Exploring Differences in Expenditure for the Functionally Impaired: Neighborhood Interaction and the Federal Structure

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Abstract:
The purpose of this paper is to study the determinants of the differences in expenditure on services for functionally impaired individuals among municipalities in Sweden. Expenditure per capita differs greatly across municipalities, even when accounting for the nature of the service. A spatial autoregressive model is used to test whether the decisions on the expenditure level in a neighboring municipality affect the municipality's own expenditure. The results show that a positive spatial interaction exists among neighbors. However, when controlling for level differences among counties the spatial interaction coefficient becomes negative although not significantly determined. Therefore, the positive interaction first found can be interpreted either as a result of differences in the way county councils diagnose individuals or due to interaction or mimicking among neighbors belonging to the same county council.

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1 Introduction

"The Act Concerning Support and Service for Persons with Certain Functional Impairments"[2] (LSS)[3] is an entitlement-law that was established as part of the 1993 Handicap Reform in Sweden. The LSS act is for individuals with "major and long-term functional disability". The purpose of the act is to enable these individuals to obtain equal opportunities in living conditions and full participation in the community. The LSS-act is a complement to other laws; it gives individuals rights to obtain support and services that they might need in addition to other legislation. The responsibility for providing LSS measures mainly lies with the municipalities.

The LSS activity is the fastest growing expenditure program of the municipalities. Since it was first implemented in 1994, the LSS act has expanded a number of times – which is the main reason for the increase in the LSS activity. While only about 0.5 percent of the population is receiving any LSS assistance, the LSS provision consumes almost nineteen percent of the municipalities' total social service expenditures (NBHW[4], 2004). However, the expenditure per capita differs greatly across municipalities; it ranges from 400 SEK to 6,000 SEK per capita (SOU 2002:103). This variation in expenditures can largely be explained by the nature of the LSS provision where, for example, each person's individual needs differ from those of others. Nevertheless, even accounting for the nature of the LSS provision, there are large differences that remain to be explained.

The purpose of this paper is to study the determinants of the differences in the municipalities' expenditures on LSS. Besides traditional explanations such as differences in the number of disabled persons in the community, or economies of scale, other explanations are studied. In particular, the focus will be on the explanation that municipalities interact in their expenditure behavior so as to avoid costs associated with LSS or otherwise engage in social interaction with each other. For example, since the LSS act is a relatively new law, the municipalities may be uncertain about some of its

[2] SFS 1993:387.

[3] In Swedish: *Lag om stöd och service till vissa funktionshindrade.*

[4] The National Board of Health and Welfare.

implications – and they may therefore consider other municipalities as being superior in their actions with regards to LSS. For this reason, the municipalities may mimic each other so as to act in a similar way. Mimicking here implies that there is a positive dependence between different municipalities' expenditures. Another reason for differences in the expenditure of LSS may be that the municipalities are engaging in a "race to the bottom" [5] with each another. However, since both the scope of the LSS production as well as its expenditure per capita increases for every year, this explanation may not be very plausible. A third explanation is related to the fact that the county councils are responsible for diagnosing those who may be eligible for LSS, implying that the expenditure levels may differ regionally. Prior to the handicap reform of 1993, the county councils were the sole providers of the LSS activity. If the differences are *only* due to this fact – there should not be any remaining interaction when controlling for the county council level.

The idea that the municipalities may affect each other in their decision making can be referred to as spatial (or social) interaction, and it can be studied via spatial spillover models, for example. Studying the reasons for differences in LSS expenditure among municipalities is both interesting and important. First, it is an interesting area to study since LSS is relatively new and is therefore to a large extent unexplored. Second, the results may have important policy implications depending on the reasons for the differences among the municipalities.

There are several studies on spatial spillover in the literature. One of the first papers is the study of Case, Rosen and Hines (1993), in which they used a spillover model to study the budget spillover among U.S. states. They found that a state's level of per capita expenditure is positively and significantly affected by the expenditure levels of its neighbors. Another example of a study of spatial interaction is Murdoch, Rahmatian, and Thayer's (1993) article where they studied recreation spillovers among municipalities in the Los Angeles area. They found that the municipalities responded positively to spillover from recreation expenditures in neighboring municipalities, and that municipalities with relatively high incomes and air pollution spend relatively less on local recreation. Since strategic interaction

[5] A "race to the bottom" scenario is here interpreted as competition between municipalities leading to progressive dismantling of LSS service production.

can be studied via spillover models, the spillover model should be an appropriate tool for testing whether municipalities do interact and influence each other when determining the level of the LSS expenditure per capita.

In this paper, a spatial autoregressive model is used to test whether a neighboring municipality's decision on LSS expenditures affects the municipality's own LSS expenditure. In order to study neighborhood interaction, neighbors must be specified in advance. The neighborhood weight matrix will be constructed in such a way that every municipality in a reference group has equal weight regardless of size, population or location of the municipality. The municipalities studied here are grouped in different sets of neighborhood specifications. For example, in one specification, neighbors are defined to be those who share a common border. In another specification, neighbors are those who belong to the same functional urban region (FUR). In all, four different neighborhood specifications are used. Using a spatial autoregressive model, it can be determined whether the level of expenditure per capita for the LSS activity may be influenced by interaction among municipalities.

The rest of the paper is organized as follows. Section 2 describes the LSS-Act, its background and its development. Section 3 presents theory, neighborhood matrix, and an empirical model which estimates spatial interaction among municipalities. Section 4 presents data and empirical findings, while concluding remarks can be found in section 5.

2 LSS ACT

"The Act Concerning Support and Service for Persons with Certain Functional Impairments" (LSS) is a law to guarantee individuals with major and long-term functional disability equality in living conditions and full participation in the community. The LSS Act contains provisions relating to measures for special support and special services for those with an intellectual disability, autism or a condition resembling autism; or for those with a significant and permanent intellectual impairment that occurred after brain damage in adulthood, or for those with other major and permanent physical or mental impairments not due to normal aging. Individuals who belong to any of the above groups are entitled to

support and services if they need such assistance in their daily lives and if their needs are not satisfied in some other way.

The measures included in the LSS act are designed to ensure that individuals entitled to LSS will have good living conditions. The measure(s) should be lasting and adapted to the individual needs of the recipient and be framed in such a way that they are easily accessible for those who need them and enhance the ability of the latter to live an independent life (www.independentliving.org). The LSS act consists of ten measures which include Counseling and other personal support; Personal assistance; Daily activities; Relief service in the home; and Living in family homes or homes with special services for children and young people (SFS 1993:387).

