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Strategic competition in Swedish local spending on childcare, schooling and care for the elderly*

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Abstract

This study tests for strategic competition in public spending on childcare and primary education, and care for the elderly, using panel data on Swedish municipalities over 1996-2005. The high degree of decentralization in the organization of the public sector implies that Swedish data is highly suitable for this type of study. The study is not limited to interactions in the same type of expenditure, but also allows for effects across expenditures. The results give no robust support for the hypothesis that municipalities react on the spending policy of neighbouring municipalities in the decision on own spending on care of the elderly, childcare and education.

Keywords: Strategic interactions, Spatial econometrics, Decentralization, Local Public Spending

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1 Introduction

In a world where information flows and people move between regions, local policy makers do not make their decisions in isolation, but need to consider the influence of the surrounding local governments' policies. This gives rise to a situation where the local decision making is affected not only by the situation in the own jurisdiction, but also by the other jurisdictions' policy decisions.

The economic literature distinguishes between two types of strategic interaction: interaction in the form of competition for a mobile resource, and interaction based on information spill-over.[1] The first of these theories recognizes that if local residents respond to differences in local policy by moving, then local policy makers may want to adjust the local policy decision in order to attract - or avoid to attract - certain residents to the jurisdiction.[2]

In the second, information-based, theory, interaction stems from the hypothesis that the voters of a jurisdiction evaluate the performance of the local policy makers by comparison with the surrounding jurisdictions. This in turn may induce the local policy maker to mimic the neighbours' policy, in order not to look bad in the comparison and be voted out of office. The idea is that the neighbours provide a yardstick against which the voters evaluate the decisions made by the local policy maker, and the model is hence referred to as the "yardstick competition" model.[3]

Theory hence describes two mechanisms that can give rise to strategic behaviour among local policy makers: the possibility of dissatisfied residents (i) to move to another jurisdiction, or (ii) to vote for another politician. In general, the literature on the former, migration-based, theory has focused on competition for a mobile tax base (tax competition), or competition to limit the inflow of costly benefit prone individuals (welfare competition).[4] The second theory, yardstick competition, has predominantly been applied to local tax policy [5], although some recent studies also

[1] See e.g. Brueckner (2003) for an overview of the different theoretical models.

[2] See e.g. Wilson (1999) and Wilson and Gordon (2003) for theoretical models.

[3] See Besley and Case (1995) for the first description of the yardstick competition model in the political economy-setting.

[4] See Brueckner (2000) and Allers and Elhorst (2005) for results of the empirical literature.

[5] See e.g. Besley and Case (1995), Bordignon, Cerniglia, and Revelli (2003) and Solé-Ollé (2003).

test for yardstick competition in local expenditures.[6]

In this paper I acknowledge that strategic behaviour may arise also in other areas of local policy, namely in the local decision on how much to spend on childcare, primary schooling and care for the elderly. In Sweden, childcare has long been a local responsibility, and in 1991-92 a series of reforms transferred the provision and financing for primary schooling and care for the elderly from the national and county levels to the municipal level.

Is the decision on how much to spend on these services likely to be affected by the threat of residents to either move from the jurisdiction or to vote the incumbent out of office? I argue that there is reason for us to believe that it might.

Let us first consider the case of competition for mobile residents. Is it likely that the local spending policy for childcare, primary schooling and care for the elderly is affected by strategic competition for residents between local governments? This naturally hinges on the assumption that there is Tiebout-migration in the sense that individuals tend to move to municipalities with high quality public service - or at least that the local policy makers believe that this is the case. There is some evidence of Tiebout-type migration in Sweden: Dahlberg and Fredriksson (2001) find a positive relationship between local public service quality and the residential choices of short-distance migrants.

The fact that the services in this study, childcare, schooling and care for the elderly do not benefit all residents, but are targeted to families with children and elderly respectively[7], furthermore means that there is scope for the local policy maker to use public service spending to attract certain demographic groups to the jurisdiction. A jurisdiction that wishes to attract more families and fewer elderly residents, may hence be tempted to favor spending on childcare and schooling on the expense of care for the elderly, and vice versa. A local policy maker may hence use public service spending as a means to attract the desired population mix; by allocating more (than the neighbours) to the services targeted to the desirable population group, and less (than the neighbours) to the less desirable

[6] See e.g. Revelli (2006), who finds evidence of yardstick competition in the social service provision of UK local authorities.

[7] Naturally, other residents may also enjoy indirect utility of these services, however, the direct effects apply only to the users of the services.

group.[8]

How about the second theory - strategic interaction based on the yardstick comparison by voters? Is this type of interaction likely to be present in the services of the study? There are some factors that speak for this: Childcare, schooling and care for the elderly are services that are important and visible to a large number of the residents of a jurisdiction. They also constitute the lion's share of the municipal budget. This suggests that these services may be important in the voting decision of residents. In addition, residents are likely to be informed about the quality of the services in the own as well as in adjacent jurisdictions, which is another important prerequisite for yardstick competition. It is hence motivated to test for yardstick type interaction among local governments. In particular, I assume that the voters in a jurisdiction observe the quality of childcare, schooling and care for the elderly that they get, given the tax rate, compared to other jurisdictions, and use this comparison to evaluate whether the local policy maker does a good job or not. This will be noted by the politician, who will avoid to deviate too much from the neighbours' decisions, in order not to be punished in the coming election.

Based on the above hypotheses, this study will test for a spatial pattern in municipal spending policy on childcare, primary schooling and care for the elderly. In the baseline analysis, I will test for a spatial pattern, consistent with strategic interactions, among jurisdictions that share border. As will be discussed later, this is a simple and straightforward measure that can be motivated from both theories. As a sensitivity analysis I also use a set of neighbourhood definitions that are closely related to the respective theories, i.e. competition for mobile residents and yardstick competition.

I will test for strategic interactions in the composite expenditure policy of local governments, i.e. I allow for interaction to take place both in expenditures on the same service category, and in expenditures on different categories of services. This makes sense if residents/voters care about the allocation of resources between different services, as well as how much is spent on each category.[9] Furthermore, while the previous literature

[8] There are several reasons for why the demographic mix could matter to the local decision maker: the young and the old may differ in the income level, and hence the income tax base they provide, and they may incur different types of costs on the jurisdiction. Local labour market concerns is another potential reason.

[9] Two previous studies estimate strategic interactions in composite local policies: the

in general tests for strategic interaction in one type of expenditure, or uses aggregate expenditures, here, I test for interactions in the three main expenditure items of the municipalities.[10]

The hypothesis that the local decision maker reacts on the spending policy of the neighbouring jurisdictions is tested using data on Swedish municipal spending on childcare, primary education and care for the elderly over the period 1996-2005. I will use spending per potential user, defined as spending per individual aged 0-15 for childcare and education[11]; and spending per individual aged 80 and older for care for the elderly, as a measure of quality. While it is true that increased spending does not necessarily imply higher quality, the idea here is that a politician who wants to increase the quality of a service, will probably do so by allocating more resources to the service; i.e. by increasing the spending per potential user. In addition, finding alternative and observable measures of quality is not trivial, especially for care for the elderly.

There is no Swedish study on strategic interactions in the municipal expenditures that are analyzed in this study. There are however studies that test for interactions in other expenditures. Hanes (2002) uses cross-sectional data for 1986 on the local rescue services of Swedish municipalities, and finds a negative spatial pattern, consistent with free-riding. Lundberg (2001) tests a similar hypothesis for municipal spending on recreational and cultural services over 1981-1990, and also finds support for the free-riding hypothesis. Dahlberg and Edmark (2004) find evidence of a positive spatial pattern in the welfare benefit levels of the municipalities, using a panel of 283 municipalities over 1990-1994, which is consistent with welfare competition. Finally, Aronsson, Lundberg, and Wikström (2000) find evidence of vertical externalities between the county and the municipal expenditures, using Swedish panel data over 1981-86. This suggests that it is important to consider potential effects of county spending when estimating interactions between municipalities.

