Demography, voting, and public expenditures: theory and evidence from Swedish municipalities

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Abstract

Do the eldery use the political system to get benefits from Swedish municipal spending at the expense of the young, and vice versa? If so, to what extent? These are the basic questions asked in this paper. To analyze this question a median voter model with altruism within families is used. The answer given by the empirical investigation is that these the effects of the intergenerational conflict on municipal spending are significant and sizeable. An increase of the relative share of spending on elderly that benefits the median voter's family by one standard deviation increases relative spending on elderly with seven percent, holding demand constant.

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1. Introduction

The populations of Western Europe and North America are rapidly aging. This aging is driven by the combined effects of increasing life expectancy due to medical advances, and the aging of the post World War II baby boomers. In the US, for example, the share of people in the population older than 65 is forecasted to increase from 13 percent in 1990 to 22 percent in 2030. The elderly will by then constitute an enormous group of dependents, requiring support, health care, and housing. However, not only will the need for services to elderly grow, the political strength of the elderly will increase as well. To analyze the effects of these changes on public spending, it is necessary to have a clear understanding of how the young and old use their political power within todays institutions. This paper aims to contribute to this understanding by studying a political arena where the intergenerational conflict is particularly stark.

The object of empirical study is Swedish municipal spending. In Swedish municipalities the main political issue is how to divide the budget between services benefiting young and old. Most municipal spending is targeted either to young in the form of day-care and education, or to old in the form of health care for the old. The remaining services provided by the municipalities, such as sanitation, and road and park maintenance, do not benefit any particular group within the municipalities. Further, the overall budget is effectively set by the national government via a restriction not to raise taxes. This constraint seems to have been binding during the time of this study. Of the 286 Swedish municipalities, only 4 lowered their taxes from 1991 to 1993.

To guide the empirical investigation, a simple median voter model with altruism within families is developed. In this model, a voter's preferred division of the budget depends on the share of the benefits from the different municipal services that goes to members of his family, the voter's *benefit share*. As the voter's benefit share in one municipal service increases, the voter wants more spending on this service. Under some additional assumptions, the older a voter becomes, the larger is the benefit share his family receives in services to old relative to the benefit share his family receives in services to young. Therefore, the preferred spending on old relative to spending on young is monotonically increasing with age. As a result, the median age in the electorate is a measure of the political power of the old.

This makes it possible to empirically separate effects of increasing political support on spending, from effects of increasing need on spending. The need for

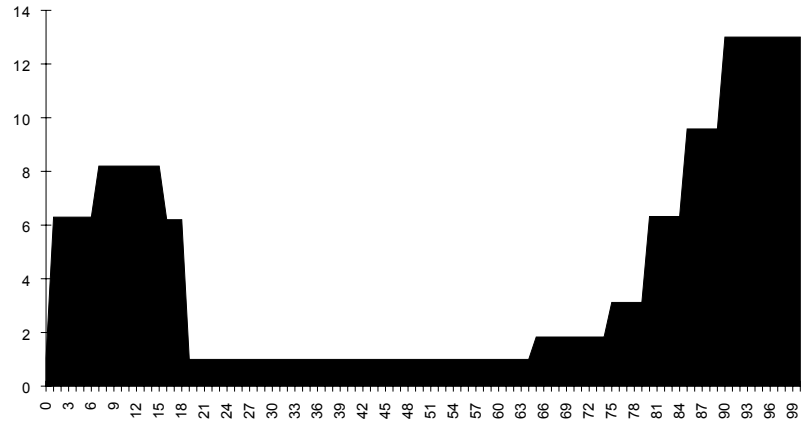

Figure 1.1: Municipal per person expenditure by recipients age, index 19-64=1. Source: Swedish Government Official Reports 1991:98, p 13, table 1.

day-care, schooling and health care for old depends on the number of people younger than 19, or older than 65. In contrast, the political support for the services are to a large extent determined by the preferences of voters aged 19 to 65. So the political support for services to young and old is not perfectly correlated with the number of users of services.

Taking advantage of this fact, the paper estimates the effects of political support on municipal spending. These effects are found to be large. An increase in the benefit share the median voter receives from spending on old relative to his benefit share from spending on young by one standard deviation increases relative spending on old by seven percent, holding the relative demand for the services constant. These effects are statistically significant and robust to different model specifications, to the inclusion of other potentially important variables and to different measures of the dependent and independent variables.

This paper relates to small body of recent empirical work that has studied the intergenerational conflicts inherent in spending on day-care, education and health care due to their targeting of age groups. Button (1992) finds that elderly Florida residents tends to oppose school bond issues, but not necessarily other local tax issues. Poterba (1996) finds that an increase in the fraction of elderly residents in a jurisdiction is associated with a significant reduction in per child educational spending. To the contrary, Borge and Rattso (1995) finds that an increase in the

number of elderly has lead to an increase in educational spending per person and a decrease in health care spending per elderly.

However, none of these empirical studies are designed to empirically separate effects of political support from effects of need. They use the same variable to express both need and political support, namely population shares measuring the number of users of these services. This implies that one can not determine why, for example in Poterba (1996), educational spending per child tends to decrease when the share of old increases. It could be because the old have become politically stronger, but it could equally well be that the larger need for expenditures on health care in these jurisdictions crowds out spending on education. In fact, in the model below it is shown that a social planner would, for the latter reason, lower spending per child in municipalities with a large share of old.

Separating the effects of political support from effect of need has important implications for the timing of the increase in spending on services for old. If the political model is correct, then we would expect spending on the old to increase already today as the baby boomers are increasing the median age of the electorate. If, on the contrary, needs drives expenditures, the expansion will wait until the bulk of the baby boomers will require health care in a decade or two.