The responsibility for the LSS activity mostly resides with the municipality. While the municipalities are responsible for nine of the ten LSS measures, the county council is responsible for the measure "Counseling and other personal support". However, some municipalities have, by agreement, taken over the responsibility also for this measure. In connection with the Handicap reform of 1993, the *"Assistance Benefit Act"* (LASS) was also established. The LASS act is where the Social Security Administration assists LSS individuals in need of personal assistance more than 20 hours per week. Thus, the municipalities have the financial responsibility for the first 20 hours and the Social Security Administration for the exceeding hours (NBHW 2006).

There has been a steady increase in the LSS expenditure. During 1997–2001, the municipalities' share of LSS expenditures increased with a yearly average of 11.3 percent (SOU[6] 2002:103), and it is also the fastest growing activity of the municipalities. The share of the municipalities' resources for the disabled was about eleven percent in 2004, as compared to nine percent in 2000 (NBHW, 2006).

[6] Statens Offentliga Utredningar, SOU.

In 2001, the number of individuals receiving at least one LSS measure was 47,283 (NHBW, 2001). This corresponds to approximately 0.6 percent of the population aged 0–64[7], or 0.5 percent of the whole population. In 2004, the number of individuals receiving at least one measure had increased to 52,995 (NBHW, 2004). The percentage increase over the four years was 12.8 percent. The costs of the LSS activities are substantial; Table 1 presents an overview of the municipalities' total expenditure on LSS for the years 2001 to 2004.

Table 1. Total expenditures on LSS activity (NBHW 2001-2004)

LSS/LASS	2001	2002	2003	2004
Billion SEK	20.4	22.5	25.1	26.5
Increase from previous year	6.80%	10.30%	11.60%	5.60%

Note: In the year 2000, total expenditures less LASS compensation amounted to 19.1 billion SEK, *current prices*.

The net expenditures[8] for LSS in 2001 amounted to 20.4 billion SEK – which is about twenty percent of the total municipal expenditures of the "Care of the Elderly and Disabled", and seventeen percent of the total Social Services expenditure in that year (NBHW, 2001). In 2004, the corresponding numbers had increased to 26.5 billion SEK for the LSS activity, which is 23.5 percent of "Care of the Elderly and Disabled" and 18.9 percent of the total expenditures of the Social Services (NBHW, 2004). Table 2 shows the average LSS expenditure per capita for the whole country.

[7] LSS measures are granted to individuals aged 0-64.

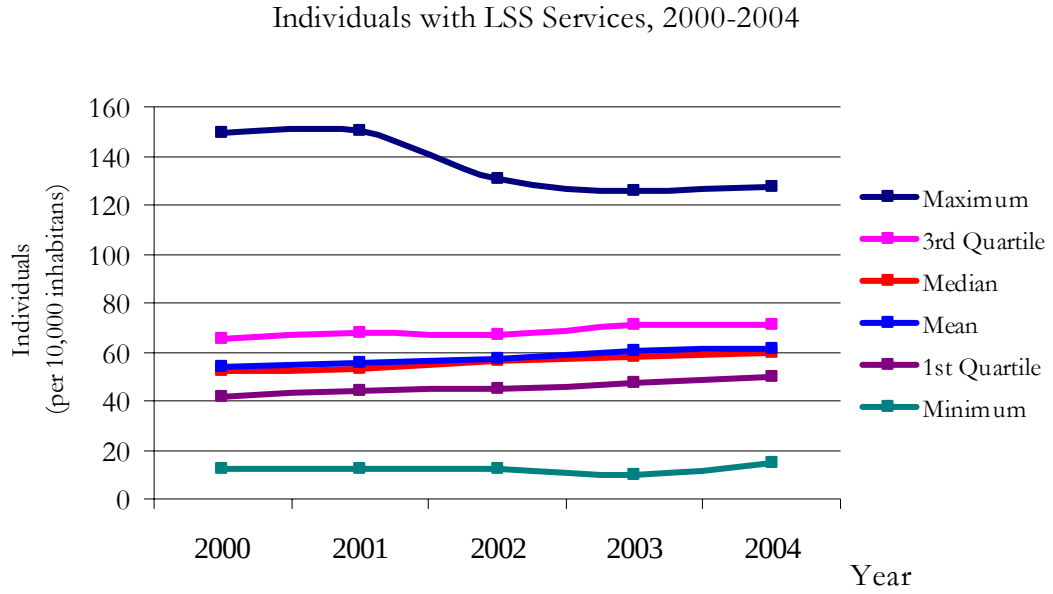
[8] Net expenditure refers to gross expenditure minus internal revenue; minus sale-revenues from other municipalities and county councils; exclusive compensations from Swedish Social Insurance Agency for LASS services, and exclusive expenditure for preventive activities and revenues from rent.

Table 2. Average expenditure on LSS per capita in SEK, *current prices*

Year	Expenditure per capita, age 0-64	Expenditure per capita	Expenditure per person receiving LSS
2001	2,899	2,333	423,627
2002	2,949	2,360	417,981
2003	3,211	2,587	438,875
2004	3,371	2,708	445,106

There are major differences among the municipalities in their LSS expenditure per capita. As mentioned, the expenditures range from approximately 400 SEK to 6,000 SEK per capita. To a great extent, this variation in expenditures can be explained by the nature of the LSS production. While LSS naturally depends on the specific needs of the individuals and the number of measures required, it also depends on the concentration of individuals with a need for LSS services in the municipalities. Before the handicap reform of 1993, the county councils were responsible for the care that later became defined as LSS-care. As part of the handicap reform, the responsibility for what became the LSS care was transferred to the municipalities. The care that was transferred from the county councils to municipalities' regime included *resident homes for adults* and *resident homes for children*. Thus, the municipalities where these resident homes were located received a higher share of individuals with LSS needs (SOU 2002:103). Consequently, those municipalities where the county councils' activities were previously located also have a higher per capita LSS expenditure. However, even accounting for the nature of the LSS provision, there are large differences that remain to be explained. Descriptive statistics for individuals (per 10,000 inhabitants) with LSS services in the municipalities for the years 2000-2004 are presented in Figure 1. In addition, a map of the distribution of the number of individuals (per 10,000 inhabitants) with LSS services in the municipalities in the year 2003 is presented in Figure 2 in Appendix A.