Identification and estimation problems abound in studies of this type.

first, Fredriksson, List, and Millimet (2004), focuses at U.S. state policies to attract firms to the locality, and the second, Millimet and Rangaprasad (2007), looks at U.S. school district inputs.

[10] For previous studies, see e.g. Case, Hines, and Rosen (1993), Baicker (2005), Redoano (2003), Schaltegger and Zemp (2003), and Solé-Ollé (2006).

[11] Adding spending for childcare and schooling to one category makes sense since both services are targeted to children. In addition, doing so facilitated the estimations, as discussed in section 3.

The fact that interaction is simultaneous - i.e. my neighbours' spending decision affects my decision, which in turn affects theirs and so on - invalidates the use of OLS. In this study, following Kelejian and Prucha (1998), I use instrumental variables estimation to overcome this problem. As shown by Kelejian and Prucha (1998) IV has the advantage of being unbiased in the presence of spatial error correlation. I include a set of municipality characteristics, as well as time and fixed effects to further reduce the risk of bias due to spatial error correlation. Finally, I account for dynamics by clustering on municipality.

The analysis is subject to the following sensitivity tests: First, as mentioned above, a set of alternative neighbourhood specifications is used. Second, the possibility of vertical interactions is accounted for through testing for effects of county expenditure on municipal spending policy. Third, a Cochrane-Orcutt-type transformation of the variables, suggested by Kelejian and Prucha (1998), is performed. The idea is that this can increase the efficiency of the estimations.

The results give no clear support for a spatial pattern in the local policy on childcare, primary education and care for the elderly. While there are some significant coefficients, especially in the regression on spending on care for the elderly, the results are not robust enough to draw any conclusions. Using the alternative neighbourhood definitions yielded no additional support for neither competition for mobile residents nor yardstick competition.

The disposition of the remaining study is as follows: section 2 describes the Swedish local public sector and section 3 the data used. Section 4 discusses the empirical specification and methodology, and section 5 presents the results. Finally, section 6 concludes.

2 The Swedish local public sector

The Swedish public sector is organized at three levels: municipal, county and central level. There are 290 municipalities and 21 counties. The main responsibility of the counties is the provision of health care. The municipalities have traditionally been responsible for a vast range of public services, such as social assistance, infrastructure and environmental regulation.[12] After the decentralization reforms in the early 1990s, the main responsibilities of the municipalities are in the areas of education, child care and care for the elderly.

An important prerequisite for strategic interaction to arise in these services, is that the municipalities can in fact affect the quality of the services. While there are national guidelines for the municipal provision of childcare, schooling and care for the elderly, there is also significant room for local decision making. The guidelines are most detailed when it comes to primary schooling, where national regulation[13] specifies the comprehensive goals and guiding principles, and provides the basic curricula and the minimum hours of teaching. Within this framework, there is room for the municipality to prepare an own plan for the practical organization and resource allocation. A quick look at the data on the resource allocation in the municipalities in 2005, shows important differences in for example the teacher density and expenses for teaching material.[14]

The national regulations for childcare and care for the elderly provide very general guidelines for the municipalities[15], and there is no national system for the control of the compliance with these. In the case of childcare, the municipalities are themselves responsible for controlling that the guidelines are fulfilled.

The local decision power is considerable also on the revenue side. The municipalities have the right to collect tax revenue in the form of a local income tax and are free to set the tax level, given that they maintain a balanced budget. The tax revenues account for around 70 percent of the total municipal revenue - the rest is made up by central government grants and user fees[16]. Until 1992 the central government grants were targeted to specific services, but since 1993 they are in general in the form of general

[12] Two municipalities, Malmö and Gothenburg, differ from the rest in that they were responsible for some of the services elsewhere provided by the counties until 1998-99. They are kept in the data, since excluding them did not change the results.

[13] See law 1985:1100 (Skollagen), regulation 1994:1194 (Grundskoleförordningen), and the National plan for education (Nationell skolplan Lpo 94).

[14] Per student expenses for teaching materials varies between SEK1000 (about $140) and SEK5000 (about $700), and the average number of students per teacher varies between 7 and 11.

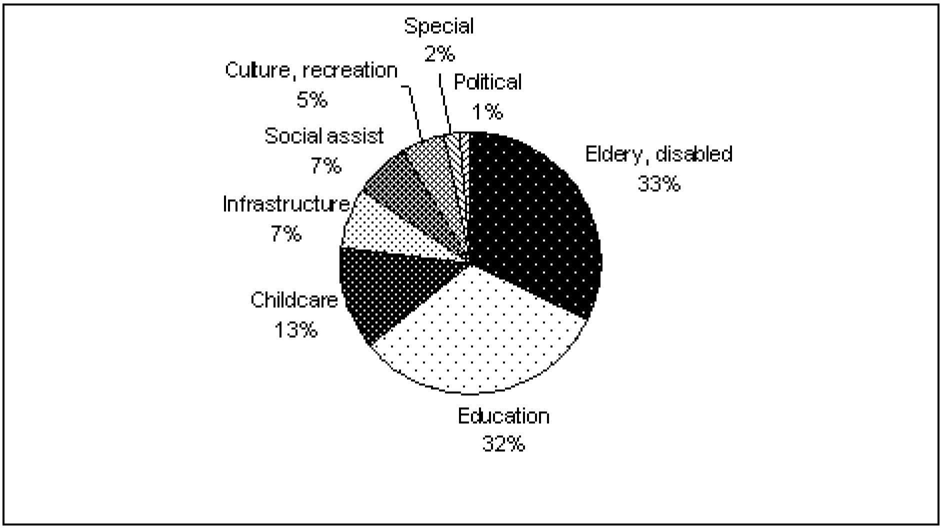
[15] For childcare see law 1985:1100 (Skollagen), and for care for the elderly, see law 2001:453 (Socialtjänstlagen).

[16] This figure is from 2002, see "Kommunernas Ekonomiska Läge 2003", published by Swedish Association of Local Authorities and Regions.

grants that can be used freely by the municipalities.

The fact that the municipalities are responsible for both the financing and provision of a number of important services, makes Sweden a particularly interesting case for the study of spatial interactions in the policies of local governments. As is illustrated in Figure 1, spending on childcare, primary education and care for the elderly and disabled account for the main part of the municipal budget.[17] This means that the citizens and the politicians are likely to have information about the cost and quality of these services and are likely to care about the cost and quality, which are important prerequisites for the hypothesis of this study.

Figure 1: Average per Capita Municipal Spending in 2003



Note: The Figure shows the distribution of the total municipal expenditures on different spending categories, given as the municipal average per user in 2003. Source: Statistics Sweden.

As was mentioned in the previous section, an assumption for the hypothesis of migration-driven strategic competition in spending on childcare, primary education and care for the elderly, is that the demographic mix of a municipality matters economically for the local policy maker. In Sweden, however, as in many other countries, there is a system of equalization of

[17] It shall be noted, though, that education in Figure (1) also includes spending on secondary and adult education.

the taxbase and of the structural costs of the municipalities. The aim of the system is to give every municipality roughly equal conditions in structural factors such as demography, climate etc. Needless to say, this decreases the incentives for migration-based strategic competition. However, Dahlberg and Edmark (2004) find evidence of welfare competition, and Edmark and Ågren (2007) find evidence of tax competition among Swedish municipalities, using data from the same period as this study. This suggests that the equalization system may not totally eliminate the incentives for strategic behavior of this type.

Finally, Revelli (2006) argues that in a multi-tiered government structure one should consider not only horizontal (between municipalities), but also vertical (between municipalities and other levels of government) interactions. In our setting, this means that it is potentially important to include county spending in the regression equation. I will therefore also, as a robustness test, include this variable in the regression. This is furthermore motivated by the fact that Aronsson, Lundberg, and Wikström (2000) find vertical externalities to be present using Swedish data during 1981-86.

3 Data

The data set of this study is a panel of 283 municipalities[18] over 1996-2005.[19][20] As stated above, I use the following variables on local public expenditures: spending on childcare, primary education, and care for the

[18] 6 of the 290 municipalities have either merged with or seceded from another municipality during the time period under study, and have hence been excluded from the sample. In addition, the municipality of Gotland has been excluded since it is an island for which it is naturally difficult to define the set of neighbors.

