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Center for Research in Economics, Management and the Arts

Spatial Spillovers in Metropolitan Areas: Evidence from Swiss Communes

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Working Paper No. 2003 - 06

Spatial Spillovers in Metropolitan Areas: Evidence from Swiss Communes

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Abstract

This paper investigates spatial spillovers in local spending decisions by using panel data of the Swiss communes in the canton of Lucerne during the 1990s. Due to the geographical fragmentation with a major central city and some 100 suburban communes within a distance from 4 to 55 kilometers to the center this area represents a particularly useful data base in order to test the relevance of spatial interactions in metropolitan areas. The empirical evidence confirms strategic interactions among suburban governments and the central city for public security spending. A 10% increase of the city's security spending leads to a 3% decrease in security spending of the suburban communes in the Lucerne area. For all other spending items, the empirical evidence suggests no quantitative and significant spatial spillover effects. The same applies for spatial spillovers in overall local spending between the Lucerne communes and the Lucerne central city.

JEL-Classification: D72, H72,

Keywords: spatial spillovers, strategic interaction, central city exploitation

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1. Introduction

Metropolitan areas are often characterized by a declining central city while the surrounding suburbs enjoy an increase in prosperity. The social and economic problems encountered with this asymmetry are widely debated both in policy and research. The provision and maintenance of central city infrastructure such as higher education, traffic, public health, public security or cultural facilities require high government revenue for the central city. At the same time, the tax bases in central cities are sensitive to high tax burdens. People react to tax incentives and move from the center to nearby communes where the tax burden is lower. As long as the exclusion of commuters from the consuming of public goods provided by the central city is costly or impossible, there is an incentive to migrate to the suburban communes, especially for people of the upper- and middle class. This lack of equivalence between income taxation and the perceived benefits is a source of inefficiency. City governments are confronted with a concentration of poverty in the center and declining relative incomes while the suburban jurisdictions enjoy a higher standard of living with relatively low taxes.

Clearly, cities and suburbs are not independent from each other (Houghwout, 1999). Local incumbents do not take policy decisions in isolation. The effect of one jurisdiction's spending decisions on residents of other jurisdictions has budgetary consequences for both jurisdictions. Hence, it is not surprising that the adequate territorial structure of metropolitan areas has been a frequently discussed issue in urban economics and politics for many years. The emphasis of this paper is on spatial spillovers in spending decisions among jurisdictions of a metropolitan area. Is there a strategic interaction among metropolitan governments due to spatial benefit spillovers from the central city to their suburbs?

The paper is organized as follows. Section two develops the main argument on spatial spillovers and strategic interactions between governments within a metropolitan area. Section three contains stylized facts on the data set used for empirical implementation. The empirical investigation appears in section four followed by conclusions in section five.

2. Spatial interactions in metropolitan areas

Exploring spatial interactions within a metropolitan area is of importance for policy for several reasons. Like the Swiss population, the inhabitants of many other nations are urban to an overwhelming and increasing extent.¹ In addition, metropolitan areas are considered as the

¹ In Switzerland, 68% of the population lives in urban areas.

“engine” of the nation’s economy (Frey, 1990). Central cities provide unique agglomeration economies, which define an important and specialized role of the city in the metropolitan economy (Ihlanfeldt, 1995). Such agglomeration economies arise from increasing returns to scale in the production of goods and services, cumulative advantages from the growth of industry, developments of skills and know-how, easy communication of ideas and experiences and opportunities of ever-increasing differentiation and specialization of human activities (Kaldor, 1970). Agglomeration economies can be of two types: localization economies and urbanization economies. Localization economies evolve from the closeness of firms so that a particular industry within the same area can achieve scale economies. In contrast, urbanization economies generate benefits for all firms through the diverse, but complementary economic activity of an area.

Since urban density influences agglomeration economies positively, a firm’s total factor productivity is significantly higher in central cities than in smaller local communes.² Nevertheless, factor payments to commuters establish a link between central city and suburban economic growth. Therefore, through various complementary and interdependent activities with the suburban area a healthy central city increases the standard of living of the whole metropolitan cluster.³

However, concentration of economic activity in central cities is often accompanied by socio-demographic problems. Disadvantages of urban agglomeration (e.g. increasing crime rate, pollution, or congestion) are mainly felt in the central city. Thus, central cities suffer from a mismatch of spending claims and revenue capacity. In this situation, urban fragmentation may result in an undersupply of public policies designed to promote economic growth for the metropolitan area as a whole. If the nation’s standard of living depends on healthy engines, then the whole economy may be negatively affected by the decline of central cities. In this logic, it may be reasonable to engage in central cities while simultaneously making residents of the whole metropolitan area better off (Voith, 1992).