In a wider setting, the model developed in this paper builds on two strains of the economic literature. One is the empirical research on local public expenditures that started in the 1960s. Notable examples from this literature are Barr and Davis (1966), Bergstrom and Goodman (1973), Pommerehne (1976) and (1978), Deacon (1977), Denzau (1977), and Lovell (1978). For recent reviews see Cutler, Elmendorf and Zeckhauser (1993), and Rubinfelt (1987). The theoretical framework in these papers is the median voter model as developed by Hotelling (1929), Black (1948), and Downs (1957). The basic empirical implication was that the size of public spending was decreasing in the median voter's perceived *tax share*, measured as the median voter's tax contribution as a share of total tax contributions. These articles thus focus on the cost of providing public services. The other strain is the political interest group models, as developed by Peltzman (1976) and Becker (1983), for a recent empirical application, see Peltzman (1993). These articles focus on the distribution of the benefits of public services. This paper takes this focus on benefits from the interest group models and develops it in a median voter model. As mentioned above, the result is that spending on a government provided service is increasing in the median voters perceived *benefit share*. In Europe, related work outside the median voter framework has been done by for example Renaud and van Winden (1991) who analyze spending within a

model with multi-level government, and Borge and Rattso (1995), who analyze the sluggishness of adjustment to changes in demand.

The general outline of this paper is as follows. Section 2 formulates two versions of a model: in one public spending is determined by a social planner, in the other it is determined by majority rule. In section 3 the calculation of benefit shares is discussed. In section 4 the data used is presented and in section 5 the model is empirically tested. The robustness of these results are then tested in section 6. The following section 7 contains a discussion of the likely development of future spending to young and old. Finally, section 8 concludes.

2. The model

A fixed amount of total public expenditure, I, is do be divided in two categories: one that benefits children, C, and one that benefits elderly, E. The utility of a child who uses public services depends on the level of expenditure, C, on the number of other users, n_c, and of the cost of providing the service, p_c, according to the utility function

$$V(C) = k - \left(\frac{C}{n_c^{\beta} p_c}\right)^{-\alpha}, \tag{2.1}$$

where $\alpha > 0$, and $\beta \in (0, 1]$. Similarly, the utility of an elderly who uses public services is

$$W(E) = k - \left(\frac{E}{n_e^{\beta} p_e}\right)^{-\alpha}. \tag{2.2}$$

The parameter β allows for increasing returns to scale in the production of services. The cost parameter, p_c, allows for effects from wages and housing prices, as well as differences in the efficiency of the service provision.

2.1. The social planner

As a benchmark, consider the allocation that would result if a social planner controlled public spending in each municipality. This social planner maximizes the unweighted sum of utilities and only takes into account those who benefit directly from the spending. In the larger model below, there is altruism within families. However, by assumption, the social planner does not take into account that a parent's utility increases because his child's utility increases when the service level in day-care improves. One implication of this is that the social planner has the

view that children with 2 parents should not receive more benefits than children with 1 parent.

The social planner maximizes

$$n_c V(C) + n_e W(E),$$

subject to the budget constraint

$$C + E = I.$$

The solution to this problem is

$$\ln\left(\frac{C}{E}\right) = \frac{1+\alpha\beta}{1+\alpha}\ln\left(\frac{n_c}{n_e}\right) - \frac{\alpha}{1+\alpha}\ln\left(\frac{p_c}{p_e}\right). \tag{2.3}$$

The social planner responds only to the number of users of the services and to cost factors. If the number of users of one type of service increases, the social planner increases spending on this service and decreases spending on the other service. If the cost of one service increases, the social planner decreases spending on this service.

These cost differences are not the main subject of investigation of this paper and are also difficult to measure. Therefore, these price differences are treated as a disturbance term. The formulation of the model that will be tested in the empirical section is

$$\ln\left(\frac{C}{E}\right) = c_0 + c_1 \ln\left(\frac{n_c}{n_e}\right) + \mu, \tag{2.4}$$

where

$$c_1 = \frac{1+\alpha\beta}{1+\alpha} \in (0,1],$$

and c_0 and μ are the mean and the deviation from the mean of the cost term in equation (2.3). Note that an increase in the number of old, n_e, will cause the social planner to decrease spending on young, C. This is because the increased need for spending on old crowds out spending on young.

2.2. Political equilibrium

The voters are altruistic within their families: parents care for their children and children care for their parents. Let the parameters ε and γ capture the degree of

altruism towards ones parents and children respectively. Further let the variable δ_c^i equal one if the voter uses the public service to young and zero otherwise, and let δ_e^i be defined analogously for services to old. The total utility from public services of a voter with n_c^i children and n_e^i parents using public services is

$$\left(\delta_c^i + n_c^i\gamma\right) V(C) + \left(\delta_e^i + n_e^i\varepsilon\right) W(E).$$

The preferred choice of voter i is the solution to the problem:

$$\max \left(\delta_c^i + n_c^i\gamma\right) V(C) + \left(\delta_e^i + n_e^i\varepsilon\right) W(E)$$

subject to the constraint

$$C + E = I.$$

The first order condition, characterizing the solution to this problem is

$$\frac{V'(C)}{W'(E)} = \frac{\delta_c^i + n_c^i\gamma}{\delta_e^i + n_e^i\varepsilon}.$$