[19] The data on spending on childcare and care of the elderly and disabled, as well as the data on most explanatory variables, is collected from Statistics Sweden. The exception is data on unemployment, which is from the Swedish Public Employment Service (Arbetsmarknadsstyrelsen). Data on spending on primary schooling is from the Swedish National Agency for Education (Skolverket), and data on county expenditures is from The Swedish Association of Local Authorities and Regions (Sveriges Kommuner och Landsting).

[20] Using data before that period is restricted first for two reasons: First, a large part of the provision of the services in the study were not provided by the municipalities before the first years of the 1990. Second, the collection of data on primary school spending changed in 1995, which means that data from the early years of the 1990s are not comparable to the more recent years.

elderly. I focus on spending per potential user, and define spending on childcare and education as one category, since both of these services are targeted to children.[21] The number of potential users is defined as the number of individuals aged 0-15 for childcare and education, and as the number if individuals aged 80 and older for care for the elderly (and disabled). The data on municipal spending does not separate between spending on elderly and disabled, and thus also includes spending on disabled.

The analysis includes a large set of municipality-level covariates. In order to control for differences in basic economic conditions, I include the per capita municipal taxbase (taxable income), per capita central government grants[22], per capita long-term debt, unemployment, employment, and the share of the population on welfare benefits (denoted welfare in Table 1), as well as per capita county expenditures. A dummy variable, which takes the value one if the political majority is left-wing, is added to the regression in order to capture political preferences[23], and the log of the population size is included in order to capture differences in returns to scale. All covariates, except for the political dummy variable, are lagged one time period. This makes sense since the local budget is decided towards the end of the previous year, when the information available concerns the previous years' economic and demographic conditions. Finally, as suggested in the previous section, I will also, as a robustness test, add county spending as a covariate in the regressions in order to account for possible vertical interactions between county and municipal expenditures.

I also control for unobserved municipality factors that stay fixed over time by including municipality fixed effects. This is important in order to control for factors such as the size of the municipality and climate, which affect the cost of service provision.[24] In addition, the analysis includes

[21] An alternative would be to have two separate categories for childcare and primary schooling. However, when doing so I encountered problems related to weak instruments. That is, when separating spending on childcare and schooling, the set of instruments were not strong enough to separatedly identify the two first stage regressions. This suggests that a large share of the variation in the instrumet set is common for the two types of services, and that it is in this sense appropriate to estimate them together.

[22] The grants variable is made up by the sum of total grants, i.e. both equalizing grants (equalizing the economic conditions across municipalities) and general grants. The negative minimum value of this variable in Table 1 is due to the fact that some municipalities end up as net payers when the equalizing grants are taken into account.

[23] We define the Left Party and the Social Democratic Party as left-wing parties.

[24] As is seen in Table 1 there are very large differences between the min and max values in spending per potential user in the cases of both childcare and education, and

year dummy variables.

Table 1 gives the average values for the variables over the period 1996-2005. All pecuniary variables are deflated to year 2002 monetary value.

Table 1: Descriptive Statistics 1996-2005

Variable	**Obs**	**Mean**	**Std.Dev.**	**Min**	**Max**
Spending Childcare Education	2793	59030	7586	39582	92326
Spending Care Elderly	2825	230338	45398	109790	476036
Taxbase	2830	1110	184	740	2509
Grants	2830	8018	4432	-15399	23194
Long Term Debt	2775	10282	10118	0	73482
Unemployment (%)	2830	4.6	1.9	0.9	13.8
Employment (%)	2830	44.2	3.5	29.4	54.2
Welfare (%)	2820	5.2	2.2	0.42	16.3
Population	2830	31142	58511	2553	771038
Left	2830	0.4	0.5	0	1
County Spending	2532*	18225	2626	12445	23868

*County spending only contains data for 1996-2004.

4 Empirical specification

The prediction to be tested in the empirical analysis is, as described in section 1, that the own spending policy on childcare and primary education, and on care for the elderly, is a function of the neighbouring municipalities' spending policy. Assuming linearity, the prediction can be described by the following regression equation system[25]:

$$s_t^k = \rho_e^k W s_t^e + \rho_c^k W s_t^c + X_{t-1}\beta + \epsilon_t, \qquad k = c, e. \tag{1}$$

In terms of notation, s_t^k is a vector of the per user spending on category k in period t, where c denotes childcare and education, and e care for the elderly. W is a matrix that gives positive weight to the municipalities that are defined as neighbours, i.e. a neighbour weight matrix (W is

care for the elderly. This suggests that controlling for fixed municipality effects may be important.

[25] Similar specifications are used in Fredriksson, List, and Millimet (2004), who model a situation where jurisdicitons compete for companies using a composite policy of local tax rate, environmental standards and local public spending, as well as by Millimet and Rangaprasad (2007) who test for strategic competition among school districts.

time-invariant in all specifications). Ws_t^e and Ws_t^c hence give the average of the neighbouring municipalities' spending on care for the elderly, and childcare and education, respectively. X_{t-1} is a matrix of municipality characteristics that affect the spending policy and also includes a constant term (since all municipality covariates contained in X, except for the political dummy variable, are lagged, I use the subscript $t-1$).

The hypothesis that will be tested in the empirical section is that the ρ-coefficients differ from zero, i.e. a non-zero result is consistent with the hypothesis of strategic interactions in local service spending. What can we expect regarding the signs of the coefficients? In a case with only one policy instrument, we would in general expect to find positive interaction coefficients, provided that all local decision makers have similar preferences.[26] However, in our present case, with two spending categories, the signs of the interaction coefficients are unknown.[27]

Since both equations in the system described in (1) include the same variables, no efficiency gains are to be made by joint estimation. The equations are therefore estimated one by one.

4.1 Definition of a municipality's neighbours

The neighbour weight matrix W needs to be defined ex ante based on exogenous factors. As discussed in the introduction, the causes for strategic interaction in the migration- based theory is the potential migration of the service-consuming residents, whereas in the yardstick competition case it is the threat to be voted out of office that gives rise to interaction. In both of these cases, a prerequisite for interaction to occur is that residents/voters, as well as policy makers, are informed about the policy of other jurisdictions. A reasonable criterion for the definition of neighbours, which is often used in the literature, is hence to let the weight-matrix reflect the geographical proximity of the jurisdictions, since information about service quality and cost is likely to be more easily available for

[26] I.e., we would expect the local policy maker to mimic the neighbours' policy decision.

[27] Consider for example the situation where the objective of the policy maker is to attract more residents - of any age - to the jurisdiction. Assume also that this can be done either by increasing spending on childcare and education; on care for the elderly; or on both. A neighbour's decision to increase spending on, say childcare and education, can then be met with a strategic decision to increase own spending on either the same or the other (or both) spending categories, and can in this case hence result in interaction coefficients of either positive or negative sign.

closely situated municipalities.

A simple weight-matrix, which captures these aspects, is to define neighbours as the municipalities that share border. If we use w_{ij} to denote the elements of matrix W, i.e. w_{ij} defines the weight that municipality j has as a neighbour of i, then we can define this weight-matrix as $w_{ij} = 1$ if i and j share border and $w_{ij} = 0$ otherwise. This type of weight matrix is common in the literature on strategic interactions, and has the advantage of being exogenous in the sense that the risk of imposing the spatial pattern that we want to observe, through the definition of the weight matrix, is small.

In addition to this geographical neighbourhood definition, I define two sets of additional weighting schemes, that are closely related to the theoretical frameworks.

First, in order to better capture the information aspect, I construct a neighbour weight matrix that reflects the coverage of local news papers. In this case, we let $w_{ij} = newspaper_{ij} \cdot coverage_{ij}$, where $newspaper_{ij} = 1$ if i and j share a local newspaper, and $coverage_{ij} =$ the sum of average newspaper coverage of the local newspapers in j and $w_{ij} = 0$ otherwise[28][29].

