality does more than it is doing at present, that generally speaking things are satisfactory at present, that the municipality's efforts should be diminished, or that you have no opinion about it.

a) School
b) Child care
c) Elderly care
d) Culture
e) Roads
f) Social assistance

The question above has one important shortcoming; it does not link an increased level of services to a corresponding tax increase. In order to control for the individual's willingness to pay for announced preferences, we need to use more information from the survey. The question stated below serves our purposes;

(Q2) Consider the following claim: It is more urgent to lower local taxes than to raise the level of local services. Do you

a) agree completely

[10] The municipalities are the following: Upplands-Väsby, Nacka, Tierp, Uppsala, Enköping, Katrineholm, Eksjö, Kalmar, Staffanstorp, Kävlinge, Sjöbo, Trelleborg, Munkedal, Göteborg, Lysekil, Ale, Tranemo, Grästorp, Töreboda, Lidköping, Kil, Surahammar, Västerås, Härjedalen, Sorsele, Kalix, Gällivare, Luleå.
[11] The individuals left out of the sample due to missing values are equally distributed across municipalities and with respect to socio-economic characteristics.

b) agree on the whole
c) disagree on the whole
d) disagree strongly
e) have no opinion

If an individual considers it ”urgent the municipality does more than at present” with respect to schools, but at the same time agrees (completely or on the whole) with the claim in Q2, one would suspect that this person would have expressed a different opinion in Q1, had this question been linked to increased taxes. In order to capture individuals' preferences for schooling, we therefore combine the answer in Q1 to the one in Q2.[12]

In doing this, we need to consider that question Q2 is not specifically linked to schooling, but to local services in general. Consequently, a respondent considering it ”more urgent to lower local taxes than to raise the level of local services”, may refer to the level of all local services but schooling. We take this possibility into account by relating the answer given with respect to schooling (alternative Q1a) to the individual's average preference for local public spending, which we calculate by using the answers to Q1a-f. [13] Thus, we control for the individual's willingness to pay in the following way:

A. If the individual
answers Q1a with ”more” or ”same”,
answers Q2 with ”agree completely”, and
expresses lower or the same preferences for schooling than for the average public service,

[12] It could also be argued that the individuals answering Q1a with ”urgent the municipality does more” expresses an opinion for organizational change – which does not require an increase in the tax rate – rather than more spending. In particular, this could be the case if they also agree with the claim in Q2. Using the answers to an additional survey question, relating to school quality, we could conclude the following; only a very small fraction – 4.6 percent – of the respondents in this “critical group” expressed dissatisfaction with the school quality. This might be an indication that interpreting ”urgent to do more” as a preference for increased spending is not too problematic.

[13] The preferences for the average public service is calculated by coding each answer as 1 if the individual expresses a preference for less spending, as 2 if the individual is satisfied and as 3 in case of a preference for more spending. Having done this, the mean is calculated, yielding a value ranging from 1 to 3, to be compared with the answer given on question Q1a (also ranging from 1 to 3).

we interpret this as a preference for *less* spending on schools

B. If the individual
answers Q1a with ”more”,
answers Q2 with ”agree on the whole”, and
expresses lower or the same preferences for schooling than for the
average public service
we interpret this as if the individual is satisfied and has a preference for the *same* level of spending on schools

C. If the individual
answers Q1a with ”same”,
answers Q2 with ”agree on the whole”, and
expresses lower or the same preferences for schooling than for the
average public service,
we interpret this as a preference for *less* spending on schools

Otherwise we assume that the answer given in Q1a directly expresses the individual's preferences.

In Table 1 we present the resulting frequencies of ”less-”, ”more-” and ”same-” answers, divided according to employment status, sex, taxprice and income.

The figures in Table 1 indicate that public employees in general want more spending on schools than private employees do, and women want more spending than men. The higher income people have, the more public spending on schools is preferred. The same is, somewhat surprisingly, true for the taxprice; the larger proportion of higher public spending that the individual has to pay, the more spending is preferred. These figures do however not control for the actual level of spending in the municipalities, and must be interpreted with care.

Table 1. Distribution of Preferences for School Expenditures

	less	*same*	*more*
Full sample	0.171	0.347	0.482
Type of employee			
Public employees	0.132	0.328	0.540
Private employees	0.203	0.344	0.453
Sex			
Women	0.132	0.342	0.526
Men	0.209	0.352	0.439
Income			
Income < 95000	0.171	0.401	0.427
95000 > Income > 140000	0.150	0.350	0.500
Income >140000	0.191	0.288	0.521
Taxprice			
Taxprice < 0.68	0.168	0.395	0.438
0.68 < Taxprice < 1.04	0.148	0.360	0.491
Taxprice > 1.04	0.194	0.293	0.513