To the extent that voluntary agreements among metropolitan governments can address the problems of the central city they may enhance the efficiency of a nation’s fiscal policy as a whole. At any rate, according to Cooter (1982), Inman and Rubinfeld (1997) or Voith (1998), the process of suburbanization and the consequent decline of central cities seem not to support

² Both localization economies and urbanization economies increase the productivity of firms located in highly populated urban areas (Ciccone and Hall, 1996). However, according to an empirical investigation by Feldman and Audretsch (1999) diversity among complementary activities is more important for innovations.

³ Results from empirical research show that urban growth is much more a stimulus for rural areas than vice-versa. See for example Roberts (2000) for the case of Scotland.

the idea that voluntary agreements address the problem of central cities effectively. Central cities provide a wide range of services which are partly used by citizens living and paying taxes in suburban areas. If they act as “free-riders”, the central city carries the burden of providing services used by commuters. This leads to continuous financial erosion, as higher taxes support the flight of the upper social-class into suburban jurisdictions, while the socially weak population is left in the central city. If the poor vote for additional redistribution in the central city, this accelerates the cumulative process (Brueckner, 1983). Hence, if voluntary agreements fail, there is a danger of a vicious circle undermining the financial capacity of the central city (Frey, 1985, 1996). In order to prevent such a development some authors argue for a coherent policy for the metropolitan region as a whole. For example, Lowery (2000, p. 65) states that “the lowest level at which (...) policies might be provided (...) is the metropolitan area”.

Nevertheless, the interpretation of fiscal interactions in metropolitan areas as an exploitation of central cities by the suburban communes is disputed. Baldwin and Krugman (2000) argue that agglomerative forces constitute a certain monopolistic advantage for the advanced “core” toward the less advanced “periphery”. In our context, this implies that central cities do not only carry the burden of regional tasks, but also have profound advantages. Industries with high economic capacities of value creation are mainly concentrated in the central city. Consequently, the central city benefits from corporate taxes and taxes of firm properties most. Central cities often have a strong local tax base. Such advantages in the tax base allow central cities to provide infrastructure with benefits for the whole metropolitan area. Contrarily, the suburban communes do not have these advantages, so that they are forced to engage in attractive tax policies. In equilibrium each region concentrates on its own advantages. Thus, integration or harmonization of the whole metropolitan area would prevent metropolitan jurisdictions from concentrating on their own advantages and may have harmful effects for both the city and the suburbs.

Obviously, the intensity of spatial benefit spillovers depends on how local public goods are financed. The structure of a central city’s budget revenues typically consists of local taxes, fees, intergovernmental transfers and revenues from local activity. Transfers as well as fees compensate the main unit for central place functions. In the case of user fees, commuters do not hamper the central city’s financial capacity, as long as payments coincide with marginal costs. Moreover, under the condition of a U-shaped average costs curve and an optimal size of the public facility’s commuter belt, additional user fees created by suburbanites cover fixed

costs. Hence, in some cases, commuters enhance the financial capacity of the central city. This implies that the intensity of spatial spillovers depends on existing tax arrangements.

Which of these arguments are valid for metropolitan areas? Empirical investigations regarding urban sprawl are largely lacking. For the purposes of this paper, we will evaluate the relevance of spatial benefit spillovers for the metropolitan area of Lucerne, Switzerland. It represents an ideal research field as one could suppose that inter-jurisdictional spillovers are of great importance in the metropolitan area of Lucerne.⁴ This assumption can be justified by the spatial organization of the metropolitan agglomeration (for details see section 3). Despite the high density, the urban space is segmented into the Lucerne central city and thirteen suburbs of different size within the canton of Lucerne which do not take responsibility for a wider scope of regional functions. Owing to the local fiscal autonomy, there is no automatic mechanism allowing for compensation of central city functions. Thus, with one major central city located in a highly fragmented metropolitan area, this region represents a useful data base to investigate the empirical relevance of spatial benefit spillovers.