Second, according to the migration-based theory, it is, naturally, reasonable to assume that interaction takes place among municipalities between which migration is common. I hence let $w_{ij} = migr_{ij}$, where $migr_{ij}$ is the immigration from j to i in 1995. Under this definition, municipality j:s weight as a neighbour to i depends positively on the migration rate. In the first of the two migration based matrices, I use data on migration of all persons aged 16-65. This is intended to capture the overall migration patterns between the municipalities. However, according to our hypothesis, what really matters is the migration of those that are attracted by good care of children and schooling, or care for elderly. I therefore let the second of the migration based weight matrices be based only on the migration of individuals with children aged 0-15. Unfortunately, we lack

[28] The data on local newspapers is from 1994, 1998 eller 2002 and is from Tidningsstatistik AB. We are grateful to Helena Svaleryd och Jonas Vlachos for having made it available to us.

[29] This type of weight matrix was also used in Edmark and Ågren (2007). We select all newspapers that are given out at least six days a week. This leaves some municipalities with no newspaper. For these we include newspapers that are given out less then six days a week. There are two newspapers that have a national coverage, Dagens Nyheter and Svenska Dagbladet. These are counted as local newspapers only for the municipalities in the Stockholm county, since they cover local news in this region.

data over the migration flows of the elderly, and can hence not incorporate this information in the weighting scheme.[30] By using migration in 1995, which is the year before the first year of our panel, we attempt to avoid endogeneity in the definition of neighbours. Since we expect migration to be affected by the spending policies of the municipalities, it is possible that using migration in later years could give rise to a spurious relation in expenditure levels.

In all cases the weight matrices are row-standardized, i.e. they are normalized so that the individual weights of a set of neighbours sum to one. This facilitates the interpretation of the coefficients, and enables direct comparison of the coefficients from specifications using different weight matrices.

What results do we expect to obtain from the different definitions of neighbours? The use of different weighting schemes shall first and foremost be seen as a robustness test of the results. However, they can also be seen as a first indication of the type of strategic interaction. In particular, this holds for the migration-based matrices: since these correspond to the migration-based model to a higher degree, we expect interaction to be stronger in these specifications if competition for attractive residents is driving interaction. Specifically, if it is true that the municipalities compete for the desired distribution of the young and the old, we expect a stronger result when we use migration of the young to define neighbours.

4.2 Estimation issues

There are several issues to consider in the estimation of strategic interactions in local spending decisions. In particular, we need to minimize the risk for bias due to the simultaneity of the municipalities' policy decisions, and for bias due to spatial error correlation.

The simultaneity of the policy decision implies that using OLS to estimate equation (1) yields biased estimates (see e.g. Anselin (1988)). An alternative to OLS, which is suggested by Kelejian and Prucha (1998), is to use the neighbours' characteristics to instrument for neighbours' spending. I follow this procedure and use the neighbours' characteristics as instruments, except for the political variable describing whether the municipality is ruled by a left-wing majority. This is excluded from the instrument set

[30] The data on inter-municipal migration comes from the data base LOUISE, and was provided by The Institute for Labor Market Policy Evaluation (IFAU).

since this is likely to be affected by the spending level and hence endogenous. The resulting set of instruments contain the neighbours' values of: the taxbase, central government grants, long-term debt, unemployment, employment, population (in logs) and the share of population that receive welfare benefits, all lagged one time period.[31] Using the lagged values of the instrumental variables makes sense not only because of the fact that the local budget decision is made towards the end of the previous year, but also since this ensures the exogeneity of the instruments in terms of there being no effect of local spending policy on the instruments.

The spatial error correlation problem can be thought of as an omitted variable problem; i.e. we want to avoid that something that is omitted from the spending equation, and that is correlated among neighbouring municipalities, affects the estimates. According to Kelejian and Prucha (1998), spatial IV regression is consistent also in the presence of spatially correlated error terms. However, in order to further minimize the risk for this type of bias, I add a set of covariates, including fixed effects and year effects. This can also be seen as a measure to strengthen the case for our instruments, since the instruments now only need to be exogenous conditional on the set of covariates. Specifically, the fact that all the variables that are used as instruments are also included as covariates means that the identifying variation that is used in the first stage of the IV-estimation is conditional on the own characteristics, i.e. only the difference between the own and the neighbours' characteristics are used for identification. This rules out any concern that the coefficients for neighbours' spending merely mirror similarities among neighbours in the variables that are used as instruments.[32]

An alternative to using instrumental variable technique to solve the simultaneity-problem of equation (1) is to use a spatial lag maximum-likelihood estimator (see Revelli (2006) for an overview of spatial ML-models). This estimator will however not be used here, since it can be computationally demanding, especially when the number of jurisdictions is large and when the weight matrix is not symmetric in the sense that the

[31] It may seem strange to include both unemployment and emplyment in the estimation, since these are likely to be correlated. However, we are interested in the prediction power of the first stage, and not the individual effects of the instruments, and we include both variables since this improves the prediction power.

[32] See e.g. Figlio, Kolpin, and Reid (1999) for a discussion on this.

number of neighbours differs between jurisdictions[33]. In addition to the computational burden, it can also be argued that the ML-estimator has less potential to identify the spatial process in the error term separately from spatial error correlation.

Yet another alternative, which is suggested by Fredriksson, List, and Millimet (2004) and Millimet and Rangaprasad (2007), is to replace neighbours' policy variables with their lagged values. The idea is that this is a simple way to get around the simultaneity problem, since it is not particularly likely that the neighbours' past policy is affected by the own current policy, and that OLS can hence be used to estimate the effects of the neighbours' lagged policy. However, while this solves the simultaneity problem, the estimates are likely to be biased by spatial error correlation if spatial shocks are persistent.

Finally, since there is evidence that the adjustment of municipal expenditures in Sweden is sluggish (see e.g. Dahlberg and Johansson (2000)), I will need to account for dynamics in the regressions. In our setting, this implies that the residuals of equation (2) are likely to be serially correlated. I take account of this by computing standard errors that are robust for serial correlation of arbitrary form in the error term[34][35].

5 Results

This section presents the results of the regression analysis. The estimated equation is obtained by adding jurisdiction-specific fixed effects, *id*, and a set of yearly dummy variables, *year*, to equation (1):

$$s_t^k = \rho_e^k W s_t^e + \rho_c^k W s_t^c + X_{t-1}\beta + id + year + \epsilon_t, \qquad k = c, e. \tag{2}$$

where k denotes the two different spending categories that are included in the analysis: childcare and primary education, and care for the elderly.

[33] When Kelejian and Prucha (1999) test the accuracy and time of spatial ML-computation they encounter problems when the number of cross-sectional units is 400, even though they use a symmetric weight matrix.

[34] The error covariance matrix is obtained by clustering on municipality (see Baum, Schaffer, and Stillman (2003)).

[35] An alternative would be to include the lagged dependent variable in the estimations, using an Anderson-Hsiao-type estimator. This would however mean that we would lose observations from the early period of our data set, since these would be used as instruments.

Following the predictions of the theoretical set-up, I will estimate two separate regressions, one for each spending category k, and will include the neighbours' spending for both categories as explanatory variables in all regressions.

The testable hypothesis of the theoretical set-up is that the ρ^k-coefficients differ from zero. In addition, they shall not exceed one in absolute value, since a larger interaction coefficient does not represent a stable interaction process[36].

As described in the previous section, I use the neighbours' values of the following variables to instruments for neighbours' spending: taxbase, central government grants, long-term debt, unemployment, employment, population (in logs) and the share of population that receive welfare benefits, all lagged one time period. The same set of instruments is used in all regressions.

5.1 Baseline regression

We start by looking at the results when using the simplest of our neighbourhood definitions, i.e. sharing border. The regressions include all municipality variables, but not county expenditures. First, the first stage results are shown in Table 2. The results show that all instruments (in the table, these are indicated with an N) are individually significant in the regression on neighbours' spending on childcare and education (N Childcare and Education), and all instruments but employment are individually significant in the regression on neighbours' spending on care for the elderly (N Care Elderly), which is comforting.