The municipal data set includes local school expenditures per capita, mean income, per capita grants targeted to education, and population (see Table A.1 in the appendix for a complete list of variables and Table A.2 for summary statistics).[14] Using school expenditures instead of output, which is hard to measure, will give biased estimates if variations in actual spending are influenced by cost differences across communities rather than purely quantitative differences. Teachers' wages constitute a significant part of the production cost and it could be a problem if wages differ much across municipalities for teachers of the same "quality" (education and experience). In 1991 there was however a centralized system of wage bargaining for teachers and any observed differences in wage costs are more likely to represent differences in the number of teachers and their experience rather than differing geographical wage setting strategies. In addition, any structural cost differences that the municipalities cannot influence, such as demographic and geographical factors, are to be compensated for

[14] Source: Kommunförbundet and Statistics Sweden (1992).

through the grant system. In 1991, the municipalities received grants targeted to the school sector on the basis of structural factors such as the density of school-aged children in the community, the share of immigrant children in the population and the number and costs of programs run in upper secondary school. As these grants are included in our analysis, in a way that was specified in section 2, we should not expect the estimations to be biased due to structural cost differences.

4 Empirical Results

Let us now turn to the estimations. We use two different specifications of the demand equation; a log-linear and a linear one. For both the log-linear and the linear specification we estimate a parsimonious model (*Model 1*) as well as an extended model (*Model 2*). The former includes only the variables needed for estimating the elasticities, i.e. spending per capita, income and taxprice. *Model 2* also includes socio-economic individual specific variables. Some of these variables, e.g. age, are likely to be correlated with income. As a result, we should interpret the income elasticity in *Model 2* as a 'pure' effect of a marginal change in the individual's income on demand in contrast to the composite effect implied by *Model 1*. Furthermore, we include personal income and the individual's share of central government grants to education separately in both models, as specified in the theoretical section.

The results from the estimations are presented in Tables 2 and 3.[15] Let us begin our study of these by looking at the elasticities, presented in Table 2. In all four specifications, the elasticities have the expected signs. It turns out that it matters how we specify our model. The parsimonious models give higher elasticities both in the log-linear and the linear specification. As mentioned above, this is to be expected when socio-economic variables correlated with income are excluded in the parsimonious model. We can also note that the elas-

[15] Testing whether our results are subject to the so called 'Tiebout bias', i.e. the possibility that the respondents' choice of community in which to live is determined by their preferences for school spending, we found no evidence of such a bias in our data. A thorough description of the methodology used, the ensuing results and a discussion of these are given in Ahlin & Johansson (2000).

ticities are lower when we choose a linear, instead of a log-linear, specification of the demand equation. For example, in the extended model, the point estimate of the income elasticity is 0.69 in the linear specification, to be compared with 1.14 in the log-linear one. The corresponding figures for the taxprice elasticities are –0.78 and –1.09, respectively. More precise statements about the magnitude of the elasticities are, however, made difficult by the relatively wide confidence intervals. In any way, the elasticities are statistically significant at the one-percent level, with the exception of the income elasticity in the linear model, which is significant at a five-percent level.[16]

Table 2. Elasticities for local school expenditures

	Log-linear		Linear	
Elasticity	Model 1	Model 2	Model 1	Model 2
Income	1.625***	1.144***	1.212**	0.686**
	(0.320)	(0.273)	(0.385)	(0.282)
Taxprice	-1.586***	-1.090***	-1.249***	-0.782***
	(0.315)	(0.270)	(0.299)	(0.252)

Notes: i) ***, **, * denotes significance at the 1-, 5- and 10-percent level respectively.
ii) Standard error in parentheses

How about the citizens' perception of external grants? Does a marginal increase in grants and personal income, respectively, have the same effect on the probability of demanding more school spending? Testing the hypothesis that the coefficients of personal income and grants are equal, we could not reject the null in any of our model specifications. There is thus no evidence that the individuals misperceive the amount of external grants to education. No grant illusion means that the equality $\phi = 1$ should hold. From the lower part of Table 3, we can see that even though the point estimates are larger than one, the standard errors are very large and we cannot reject the hypothesis that $\phi = 1$ in any of the four cases.

[16] The standard errors of the elasticities have been derived using the delta method, see, e.g., Greene (2000).