The voters preferences for spending may be monotonically ordered by the ratio on the right hand side of the above equation. Since preferences are single peaked, the median in this ordering will be the median voter. In an election on two proposed budget allocations, the allocation preferred by the median voter will defeat any other allocation, and will be the political equilibrium allocation. Voters who are themselves using public services will never be median voters in the election because they are too few. Therefore we focus on the choice of voters who are not themselves using public services. The equilibrium allocation will be characterized by

$$\ln\left(\frac{C}{E}\right) = c_0' + c_1' \ln\left(\frac{n_c}{n_e}\right) + c_2' \ln\left(b^m\right) + \mu, \tag{2.5}$$

where b^m, the median voter's *relative benefit share* is

$$b^m = \frac{n_e^m}{n_e} / \frac{n_c^m}{n_c}$$

and the parameters

$$\begin{aligned} c_0' &= c_0 + \frac{1}{1+\alpha} \ln\left(\frac{\gamma}{\varepsilon}\right), \\ c_1' &= c_1 \in (0,1], \\ c_2' &= \frac{1}{1+\alpha} \in (0,1). \end{aligned}$$

In a traditional cost based median voter model, the *tax share* is the share a voter must pay when total taxes are increased. The analogy in this model is a *benefit share* that is the share of benefits that goes to the voter's family when total benefits increase. This share is the number of persons in the voter's family benefiting from public spending over the total number of people benefiting from public spending in the municipality, for example $\frac{n_c^m}{n_c}$ in services to young. In the political equilibrium, what matters is the *relative benefit share,* b^m*,* defined as the benefit share in services to old relative to the benefit share in services to young.

The above equation may be compared with equation (2.4) describing the social planner's preferred allocation. First, the median voter only cares for the benefits received by members of his family. Therefore, spending on young is decreasing in the *relative benefit share* of the median voter, that is $c_2^{'}$ is negative. In contrast, the social planner cares for all who use the public services. Therefore, the *relative benefit share* of the social planner is 1 and this term is not part of equation (2.4). Second, the median voter may care more or less for his children than for his parents. This effect ends up in the intercept $c_0^{'}$. The social planner cares equally for young and old, so this term is not part of c_0.

The only measurable effect of political struggle between young and old is the effect through the benefit shares of the median voter. Equations (2.4) and (2.5), describing the predictions of the social planner model and the political model respectively, are the equations that will be tested in the empirical section. A negative coefficient estimate of $c_2^{'}$ will be interpreted as evidence of a political effect on spending. In the following section, the measurement of the benefit shares will be discussed.

3. Calculating median voter benefit shares

To be able to measure the benefit shares, it will be assumed that every person of a certain age have the same benefit shares: the average benefit share of a person of this age in the sense defined below. This assumption is necessary because of data constraints. There is no easily accessible data on the number of grandparents in different families, let alone in families with a specific number of children. The only possibility to link generations together is therefore to construct average family ties. This can be done by determining how many children and how many parents a person of a specific age on average has.

Let $a(x)$ be the number of persons of age x benefiting from public spending, $y(x)$ be the distribution of age differences between children and parents, (to be

approximated by the distribution of mothers' ages at the birth of child). The number of children of age x_c who benefit from public spending, and who have parents of age x will then be $a(x_c)y(x - x_c)$.

Children benefit from public spending when they are in the ages $[\underline{x}_c, \overline{x}_c]$, and old benefit from public spending when they are in the ages $[\underline{x}_e, \overline{x}_e]$. The average number of children of a person of age x benefiting from public spending on children is thus

$$n_c(x) = \sum_{x_c=\underline{x}_c}^{\overline{x}_c} a(x_c)y(x - x_c). \tag{3.1}$$

For elderly there is an additional aspect that arises because of migration. In general it is reasonable to assume that parents live in the same municipality as their children when the children are in day-care or school. But it is not certain that a child and a parent live in the same municipality when the parent is old and in need of health care. This implies that even if the children are upset by the poor standards in health care their parent receives, they can not express this dissatisfaction in the municipal elections because they are casting their vote in another municipality. Therefore, migration undermines the political strength of the old. Let *stay* be the share of old whose children live in the same municipality. The average number of parents of a person of age x benefiting from public spending in the same municipality is then

$$n_e(x) = stay \sum_{x_e=\underline{x}_e}^{\overline{x}_e} a(x_e)y(x_e - x). \tag{3.2}$$

Equations (3.1) and (3.2) above determine the *benefit share* a voter of age x receives from services to old relative to services to young.

In Figure 3.1, $n_e(x)/n_e$ and $n_c(x)/n_c$ have been computed for the whole of Sweden. Since the distributions are nation, regional migration is not included. People of age 38 on average have most children in day-care or school. Their families receive roughly 5.5 percent of total benefits. People of age 52 on average have most parents in health care. Their families receive roughly 4.2 percent of total benefits from health care towards elderly. People of age 44 receive equal benefit shares from both types of services, that is their *relative benefit share* is 1.

The distributions for the municipalities are similar to the national distribution. The benefit share from services to old relative to services to young is monotonically increasing for all ages above 20 in all municipalities. There is however a very slight non-monotonicity in the interval 18 to 20 in some municipalities.

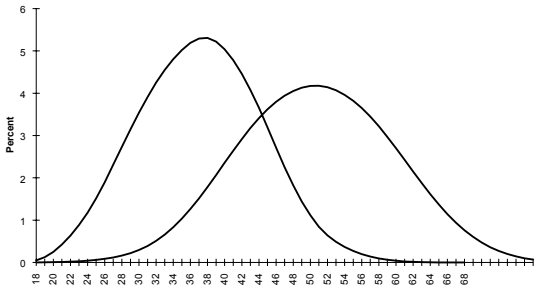

Figure 3.1: Average *benefit shares* of persons aged x : $n_c(x)/n_c$ and $n_e(x)/n_e$.