Table 3 shows the results from the IV-estimation of equation (2). For the sake of comparison, the OLS-results are also given, although these, as discussed in section 4, are not unbiased. The results for spending on childcare and primary education are given in columns 1-2 and the results for spending on care for the elderly in columns 3-4. The coefficients for neighbours' spending per user are denoted N Childcare and Education and N Care Elderly.

[36] This restriction applies to all row-standardized neighbour weight matrices, but not to weight matrices that are not row-standardized (Anselin (1988)). Note that this restriction is not imposed on the estimations.

Table 2: First stage results Baseline IV regression

	N Childcare and Education	**N Care Elderly**
Debt $t-1$	.009 (.011)	.054 (.072)
Taxbase $t-1$	2.654 (3.369)	22.883 (15.05)
Grants $t-1$	.004 (.073)	.402 (.376)
Unempl $t-1$	100.966 (87.322)	184.084 (387.003)
Empl $t-1$	66.425 (70.608)	-346.348 (418.974)
Welfare $t-1$	-116.058** (55.434)	-142.069 (289.847)
Ln Pop $t-1$	-173.44 (2841.546)	20065.15 (15813.77)
Left	-369.843* (215.292)	486.653 (1221.218)
N Debt $t-1$	-.049** (.02)	.233** (.11)
N Taxbase $t-1$	21.028*** (4.532)	55.337* (28.296)
N Grants $t-1$	.974*** (.118)	2.051*** (.769)
N Unempl $t-1$	270.197* (144.817)	-1619.824** (768.272)
N Empl $t-1$	419.696*** (140.195)	-88.253 (743.802)
N Welfare $t-1$	-263.568** (123.17)	-1675.133** (765.197)
N Ln Pop $t-1$	-23301.8*** (4750.953)	69220.99*** (24821.87)
Obs.	2751	2751

Note: The standard errors in parenthesis are robust to heteroscedasticity and serial correlation of arbitrary form. ***, ** and * denote significance at the 1, 5 and 10 percent level, respectively. Year and fixed effects are included in all regressions.

Table 3: Baseline regression, Border-based weight matrix

	Childcare and Education		**Care Elderly**	
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
N Childcare and Education	.07	.078	-.225	-.981
	(.061)	(.185)	(.284)	(.986)
N Care Elderly	-.009	.021	.249***	.677**
	(.013)	(.055)	(.073)	(.297)
Debt $t-1$	-.038*	-.041*	-.008	-.031
	(.021)	(.022)	(.124)	(.13)
Taxbase $t-1$	22.167***	20.881***	40.667	21.486
	(4.703)	(5.27)	(29.136)	(31.026)
Grants $t-1$	.998***	.968***	.91	.634
	(.142)	(.152)	(.833)	(.881)
Unempl $t-1$	29.956	28.774	-104.71	116.822
	(159.012)	(160.997)	(794.325)	(843.852)
Empl $t-1$	315.004**	324.422**	876.471	1297.219
	(139.874)	(157.642)	(729.715)	(821.279)
Welfare $t-1$	-190.463*	-177.122*	-1105.904	-959.298
	(99.867)	(103.528)	(711.256)	(703.004)
Ln Pop $t-1$	-16267.89***	-18063.58***	33459.34	-32.379
	(5036.767)	(6184.495)	(24056.27)	(31285.21)
Left	430.186	419.44	-403.919	-804.928
	(351.034)	(361.573)	(2415.638)	(2430.278)
Cragg-Donald F		15.04		15.02
J-statistic		7.853		3.728
p-value J-stat		0.165		0.589
Obs.	2715	2715	2746	2746

Note: The standard errors in parenthesis are robust to heteroscedasticity and serial correlation of arbitrary form. ***, ** and * denote significance at the 1, 5 and 10 percent level, respectively. The J-statistic is the test of overidentifying restrictions. Instruments: neighbours' values of: taxbase, central government grants, long-term debt, unemployment, employment, population (in logs) and the share of population that receive welfare benefits, all lagged one time period. Year and fixed effects are included in all regressions.

We start by looking at the IV-estimates. The signs of the coefficients for neighbours' spending are insignificant and close to zero for the regression on spending on childcare and education. The corresponding coefficients in the regression on spending on care for the elderly, are larger: A negative coefficient is estimated for neighbours' spending on childcare and education, while a positive coefficient is given for spending on care for the elderly, which suggests that the municipalities respond to changes in neighbours' spending mix with the same type of policy change. Only the latter of the coefficients is however significantly different from zero.

The common way of testing for instrument relevance, using the F-statistic of the joint significance of the instruments in the first stage regression, is not valid when there are multiple endogenous regressors. (see e.g. Baum, Schaffer, and Stillman (2003) for a description of the problem). Instead, we need to use other tests to judge whether the instrument set is relevant. Baum, Schaffer, and Stillman (2003) suggests a comparison of the partial R^2 and the Shea partial R^2[37] for the instruments. This is not a formal test, but, as a rule of thumb, a large partial R^2 and a small Shea partial R^2 shall make us suspicious that the instruments are lacking sufficient prediction power to explain all the endogenous variables. This is not the case in the regressions of Table 3, where the two measures are identical down to the fourth decimal: 0.1467 for neighbours' spending on childcare and education and 0.0413 for neighbours' spending on care for the elderly.

Another test for instrument relevance is the Cragg-Donald F-statistic. This is originally a test of underidentification, but can also be used for testing for weak instruments by using the critical values computed by Stock and Yogo (2002). It shall be noted, however, that this test statistic and the related critical values are derived under the assumption of homoscedasticity, and it is not clear how well it performs when this assumption is not fulfilled. As can be seen in Table 3, the Cragg-Donald F-statistic for the baseline regression is 15[38]. This is above the critical value[39] and hence rejects the hypothesis of weak instruments.

In addition to being relevant, the instruments need to be exogenous in the sense that there shall be no direct effect of the instruments on the dependent variable, other than through their effect on the endogenous

[37] This is a partial R^2-measure which takes the intercorrelation between the instruments into account, see Shea (1997).

[38] 15.02 or 15.04, as can be seen in Table 3. The difference is due to the fact that the number of observations differs somewhat between the regressions on childcare and education and care of the elderly, and that this also affects the computation of teststatistic as I use the ivreg command in Stata.

[39] The critical value for two endogenous variables, allowing for a maximum relative bias of 10% compared to OLS, and at the 5% significance level, is 8.78. According to Stock and Yogo (2002), this value is comparable to the Staiger and Stock (1997) rule of thumb of 10 for the F-statistic in a regression with one endogenous variable.

variable. The test of overidentifying restrictions, which is usually used as a test of instrument validity, does not reject the hypothesis of exogenous instruments (see the Hansen J-statistic in the table). Note however, that the validity of the full set of instruments cannot be tested, since the test of overidentifying restrictions ex ante assumes that one of the instruments is valid.

We then turn to comparing the IV-estimates with the OLS-results. How do we expect these to differ? While the simultaneity problem suggests that the OLS-coefficients will be biased upwards, in absolute value, the OLS-coefficients may also suffer from bias due to spatial error correlation, which can be positive or negative depending on the sign of the correlation. The relation between OLS and IV hence depends on the relation between these sources of bias. Comparing the OLS- and the IV-coefficients of the interaction variables, we see that the OLS-estimates are in general smaller in absolute value than the IV-counterparts. This could be due to negative spatial error correlation. It shall however be noted that the 95%-confidence intervals for the IV-estimates in most cases well cover the OLS-coefficients.

Another interesting comparison can be made if we run the IV-regression excluding the municipality-fixed effects. The results from this specification, that are given in Table A.1, Appendix, are highly unrealistic in terms of measuring strategic interactions. The coefficient for neighbours' spending on childcare and education, in the specification in column 4, is much larger than one, which suggests that the coefficient is picking up some effect other than strategic interaction. This suggests that municipality-fixed effects may be needed to control for spatially correlated variables that stay fixed over time and that are correlated with the instrumental variables. The results furthermore indicate that the inclusion of fixed effects are important for the validity and relevance of the instruments; without fixed effects the test of overidentifying restrictions rejects the hypothesis of instrument exogeneity in the regression on spending on childcare and education. Furthermore, comparison of the Shea R^2 and partial R^2 indicates weak instruments, which suggests that identification becomes significantly weaker as fixed effects are excluded. Using deviations over time as identifying variation is therefore the proper approach.