Table 3. Estimated demand for local school expenditures

	Log-linear		Linear	
	Model 1	Model 2	Model 1	Model 2
Ordered logit coefficients				
Spending	-1.647***	-1.829***	-1.96e-04***	-2.23e-04***
	(0.417)	(0.480)	(4.84e-05)	(5.44e-05)
Income	2.676***	2.092***	1.39e-05***	8.94e-06***
	(0.564)	(0.480)	(2.57e-06)	(2.79e-06)
Grants	6.183	10.604	5.99e-06	4.35e-05
	(19.982)	(22.874)	(1.24e-04)	(1.31e-04)
Taxprice	-2.613***	-1.994***	-1.909***	-1.358***
	(0.564)	(0.644)	(0.487)	(0.512)
Female		0.327***		0.279***
		(0.088)		(0.088)
Age_30		0.807***		0.789***
		(0.189)		(0.186)
Age_40		0.799***		0.841***
		(0.207)		(0.207)
Age_50		0.717***		0.787***
		(0.192)		(0.191)
Age_60		0.371*		0.416**
		(0.198)		(0.198)
Age_70		0.127		0.166
		(0.201)		(0.201)
Municipal		0.334***		0.358***
		(0.108)		(0.108)
Child		0.209*		0.226*
		(0.120)		(0.119)
School child		0.345***		0.341***
		(0.110)		(0.110)
β_0	-9.885	-4.821	11397.264	6633.903
δ	1.668	1.600	1.583	1.525
ϕ	2.311	5.069	0.431	4.866
	(7.847)	(9.793)	(8.885)	(15.113)
N	2835	2298	2835	2298
Log L	-2856.074	-2243.542	-2865.969	-2248.5032
LR chi2 (df)	75.720 (4)	192.67 (13)	55.93 (4)	180.75 (13)

Notes: i) ***, **, * denotes significance at the 1-, 5- and 10-percent level respectively.
ii) Standard error in parentheses
iii) The LR-test tests the joint significance of all coefficients.

Turning to the socio-economic variables we find that, irrespective of which specification is used, the probability of demanding more school spending increases if the individual is female, municipally employed, of working age and has children – in particular if these are of school age. In all setups, the coefficients have the expected signs and are statistically significant but in one case (the dummy indicating whether the individual is 61-70 years of age). The three coefficients used for deriving the elasticities also have the expected signs and are significant on a one-percent level. The negative sign preceding the spending coefficient tells us that a positive change in school expenditures decreases the probability of demanding more spending. Correspondingly, an increase in the taxprice decreases the probability of demanding more spending, while the opposite interpretation is valid when individual income increases.

Does it matter how we specify the dependent variable? Running the ordered logit estimations on the basis of three alternative definitions of the dependent variable, the qualitative results do not change.[17] The estimated coefficients, elasticities and the associated standard errors are similar in magnitude, and the statistical significance remains the same. We therefore conclude that the results are not particularly sensitive to the definition of the dependent variable.

5 Public and Private Employee

Do public employees tend to have a higher demand for public spending than private employees? Some support for this hypothesis was given by the above analysis, where the dummy reflecting whether an individual is municipally employed was statistically significant (at a one percent level), hence indicating that the constant in the demand equation differs for municipal employees and

[17] These alternative ways of adjusting for the individual's willingness to pay are summarized in Table A.3 in the appendix. The coefficient estimates and elasticities are available from the authors on request.

others.[18] Considering also the relatively high ratio of municipal employees to total employment in Sweden, amounting to more than 20 percent at the time of the survey, this issue seems relevant to investigate further. We will therefore devote this section to tests for differences in demand between public and private employees.

There are several reasons to expect demand to differ between these two types of employees, one being that cutbacks in public spending might be associated with decreasing job security in the public sector. Another hypothesis is that public employees in general might be more prone towards public services because of, e.g., their political identification. In both these cases, this will be reflected by a differing constant in the demand equation for the two groups of employees. Just assuming public employees to have higher demand for public services because of some underlying taste parameter seems a bit unsatisfactory however. Courant, Gramlich and Rubinfeld (1979b) put forth a theoretical model where the reasons for differences in the demand equations are modeled more thoroughly.[19] In the model, differences in demand are due to differences in the budget constraints. The main mechanism is that the suppliers of the public goods are in part their own demanders, with the private sector having little to do but pay. Consider, for example, public sector wages. For a private employee, higher public sector wages mean that the public services have become more expensive and she will hence demand less public service. For a public employee, this is only one side of the coin, since higher public wages also imply higher income. As a consequence, the price elasticity will be less negative for public employees than for private employees and the income elasticity will be higher.

Below we will test whether the hypothesis that demand differs for public and private employees is true in Sweden.[20] More precisely, we will test if the intercept as well as the slope coefficients differ for people employed by the municipalities.

[18] We have chosen to use municipal employees rather than public employees (which also includes state and county employed) since the supply of education is a municipal matter.
[19] The same topic is discussed in Courant, Gramlich & Rubinfeld (1979a) and in and Gramlich & Rubinfeld (1982b).
[20] It is worth noting that we are not testing the Courant-Gramlich-Rubinfeld model directly, since their theoretical model is quite different from the one put forth in section 2.1 in this paper.