To identify the median voter, the electorate is divided into two groups: those younger than 24 and those older than 24. The voters younger than 24 are always in minority. They have preferences for less relative spending on old than any voter older than 24. In the group of voters older than 24 preferences for more spending on old increase monotonically with age. To find the median voter first count all the voters in the first group. Then add members of the second group, ordered by age, until half the electorate is counted. The last counted voter is then the median voter. Since half the electorate is younger than this last voter, this voter is of median age. Thus the median voter is the voter of median age[1], and the relative benefit share of the median voter is that of a voter of median age:

$$b^m = \frac{n_e(x^m)}{n_e} / \frac{n_c(x^m)}{n_c}. \tag{3.3}$$

[1]It is possible to approximate the n_e^m/n_e and n_c^m/n_c distributions by normal form distributions whose moments are functions of the $a(x)n(x)$ distribution. This gives the follwing insights: (i) if the mean age is high in the group of children who benefit from public spending, the median voter's family receives a larger share of public spending on young, (ii) likewise if the mean age is low in the group of elderly who benefit from public spending, the median voter's family receives a larger share of benefits from public spending on elderly, and most important (iii) in explaining differences in the ratio $(n_e^m/n_e)/(n_c^m/n_c)$, the effects from differences in the distribution of young and old people using public services are negligible compared to the effects from the differences in median age in the electorate.

4. Description of data

In this section the data used in the empirical investigation are discussed. The discussion follows the structure of equation (2.5). First the expenditures, C and E are discussed, then the number of users of services to young and old, n_c and n_e, and finally the variables needed to determine the median voter's benefits shares. For an overview of these series, see the summary statistics in Table 8.1.

The 1991 spending on day-care and schools from first to 12th grade is used to measure spending on young[2], C. Per capita municipal spending varies from SEK 8 000 to 16 000. The total national spending is SEK 96 billion or roughly 7 percent of Swedish GDP 1991. The 1991 municipal spending on health care to elderly[3] is used to measure spending on elderly, E. The mean spending level is about half of the mean spending on young, roughly 4 percent of Swedish GDP. However, the variance is higher in spending on old than on young. The variable to be explained, C/E, varies from 0.91 to 8.86. It has a mean of 1.94 and a standard deviation of 1.03, so there is quite some variation to be explained.

The number of users of municipal services, n_c and n_e, are approximated by the number of persons younger than 19 and older than 65 respectively. This measure will be refined in the sensitivity analysis section. The share of people younger than 19 varies from 16 to 32 percent of the population, while the share of people older than 65 varies between 6 and 27 percent.

To compute the median voter's benefit shares from the municipal services, the following data are needed: the age distribution, the distribution of age differences between children and parents, the share of people of different ages benefiting from public spending, and the share of elderly with relatives in the same municipality. These series were measured in the following way.

Data on the 1991 age distributions of the municipalities exists. The distribution of age differences between children and parents, $y(x)$, is approximated by the national Swedish distribution of the ages of mothers at the birth of their children in 1974[4]. One might suspect that these distributions would vary a lot between different municipalities. But a rough look at the data indicates that they do not. For example, the average age of mothers at child birth only varies between 26 to 29. However, one should ideally use all different $y(x)$ distribution for all relevant parent child relations. This implies using the $y(x)$ distributions from around

[2]Source: The Swedish Association of Local Authorities.
[3]Source: Statistics Sweden.
[4]Source: Statistics Sweden.

1910 to 1993. Since the data series starts in the 1970:s, this is not possible. The national 1974 data is thus an approximation both over time and over municipalities. The share of children of different ages benefiting from public spending[5] , is approximated by the national averages 60 percent for children aged 1-6, 100 percent for children aged 7-15, and 75 percent for children aged 16-18. The share of elderly of different ages using municipal services is approximated by a national average age-profile complemented by a municipality specific volume index[6]. The share of old with relatives in the same municipality, *stay*[7], was approximated in the following way. Assume that people older than 20 who move from the municipality leave their parents behind. Further, assume that voters who are older than 50 when they immigrate do not bring their children with them. In this case, these two groups of elderly will not be represented by their children in the elections. Let $mig50$ be the share of people of older than 50 who moved to a municipality, and $mig20$ the share of people older than 20 who left the municipality. The share of elderly who had not moved to the municipality and whose children had not moved from the municipality was approximated by $stay = (1 - mig50)(1 - mig20)$. The variables $mig50$ and $mig20$ was measured in four years, 1970, 1975, 1980 and 1985. The underlying assumption is that these migration patterns have been stable over time. The share of elderly with relatives in the same municipality measured in this way varies between 0.57 and 0.94, the mean is 0.88 and the standard deviation 0.06.

The median voter's *relative benefit share* from services for old relative to services for young, computed using the data discussed above, varies between 0.12 and 5.05. This means that in some municipalities, where this variable is smaller than one, the median voter receives a larger share from spending on young and in others the median voter receives a larger share from spending on young. The national average of this term is 0.76, so the median voters on average receive larger shares from spending on young.

Since this is a cross-sectional study of with municipalities of very different sizes one may suspect that there is heteroscedasticity. The hypothesis of homoscedasticity was tested using a White heteroscedasticity test and rejected at the five percent significance level. In consequence, all estimates use heteroscedastic consistent standard errors.

[5]Sources: Vad kostar verksamheten i din kommun? Bokslut 1991. Tabell 6: Nyckeltal för kommunal utbildning 1991, and Jämförelsetal för socialtjänsten 1991. SCB.