5.2 Sensitivity analysis

5.2.1 Varying the neighbourhood definition

The regressions using the border-based definition of neighbours yielded support for an effect of neighbours' spending policy on own spending on care for the elderly, but no effect on spending on childcare and education. Are these results robust to varying the way we define neighbours? In order to test this we re-estimate equation (2) using the alternative definitions of neighbours that were described in section 4. The results for the media-based weight matrix, *Wmedia*, is given in column 2. The results for the weight-matrix based on migration of all persons aged 16-65, *Wmigr*, are shown in column 3 in Tables 4 and 5, and the results when using only migration of persons with children aged 0-15, *Wmigr015*, are shown in column 4. The results from the border-based specification, *Wborder*, are repeated in column 1 of the tables for ease of comparison.[40]

Comparing the results from the different specifications in Table 4, we see that the media- and the migration-based neighbourhood specifications yield results that are qualitatively similar to the border-based specification in the regression on spending on childcare and education: The effect of neighbours' spending policy is insignificant for both categories of spending irrespective of the definition of neighbourhood.

For the regression on spending on care for the elderly and disabled, in Table 5, the coefficient on neighbours' spending on care for the elderly turns insignificant as the alternative neighbourhood specifications are used. The coefficient on neighbours' spending on childcare and education is negative as in the border-based specification, but becomes unreasonably large, over one in absolute value, for the migration-based specifications. This is however only significant in one of the specifications, Wmigration, and then only at the 10 percent level. The results in Table 4 and 5 hence give no additional support for the theories of strategic interactions.

Regarding the validity of the instruments, the Hansen J-statistic supports the exogeneity of the instruments in all specifications, except for the migration-based specification in column 3, Table 4, when spending on childcare and education is the dependent variable. The relevance of the instruments is supported for all specifications (the Cragg-Donald F-statistic

[40] Note that the instruments - i.e. the neighbours' covariates - are also weighted according to the different neighbourhood weight matrices.

is above the critical value of 8.78, and the Shea partial R^2 is close to the partial R^2[41]).

Table 4: IV regression, Different neighbour weight matrices

	Childcare Education			
	Wborder	*Wmedia*	*Wmigr*	*Wmigr015*
	(1)	(2)	(3)	(4)
N Childcare and Education	.078	-.029	.075	.013
	(.185)	(.185)	(.236)	(.223)
N Care Elderly	.021	-.074	.135	.13
	(.055)	(.061)	(.097)	(.098)
Debt $t-1$	-.041*	-.041**	-.04*	-.039*
	(.022)	(.02)	(.023)	(.023)
Taxbase $t-1$	20.881***	23.722***	18.307***	18.147***
	(5.27)	(4.925)	(5.361)	(5.156)
Grants $t-1$	.968***	1.003***	.917***	.934***
	(.152)	(.142)	(.161)	(.158)
Unempl $t-1$	28.774	15.625	37.76	39.333
	(160.997)	(160.971)	(165.008)	(165.261)
Empl $t-1$	324.422**	331.431**	331.751**	333.674**
	(157.642)	(150.196)	(151.887)	(155.031)
Welfare $t-1$	-177.122*	-166.597	-186.649*	-183.599*
	(103.528)	(101.443)	(105.686)	(104.667)
Ln Pop $t-1$	-18063.58***	-15484.34***	-22281.44***	-21739.74***
	(6184.495)	(5391.413)	(6118.678)	(6007.824)
Left	419.44	304.293	462.708	483.587
	(361.573)	(365.297)	(401.842)	(404.857)
Cragg-Donald F	15.04	12.97	17.82	14.42
J-statistic	7.853	8.148	10.376	9.203
p-value J-stat	0.165	0.148	0.065	0.101
Obs.	2715	2705	2715	2715

Note: See Table 3.

[41] For the two migration-based specifications both the Shea partial R^2 and the partial R^2 are about 0.09 for the first stage on neighbors' spending on childcare and education, and are about 0.05-0.06 for the first stage on neighbors' spending on care of the elderly. The corresponding figures for the media-based specification are around 0.04 and 0.06, respectively.

Table 5: IV regression, Different neighbour weight matrices

	Care Elderly			
	Wborder (1)	*Wmedia* (2)	*Wmigr* (3)	*Wmigr015* (4)
N Childcare and Education	-.981 (.986)	-.396 (1.086)	-2.172* (1.252)	-1.849 (1.218)
N Care Elderly	.677** (.297)	.598 (.379)	.699 (.437)	.63 (.467)
Debt $t-1$	-.031 (.13)	.053 (.124)	-.005 (.126)	-.006 (.125)
Taxbase $t-1$	21.486 (31.026)	35.635 (30.967)	32.177 (30.311)	31.227 (31.621)
Grants $t-1$	.634 (.881)	1.198 (.8)	1.295 (.849)	1.292 (.912)
Unempl $t-1$	116.822 (843.852)	227.982 (819.976)	-42.655 (776.779)	22.313 (779.311)
Empl $t-1$	1297.219 (821.279)	963.592 (757.501)	1084.145 (704.331)	1059.052 (725.697)
Welfare $t-1$	-959.298 (703.004)	-1385.383* (708.034)	-1102.433* (650.527)	-1124.255* (674.115)
Ln Pop $t-1$	-32.379 (31285.21)	28137.48 (27332.92)	27278.5 (24993.13)	31197.52 (23924.9)
Left	-804.928 (2430.278)	65.358 (2587.703)	406.114 (2385.284)	395.115 (2429.104)
Cragg-Donald F	15.02	12.97	17.82	14.42
J-statistic	3.728	2.490	2.055	6.164
p-value J-stat	0.589	0.778	0.842	0.291
Obs.	2746	2705	2715	2715

Note: See Table 3.

5.2.2 Adding county expenditures

So far, we have included only municipality-specific covariates in the regressions. However, Aronsson, Lundberg, and Wikström (2000) find support for the hypothesis that county expenditures and municipal spending are related. The intuition is that services provided at different levels can be either substitutes or complements for the local decision maker. Including county expenditures may therefore be important in order to correctly estimate inter-municipal interactions (see e.g. Revelli (2006)).

In general, the same endogeneity problem applies here as in the case of interactions between municipalities, i.e. if municipality spending also affects the county spending decisions, then county spending will be endogenous, although, since county is the larger unit[42], this should be a smaller problem than in the case of municipality-wise interaction. Since the aim here is merely to test the sensitivity of the results to the inclusion of the variable, we will include county expenditures without accounting for potential endogeneity. It shall however be noted that its coefficient shall not be interpreted as a causal effect.

Tables 6 and 7 show the results including county expenditures for the border-, media- and migration-based weight-matrices. For the sake of brevity, only the coefficients for neighbouring municipalities' spending and county spending are shown. (The results for all covariates are shown in Tables A.2 and A.3, Appendix).

Table 6: IV regression, Including county expenditures

	Childcare and Education			
	Wborder	*Wmedia*	*Wmigr*	*Wmigr015*
	(1)	(2)	(3)	(4)
N Childcare and Education	.098	-.017	.035	-.035
	(.212)	(.229)	(.253)	(.236)
N Care Elderly	.02	-.066	.085	.105
	(.058)	(.062)	(.106)	(.105)
County costs	.227	.068	.266	.299
	(.202)	(.218)	(.211)	(.212)
Municip covariates	yes	yes	yes	yes
Cragg-Donald F	12.95	7.40	11.20	9.73
J-statistic	4.619	6.950	7.482	6.676
p-value J-stat	0.464	0.224	0.187	0.246
Obs.	2420	2411	2420	2420

Note: See Table 3.