Consider the following model:

$$G_i^* = \beta_0 + \beta_1 y_i + \beta_2(\tau_i s_i) + \beta_3 \tau_i + \sum_{j=3}^{J} \beta_j x_{ij} + \gamma D_i + \\ + D_i \lambda_1 y_i + D_i \lambda_2(\tau_i s_i) + D_i \lambda_3 \tau_i + D_i \sum_{j=3}^{J} \varphi_j x_{ij} - \varepsilon_i \tag{13}$$

where D_i takes the value 1 if the respondent is municipally employed, 0 otherwise. From equation (13), we see that there are least three potential hypotheses that we could be interested in testing:

H1: $\gamma = 0$
H2: $\lambda = 0$
H3: $\varphi = 0$

H1 tests the hypothesis that the intercept is the same for municipal and non-municipal employees, H2 the hypothesis that income, grants and taxprice enter with the same parameters for the different employment types, and H3 finally tests whether the effect of the socioeconomic variables is the same across employment types. As always, when there are a number of different hypotheses one likes to test, there is the question of which order to test the hypotheses in. In Table 4 we describe the procedure we have chosen. We use the traditional LR-test given by

$$LR = -2(\ln L^R - \ln L^U), \tag{14}$$

which under the null is distributed as χ^2 with as many degrees of freedom as there are restrictions imposed.

Starting out with a model with no differences between municipal employees and the rest of the population, and testing whether the intercepts differ, we see from line *i* of Table 4 that we reject the null of equal intercepts. If we instead test whether the slope coefficients on income, grants and taxprice differ (line *ii*) we reject the null in this case as well. In line *iii* we test the hypothesis that the socioeconomic variables have the same impact for the two different employee types. Also in this case we reject this hypothesis.

Table 4. Tests of model specification

	Log-linear model	Linear model	
	LR-test	LR-test	Critical value (df)
i. $\gamma = 0$, given that $\lambda = \varphi = 0$	351.96	357.93	3.84 (1)
ii. $\lambda = 0$, given that $\gamma = \varphi = 0$	259.94	370,38	7.81 (3)
iii. $\varphi = 0$, given that $\gamma = \lambda = 0$	361.49	368.38	15.5 (8)
iv. $\lambda = 0$, given that $\varphi = 0$, $\gamma \neq 0$	8.25	13.94	7.81 (3)
v. $\gamma = 0$, given that $\varphi = 0$, $\lambda \neq 0$	0.28	1.49	3.84 (1)
vi. $\varphi = 0$, given that, $\lambda = 0$, $\gamma \neq 0$	10.91	13.72	15.5 (8)
vii. $\varphi = 0$, given that, $\lambda \neq 0$, $\gamma = 0$	0.60	0.67	15.5 (8)

Note: The tests are conducted at the 5-percent level.

Is it the case that both the intercept and the three slope coefficients are different for the two groups of employees? Assuming that the intercept differs and testing whether the slope-coefficients for income, grants and taxprice differ as well, we can reject the hypotheses that they do not differ (line *iv*). On the other hand, assuming that that the slope coefficients differ and testing the null of equal intercepts, we cannot reject the null (line *v*) for neither of the models. The conclusions from these tests are clear-cut; a model with differing coefficient on income, grants and taxprice for municipal and non-municipal employees seems to work best.

Let us finally test for different slope coefficients on the socioeconomic variables. From lines *vi* and *vii*, we see that we cannot reject the null that they do not differ, neither when we allow for different intercepts for the two types of employees, nor when differing coefficients are allowed. Thus, we can conclude that income, grants and taxprice enter differently for municipal employees, while the constant term seems to be the same across groups, as is the effect of the socio-demographic variables.

What happens with the income and price elasticities? Do municipal and non-municipal employees react differently to changes in price and income? In Table 5 we present the results from ordered logit estimations where we allow for different impact of income, grants and taxprice for the two groups of employees and in Table 6 we present the resulting elasticities.

Table 5. Estimated demand for local public school expenditures – municipal vs non-municipal employees

	Log-linear		Linear	
	Estimate	Standard Error	Estimate	Standard Error
Coefficient				
Spending	-1.808 ***	0.481	-0.00021 ***	5.47e-05
Income	2.099 ***	0.644	7.81e-06 ***	2.97e-06
Taxprice	-2.030 ***	0.646	-1.365 ***	0.526
Grants	23.619	23.597	8.58e-05	1.3e-04
Income *Munic	0.178 ***	0.066	1.64e-05 *	8.98e-06
Taxprice*Munic	0.084	0.138	-0.049	1.381
Grants*Munic	-62.720 **	28.420	-4.6e-04	2.9e-04
Female	0.327 ***	0.088	0.281 ***	0.086
Age_30	0.811 ***	0.189	0.798 ***	0.186
Age_40	0.789 ***	0.207	0.828 ***	0.207
Age_50	0.703 ***	0.192	0.757 ***	0.192
Age_60	0.347 *	0.198	0.376 *	0.198
Age_70	0.118	0.201	0.153	0.201
Children	0.219 *	0.120	0.235 **	0.119
Sch_child	0.354 ***	0.110	0.346 ***	0.110
β_0	-5.215	--	6631.259	--
δ	1.610	--	1.559	--
N	2298	--	2298	--
Log L	-2238.55	--	-2242.28	--
LR chi2 (df)	200.65 (15)	--	193.20 (15)	--

Notes: i) ***, **, * denotes significance at the 1-, 5- and 10-percent level respectively.
ii) Standard errors in parentheses.
iii) The LR-test tests the joint significance of all coefficients.