Figure 1. Individuals with LSS Services in the Municipalities* (per 10,000 inhabitants) 2000-2004 (NBHW)



*Note: Missing data for the following municipalities (year in parenthesis): Ljusnarsberg (2000-2002), Nora (2002), Sorsele (2000), Ydre (2000-2001), Åsele (2001), Älmhult (2000), Ödeshög (2000), Överkalix (2001). Missing data has been replaced by data for the next available year.

The differences among municipalities are also clear when comparing the average expenditure on LSS per person receiving LSS. The average municipality expenditure per person receiving LSS-measure ranges from 103,711 to 791,132 SEK in 2001. Furthermore, the expenditure also increases every year. The following years, 2002-2004, show a similar trend (NBHW, 2001-2004). Moreover, the differences in LSS expenditures are not limited to be just among municipalities, they are also evident among counties. For example, for the year 2003 the per capita expenditure for LSS ranges between 3,142 SKR and 4,037 SKR among the counties in the country.

The expenditures on LSS activities constitute a substantial part of the municipalities' service production; however, the resources are limited and many of the municipalities have not fulfilled their obligations according to the LSS Act. For example, one problem has been that municipalities are denying applications and/or are not carrying out the approved applications or the verdict according to LSS in time. The National Board of Health and Welfare has examined this issue in cooperation with the County Boards. They reported that

there are large regional differences, and that some municipalities systematically deny certain LSS applications that they are not able to fulfill within reasonable time (NBHW 2005).

3 Theory and Empirical Model

In economics, social interaction models describe the behavior of agents as affected by the characteristics or behavior of other agents; agents interact through their chosen action (Manski, 1993, 2000). The cause of interaction among economic agents is distinguished to three hypotheses: endogenous interaction, contextual interaction and correlated effects. According to the endogenous interaction hypothesis, the propensity of an agent to behave varies with the behavior of the group. The contextual (or exogenous) interaction states that individual action varies with the exogenous characteristics of the group members. The correlated effect is that agents in the same group behave similarly because they have similar individual characteristics or face similar institutional environments. Endogenous and exogenous interaction state ways in which agents might be influenced by their social environment, while correlated effects express a non-social occurrence (Manski, 2000).

Strategic (and social) interaction among governments can be studied via spillover models, where the spending of one jurisdiction depends on its own characteristics but also on the level of spending by its neighbors. Case, Rosen and Hines (1993) used a spillover model to study the budget spillover among U.S. states. Murdoch, Rahmatian, and Thayer (1993) studied recreation spillovers among municipalities in the Los Angeles area. Since the direct effect of strategic interaction can be studied using the means of a spillover model, this model can be used to test whether municipalities influence each other when determining the level of LSS expenditure per capita.

As stated, in spillover models, one jurisdiction is directly affected by the decision(s) of jurisdictions elsewhere. Applied to the LSS expenditure problem, one municipality decides its own level of LSS expenditure per capita, but is also directly affected by the level of LSS expenditures per capita of other municipalities.

A spatial autoregressive model for local interaction

The municipality *i*'s per capita expenditures of LSS (log), L_i, depend on the municipality's own characteristics, X_i, as well as its neighbors' per capita LSS expenditures (log), L_j.

The estimating equation can be written as:

$$L_i = \phi \sum_{j \neq i} w_{ij} L_j + X_i \beta + \varepsilon_i \quad (1)$$

In matrix form, the model is written as:

$$L = \phi \boldsymbol{WL} + \boldsymbol{X}\beta + \varepsilon \quad (2)$$

where L is a $(n \times 1)$ vector of LSS expenditures per capita; ϕ is the parameter for "local interaction"; W is a $(n \times n)$ weight matrix with elements w_{ij}; X is a $(n \times k)$ matrix of explanatory variables for the municipalities; β is a $(k \times 1)$ vector of parameters; and ε is a $(n \times 1)$ vector of error terms. Here, the error terms are assumed to be independent and normally distributed with a constant variance[9].

Econometric issues

With spatial interaction, multidirectional dependence may be present; errors for one observation are likely to be related to the errors in neighboring observations, i.e. spatial dependence (Anselin, 1988). Since L appears on both sides of the equation, multidirectional dependence between the dependent variables exists. The resulting correlation means that ordinary least squares (OLS) estimates of the parameters of equation (2) are biased and inconsistent. Therefore, to account for multidirectional dependence, a spatial lag model is used to make the error term uncorrelated between the neighbors.

Spatial error dependence arises when ε includes omitted variables that are themselves spatially dependent. When spatial error dependence is ignored, estimation of the model can

[9] An alternative way of specifying the spatial process, rather than specifying it as in equations (1) and (2), is to specify it in the error term (Anselin, 2003). Formally: $L = \boldsymbol{X}\beta + U$ and $U = \gamma WU + \varepsilon$. However, since the hypothesis in this paper is that the municipalities interact with each other in order to decide on their own expenditure level, the model specified in equations (1) and (2) is used, and I will later on test for error dependence.

present false evidence for spatial interaction. One way of dealing with this is to estimate the equation by Maximum Likelihood under the assumption that spatial error dependence is absent, and then test to verify the absence. The robust test of Anselin, Bera, Florax, and Yoon (1996) can then be used to test if spatial dependence is present (Bruckner, 2003). In this paper, this is the method used; a reduced form[10] of equation (2) will be estimated using the maximum likelihood method.

The Weight Matrix

The weight matrix must be specified in advance since it is not possible to estimate neighborhood pattern on cross-sectional data. The weight matrix consists of 288 municipalities. In this paper, neighbors have been defined in four different ways. In the specification "GEO", it is assumed that the neighbors are all those municipalities that share a common border. The neighbors in the specification "GEOLAN" are the municipalities within a county council that share a common border. In the "FUR" specification, neighbors are based on a functional urban regional area, where each region consists of up to four adjacent municipalities cooperating with regard to industry, employment and communication (SCB *MIS 2003:1*). Following Case, Rosen and Hines (1993), the fourth specification, "ALPHA", is specified as an intentionally absurd matrix. Here, the neighbors are based upon an alphabetical index, where neighbors are divided into groups of four according to alphabetical order (i.e. the first four municipalities are one region of neighbors, and the next four municipalities are another region of neighbors etc). The "ALPHA" specification is only used for comparison.