[42] There are 290 municipalities and 21 counties in Sweden - hence on average about 14 municipalties per county.

Table 7: IV regression, Including county expenditures

	Care Elderly			
	Wborder (1)	*Wmedia* (2)	*Wmigr* (3)	*Wmigr015* (4)
N Childcare and Education	-1.244 (1.168)	-.632 (1.265)	-2.441* (1.378)	-2.162 (1.327)
N Care Elderly	.838*** (.316)	.552 (.369)	1.001** (.492)	.818 (.519)
County costs	-1.386 (1.409)	-1.293 (1.507)	-1.555 (1.17)	-1.708 (1.231)
Municip covariates	yes	yes	yes	yes
Cragg-Donald F	12.89	7.40	11.20	9.73
J-statistic	2.993	2.545	3.402	8.450
p-value J-stat	0.701	0.770	0.638	0.133
Obs.	2451	2411	2420	2420

Note: See Table 3.

As can be seen in Tables 6 and 7, the results change somewhat when county expenditures are included. The coefficients on neighbours' spending stay insignificant in all specifications in the regression on spending on childcare and education in Table 6. In the regression on spending on care for the elderly (Table 7), the coefficients are larger, and are over one in many specifications. In the migration-based specification, both coefficients of neighbours' spending are over one in absolute value, and significant at the 10 and 5 percent levels. This is an unreasonable result which suggests that the coefficients may be picking up the effect of some omitted variable.

The coefficient on county spending is positive in the regression on spending on childcare and education, and negative in the regression on care for the elderly, but is insignificant in all specifications.

Although, as commented earlier, the coefficient on county expenditures shall not be interpreted as a causal effect, it is nevertheless interesting to compare result in Table 7, with the findings in Aronsson, Lundberg, and Wikström (2000). They find a positi ve relation between county and aggregate municipal expenditures, suggesting complementarity, using data over 1981-86. Since that period, the municipal responsibilities for care for the elderly have increased, due to the previously mentioned reform in 1992. An interesting topic for future research would be to test if the sign of the vertical interactions have also changed after this. Guiding from the negative, although insignificant, coefficients in Table 7, one could suspect county expenditures (which mainly consists of medical services) and municipal spending on care for the elderly to be substitutes.

The Cragg-Donald F-statistic and the Shea partial R^2 are very similar to Tables 4 and 5 of the previous section[43], supporting the instrument relevance in all specifications, except for the media-based specification, where the Cragg-Donald F-statistic falls just below the critical value and where weak instruments in this case might be a problem.

5.2.3 Transforming the variables to increase efficiency

The results obtained in the above sections over-all yield very weak evidence for strategic interactions in the spending decision on care for the elderly, childcare and education. Kelejian and Prucha (1998) however suggests that the efficiency of the estimations can be increased by using an alternative estimator, where the variables are transformed in order to take potential spatial error correlation into account. The idea is that in models of spatial interactions, we are likely to experience spatial correlation in the error term due to spatially correlated shocks, and that this correlation contains information that could be utilized in the estimation procedure. This section tests if applying this estimation procedure to the data increases the efficiency of the estimations.

The following description follows Kelejian and Prucha (1998) and Kelejian and Prucha (1999). Let us start by defining WX_t^* as the instrument set, and let $H_t = (X_{t-1}, WX_{t-1}^*)$ denote the resulting instrument matrix (that is used in the first stage regressions). Second, I assume that the error term is described by the following process:

$$\epsilon_t = \lambda W \epsilon_t + u_t, \tag{3}$$

where u_t is a vector of independently distributed error terms. That is, the error term of equation (1) is correlated with the error terms of the neighbouring municipalities.[44] The idea is to transform the variables of

[43] The Shea partial R^2 and the partial R^2 are both around 0.12 in the border-based regression on neighbors' spending on childcare and education, and 0.04 in the regression on neighbors' spending on care for the elderly. The corresponding figures for the media-based specification are around 0.03 and 0.06, and for the migration-based specifications around 0.06 and 0.05.

[44] We assume that the weight matrix for the spatial process in the error term is the same as that of the dependent variable.

the second stage taking into account spatial error correlation in the form of (3). Following Kelejian and Prucha (1999), I estimate $\hat{\lambda}$ using non-linear least squares, and use the predicted coefficient to transform the variables in the following manner:

$$\tilde{Z}_t = Z_t - \hat{\lambda} W Z_t, \qquad \tilde{s}_t = s_t - \hat{\lambda} W s_t, \tag{4}$$

where $Z = (Ws_t, X_{t-1})$ and s_t denotes service spending.

IV is then applied to the transformed data. The resulting estimator is the following:

$$\left(\tilde{\rho}, \tilde{\beta}'\right)'_{IV} = \left(\tilde{Z}_t' P_t \tilde{Z}_t\right)^{-1} \left(\tilde{Z}_t' P_t \tilde{s}_t\right), \qquad P_t = H_t \left(H_t' H_t\right)^{-1} H_t'. \tag{5}$$

The estimator in equation (5) is applied to the baseline regression, using the border-based neighbourhood criterion. In order to facilitate the estimations, I replace the missing values in the dataset with the municipality-wise mean over the period. Table 8 shows the results for neighbours' spending when the variables are transformed in the above described manner, *(IV transformed)*. For the sake of comparison, the results from using ordinary IV on the same dataset (with no missing values) are also shown.[45] The full set of covariates, are included in the regressions, although here only the coefficients for neighbours' spending policy are shown (the results for all coefficients can be seen in Table A.4, Appendix).

As can be seen in Table 8, the results of the estimation on the transformed variables are very similar to the results of the regression on the untransformed variables in Table 3. Neighbours' spending has no significant effect on own spending on childcare and education, while neighbours' spending on care for the elderly has a positive significant effect on own spending on the same category. According to the results in Table 8, using the transformation suggested by Kelejian and Prucha (1998) did thus not qualitatively change our results. This is in line with recent Monte Carlo results for the estimator, which suggest that the efficiency-gains to be made from using the estimator are limited in small samples (see Kelejian, Prucha, and Yuzefovich (2004)).

[45] As can be seen in Table 8, the results are very similar to the results of the unbalanced panel in Table 3.

Table 8: Kelejian and Prucha IV regression, Including county expenditures, Border-based weight matrix

	Childcare and Education		**Care for Elderly**	
	IV	IV transf	IV	IV transf
	(1)	(2)	(3)	(4)
N Childcare and Educ	0.049	0.116	-0.851	-0.798
	[0.180]	[0.182]	[0.979]	[0.930]
N Care Elderly	0.015	0.003	0.643***	0.776***
	[0.054]	[0.052]	[0.292]	[0.250]
Municip covar	yes	yes	yes	yes
$\hat{\lambda}$		-0.392		-0.403
Obs.	2380	2380	2380	2380

Note: The standard errors in parenthesis are robust to heteroscedasticity and serial correlation of arbitrary form. ***, ** and * denote significance at the 1, 5 and 10 percent level, respectively. Instruments: neighbours' values of: taxbase, central government grants, long-term debt, unemployment, employment, population (in logs) and the share of population that receive welfare benefits, all lagged one time period. Year and fixed effects are included in all regressions.

The NLS-estimates of $\hat{\lambda}$ are also given in the table. The negative values of the estimates suggest negative spatial error dependence.

For the alternative neighbourhood specifications, the NLS-estimation of $\hat{\lambda}$ proved unstable in many cases[46]. No results for the transformed variables are therefore given for these specifications.

6 Conclusion

To conclude, the results largely reject the hypothesis of strategic interaction in local spending on childcare, primary education and care for the elderly. While there are some significant coefficients, especially in the regression on spending on care for the elderly, the results are not robust enough to be interpreted as evidence for strategic interaction. Specifically, while the border-based baseline specification for spending on care for the elderly indicate a positive effect of neighbours' spending on care for the elderly, using the alternative neighbourhood definitions yielded no additional support for the theories of strategic interaction. Furthermore,

[46] Unrealistic values for $\hat{\lambda}$ were estimated in some cases, or the results were not robust for small changes in the starting values.

coefficients larger than one in absolute value were given in some of the alternative neighbourhood specifications.