Table 6. Elasticities for local public school expenditures – municipal vs non-municipal employees

	Log-linear		Linear	
Elasticity	**Estimate**	**Standard Error**	**Estimate**	**Standard Error**
Income	1.161 ***	0.278	0.668 **	0.317
Price	-1.123 ***	0.277	-0.872 ***	0.300
Income, munic. employees	1.259 ***	0.289	1.739 **	0.776
Price, munic. employees	-1.076 ***	0.280	-0.767	0.704

Notes: i) ***, **, * denotes significance at the 1-, 5- and 10-percent level respectively.
ii) Standard errors are calculated using the delta method.

From Table 6, we see that the results are consistent with economic theory. Both specifications indicate more elastic demand with respect to income, and less elastic demand with respect to taxprice for municipal employees, although the differences are rather small for the log-linear model. Looking at the linear model, we see that the income elasticity for municipal employees is 1.74, to be compared with 0.67 for the rest of the population. The corresponding figures for the price-elasticities are -0.77 and -0.87. It hence seems like municipal employees are less sensitive to rises in price than non-municipal employees and that they increase their demand with approximately one percent more than non-municipal employees when own income increases by one percent. The elasticities are however not significantly (in a statistical sense) different for municipal and non-municipal employees. It is also worth noting that the elasticities for the non-municipal employees are very similar to the ones presented in Table 2.

6 A Comparative Perspective

A number of American studies estimate taxprice and income elasticities of demand for local school expenditures using the same method as we do[21]. Need-

[21] See Bergstrom *et al.* (1982) for a comparison between macro and micro estimates and Inman (1979) for a review of demand estimates for public education as well as other local public services.

less to mention, the US system differs considerably from the Swedish one, with respect to the school setting as well as other aspects. A comparison between studies applying the same method of estimation is nevertheless of interest. It is also of value to know whether our survey data estimates correspond to those found in earlier Swedish work, where other methods have been employed. In this section we will therefore discuss our results in light of earlier Swedish and US studies.

6.1 A comparison with American studies

In Table 7 we list American studies estimating a log-linear demand equation, using survey data. All of them examine the demand for local public school expenditures

In contrast to our findings, Bergstrom *et al.* (1988) and Rubinfeld *et al.* (1987) find evidence of Tiebout sorting, using Michigan survey data. Since our data contains a set of randomly chosen municipalities across the country, and only a few municipalities in the vicinity of larger Swedish cities, it is likely that the mobility costs are considerably higher than in the Michigan data set. This might explain the divergent results.

How do the elasticities of the US studies compare to ours? We can start by noting that the US point estimates typically are lower than the ones we find. This is true both in a parsimonious model and in an extended model where socioeconomic variables are taken into consideration. Bergstrom *et al.* (1982) and Rubinfeld & Shapiro (1989) estimate a model similar to our parsimonious one (*Model 1* in Table 3). As the resulting income elasticities (taxprice elasticities) range from 0.83 to 0.93 (from -0.57 to -0.72), demand seems much less elastic than according to our findings where, in the log-linear case, the point estimates centers around 1.6, in absolute terms.

Comparing the results of the extended models, it can be noted that the US estimations tend to control for a larger set of socio-economic variables than we do in *Model 2*.[22] Not taking potential Tiebout sorting into account, the point estimates of the income elasticity (taxprice elasticity) run from 0.29 to 0.72 (from 0 to -0.70), while the Tiebout corrected estimates vary from 0.10 to 0.23

[22] In the survey used in this study, the questions relating to, e.g., the educational level, occupational status (employed/unemployed/welfare recipient), and citizenship of the respondent contained too many missing observations for them to be included in the estimations.

(from -0.11 to -0.87). Evidently, these results suggests considerably less elastic demand compared to our log-linear case, while the "uncorrected" results are not out of line with those of our linear demand specification.

Table 7. Estimated income/taxprice elasticities of demand for local school expenditures in studies applying US survey data on a log-linear demand specification.