3. Stylized facts on the Lucerne metropolitan area

In the current political context of Switzerland, the spatial organization of urban agglomerations is an important subject. In order to strengthen the competitiveness of metropolitan areas the federal government initiated a development program in 2001. Efforts in building appropriate metropolitan structures also take place at lower governmental levels (the cantons). The canton of Lucerne is a typical example. In 2002, the authorities of the central city (City of Lucerne) and the suburban municipalities passed a development plan which contains objectives regarding a coherent metropolitan public policy in different fields.⁵

Although incumbents of the urban local communes reached an agreement with the central city, changes in the territorial structure are still controversially discussed. While most communes prefer maintaining their autonomy, the central city government as well as the cantonal government argue in favor of territorial consolidation. According to the central city authority, larger scale jurisdictions would support a coherent planning of the whole urban area, making it easier to find appropriate cost-sharing arrangements. Hence, according to their view the existing spatial division of the canton's 326'268 inhabitants into 107 municipalities

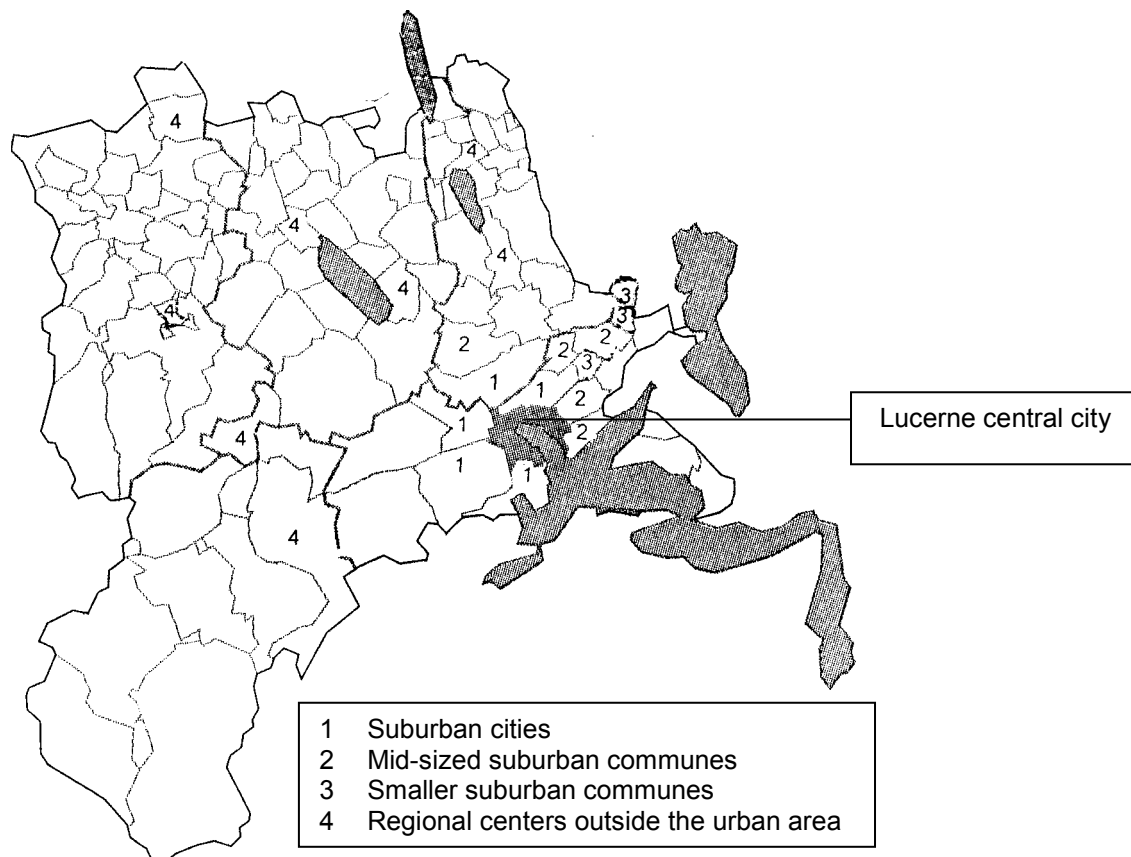
⁴ The Zurich metropolitan area represents another natural laboratory for investigating spatial spillovers. In an early study, Kesselring (1979) estimates the creation of the central city benefit spillovers for the suburbs at 33.1 mio. CHF. However, these results are questioned by Pommerehne and Krebs (1991).