The weight matrix is row-standardized, i.e. each element is divided by the row sum. Thus, each row will sum to one. The neighboring municipalities' expenditure on LSS is assumed to affect the expenditures in municipality *i* with a weighted average of the neighboring municipalities' expenditures. The four different specifications of the weight matrix are based upon contiguity. Let $w_{ij} = 1/M_i$ for municipalities *j* defined to be neighbors to *i* and

[10] The reduced form is obtained by solving (2) for L: $L = (I - \phi W)^{-1} X\beta + (I - \phi W)^{-1} \varepsilon$.

$w_{ij} = 0$ otherwise; where M_i is the number of neighbors to municipality *i*. Then, the total "spillin" can be written as: $\sum_{j \neq i} w_{ij} L_j$.

4 Data and Empirical Findings

The data set used in the present study has been collected from Statistics Sweden and The National Board of Health and Welfare. Data refers to the year 2003 and it includes the number of individuals receiving any LSS measure and the number of individuals receiving each measure. The dependent variable used in the analysis is the logarithm of *LSS expenditure per capita age 0-64*. This is the cost for measures according to LSS excluding the LASS compensation from Social Administration. A small part of the total expenditures is expenditures on measures for individuals older than 65.[11]

Explanatory variables

The LSS measure variables are defined as "Individuals receiving a particular measure per total number of individuals receiving any LSS measure". Explanatory variables are included for §17-agreements between municipalities. Using §17-agreements, a municipality can retain the cost responsibility for persons living in another municipality and thus does not have to execute the measure itself. This is used by, for example, small municipalities that do not have the suitable measure for some individuals, for example, special resident homes. Instead, by agreement, the LSS individual moves to a resident home in another municipality that can provide the proper care, while the original municipality retains the responsibility for the cost. That is, the submitting municipality is accountable for the cost incurred by the treating municipality. The §17 variables are defined as a percentage of the number of agreements per total number of individuals receiving any LSS measure. The idea of using these as explanatory variables is to account for economies of scale; both the "receiving" and the "transmitting" municipalities get a lower LSS expenditure per capita with the §17-agreements. Moreover, an explanatory variable for a 350 million SEK LSS-specific grant is included. This was a grant that was divided among a number of

[11] LSS measures are not approved after the age of 64; however, measures approved prior to the age of 65 can be continued after the age of 65.

municipalities that had extraordinarily high costs for their LSS production in the years 2001, 2002 and 2003. The year 2003 is the first (and only) year where both data for the specific LSS grant and for the §17-agreements is available, and since these are important variables for the determinants of LSS expenditure – it makes the year 2003 ideal to study.

Additional explanatory variables are used for municipal characteristics such as population density and tax base per capita. The population density variable is included to capture, for example, economics of scale. As the population increases in one specific area, the expenditure per capita is expected to decrease. General grants per capita of income equalization and cost equalization are also included among the explanatory variables. The general grant is expected to have a positive effect on the dependent variable. If a municipality receives general grants, they may choose to use it for their LSS services production, therefore, in that case, the LSS expenditure per capita increases with general grants. Finally, in the analysis, the natural logarithm of population is used since the effect of population is likely to be nonlinear. Descriptive statistics including minimum and maximum values for the relevant variables are presented in Table 3.

There are 290 municipalities and 21 county councils in Sweden. All municipalities except two are included in the analysis. Ydre is excluded due to missing data and Gotland is excluded due to the fact that the municipality and the county council coincide. Therefore, the analysis consists of twenty county councils with a varying number of municipalities. Since county councils may play a significant role in the determinants of LSS expenditures per capita, dummy variables indicating whether municipalities belong to the same county council level will be included in some of the model specifications tested.

Table 3. Descriptive statistics

Variable	Mean	Std. Dev	Min	Max
Type of LSS-measure;				
Companion service, percent	17.32	12.81	0	61.26
Counseling and other personal support, percent	23.14	32.59	0	145.00
Daily activities, percent	44.01	11.72	0	73.08
Personal assistance, percent	9.17	9.62	0	45.16
Personal contact, percent	30.52	13.34	0	73.68
Relief service in the home, percent	4.28	5.06	0	20.59
Residential arrangements with special service for adults, percent	34.29	12.34	0	65.59
Living in family homes or homes with special service for children and young persons, percent	2.01	3.68	0	20.59
Short period of supervision for schoolchildren aged above 12, percent	6.92	6.21	0	35.00
LSS-specific variables				
Expenditure for LSS-activity per capita age 0-64, SEK	3218	1056	835	7975
Expenditure for LSS per Individual receiving any LSS assistance, SEK	438781	111476	177415	973034
Expenditure for LSS-activity per capita age 0-64, SEK (log)	3.48	0.15	2.92	3.90
Expenditure for LSS-per Individual receiving any LSS assistance, SEK (log)	5.63	0.11	5.25	5.99
LSS-grant, grant per person receiving any LSS activity, SEK	6727	20965	0	192683
Individuals receiving any LSS measure per capita age 0-64, percent	0.75	0.23	0.26	1.64
Number of measures per capita age 0-64, percent	1.47	0.65	0.22	5.49
§17-agreements of cost responsibility, agreements as a percentage of total number of individuals receiving any LSS measure	4.46	6.09	0	41.38
§17-agreements of measure responsibility with municipality agreements as a percentage of total number of individuals receiving any LSS measure	1.14	3.15	0	26.14
Municipality-specific characteristics				
Grant-income, SEK per capita	6758	5183	-15698	22144
Population density, population per km^2	128	422	0	4058
Population size (log), age 0-64	4.17	0.40	3.26	5.81
Tax base per capita	122491	17184	99291	250576

Note**:** "The Type of LSS-measure" variables are measured as the number of individuals receiving each measure as a percentage of the total number of individuals receiving any LSS measure

Empirical Findings

In this subsection, and the following, the results from the empirical analysis are presented and discussed. There are three neighborhood specifications tested with and without county council specific effects, making it a total of six model specifications.[12] For the specifications without controlling variables for county councils, the result indicates that interaction among municipalities exists, possibly pointing toward mimicking or interaction. The estimate of the interaction term is positive and significant for the three specifications without explanatory variables for county councils. However, for the specifications with explanatory variables for county councils, the interaction term is now negative and non significant, indicating that there is no mimicking or interaction among municipalities with regards to LSS expenditure levels. Since the negative interaction term is not significantly different from zero, there is no statistical evidence that - for the three model specifications with explanatory variables for county councils - the municipalities interact with each other in determining the LSS expenditure levels.