Study	Model	Income elasticity	Taxprice elasticity
Models that do no control for Tiebout sorting [23]			
Bergstrom *et al.* (1982)	Parsimonious	0.83	-0.57
	Extended model 1	0.49	-0.41
	Extended model 2	0.38	-0.43
Gramlich & Rubinfeld (1982a)	Extended model 1	0.29	-0.01
	Extended model 2	0.35	-0.01
	Extended model 3	0.41	0
Rubinfeld & Shapiro (1989)	Parsimonious	0.93	-0.72
	Extended model 1	0.72	-0.70
	Extended model 2	0.70	-0.64
Rubinfeld *et al.* (1987)	Extended	0.32	-0.32
Models controlling for Tiebout sorting			
Bergstrom *et al.* (1988)	Extended	0.23	-0.87
Rubinfeld *et al.* (1987)	Extended	0.10	-0.11

Hence, the US studies typically find considerably lower elasticities than we do, both with respect to income and price. Why are Swedes more sensitive to changes in income and taxprice than their fellow Americans? This paper gives no clear guidance in understanding why this is the case. Let us, however, devote a few sentences to speculations. One potential explanation for the differing

[23] As the results from estimating a Tiebout corrected model are sensitive to the instrumental variables used, we believe that it is relevant to look at the estimates that do not control for potential Tiebout sorting as well.

results might be that education is more necessary for the well being of individuals in the US than in the Swedish social welfare state of the early 1990's. Compared to the US, the returns to education are relatively low. Knowing that you are going to do relatively well regardless of your education, due to a guaranteed income floor and high marginal tax rates, might cause education to be considered more of a luxury good than a necessity. This would imply higher elasticities in Sweden, both with respect to income and taxprice.

6.2 A comparison with Swedish studies

At least four different methods are available when estimating the demand for publicly provided services, for which there are no market; the survey data method, used in this paper, the median voter model, the hedonic approach and the random utility model. Each of these methods has their strengths and weaknesses. With the results pointing in the same direction, however, we will have a more comprehensive picture of individual demand for local public goods in Sweden.

In Table 8, we compare the results from this paper with the findings of earlier Swedish studies using other methods. One fundamental difference to our study is that these are based on macro or household data rather than micro data. Also, they focus on demand for local public services in general, and not on a specific sector such as education. This latter difference is to be kept in mind when interpreting the results.

The models in the Swedish studies typically include variables reflecting household or municipal characteristics (see Table 8). Thus, a comparison of results should primarily focus on those of our extended model (*Model 2*). Consistent with our findings, attributes such as municipal age structure, presence of children in the household and a woman head of the household are statistically significant and positive, irrespective of the methodology employed.

Table 8. Estimated income/taxprice elasticities of demand for local public services in Sweden

Study	Method	Year	Model	Income elasticity	Taxprice elasticity
Boije (1997) [i]	Hedonic	1990		0.09	-0.89
Aronsson & Wikström (1996) [ii]	Median voter	1990	Median voter model	0.82	-0.53
			General model	0.87	-0.53
Dahlberg & Jacob (2000) [iii]	Median voter	1981-1987	Log-linear : Fixed effect	1.30	-1.48
			GMM, static	0.45	-0.67
			GMM, dynamic	0.47	-0.74
			Linear: Short run, dynamic	0.57	-0.91
			Long run, dynamic	0.83	-1.32
This paper [iv]	Survey data	1991	Log-linear	1.13	-1.07
			Linear	0.73	-0.74

Notes:

i) Dependent variable: Marginal price of local public services. Household attributes: disposable household income, age of the head of household, number of children in household, dummy for female head of household, dummy for married head of household, dummy for one member household.

ii) Dependent variable: Local public expenditures. Municipal attributes: per capita tax base, median income, share of members in local council representing socialist parties, municipal age structure, size and density of municipal population, respectively, dummy indicating geographic location, total operating cost net of user fees.

iii) Dependent variable: Local public expenditures. Municipal attributes: median household income before tax + taxprice * grants, household median income/household mean income, share of population young and old, respectively, density of municipal population.

iv) Dependent variable: Local public school expenditures. Individual attributes: income before tax, taxprice, age, dummy for female, dummy for municipal employees, dummy indicating presence of children younger than school age, dummy indication presence of children of school age respectively.

Boije (1997) and Aronsson & Wikström (1996) both use the same municipal data set from 1990. Relying on hedonic price functions, Boije's results indicate substantially lower income elasticity than the median voter framework of Aronsson & Wikström, or in any of the other studies, while the price elasticity is higher. Relating these results to our point estimates, the price elasticity given by the hedonic approach is of a similar magnitude as that of the linear demand model. However, the income elasticity resulting from the linear specification, corresponds more closely to those of the median voter model.

Dahlberg & Jacob (2000) take dynamics and endogeneity into account in a panel for the years 1981-1987. The point estimates for the log-linear model in that paper are lower than ours. Their estimates of a linear demand specification on the other hand, are slightly higher, at least in the long run. Finally, when estimating a fixed effect log-linear model, they find somewhat more elastic demand than we do in our log-linear version of the extended model.