⁵ See „Leitbild für Stadt und Region Luzern“, Luzern 2002 (http://www.region-luzern.ch/aktuell/fs_aktuell.html).

hampers economic growth. The average size of the Lucerne communes is 3026 citizens. 89% of the local governments consist of fewer than 5'000 citizens, 6.3% of all communes have between 5'000 and 10'000 inhabitants. Large units (over 10'000 citizens) constitute only 4.7% of all local governments (our calculations according to Statistical Yearbook of the Canton of Lucerne 2003, p. 52). In comparison to the second largest commune, the central city has twice as many residents (Statistical Yearbook of the Canton of Lucerne 2003, p. 52).

There is not only considerable variation in the size of communes but also in population density. The highest concentration of inhabitants is situated in the southern part of the canton (see *Figure 1*). 44.5% of the canton's inhabitants live in and near Lucerne. The urban space is segmented into the central city (57'435 citizens), five suburban cities (11-24'000 inhabitants), five mid-sized municipalities (3'500-6'000 citizens) and three smaller units (340-1'300 inhabitants). The rest of the cantonal territory contains medium-sized communes and small villages. The largest concentration of small local units can be found in the northwestern, northeastern and southwestern parts of the canton. Figure 1 shows the territorial organization of the canton. For a better overview, we have only represented communes of the metropolitan area and regional centers outside the urban space.

Figure 1: The Lucerne metropolitan area



Independent of the size of the communes, local authorities enjoy considerable autonomy in deciding, fulfilling and financing their tasks. Local governments are responsible for the provision as well as for the financing of local services (administration, public order, social security, environmental issues, social care, education, public utilities, etc.). They fund their financial needs primarily through local taxes and fees, transfers of the cantonal budget and revenues of property ownership.

According to the State Development Plan⁶, the Lucerne central city serves as the major place of economic, social, and cultural life and offers public infrastructure not only for itself, but also for the whole canton.⁷ It is supposed that the main city produces considerable external benefits for the region as a whole in the fields of theatre, music, museums and secondary schools. Moreover, the use of public institutions by suburban inhabitants and the commuter traffic both need transportation infrastructure, whose costs are partly taken over by the central city.

Another often mentioned problem of the Lucerne central city consists in the flight of residents to the suburbs. Since 1970 the population of the central city has decreased from 69'879 to 57'275 inhabitants (Statistical Yearbook of Lucerne City 2003, p. 35). As some public services are affected by indivisibility and fixed costs, the total costs of public production have not decreased equally with the population.⁸ The smaller number of inhabitants is accompanied by a decline in the working age population and an increase of elderly inhabitants. Therefore, the flight to the suburbs undermines the financial capacity of the central city and increases the intensity of external benefits produced by the central city. The authorities of the central city estimated the costs of providing central public services at 92 million CHF in 1998 (Merki, 2002, p. 14). In this context, it is argued that 34 million CHF of this sum are due to non-local residents, corresponding with 7.1% of central city expenditures (our calculation according to the Statistical Yearbook of Lucerne City 2003, p. 274). As a result of further negotiations, the cantonal government increased vertical grants for specific central city services in the following years. The canton also succeeded in taking over responsibility for some higher-level schools from the central city in 2002. Moreover, the renewed system of fiscal equalization nowadays compensates the central city for urban agglomeration costs. It is argued that these arrangements managed to reduce the benefit spillovers to the suburban communes by approximately one half (Merki, 2002, p. 14).

⁶ See "Richtplan für den Kanton Luzern", Luzern 1998, (http://www.lu.ch/richtplan98/s1_1.html).

⁷ Outside the urban space, eight regional centers fulfil functions on a lower scale for surrounding communes or the remote rural area.

⁸ Similar observations in the US context are made by Ladd (1994).

4. Empirical investigation

In order to test for the presence of spatial interactions in the Lucerne metropolitan area, the following equation is estimated.⁹ In equation 1, the index i refers to the communes within the territory of the canton of Lucerne ($i = 1, \dots, 107$), and the index t refers to the fiscal year ($t = 1992, \dots, 2001$). e_{it} represents the public spending decision by a commune i in year t .

$$e_{it} = \delta w e_{jt} + X_{it} \gamma + d_t + \varepsilon_{it}. \quad (1)$$

δ and γ are unknown parameters and ε_{it} is an error term. X_{it} is a matrix of explanatory variables specific to commune i in year t . It includes the population size, the unemployment ratio, the geographical size, the population density, the share of foreign residents, the share of inhabitants with age below 20, the share of inhabitants with age over 65, the altitude, the presence of a local parliament, the size of the local cabinet and the fiscal capacity. d_t represents a set of 10 fixed-time dummies in order to control for time-specific effects common to all communes in a given year (e.g. business cycles).