Spatial Dependence Test

In this paper, two different tests have been used in order to determine the spatial dependence of the models: Likelihood Ratio (LR) test and Lagrange Multiplier (LM) test. Here, the LR test is a test on the spatial lag coefficient ϕ. It tests the specified spatial lag model against a standard regression model with the same set of explanatory variables with ϕ set to zero (Anselin 1995). The second test, the LM test, is to test if spatial error dependence remains in the residuals. Test statistics for the two tests are presented in Table 4.

For the model-specifications without controlling variables for country councils, the significance test of the LR test statistic indicates that there is spatial interaction among municipalities. However, for the model-specifications with controlling variables for county councils, the non-significance test of the LR test statistic indicates that there is *no* spatial dependence among municipalities.

[12] Not counting the Alpha-specifications (which are just for comparison).

Table 4. Spatial Error and Spatial Lag Dependence Tests

Models *excluding* county councils as explanatory variables	GEO		GEOLAN		FUR		ALPHA	
	Value	Prob	Value	Prob	Value	Prob	Value	Prob
Test for Spatial Lag Dependence								
Likelihood Ratio Test	7.60	0.01	11.93	0.00	7.96	0.01	0.04	0.84
Test for Spatial Error Dependence								
Lagrange Multiplier Test	0.11	0.92	0.22	0.64	1.49	0.22	0.57	0.45

Models *including* county councils as explanatory variables	GEO		GEOLAN		FUR		ALPHA	
	Value	Prob	Value	Prob	Value	Prob	Value	Prob
Test for Spatial Lag Dependence								
Likelihood Ratio Test	0.48	0.49	0.52	0.47	0.80	0.37	0.38	0.54
Test for Spatial Error Dependence								
Lagrange Multiplier Test	1.28	0.26	1.58	0.21	0.12	0.73	0.10	0.75

As mentioned, the next test, the Lagrange Multiplier test, is to test if spatial dependence remains in the residuals. If the spatial lag model specified is the correct one, no spatial dependence should remain in the residuals (Anselin 1995). The test statistics for all six specifications are non-significant, which is an indication of there being no spatial dependence remaining in the residual. Consequently, taking both the LR and the LM tests into account, this could then be interpreted as the spatial lag models that exclude explanatory variables for county councils being correctly specified. However, as discussed in the LSS-section, county councils used to be the providers of the services that later became defined as LSS services - this could mean that the interaction result just obtained is not "true" interaction, but a result of the underlying federal structure. Therefore, to determine which set of model-specification is the best, a likelihood ratio test is performed.

Should explanatory variables for county councils be included in the model-specification?

Since the test on spatial dependence in the error term was non-significant for both types of specifications (with and without explanatory variables for county councils) the next step is to determine which of the spatial lag model specifications is the right one, the one without explanatory variables for county councils or the one with explanatory variables for county councils. A likelihood ratio test is performed to determine if the two types of specifications

differ from each other and if the specification for the county council type can explain the reasons for differences in the LSS expenditure among the municipalities to a higher degree. The likelihood ratio test is a statistical test of the goodness-of-fit between two models (specifications). Table 5 presents the results from the likelihood ratio test between the two specifications.

The likelihood ratio statistic is

$$\lambda = -2(\ln L_R - \ln L_U)$$

where L_U is the unconstrained value of the likelihood function and L_R is the value of the restricted likelihood function (Green, 2003).

Table 5. Likelihood Ratio Test statistics

Model	Log Likelihood	Likelihood Ratio Test	P-value
GEO *excl* variables for county councils	315.08		
GEO *incl* variables for county councils	348.11	66.06	0.00
GEOLAN *excl* variables for county councils	317.25		
GEOLAN *incl* variables for county councils	348.13	61.76	0.00
FUR *excl* variables for county councils	309.32		
FUR *incl* variables for county councils	342.83	67.02	0.00

From the test statistic in Table 5, it is evident that the specifications that include explanatory variables for county councils are more suitable. Even though the Lagrange Multiplier test showed no spatial dependence in the error term for either of the specifications, the Likelihood Ratio Test indicates that it is the specifications with explanatory variables for county councils that to a higher degree explain the reasons for differences in the LSS expenditure among the municipalities. The result in Table 5 confirms the inclusion of county council variables in the specifications.

Determinants of LSS-Services Expenditure

Table 6 present the results of estimating the municipalities' LSS expenditure per capita (log) as the dependent variable.[13] Since the specifications that include explanatory variables for county councils are superior to those that do not, these are the only results presented in the paper.[14][15] Here, geographic border (GEO); geographic border within a county (GEOLAN); and functional urban regions (FUR); respectively, are used to define neighbors.[16]

In most cases, the sign and significance do not change between the two sets of specifications (i.e. when county council variables are included), except for the *Interaction term*, the *Counseling and other personal support* term and the *Residential Arrangements with special services for adults* term. In the model-specifications without explanatory variables for county councils, the term for Counseling and other personal support was positive but non significant. When controlling for county councils, the term is still positive, but now it is significant. The Residential Arrangements with special services for adults and the previously mentioned Interaction term have changed to negative; however, neither estimate is significant, which makes it impossible to draw any conclusions from this.

[13] Since the LSS services production is likely to exhibit economics of scale, an analysis with the dependent variable *LSS expenditure per individual receiving LSS services* has also been performed. The results of the analysis are presented in Table 7 in Appendix B, along with a brief discussion. The results are similar to the results obtained for the dependent variable *LSS expenditure per capita (0-64)* which are presented in Table 6 here in the result section.

[14] The estimates for the spatial lag model specification without explanatory variables for county councils can be obtained from the author upon request.

[15] The estimates for the county council dummies are not presented here, but can be found in Table 8, Appendix C along with a brief discussion.

[16] As is evident in Table 6, the spatial interaction (lag) coefficient is negative and non significant for all specifications that includes explanatory variables for county councils. Furthermore, the ALPHA neighborhood specification does not differ much from GEO, GEOLAN, and FUR neighborhood specification. For that reason, an analysis without the spatial specification (OLS) was performed. Even though the quantitative results differ somewhat between the Spatial Lag Models and the OLS model, the qualitative results are the same. The OLS results can be obtained from the author upon requests.