The aggregate results hence gives no robust evidence of strategic interactions in childcare, primary schooling and care for the elderly. However, it may be that the dependent variable that is used in this study, spending (per potential user) is not a relevant measure for service quality. While alternative quality measures for the time period under study are not easily found, the Swedish Association of Local Authorities and Regions have recently started to produce open evaluations of the relative performance of the public service in all Swedish municipalities.[47], providing additional measures on the quality of local public services. Rather than establishing that strategic interactions are not an issue in the types of services of this study, the results may be due to the difficulties of capturing quality-differentials when using expenditure data, and better possibilities to test for such interactions may be given in the future.

[47] The Swedish Association of Local Authorities and Regions started to publish yearly open quality comparisons for primary schooling and care for the elderly in 2007 (see "Öppna Jämförelser 2007 - Grundskola", and "Öppna Jämförelser 2007 - Äldreomsorg"), and will, in cooperation with the The National Board of Health and Welfare, work to develop these further.

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A Appendix

A.1 Baseline IV no municipality fixed effects

Table A.1: Baseline regression without fixed effects

	Childcare and Education		Care Elderly	
	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
N Childcare and Education	.469***	.561***	1.215**	4.613**
	(.059)	(.172)	(.525)	(1.941)
N Care Elderly	-.004	-.004	.825***	.634***
	(.008)	(.022)	(.087)	(.207)
Debt $t-1$	-.006	-.01	-.174	-.235
	(.018)	(.018)	(.159)	(.178)
Taxbase $t-1$	20.731***	18.305***	-35.956	-88.296**
	(3.543)	(4.143)	(21.975)	(35.259)
Grants $t-1$	.89***	.787***	-.839	-3.028*
	(.126)	(.152)	(.999)	(1.626)
Unempl $t-1$	-51.244	-109.935	4655.295***	3585.592**
	(183.344)	(192.139)	(1707.959)	(1763.242)
Empl $t-1$	61.638	34.165	4191.543***	4200.267***
	(116.34)	(133.673)	(1037.598)	(1225.657)
Welfare $t-1$	-43.821	-28.145	-1158.331	-441.338
	(94.228)	(107.356)	(918.303)	(972.302)
Ln Pop $t-1$	463.096	461.102	-1632.402	-1286.629
	(360.783)	(357.592)	(2392.802)	(2489.017)
Left	1131.723***	979.387**	9114.321***	4128.145
	(414.566)	(450.688)	(3500.161)	(5074.422)
Cragg-Donald F		35.95		36.34
J-statistic		15.296		1.352
p-value J-stat		0.009		0.929
Obs.	2715	2715	2746	2746

Note: See Table 3. Fixed effects are however excluded in the regressions in Table A.1.

A.2 Baseline IV including county expenditures

Table A.2: IV regression, Including county expenditures

	Childcare and Education			
	Wborder (1)	*Wmedia* (2)	*Wmigr* (3)	*Wmigr015* (4)
N Childcare and Education	.098 (.212)	-.017 (.229)	.035 (.253)	-.035 (.236)
N Care Elderly	.02 (.058)	-.066 (.062)	.085 (.106)	.105 (.105)
Debt $t-1$	-.035 (.023)	-.035* (.02)	-.033 (.022)	-.033 (.023)
Taxbase $t-1$	19.792*** (5.615)	22.196*** (5.234)	19.109*** (5.448)	18.575*** (5.357)
Grants $t-1$	.939*** (.154)	.956*** (.142)	.937*** (.16)	.947*** (.158)
Unempl $t-1$	27.881 (163.125)	12.871 (163.763)	40.194 (165.883)	44.367 (166.766)
Empl $t-1$	217.447 (173.037)	213.8 (167.031)	217.329 (164.727)	216.422 (168.082)
Welfare $t-1$	-174.518 (112.703)	-174.996 (106.823)	-191.724* (108.303)	-189.895* (108.096)
Ln Pop $t-1$	-15765.26** (6940.9)	-12929.23** (5712.656)	-18052.32*** (6444.467)	-18288.96*** (6081.03)
Left	420.256 (368.805)	321.644 (371.539)	437.59 (379.257)	472.853 (389.363)
County costs	.227 (.202)	.068 (.218)	.266 (.211)	.299 (.212)
Cragg-Donald F	12.95	7.40	11.20	9.73
J-statistic	4.619	6.950	7.482	6.676
p-value J-stat	0.464	0.224	0.187	0.246
Obs.	2420	2411	2420	2420

Note: See Table 3.

Table A.3: IV regression, Including county expenditures

	Care Elderly			
	Wborder (1)	*Wmedia* (2)	*Wmigr* (3)	*Wmigr015* (4)
N Childcare and Education	-1.244 (1.168)	-.632 (1.265)	-2.441* (1.378)	-2.162 (1.327)
N Care Elderly	.838*** (.316)	.552 (.369)	1.001** (.492)	.818 (.519)
Debt $t-1$	-.071 (.137)	.022 (.125)	-.036 (.128)	-.041 (.127)
Taxbase $t-1$	18.614 (33.173)	35.747 (32.914)	32.883 (31.604)	32.801 (32.76)
Grants $t-1$	.548 (.889)	1.148 (.807)	1.226 (.861)	1.243 (.918)
Unempl $t-1$	146.513 (836.879)	263.845 (783.638)	-84.682 (756.697)	43.797 (766.071)
Empl $t-1$	1194.01 (963.84)	703.632 (887.585)	683.364 (843.564)	664.378 (876.37)
Welfare $t-1$	-1022.801 (758.867)	-1539.9** (739.619)	-1312.48* (686.248)	-1356.353* (715.025)
Ln Pop $t-1$	-17989.67 (35275.31)	25068.19 (28973.56)	20427.74 (27047.76)	28329.07 (25191.43)
Left	-945.967 (2371.256)	108.453 (2426.293)	786.898 (2249.147)	806.25 (2294.201)
County costs	-1.386 (1.409)	-1.293 (1.507)	-1.555 (1.17)	-1.708 (1.231)
Cragg-Donald F	12.89	7.40	11.20	9.73
J-statistic	2.993	2.545	3.402	8.450
p-value J-stat	0.701	0.770	0.638	0.133
Obs.	2451	2411	2420	2420

Note: See Table 3.

A.3 Transforming the variables to increase efficiency

Table A.4: Kelejian and Prucha IV regression, Border-based weight matrix

	Childcare and Education		Care for Elderly	
	IV	IV transf	IV	IV transf
	(1)	(2)	(3)	(4)
N Childcare and Education	0.049	0.116	-0.851	-0.798
	(0.180)	(0.182)	(0.979)	(0.930)
N care for elderly	0.015	0.003	0.643**	0.776***
	(0.054)	(0.052)	(0.292)	(0.250)
Debt $t-1$	-0.045**	-0.039*	-0.061	-0.041
	(0.021)	(0.021)	(0.128)	(0.122)
Taxbase $t-1$	20.830***	21.655***	22.706	20.724
	(5.193)	(5.186)	(30.645)	(26.991)
Grants $t-1$	0.978***	0.949***	0.633	0.657
	(0.149)	(0.156)	(0.867)	(0.830)
Unempl $t-1$	35.476	120.435	46.187	91.989
	(159.061)	(152.133)	(833.042)	(731.396)
Empl $t-1$	306.644*	325.814**	1325.677	969.841
	(157.291)	(144.750)	(820.334)	(712.725)
Welfare $t-1$	-182.854*	-254.289**	-732.091	-727.223
	(101.343)	(101.352)	(701.298)	(641.644)
Ln Pop $t-1$	-18690.225***	-18371.477***	10728.280	1414.449
	(6155.095)	(6333.887)	(31432.996)	(29221.325)
Left	437.615	332.145	-1228.647	-992.321
	(383.861)	(386.621)	(2383.212)	(2206.521)
$\hat{\lambda}$		-0.392		-0.403
Obs.	2380	2380	2380	2380

Note: See Table 7.

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