In our case parameter δ is of interest. It measures the spillover effects between the city of Lucerne (the center) and the other communes in the metropolitan area. w reflects a vector with spatial weights. These weights indicate the relevance of the center's spending decision (commune j) for commune i 's policy formulation. In our case the weights capture the location (geographical distance) of commune i relative to the center. In the case of the center, weights capture the average distance to the other communes.

As known from the literature on spatial econometrics, three major issues must be addressed when estimating equation (1).¹⁰ According to Brueckner (2003, p. 183) these are (1) endogeneity of the e_{jt} s, (2) possible spatial error dependence and (3) possible correlation between X_i and the error term.

First, the spending decisions of the neighboring areas on the right-hand side of equation (1) are endogenous, due to the fact that the spending decisions of the center and of the neighboring areas are determined simultaneously. In order to tackle endogeneity problems, which cause biased OLS estimates, we use an instrumental variables (IV) method.¹¹ This approach has been successfully implemented by Ladd (1992), Holtz-Eakin (1994), Holtz-Eakin and Schwartz (1995), Heyndels and Vuchelen (1998), Revelli (2001) and Büttner (2001). However, the focus of their analyses is not on the empirical relevance of spatial

⁹ A similar approach can be found in Brueckner (2003).

¹⁰ A review on spatial econometrics is given by Anselin (1988).

¹¹ Another approach in estimating spatial interactions consistently is to use a maximum likelihood (ML) method, which has been applied by Case, Rosen and Hines (1993) or Brueckner and Saavedra (2001).

benefit spillovers from the central city to the suburbs but on tax mimicking between neighboring jurisdictions or on spillovers from public sector capital on private sector production. Under this approach we regress $w e_{jt}$ on X_{it} and $w X_{it}$. The fitted values $\hat{w} e_{jt}$ are then used as instruments for $w e_{jt}$. The IV approach yields consistent parameter estimates. A further approach is to assume that spatial interactions occur with a time lag. Thus, the e_{jt} values of the right-hand side of equation (1) require a temporal delay for one or more periods. Eliminating simultaneity, OLS estimates yield consistent coefficient values (Brueckner, 2003, p. 184).

Second, spatial dependence in the error ε_{it} arises due to omitted variables that are themselves spatially dependent (Brueckner, 2003, p. 184). Often, topographical features are spatially correlated since they are likely to be unmeasured. Ignoring spatial dependence in the error term causes biased parameter estimates. Several methods to deal with spatial dependence exist. An easy solution to attain unbiased estimates is to use the IV approach discussed above.