Table 6. Estimation results for LSS expenditure per capita age 0-64, models include dummy variables for county councils**

	GEO		GEOLAN		FUR*		ALPHA	
Variable	Estimate	z-value	Estimate	z-value	Estimate	z-value	Estimate	z-value
W_LSSEXP neighboring municipalities	-0.0487	-0.73	-0.0442	-0.77	-0.0448	-0.88	-0.0319	-0.63
Constant	2.5511	8.82	2.5394	9.45	2.571	10.19	2.4884	10.06
LSS-measure variables								
Companion service	4.27E-04	0.77	4.05E-04	0.73	3.46E-04	0.62	4.41E-04	0.80
Counseling and other personal support	1.09E-03	2.70	1.09E-03	2.69	1.08E-03	2.66	1.08E-03	2.67
Daily activities	2.98E-03	4.58	2.99E-03	4.59	2.98E-03	4.54	3.01E-03	4.61
Personal assistance	8.13E-04	1.30	8.16E-04	1.31	7.87E-04	1.26	8.06E-04	1.29
Personal contact	5.73E-04	1.09	5.59E-04	1.07	4.85E-04	0.92	5.45E-04	1.04
Relief service in the home	1.64E-03	1.30	1.61E-03	1.28	1.70E-03	1.35	1.60E-03	1.28
Living in family homes or homes with special service for children and young persons	-7.76E-04	-0.53	-7.96E-04	-0.55	-9.84E-04	-0.68	-8.78E-04	-0.61
Residential arrangements with special service for adults	2.50E-03	3.98	2.50E-03	3.98	2.46E-03	3.92	2.43E-03	3.84
Short stay away from the home	1.07E-03	1.64	1.07E-03	1.64	1.09E-03	1.66	1.08E-03	1.64
Short period of supervision for schoolchildren aged above 12	1.11E-03	1.21	1.12E-03	1.22	1.02E-03	1.11	1.12E-03	1.22
Individuals receiving any LSS measure per capita age 0-64	5.45E-01	6.24	5.46E-01	6.25	5.42E-01	6.19	5.42E-01	6.21
Number of measures per capita age 0-64	-8.34E-02	-1.99	-8.34E-02	-1.99	-8.14E-02	-1.94	-8.14E-02	-1.94
§17-agreements of cost responsibility	4.83E-03	5.17	4.84E-03	5.18	4.86E-03	5.19	4.86E-03	5.21
§17-agreements of measure responsibility with municipality	-4.69E-03	-2.88	-4.75E-03	-2.91	-4.86E-03	-2.96	-4.71E-03	-2.88
Municipal income variables								
Grant-income SEK per capita	8.66E-06	2.88	8.57E-06	2.84	8.34E-06	2.74	8.64E-06	2.87
LSS-grant	1.33E-06	5.43	1.33E-06	5.44	1.34E-06	5.45	1.32E-06	5.39
Tax base per capita	1.61E-06	2.04	1.59E-06	2.01	1.45E-06	1.81	1.62E-06	2.04
Municipal characteristics								
Population density. inv per km²	-2.90E-05	-2.16	-2.92E-05	-2.17	-3.02E-05	-2.24	-2.91E-05	-2.16
Population size (log). age 0-64	7.12E-02	4.26	7.13E-02	4.27	7.17E-02	4.25	7.26E-02	4.34
Log Likelihood	348.108		348.128		342.828		348.057	
Nobs	288		288		284		288	

*The estimates for the dummy variables for county councils are presented in Table 8, Appendix C

**For computational reasons the municipalities of Norrtälje, Västervik, Sollefteå and Örnsköldsvik are excluded from the analysis of the FUR neighborhood matrix, leaving 284 municipalities to be analyzed (these municipalities have no neighbors as neighbor is defined in the functional urban region neighborhood matrix)

As mentioned in the data section, the LSS measure variables are measured as "Individuals with the *(measure)* per total number of individuals receiving any LSS measure". Therefore, the result can be understood as when the shares of individuals with the measure *Daily Activities* increases, this has a positive effect on the LSS expenditures per capita (log), i.e. the LSS expenditure per capita increases. In the same way, when the share of individuals with the measure *Living in family homes or homes with special service for adults* increases, so does the expenditures per capita (log). The results also indicate that municipalities with §17 cost responsibility agreements have higher expenditures per capita, and municipalities with §17-agreements of performing the service have lower LSS expenditures per capita. Both these results are as expected, since §17-agreements only involve individuals with extensive needs. The share of *"Individuals receiving any LSS measure per capita age 0-64"* is also positive and significant as expected. The number of measures granted in a municipality does not, however, have any significant effect on the expenditure level of LSS.[17]

The population coefficient is positive and significant, indicating that with an increased population, LSS expenditure per capita (log) in a municipality increases. This is due to the fact that larger municipalities have a greater share of individuals with need of LSS services. The coefficient for population density is negative and significant; as the population increases in one specific area, due to economics of scale, expenditure decreases.

As expected, the coefficients for tax base, grant income and LSS grant all have a positive and significant impact on municipalities' expenditure level on LSS per capita. Moreover, the coefficient for grant income is greater than the coefficient for tax base, which can be taken as evidence of the flypaper effect[18]. The flypaper effect refers to the occurrence where expenditure increases more from grants than from an equivalent increase in income. However, when comparing the LSS grant and the tax base coefficients, there is no evidence of the flypaper effect, thus implying that the LSS grant is treated as any other tax income.

[17]However, this term is significant at the ten-percent level for the model specifications with explanatory variables for county councils.

[18] Cournant, Gramlich and Rubinfeld (1979) coined the term "flypaper effect" as a result of Arthur Okun's observation "money sticks where it hits".

Here, the municipalities may use the LSS grant to decrease the level of taxes in their municipalities.

5 Concluding remarks

The LSS services is the fastest growing activity of the municipalities and its expenditure has steadily increased over the years, even though the expenditure per capita varies greatly across municipalities. This variation in expenditures can to a great extent be explained by the nature of the LSS provision – where each person's individual needs differs from others' - but even accounting for this, large differences remain. In this paper, the determinants of differences in the municipalities' expenditures on LSS have been studied. By constructing different neighborhood specifications, social interaction among neighbors was studied as one explanation. Another explanation studied is related to the fact that county councils used to be the primary care givers of what later became the municipalities LSS service. In an effort to account for differences due to county councils, the model was specified with and without explanatory variables for county councils.