[6]Source: The Swedish Association of Local Authorities.

[7]Source: Statistics Sweden.

5. Empirical results

The two equations to be tested describe the preferred outcome of the median voter and the social planner: equations (2.5) and (2.4):

$$\ln\left(\frac{C}{E}\right) = c_0^{'} + c_1^{'} \ln\left(\frac{n_c}{n_e}\right) + c_2^{'}\sigma \ln\left(b^m\right) + \mu,$$

$$\ln\left(\frac{C}{E}\right) = c_0 + c_1 \ln\left(\frac{n_c}{n_e}\right) + \mu.$$

Before the regressions it may be useful to look at the plotted series in Figure 5.1 and Figure 5.2 to get a rough picture of how the relevant data series are related.

The result of the regression on the median voter model is shown in Table 8.2, column 1. Notably, the estimate of $c_2^{'}$ of -0.088 is significantly negative at the one percent level. The estimate of $c_1^{'}$ is 0.841, also significant at the one percent significance level. The result of the regression on the social planner model is shown in Table 8.2, column 3. The estimate of c_1 is 1.077 and significant at the one percent level.

Since the social planner model is nested in the median voter model, a model specification test can be done by testing if the coefficient $c_2^{'}$ is significantly different from 0. As reported above, the $c_2^{'}$ is significant at the 1 percent significance level.

The significantly negative effect of the median voter's *relative benefit share* indicate that young and old do use their political power to get benefits from municipal services. The estimated effects are large. A shift from lowest to highest value of the median voters *relative benefit share* from services on old, causes relative spending on old to increase by 38 percent all else equal. An increase by one standard deviation causes relative spending on old to increase by 7 percent.

The inclusion of the median voter's *relative benefit share*, b^m, diminishes the importance of the need term. This is not surprising since one would expect need and political support be positively correlated. When there is a great need for one type of services, measured as the number of recipients, there is also strong political support for high spending in this type of services. Estimating the effect of need on spending while omitting the political support variable, will lead to a positive bias in the estimated effect of need on spending. This may create problems when, as has been proposed in Sweden, national grants are given to the municipalities based the effects of need on spending estimated as above. This way of giving grants will subsidize the politically dominant age groups of the municipalities.

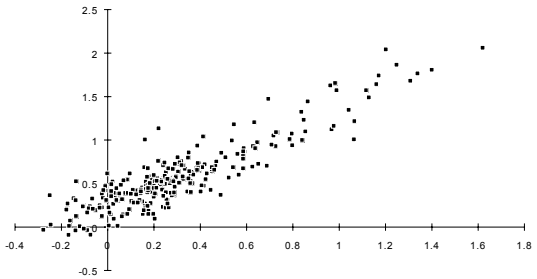

Figure 5.1: Plot, y-axis: $\ln\left(\frac{C}{E}\right)$, x-axis: $\ln(n_c/n_e)$

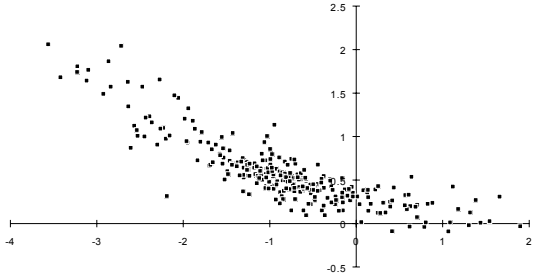

Figure 5.2: Plot, y-axis: $\ln\left(\frac{C}{E}\right)$, x-axis: $\ln(b^m)$

6. Sensitivity analysis

This section will study if the results obtained above are robust to different specifications of the model, to the inclusion of control variables, and to different measures of the dependent and independent variables.

6.1. Model specification

First the *relative benefit share* of the median voter, b^m, will be substituted by the median age in the electorate and the share of old with relatives in the same municipality. If the theory is correct, then both these variables should have a separate negative effect on relative spending to young. To see this, note that the *relative benefit share* of the median voter, b^m, depends positively on these variables, see equations (3.1), (3.2), (3.3) and footnote 1. As footnote 1 explains, most of the variation in b^m is due to the different ages of the median voters, although the share of old with relatives in the same municipality is also important. Approximating $\ln(b^m(x^m, stay))$ by a first order Taylor-expansion around the means of x^m and $stay$ (denote this point by z) yields

$$\ln b^m\left(x^m, stay, ...\right) = const. + \left.\frac{\partial \ln d\left(.\right)}{\partial \ln\left(x^m\right)}\right|_z \ln\left(x^m\right) + \left.\frac{\partial \ln d\left(.\right)}{\partial \ln\left(stay\right)}\right|_z \ln\left(stay\right) \quad (6.1)$$

If this approximation is inserted in equation (2.5) the result is

$$\ln\left(\frac{C}{E}\right) = c_0^{'} + c_1^{'} \ln\left(\frac{n_c}{n_e}\right) + c_3^{'} \ln\left(x^m\right) + c_4^{'} \ln\left(stay\right) + \mu. \quad (6.2)$$

Since the partial derivatives are positive and the coefficient of b^m is negative, the model predicts that $c_3^{'}$ and $c_4^{'}$ should be negative. In other words, relative spending on young should decrease if the median age increases or if the share of the old with relatives in the same municipality increases.

When the above equation is tested in a regression, both the median age and migration are shown to have significant negative effects on the relative spending ratio at the 1 percent significance level; see Table 8.2, column 2. The estimated effects from differences in median ages in the electorates are large. Median ages span from 40 to 53, the difference between highest and lowest median age is thus about 30 percent. According to the above estimation, a shift from highest to lowest median age in the electorate in a municipality would shift relative expenditures by about 30 percent, all else equal.