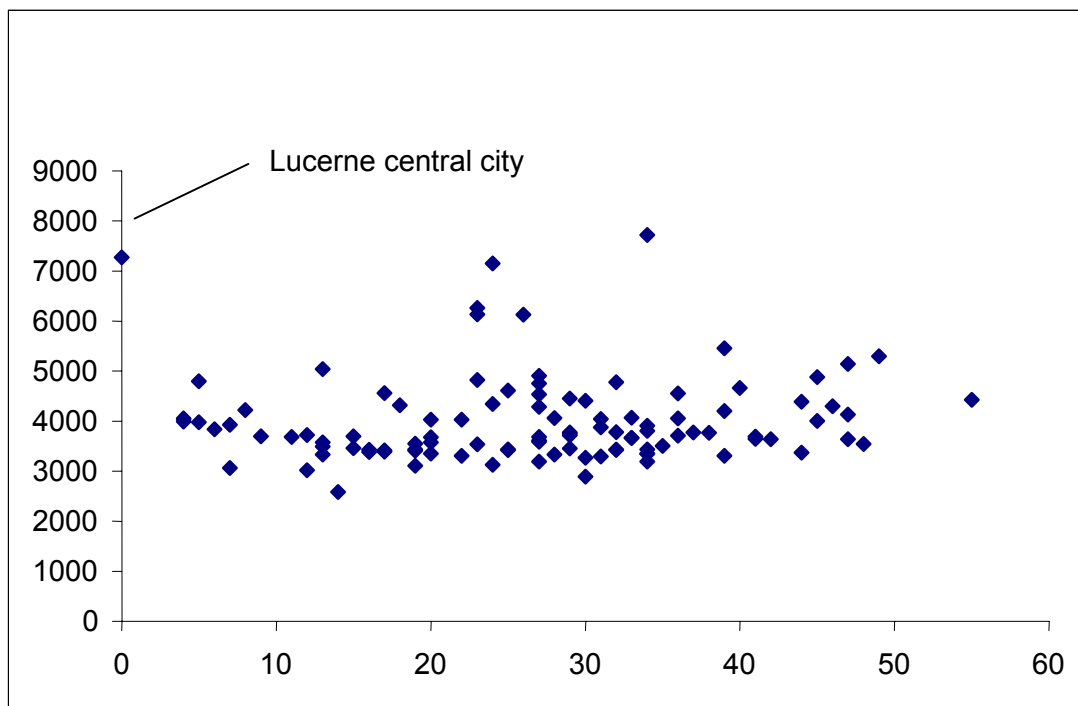
Third, unobserved communal characteristics in X_{it} may be correlated with the error term (Brueckner, 2003, p. 185). If data on communal characteristics are lacking, one suitable remedy is to rely on panel data, leaving all time-invariant communal characteristics to the communal-specific intercept. However, using communal fixed-effects has the drawback of hiding the information of time-invariant variables in X_{it} while rendering the estimated coefficients insignificant (in our case acreage, existence of a local parliament, altitude and number of seats in the local executive). Since our data set consists of several variables capturing communal characteristics to a far extent, we use them as regressands and abstain from using communal intercepts.

The data set used in the empirical analysis consists of data collected by the cantonal statistical office in Lucerne. The data set covers per capita public spending for all spending items of all 107 communes within the canton of Lucerne over the 1992-2001 period, which have been deflated to the year 1990. The set of regressands includes a number of socio-demographic variables (population, population density, residents under the age of 20 as well as residents above the age 65, unemployment, foreign residents) as well as variables reflecting the communal budget constraint (financial capacity).¹² Other communal characteristics are included by the variable altitude, seats in the local executive and dummy variables for those communes having a parliament instead of town meetings (see *Appendix 1*).

¹² Since the cantonal statistical office does not provide income data for the single communes we use a proxy of the local financial strength, which is used for the inter-communal fiscal equalization program.

Figure 2 shows the average public spending of all 107 communes with respect to their distance to the center. Obviously, with an average amount of more than 7000 CHF per capita the center has extraordinarily high per capita spending while most of the other communes average around 4000 CHF per capita. For the overall public spending there is hardly any other spatial pattern observable in Figure 2.

Figure 2: Per capita local public spending and distance from the center in km., 107 communes, 1992-2001, mean values



The estimation results for general expenditure are presented in Table 1. Column 1 displays OLS estimates without the spillover effect. In column 2 the spillover effect is introduced according to equation 1. Column 3 represents the IV regression taking spatial dependence of the error term into account. Finally, column 4 presents OLS estimates with temporal delays of the e_{jt} by one period, so that the variable takes the form e_{jt-1} . In our context, the spatial spillover variables are of interest.

The results show that horizontal fiscal interactions between the communes and the center in the Lucerne metropolitan area are not of great importance on a convenient level of significance. In addition, the estimate of the spillover coefficient can not be calculated quantitatively. In column 2, 3 and 4 the spillover coefficient is approximately -0.09 with a t-value varying between 1.7 and 1.4. This implies that an increase of public spending in the center has no empirically significant impact on the expenditure decisions of neighboring

communes in the Lucerne metropolitan area. Hence, the hypothesis that spatial interactions between the center and the suburban communes in the Lucerne metropolitan area exist can be rejected.