To conclude, the elasticities we find in this paper are not out of line of the ones found in earlier Swedish studies. The elasticities from the log-linear specification indicate, however, a somewhat higher sensitivity to changes in income and taxprice than studies using different methods. This might not be so surprising since these studies typically use a linear demand specification.

7 Conclusions

In this paper, we have used survey data from 1991 to estimate individual demand for local public school expenditures. In particular, we have estimated income and taxprice elasticities. We have also tested the hypothesis that the preferences of municipal employees differ from those of other types of employees. In addition, we have compared the results found with those of i) earlier American studies using the same method as we do, and ii) earlier Swedish studies using other methods.

In a log-linear setting, a model including individual specific socio-economic variables indicates rather elastic demand, both with respect to income and taxprice (1.14 and -1.09, respectively). Demand is found to be considerably more elastic than in US-studies using survey data to estimate demand for local public school expenditures. In addition, our elasticities are higher than the ones typically found in earlier Swedish studies. Estimations of a linear demand

specification indicate considerably less elastic demand (0.69 and -0.78, respectively), which to a large degree is consistent with previous findings for Sweden based on a median voter framework, in particular in a setting where dynamics is controlled for. Remember, however, that the earlier Swedish studies investigate total local public spending rather than school spending alone.

From our analysis of whether there are significant differences in demand between municipally employed and others, we conclude that income as well as taxprice and grants enter differently in the demand function for municipal employees. On the other hand, we cannot find evidence of differences with respect to the constant term, or the socio-economic variables. As predicted by theory, the income elasticity is higher for municipal employees than for others. The price elasticity associated with municipal employees is lower than for the other group of employees. However, the differences in the elasticities are not significant, in a statistical sense.

Besides employment status, being female, of working age and presence of children in the household increases the probability of demanding more spending on schools. Not controlling for these individual characteristics yields considerably higher income and taxprice elasticities (in absolute terms).

Evaluating the efficiency of local public provision of schooling cannot be accomplished by demand elasticities alone. An important task for future research is therefore to investigate the supply side more thoroughly. Also, from a comparative perspective it would be interesting to estimate the demand for *total* local public spending using survey data. Finally, a theoretical model explaining differences between private and public employees' demand for public spending, adapted to the Swedish setting, would be a useful contribution to local public finance.

References

Ahlin, Å and E. Johansson (2000) "Demand for Local Public Schooling: Another Brick in the Wall", Working Paper 2000:12, Department of Economics, Uppsala University.

Aronsson, T. and M. Wikström (1996), "Local Public Expenditures in Sweden: A Model where the Median Voter is not Necessarily Decisive", *European Economic Review* 40, 1705-16.

Bergstrom, T. C., D. L. Rubinfeld and P. Shapiro (1982), "Micro-Based Estimates of Demand Function for Local School Expenditures", *Econometrica* 50, 1183-1205.

Bergstrom, T. C., J. A. Roberts, D. L. Rubinfeld and P. Shapiro (1988), "A Test for Efficiency in the Supply of Public Education", *Journal of Public Economics*, 35, 289-307.

Bergström, P, M. Dahlberg and E. Johansson (1998), "Municipal Labor Demand, Sweden 1988-1995", Working Paper 1998:1, IFAU.

Bradford, D. F. and W. E. Oates (1971), " An Analysis of Revenue Sharing in a New Approach to Collective Fiscal Decisions", *Quarterly Journal of Economics,* 85(3), 416-39.

Boije, R. (1997), "Residential Choice, Hedonic Prices, and the Demand for Local Public Services", in R. Boije, *Capitalisation, Efficiency and the Demand for Local Public Services*, Department of Economics, Uppsala University.

Courant, P. N., E. M. Gramlich, and D. L. Rubinfeld (1979a), "Public Employee Market Power and the Level of Government Spending", *American Economic Review*, 69, 806-17.

Courant, P. N., E. M. Gramlich, and D. L. Rubinfeld (1979b), "Tax Limitation and the Demand for Public Services in Michigan", *National Tax Journal*, 32, 147S-157S.

Dahlberg, M. and J. Jacob (2000), ”Sluggishness, Endogeneity and the Demand for Local Public Services”, Working Paper 2000:17, Department of Economics, Uppsala University.

Filimon, R., Romer, T. and H. Rosenthal (1982), “Asymmetric Information and Agenda Control: The Bases of Monopoly Power in Public Spending*”, Journal of Public Economics*; 17, 51-70.

Gramlich, E. M. and D. L. Rubinfeld, (1982a), “Micro Estimates of Public Spending Demand Functions and Tests of the Tiebout and Median-Voter Hypotheses”, *Journal of Political Economy*, 90, 536-60.