To make the model more general one may assume different returns to scale in the two services. Utility would then depend on $C/n_c^{\beta_1}$ and $E/n_e^{\beta_2}$ where $\beta_1 \neq \beta_2$. This will generate marginal conditions were n_c and n_e appear separately and not as a ratio. If n_c and n_e are measured as the number of persons younger than 19 and older than 65, this will affect the estimate of the coefficient of the benefit share term. However, when a more precise measure (presented below) is used, the coefficient estimate is not affected. Further, the coefficients of n_c and n_e have different signs but are not significantly different in size. Thus it seems appropriate to use the ratio.

6.2. Measurement problems

Since people of age 65 require fewer and much less costly services than people of age 95, specifying utility as a function of spending per person older than 65 in the municipality (to the power of β): E/n_e^{β}, is not a good approximation. It implies that municipalities with many inhabitants older than 95 would seem to provide better services for old than they actually do since they put in a lot of resources per person over 65.

To control for this potential problem, each person is weighted by the national average per person spending for services to persons of his age. Let $\overline{p}(x)$ denote the national average per person spending on municipal services to persons of age x. The age profile of national average expenditure for people over 65, $\overline{p}_e(x)$[8], is very steep, rising from SEK 7 000 per person aged 65 to SEK 170 000 per person aged 90. The age profile of the national average expenditure for people aged 1-19 , $\overline{p}_c(x)$[9], is rather flat. Per person spending on these are just above SEK 40 000. The exception is persons of ages 7-9. Spending on these are SEK 70 000 per person because they are both in school and a form of after school activities.

[8]Source: Swedish Government Official Reports 1993:53, p. 203.
[9]Source: Swedish Government Official Reports 1993:53, Appendix 6.

Define $\overline{n}_c$ and $\overline{n}_e$ as[10]

$$\begin{aligned}\overline{n}_c &= \sum_{x_c=\underline{x}_c}^{\overline{x}_c} \overline{p}\left(x_c\right) n\left(x_c\right), \\ \overline{n}_e &= \sum_{x_e=\underline{x}_e}^{\overline{x}_e} \overline{p}\left(x_e\right) n\left(x_e\right).\end{aligned}$$

The weighted population shares, $\overline{n}_c$ and $\overline{n}_c$ replace n_c and n_e in the utility functions defined in equation (2.1) and equation (2.2). This implies that the service level is high when the actual expenditures are higher than the expenditures a municipality would have, had it spent the national average on each person of each age.

The result of the regressions with these much more realistic measures of service quality are shown in Table 8.3 columns (1), (3), and (5). The coefficient estimates remain largely unchanged. The explained variation increases from 82 to 85 percent in the median voter model. The cost-weighted number of recipients of services thus has more explanatory power than the unweighted. The political support variables – relative benefit share, median age and migration – are all significant at the one percent level.

Even this refined cost based measure of service level is admittedly coarse. It would therefore be valuable to test an independent measure of the service level. One possible proxy of the service level is the number of employees per receiver of services. In schools, for example, this corresponds to the number of teachers per student. Let the number of employed in day-care and schools be N_c and the number of employed in health care of elderly be N_e. Further let $\overline{N}_c$ and $\overline{N}_e$ be the number employees the municipalities would have if they had the national average number of employees per receiver of services[11]. The utility that people receive from municipal services now depends on $N_c/\left(\overline{N}_c\right)^{\beta}$, and $N_e/\left(\overline{N}_e\right)^{\beta}$ instead

[10] The weights could be normalized by letting $\overline{p}_{norm} = \overline{p}\left(x_e\right) / \sum \overline{p}\left(x_e\right)$. But when $\overline{n}_c$ and $\overline{n}_e$ are not normalized, they are of the same size as the actual expenditures, and can be compared directly to those, see table 1, summary statistics. Since the variables used in the regressions are logarithms, scaling does not affect the coefficient estimates.

[11] It would of course be simpler to use the number of emplyees per receiver of services. However, those who receive different services should be weighted differently. For example in day-care there are three different types of services with a national average of 4.5, 8.9 and 17.5 children per employed. The number of children in one municipality in the first service is divided by 4.5, the number of children in the second by 8.9, and the number of children in the third by 17.5. The sum of these three is the number of employed the municipality would have if they kept the national average number of employed in each service.

of C/n_c^{β} and E/n_c^{β}. The equivalents of equations (2.4), (2.5) and (6.2) will then be

$$\ln\left(\frac{N_c}{N_e}\right) = c_0 + c_1 \ln\left(\frac{\overline{N}_c}{\overline{N}_e}\right) + \mu, \tag{6.3}$$

$$\ln\left(\frac{N_c}{N_e}\right) = c_0^{'} + c_1^{'} \ln\left(\frac{\overline{N}_c}{\overline{N}_e}\right) + c_2^{'} \ln\left(b^m\right) + \mu, \tag{6.4}$$

$$\ln\left(\frac{N_c}{N_e}\right) = c_0^{'} + c_1^{'} \ln\left(\frac{\overline{N}_c}{\overline{N}_e}\right) + c_3^{'} \ln\left(x^m\right) + c_4^{'} \ln\left(stay\right) + \mu. \tag{6.5}$$

The results are shown in Table 8.4, columns (1), (3), and (5). The coefficients on the political variables are significant, and the point estimates are not significantly different from the ones obtained by using the cost based service level measure. The results indicate that the larger the share of the benefits from services for young that goes to the median voter's family, the more people are employed in services for young. This model explains about 65 percent of the variation in the employment ratio, which is considerably lower than in the previous expenditure regression.