Table 1: general expenditure, 107 Swiss communes, 1992-2001.

expenditure	OLS		OLS		IV		OLS (lag)	
	Coef.	t	Coef.	t	Coef.	t	Coef.	t
spillover			-.096008	-1.69	-.089299	-1.60		
spillover (t-1)							-.080851	-1.39
population	-.038688	-1.19	-.017034	-0.46	-.018547	-0.52	-.020953	-0.59
unemployment	.000148	0.02	.002186	0.26	.002044	0.25	.003760	0.45
geographical size	.000916	1.45	.000733	1.10	.000746	1.14		
density	.000131	4.11	.000114	3.03	.000115	3.13	.000117	3.12
foreign residents	-.000017	-0.02	-.000417	-0.42	-.000389	-0.40	-.000422	-0.45
population < 20	.002976	1.03	.003653	1.28	.003606	1.28	.004187	1.47
population > 65	.002085	2.00	.001763	1.84	.001786	1.87	.003245	1.53
altitude	.000137	1.30	.000127	1.21	.000128	1.23	.000126	1.22
parliament	-.044833	-0.92	.005627	0.10	.002101	0.04	-.004009	-0.07
seats in cabinet	-.004622	-0.44	-.008399	-0.76	-.008135	-0.75	-.005237	-0.47
financial strength	.000241	1.39	.000495	2.31	.000478	2.21	.000471	2.31
time fixed effects	Yes		Yes		Yes		Yes	
observations	1070		1070		1070		963	
R-squared	0.283		0.295				0.293	
Hansen J-statistic					15.741 (p-value = 0.072)			
number clusters	107		107		107		107	

Notes: Dependent variable is per capita public spending for 107 communes over 1992-2001. All financial numbers are deflated to the year 1990. The Hansen J statistic tests for over-identification of all instruments.

Remarkably, the results do not differ considerably when the spillover-variable has a temporal delay of one period or when we use an IV technique to take account of possible simultaneity biases. As the Hansen J-statistics for over-identifying restrictions in the IV regression with a p-value of 0.072 show, there is no reason to reject the validity of the instrumental variables on the 95% significance level or higher. However, spatial spillover effects for general expenditure do not provide information as to whether any kind of public task creates spatial spillovers. For policy makers it is crucial to know which category of public spending spills out to neighboring jurisdictions in order to implement cost-sharing agreements adequately.

Appendix 2 displays the results for all spending categories of the local communes in the Lucerne metropolitan area. Most interestingly, the existence of spatial spillovers varies considerably across the different spending items. In a majority of spending categories, spatial interactions do not play an important role, as in the case of administration, education, health, culture and recreation, welfare, traffic, environment and economy spending. However, there is an indication of an urban sprawl in a politically important and controversially discussed policy field. In the case of security spending, the spillover effect is quite strong. The estimated coefficients with a value around -0.31 and a t-value around 5.3 indicate that an increase of

central security spending by 10 % will be anticipated by the surrounding communes with a decrease of their own security spending by 3.1 %. This result indicates that a cost-sharing agreement between the benefiting communes and the center in the case of public security decisions may be beneficial for the region as a whole.

For the other spending items, the spillover coefficient is small and insignificant in any of the estimation approaches with the exception of the finance item.¹³ Thus, according to the obtained results, the Lucerne central city does not provide public services from which the whole metropolitan area benefits in most policy fields with the important exception of security spending.

5. Policy implications

Empirical evidence presented in this paper suggests that spatial benefit spillovers from the central city to suburban communes do not play an important role in the case of Lucerne, with the exception of security spending. Interestingly, some Swiss cantons are discussing the integration of the city police forces (local police) into the cantonal police forces (state police).¹⁴ However, an internalization of spillovers by centralization requires far-reaching state interventions in a wide range of areas and implies considerable costs, too. Thus, it is crucial to find cost-saving inter-jurisdictional agreements in those fields which are confronted with spatial benefit spillovers.

- A possible approach to internalize spillovers is seen in a *special grant from the canton's budget* or *special compensations within the fiscal equalization system* (Oates, 1999). With this option local units are able to keep their autonomy, while central government authorities can enlarge their influence on the political decisions of municipalities. Thus, the “matching-grant-solution” represents a politically attractive strategy. However, democratic accountability is not granted under such a regime since vertical grants violate the fiscally equivalent financing of local public goods. There is no direct link between paying taxes and receiving public services, which creates a so-called fly-paper effect (Gramlich, 1977; Hines and Thaler, 1995). Hence, as empirical investigations have shown time and again, the distribution of vertical inter-governmental grants is determined politically rather than according to considerations of economic theory alone (Inman, 1988 for the US grant program; Pitlik, Schmid and

¹³ In the case of finance spending, spatial spillovers do not provide a reasonable policy implication. The results can be seen as a statistical artifact.

¹⁴ For example in the Swiss canton Zoug, the city police forces were integrated in the cantonal police forces in 2002.