Gramlich, E. M. and D. L. Rubinfeld (1982b), ”Voting on Public Spending: Differences Between Public Employees, Transfer Recipients, and Private Workers*”, Journal of Policy Analysis and Management*, 1, 516-533.

Greene, W. H. (2000) “Econometric Analysis”, Prentice Hall International, NJ.

Hausman J. A. (1980), ”The Effect of Wages, Taxes, and Fixed Costs on Women’s Labor Force Participation”, *Journal of Public Economics*, 14, 161-194.

Inman, R. (1979), ”The Fiscal Performance of Local Governments: An Interpretative Review” in Mieszkowski, P. & M. Straszheim (eds), *Current issues in Urban Economics*, John Hopkins, 1979, 270-321.

Johansson, F., Lorentzon, L. O. and L. Strömberg (1993), ”Kommunmedborgar-undersökningen 1991. Undersökningsdesign, urval, datainsamling, marginalfördelningar och bortfall”, Working Paper 1, CEFOS, Göteborg.

Kommunförbundet and Statistics Sweden (1992), ”Vad kostar verksamheten i din kommun?”

Preston, I. and M. Ridge (1995), ”Demand for Local Public Spending in the UK: Evidence from the British Social Attitude Survey”, *Economic Journal*, 105, 644-660.

Rongen, G. (1995), ”Efficiency in the Provision of Local Public Goods in Norway”, *European Journal of Political Economy*, 11, 235-264

Rubinfeld, D. L. (1987), ”The Economics of the Local Public Sector” in A. J. Auerbach and M. Feldstein (eds), *Handbook of Public Economics*, Volume 2, Elsevier Science Publishers, Amsterdam, 571-645.

Rubinfeld, D. L., P. Shapiro and J. Roberts (1987), ”Tiebout Bias and the Demand for Local Public Schooling”, *The Review of Economics and Statistics*, 69, 426-437.

Rubinfeld, D. L. and P. Shapiro, (1989), ”Micro-estimation of the Demand for Schooling: Evidence from Michigan and Massachusetts ”, *Regional science and Urban Economics*, 19, 381-398.

Schokkaert, E. (1987), “Preferences and Demand for Local Public Spending”, *Journal of Public Economics*, 34, 175-188.

Shapiro, P. and E. Papadakis (1993), ”Citizen Preference and Public Education in Australia: An Analysis of Interstate Differences”, *The Economic Record*, 69, 149-162.

Appendix

A.1. Variable definitions and summary statistics

Table A.1 Definitions of variables

Variable	Description
INCOME	respondent's gross income
TAXPRICE	respondent's taxprice (respondent's gross income/municipal mean income)
GRANTS	grants per cap * taxprice (linear model)
	(grants per cap * taxprice)/income (log-linear model)
FEMALE	1 if female, 0 otherwise
AGE_30	1 if the respondent is 18-30 years; 0 otherwise
AGE_40	1 if the respondent is 31-40 years; 0 otherwise
AGE_50	1 if the respondent is 41-50 years; 0 otherwise
AGE_60	1 if the respondent is 51-60 years; 0 otherwise
AGE_70	1 if the respondent is 61-70 years; 0 otherwise
MUNIC	1 if employed by municipality; 0 otherwise
CHILDREN	1 if children 0-6 years of age; 0 otherwise
SCH_CHILD	1 if children under the age of 16; 0 otherwise
SPENDING	municipal spending per capita on primary and secondary schools

Table A.2 Summary statistics

Variable	Mean	Std. Dev.	Min	Max
DEP VAR	2.311	0.746	1	3
INCOME	125369.7	114114.5	1000	3564000
TAXPRICE	0.940	0.809	0.006	25.3
GRANTS [a]	3483.4	383.1	2828.7	4377.8
FEMALE	0.494	0.500	0	1
AGE	43.277	15.7	18	80
MUNIC	0.203	0.403	0	1
CHILDREN	0.223	0.417	0	1
SCH_CHILD	0.311	0.463	0	1
SPENDING	7321.7	1019.1	5666	9618

Note: a) This is the "clean" grant variable, that is, it is not multiplied by taxprice.

A.2. Alternative definitions of the dependent variable

Table A.3 Alternative ways of controlling for willingness to pay when the individual expresses lower or the same preferences for schooling than for the average public service

	Original definition*		**Alt. 1**		**Alt. 2**		**Alt. 3**	
Q1 \ Q2	**Agree completely**	**Agree on the whole**	**Agree completely**	**Agree on the whole**	**Agree completely**	**Agree on the hole**	**Agree completely**	**Agree on the whole**
"More"	Less	Same	Less	Less	Less	Same	Less	More
"Same"	Less	Less	Less	Less	Less	Same	Less	Same

Note: * See description on pages 12-13.