6.3. Omitted variables

There are some explanatory variables that have been omitted in the analysis although they may potentially be important. For computational convenience, a utility function with unitary income elasticity was used. In a more general model, however, income effects could of course matter. Another restrictive assumption was that the distribution of costs was not important in determining relative expenditures. However, if the price elasticities of the two services were different, then people with different tax prices would prefer different relative spending levels. Since Swedish municipal spending is financed by a proportional income tax, tax price may be approximated by the ratio of median income over mean income. To control for the above effects, median income and median income over mean income are included in the regression.

There are a number of, non-demographic, factors that affect the costs of providing municipal services. These factors have been investigated in a Swedish Government Official Report (1993), which finds that, for example, population density and the share of immigrants from non-Nordic countries are important. To control

Data exists for day-care and school. For health care to elderly, data is only available for one type of service, which accounts for approximately 30 percent of total expenditures.

for other structural costs, a variable containing relevant extra costs is added to the regression equation. Population size and population density are also controlled for separately. Another factor which affects costs directly is the average wage in municipal service. This factor is therefore also included in the regression.

Finally, it is possible that the preferences of the politicians affect the political equilibrium. To control for these effects, the median age in the legislative body of the municipalities is entered into the regression.

Regressions including the control variables discussed above are shown in Table 8.3 and Table 8.4, columns (2), (4), and (6). The coefficient estimates in main specification are not significantly affected. The estimate of the coefficient of the relative benefit share, b^m, rises by roughly one standard deviation from -0.106 to -0.075. The estimate of the coefficient on the share of old with relatives in the same municipality is also stable when control variables are included. The coefficient on the median age in the electorate is, however, sensitive to these changes. In the spending equation, Table 8.3 is looses significance, while in the employment equation, Table 8.4, it gains significance.

The cost difference between municipalities show up significantly in the regression with the expected sign: when costs are higher, spending must be higher to give the same level of service. Also, the tax price is significant. This indicates that the distribution of costs have also been important in determining relative spending. The coefficients of median income, population, population density, wage costs and the median age in the municipal legislative body are insignificant at the 5 percent significance level.

The main conclusion from this section is that the coefficient estimates in the main specification are robust to the inclusion of unmodelled independent variables, to different specifications of the equation to be tested, and to different measures of the independent variables.

7. Discussion

In this section, an example is used to illustrate how the model works empirically. The question whether there is a general political bias for or against the old or young is also discussed.

Over the next twenty years or so, the age distribution in Sweden will change dramatically; see Figure 7.1. There are at present few people aged 45 to 70. This demographic gap will be filled in two different stages. First the number of persons aged 45 to 65 will increase; see the age distribution forecast of 2004. These

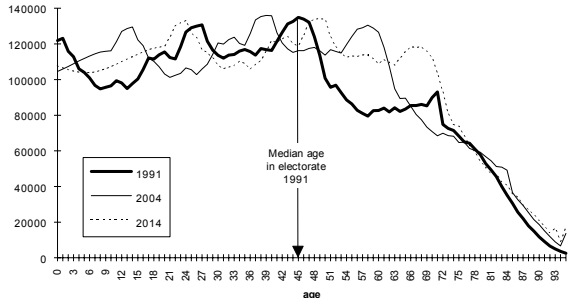

Figure 7.1: Swedish national age distribution 1991, 2004 and 2014

people will push up the median age in the electorate and increase the political support for services to old. They will not, however, be in great need of health care themselves. The model predicts that relative spending on old will increase by 16 percent during this period. Most of this increase, 9 percent, will be due to increased political support for services to old. In the second stage this large group will enter into their seventieth and require health care; see the age distribution forecast of 2014. Thus need for services to old will increase substantially. The model predicts that relative spending on old will increase by an additional 15 percent during this period. However, 4/5 of this increase is driven by increased need of services to old. If one did not take the political effects into account, then the projected increase in spending to old during the first period would be seriously underestimated.

It has been claimed that the lack of voting rights of children makes majority rule biased against children. How does this argument stand up in the light of this model?

To determine this question first notice that not only those directly benefiting from one type of service are important. After all, the ones benefiting directly from spending on young or spending on old are never a majority of the electorate. It is therefore important to understand the preferences of those not directly involved. In this model this has been done by assuming altruism within families. The result is that preferences are ordered by age: older people want more spending on old. At the national level, for example, people aged 44 care equally much for spending on young and old, in the sense that their families receive an equal share of the benefits from both types of services, see Figure 3.1.

The bias of the voting system is then determined by if there are more people

younger than, or older than, 44. The exclusion of the children from the electorate surely works against the young. However, in Sweden there are more people aged 18 to 44 than aged 45 to 65. So the young in day-care and school have a larger support group in their parents than the old using health care have in their children. This effect almost balances the exclusion of the children since the national median age is 45.

There is however, still another effect that works in favor of the young. Not all children live in the same municipality as their old parents. Thus the representation of the old in health care by their children is further weakened by migration. In the sample of Swedish municipalities, this shifts the bias in favor of the children. On average, the median voters families get a larger share of municipal spending on young.

There is, however, a third effect which may change this result. If people on average care more for their parents than for their children, then they may value increased spending on elderly more even if they receive a smaller share of this spending. Since the relative altruism is very difficult to measure, it is not clear whether the final bias is for or against children.