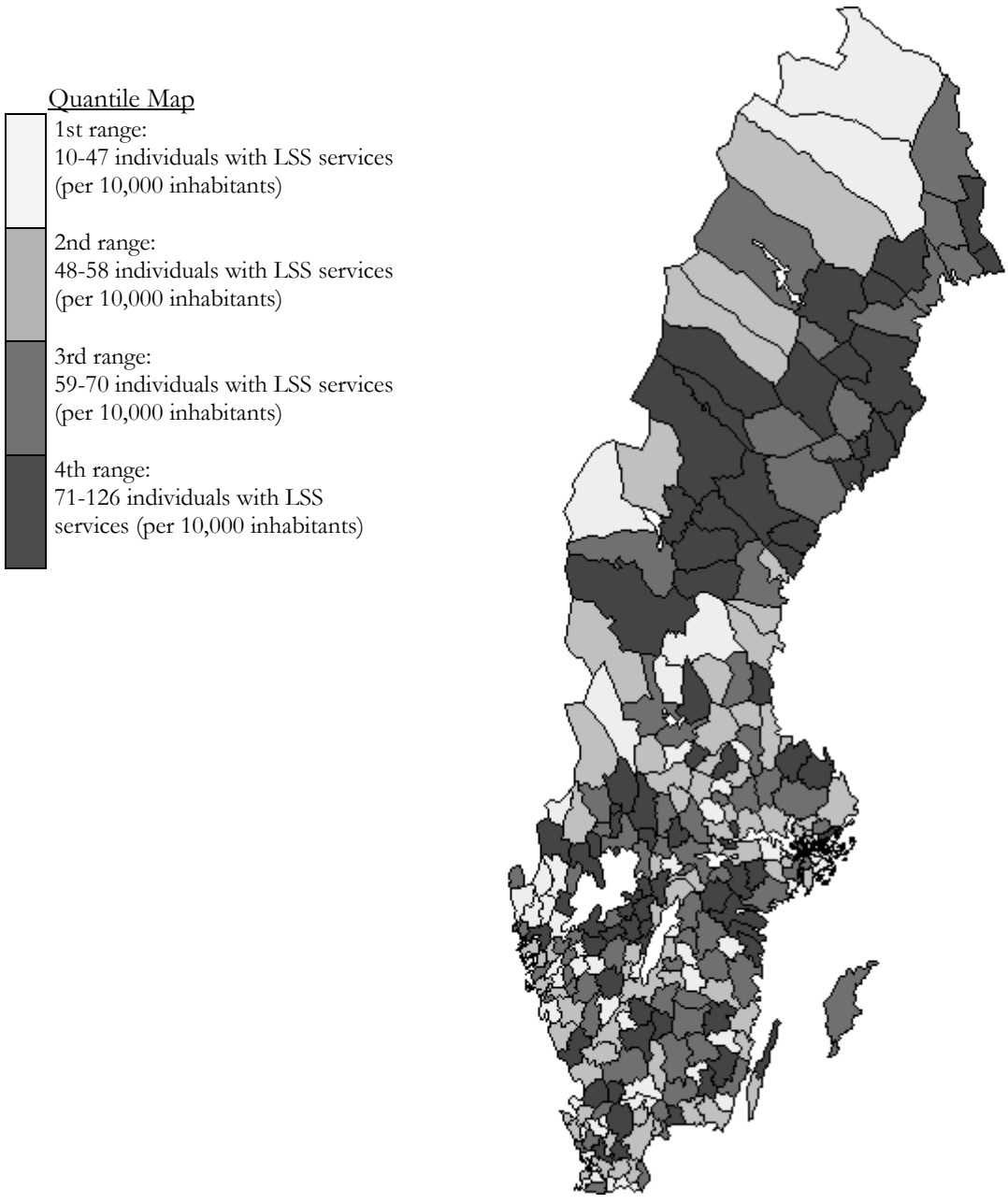
The results show a positive and significant interaction term for model-specification without explanatory variables for county council, indicating cooperation or mimicking among municipalities. However, due to the potential influence of county councils, specifications without explanatory variables for county council may not be satisfactory. The model was therefore specified with explanatory variable for county councils, and the results show a (negative) non significant interaction term. Since the interaction term is non-significant, this may indicate that for LSS-services, the municipalities does not engage in mimicking or interaction when determining their LSS level. However, it is not possible to determine if the positive interaction among municipalities found in the specifications without county councils explanatory variables are caused by municipalities belonging to the same county council, or if it is due to the fact that the municipalities in the same county cooperates or mimic each other. For example, the interaction may be due to county councils' differences in the level of diagnosis for individuals with LSS services, which would affect the municipalities differently. The similarities among neighboring municipalities may instead be

due the fact that the county councils used to be caregivers for individuals with functional impairments, and that the county councils are still the ones diagnosing individuals receiving LSS services. It is clear, however, that the county councils play a large role when explaining the differences in the LSS expenditures among municipalities.

The differences in LSS expenditure per capita among the municipalities as well as the steady increase in LSS production have advocated a change in the system. After several investigations on how to best change the system, the parliament decided to implement *"The Act of LSS expenditure equalization system"* starting in 2004 (SFS 2003:386-7). The purpose of the system is to equalize and see to it that all municipalities have the same basic conditions in their LSS activity. Further studies are needed to determine the effect of the *"LSS expenditure equalization system"* and what the implications for the municipalities are. Therefore, one study could be to incorporate the LSS expenditure system into the models to study if the municipalities' behavior has changed since the system was implemented. Furthermore, in order to determine if interaction among municipalities exists with regards to LSS expenditure, it would be vital to study if the municipalities have changed their behavior according to their neighborhood group after the implementation of the LSS expenditure equalization system.

Appendix A: Map of the number of individuals with LSS Services per municipality in Sweden, 2003

Figure 2. Individuals with LSS Services in the Municipalities (per 10,000 inhabitants), (NBHW, 2003)



Appendix B: Estimation results for the dependent variable *LSS expenditure per individual receiving LSS services*

Since the LSS services production is likely to exhibit economics of scale, an analysis with the dependent variable *LSS expenditure per individual receiving LSS services* has also been performed in an effort to capture it. The results of the analysis are presented in Table 7. However, as mentioned, the results are almost identical to the results for the dependent variable *LSS expenditure per capita (0-64) already* presented.

All significant estimates continue to be significant with the same sign when analyzed with the dependent variable *LSS expenditure per individual receiving LSS services* except the estimate for the explanatory variable "Individuals with LSS services" (which is the share of individuals with LSS services in a municipality). The estimate for this variable is now negative and significant. However, this is as expected, since this variable captures the economics of scale of the LSS production. In this analysis, it can also be evident that the effect of the §17-agreements between the municipalities further indicates that the LSS production creates economics of scale. The municipalities with §17 cost responsibility agreements have higher expenditures per individual receiving LSS services, and municipalities with §17-agreements for performing the service have a lower LSS expenditure per individual receiving LSS services.