8. Conclusions

Young and old seem to use the political system to get benefits from Swedish local governments. The economic size of these effects are significant: when median voters *relative benefit share* in municipal services for old changes from lowest to highest, relative spending on old increases by 34 percent all else equal. When the same variable increases by one standard deviation, relative spending increases by 7 percent. These results are fairly robust to different model specifications, to the inclusion of a large set of control variables, and to different measures of the dependent and independent variables.

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Table 8.1: Summary statistics

	Mean	Median	St. dev.	Minimum	Maximum	Count
C/E	1.94	1.69	1.03	0.91	7.86	280
C	11179	10960	1395	7812	16375	280
E	6517	6489	1758	1519	11301	280
n_c	0.24	0.24	0.02	0.16	0.32	280
n_e	0.19	0.19	0.04	0.06	0.27	280
n_c/n_e	1.43	1.28	0.58	0.76	5.05	280
b^m	0.76	0.55	0.7	0.12	5.04	280
$\overline{n}_c/\overline{n}_e$	1.79	1.55	0.87	0.95	7.39	280
$\overline{n}_c$	11221	11221	1026	7237	15048	280
$\overline{n}_e$	6998	7197	1734	1852	10366	280
median age	45.63	45.5	2.39	40	53	280
median income	114	112	10	90	152	280
median/mean income	0.953	0.958	0.03	0.688	1.003	280
population	30553	16317	53768	3524	679364	280
population density	0.07	0.05	0.08	0.01	0.59	280
cost differences	1.18	1.18	0.07	1.05	1.55	280
stay	0.88	0.89	0.06	0.57	0.94	280
Volume index, old	1.04	1.03	0.17	0.3	1.63	280
N_c	488	230	944	42	12559	272
N_e	186	92	384	21	4820	272
N_c	486	238	866	42	10998	272
N_e	186	96	355	25	4357	272

Table 8.2: Basic regression: dependent variable ln(C/E)

	Median voter model	Median voter model 2	Social planner model
b^m	-0.088**		
	(0.029)		
median age		-1.091**	
		(.290)	
stay		-1.838**	
		(-.309)	
n_c/n_e	0.841**	.620**	1.077**
	(0.091)	(.066)	(0.036)
constant	0.251**	.156**	0.254**
	(0.013)	(.032)	(0.014)
R2 adj.	0.821	.862	0.812
Std. error	0.162	.141	0.165

Standard errors in parenthesis.

Table 8.3: Expenditure regressions: dependent variable ln(C/E)

	(1)	(2)	(3)	(4)	(5)	(6)
b^m	-0.106**	-0.075**				
	(0.025)	(0.024)				
median age			-1.148**	-0.396		
			(0.290)	(0.335)		
stay			-1.602**	-1.051**		
			(0.321)	(0.323)		
$\overline{n}_c/\overline{n}_e$	0.815**	0.789**	0.59**	0.695**	0.966**	0.880**
	(0.048)	(0.047)	(0.06)	(0.066)	(0.028)	(0.034)
structural costs		1.137**		0.641*		0.843**
		(0.243)		(0.257)		(0.249)
median income		-0.197		-0.055		-0.084
		(0.213)		(0.216)		(0.219)
median/mean		-1.370**		-1.224**		-1.349**
income		(0.234)		(0.253)		(0.233)
population		0.001		0.032*		0.018
		(0.012)		(0.014)		(0.011)
pop. density		0.17		-0.037		0.314*
		(0.134)		(0.168)		(0.129)
wage		-0.05		-0.061		-0.049
		(0.049)		(0.050)		(0.055)
median age in		-0.09		-0.175		-0.121
legislative body		(0.168)		(0.17)		(0.173)
constant	0.188**	-0.316**	0.076*	-0.157	0.086**	-0.222*
	(0.029)	(0.091)	(0.031)	(0.092)	(0.16)	(0.093)
Std. error	0.149	0.126	0.137	0.124	0.156	0.128
R2 ad.	0.848	0.891	0.871	0.895	0.834	0.887

Standard errors in parenthesis.

Table 8.4: Employment regressions: dependent variable $\ln(N_c/N_e)$

	(1)	(2)	(3)	(4)	(5)	(6)
b^m	-0.200**	-0.347**				
	(0.048)	(0.049)				
median age			-1.580**	-3.780**		
			(0.603)	(0.605)		
stay			-1.341**	-1.260**		
			(0.503)	(0.380)		
$\overline{N}_c/\overline{N}_e$	0.714**	0.706**	.640**	0.637**	0.928**	0.982**
	(0.060)	(0.079)	(0.088)	(0.091)	(0.044)	(0.072)
structural costs		1.767**		1.196*		0.258
		(0.486)		(0.507)		(0.507)
median income		-1.589**		-1.857**		-0.555
		(0.467)		(0.492)		(0.522)
median/mean		-1.794**		-2.335**		-1.518**
income		(0.509)		(0.591)		(0.512)
population		-0.245		-0.278		-0.068
		(0.392)		(0.400)		(0.428)
pop. density		-0.112**		-0.078*		-0.043
		(0.039)		(0.036)		(0.041)
wage		-0.029		-0.062		0.034
		(0.074)		(0.074)		(0.084)
median age in		-0.244		-0.173		-0.467
legislative body		(0.381)		(0.395)		(0.425)
constant	0.391**	-0.265	0.255**	-0.230	0.151**	-0.038
	(0.065)	(0.176)	(0.065)	(0.182)	(0.043)	(0.196)
Std. error	0.662	0.303	0.658	0.307	0.640	0.327
R2 ad.	0.318	0.695	0.320	0.687	0.329	0.645

Standard errors in parenthesis.