Table 7. Estimation result for (log) *LSS expenditure per LSS individual* and for (log) *LSS expenditure per capita (0-64), both models include dummy variables for county councils

Dependent Variable	log LSSexp/LSSind		logLSSexp/cap0-64	
Explanatory Variables:	Estimate	z-value	Estimate	z-value
W_LSSEXP neighboring municipalities	-0.04896	-0.71	-0.0442	-0.77
Constant	5.46142	13.14	2.5394	9.45
LSS specific variables				
Companion service	-4.17E-04	-0.79	4.05E-04	0.73
Counseling and other personal support	4.30E-04	1.11	1.09E-03	2.69
Daily activities	2.11E-03	3.37	2.99E-03	4.59
Personal assistance	-3.72E-05	-0.06	8.16E-04	1.31
Personal contact	-3.50E-04	-0.70	5.59E-04	1.07
Relief service in the home	1.39E-03	1.15	1.61E-03	1.28
Living in family homes or homes with special service for children and young persons	-1.88E-03	-1.36	-7.96E-04	-0.55
Residential arrangements with special service for adults	1.67E-03	2.77	2.50E-03	3.98
Short stay away from the home	1.75E-04	0.28	1.07E-03	1.64
Short period of supervision for schoolchildren aged above 12	9.54E-05	0.11	1.12E-03	1.22
Individuals receiving any LSS measure per capita age 0-64	-2.04E-01	-2.43	5.46E-01	6.25
Number of measures per capita age 0-64	1.54E-02	0.38	-8.34E-02	-1.99
§17-agreements of cost responsibility	5.10E-03	5.70	4.84E-03	5.18
§17-agreements of measure responsibility with municipality	-4.23E-03	-2.69	-4.75E-03	-2.91
Municipal income variables				
Grant-income SEK per capita	7.22E-06	2.51	8.57E-06	2.84
LSS-grant	1.35E-06	5.76	1.33E-06	5.44
Tax base per capita	1.78E-06	2.36	1.59E-06	2.01
Municipal characteristics variables				
Population density. inv per km^2	-1.84E-05	-1.43	-2.92E-05	-2.17
Population size (log), age 0-64	4.87E-02	3.04	7.13E-02	4.27
Log Likelihood	360.094		348.128	
Nobs	288		288	

*The results for the dependent variable LSS expenditure per capita (0-64) are presented in the table for comparison. Both these models are estimated using the GEOLAN matrix (neighbors that are geographical neighbors within the same county council)

Appendix C: Estimation results for the explanatory variables for county council (dependent variable log *LSS expenditure per capita)*

The explanatory variables for the county councils are dummy variables. The dummy variables takes the value "one" if the municipalities belong to the same county councils, otherwise it takes the value "zero". As mentioned in the data section, there are 20 county councils in this study (the county council of Gotland is excluded). From the estimates, it is evident that most of the county councils have significantly lower expenditure per capita than Stockholm county. Also, the estimates are similar between the different neighborhood matrices.

Table 8. Estimation results: Explanatory variables for county council
(dependent variable log LSSexp/cap 0-64)

Variable	Estimate	z-value	Estimate	z-value	Estimate	z-value	Estimate	z-value
*County Councils***								
Uppsala	-4.62E-02	-1.34	-4.65E-02	-1.35	-5.46E-02	-1.56	-4.53E-02	-1.32
Södermanland	-4.48E-02	-1.40	-4.70E-02	-1.46	-5.68E-02	-1.73	-4.72E-02	-1.46
Östergötland	-1.38E-01	-3.84	-1.40E-01	-3.87	-1.48E-01	-4.06	-1.35E-01	-3.78
Jönköping	-1.20E-01	-3.86	-1.22E-01	-3.89	-1.31E-01	-4.10	-1.20E-01	-3.84
Kronoberg	-6.02E-02	-1.78	-6.23E-02	-1.83	-6.93E-02	-2.01	-6.23E-02	-1.84
Kalmar	-3.36E-02	-1.00	-3.42E-02	-1.02	-4.27E-02	-1.22	-3.74E-02	-1.11
Blekinge	-1.78E-02	-0.45	-1.74E-02	-0.44	-2.54E-02	-0.63	-1.90E-02	-0.48
Skåne	-1.41E-01	-5.21	-1.41E-01	-5.19	-1.50E-01	-5.47	-1.37E-01	-5.26
Halland	-9.85E-02	-2.65	-9.96E-02	-2.67	-1.08E-01	-2.85	-9.86E-02	-2.64
Västra Götaland	-5.38E-02	-2.17	-5.40E-02	-2.18	-6.16E-02	-2.43	-5.50E-02	-2.20
Värmland	-6.29E-02	-2.13	-6.46E-02	-2.18	-7.14E-02	-2.37	-6.44E-02	-2.16
Örebro	-6.84E-02	-2.03	-6.88E-02	-2.05	-7.65E-02	-2.23	-6.97E-02	-2.06
Västmanland	-1.43E-01	-4.19	-1.45E-01	-4.20	-1.52E-01	-4.40	-1.40E-01	-4.13
Dalarna	7.50E-03	0.25	8.56E-03	0.29	9.08E-04	0.03	6.03E-03	0.20
Gävleborg	8.69E-03	0.27	7.83E-03	0.24	5.74E-04	0.02	6.00E-03	0.19
Västernorrland	-6.71E-02	-1.74	-6.83E-02	-1.78	-8.60E-02	-1.98	-7.44E-02	-1.96
Jämtland	-6.07E-02	-1.57	-6.11E-02	-1.60	-6.77E-02	-1.72	-6.72E-02	-1.76
Västerbotten	-1.03E-01	-1.86	-1.04E-01	-1.88	-1.12E-01	-1.99	-1.09E-01	-1.99
Norrbotten	-7.19E-02	-1.76	-7.25E-02	-1.78	-7.98E-02	-1.92	-7.82E-02	-1.95
Log Likelihood	348.108		348.128		342.828		348.057	
Nobs	288		288		284*		288	

* For computational reasons, the municipalities of Norrtälje, Västervik, Sollefteå and Örnsköldsvik are excluded from the analysis of the FUR neighborhood matrix, leaving 284 municipalities to be analyzed (these municipalities have no neighbors as neighbor is defined in the functional urban region neighborhood matrix)
**The county of Stockholm is used as the reference county

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