Schneider, 2001 for the German Länderfinanzausgleich and Borck and Owings, 2003 for the case of Californian counties). Special compensations and matching grants often fail to internalize benefit spillovers adequately.¹⁵

- Horizontal *cost-sharing agreements* represent pragmatic and cost-saving solutions to the spillover problem. Though it is often argued that the central city has a weak position in the negotiations with suburban communes, some Swiss urban areas have succeeded in reaching agreements under the condition that the central city was able to convincingly illustrate the excess burden it has to carry (Frey 1979; Pommerehne and Krebs 1991). From a theoretical point of view, horizontal negotiations are especially effective since all parties have vested interests in an agreement. Voluntary co-operation fosters intrinsic motivation to comply with the agreement (Frey 1997). Moreover, both the communes and the central city are not only motivated to fulfill the contract but also to monitor each other.¹⁶ A common strategy of central cities to enforce an agreement with the nearby communes is the threat to tax commuters. Indeed, several US-cities levy taxes on non-resident employees in an attempt to price the benefits that suburban commuters enjoy from the central city (Ladd and Yinger, 1991).
- Voluntary co-operation of local governments in *communal associations* is a frequently used form of inter-jurisdictional cooperation in many countries. Communal associations permit the exploitation of economies of scale when joint production is required. Compared to the cost-sharing agreement, the communal association is a tighter single purpose co-operation often with its own organization. On the other hand and in contrast to municipal mergers, political power remains within the local government, which protects possibilities of democratic monitoring. Maintained autonomy of communes also enhances political acceptability of associations' policy decisions since there is always the option to withdraw from the consortium (Vanberg, 2001).

However, in reality communal associations are confronted with serious drawbacks. Often, a lack of transparency concerning the associations' activities and their financial responsibility is claimed as well as a growing influence of interest groups. The shortcomings are largely the result of the limited participation possibilities of citizen-

¹⁵ As shown by Gossman, Mavros and Wassmer (1996) for US urban areas, city expenditures funded by vertical grants can even have a negative impact on economic growth.

¹⁶ On the other hand, Heinz (2000) reports from experience of Western European countries where negotiations between the central city and the surrounding communes did not succeed.

voters in the political decision making process.¹⁷ There is hardly any incentive for voters to monitor the associations' policies as long as possibilities to take influence are largely lacking (Dafflon and Ruegg 2001, p. 28).

- Another proposal for internalizing spatial spillovers concerns *territorial consolidation* of metropolitan areas. Enlargement of municipalities allows the newly created unit to provide a wider range of services for the whole urban territory. Theoretically, a better mapping of electoral with fiscal responsibility can be achieved. However, as Bradford and Oates (1974) show, turning from a decentralized service provision to a “unified system” can lead to very substantial efficiency losses. The catchment area of the newly created municipality is too big and too small at the same time. Optimal centralization of local governments for one public task fails to internalize urban sprawls in another public task. As a consequence, some inter-jurisdictional spillovers are internalized by chance, while new external effects are created (Frey and Eichenberger 2001).¹⁸

Next, amalgamation of municipalities in urban agglomerations reduces regional diversification, erodes identification with political decisions in their areas of jurisdiction and hampers competition between local authorities.¹⁹ Thus, the efficiency enhancing effect of internalizing some external effects by municipal merger has to be compared with the efficiency loss due to suboptimal allocation of resources and the decreasing number of innovations. Evidence for consolidated urban areas in the US shows that efficiency gains from internalizing spatial benefit spillovers do not compensate by far for the loss of competition.²⁰

Summing up, experiences with existing inter-municipal cooperation arrangements suggest that simple and flexible structures represent a prerequisite for their success. Organizational structures, financial transactions, and democratic accountability have to be transparent in order to establish incentives for efficient inter-jurisdictional co-operation. This requires the stimulation of democratic control by introducing political participation rights to citizens (Feld

¹⁷ The impact of direct voter participation in the political decision-making process by means of voter initiatives and popular referendums is empirically shown by Feld and Kirchgässner (2001).

¹⁸ Another often mentioned problem of government centralization with locally elected agents consists in their engagement in pork barrel politics (Weingast, Shepsle and Johnson, 1981).

¹⁹ Olivier (2000) shows for US cities that civic participation is significantly negative correlated with the commune size. He measured civic involvement by four aspects: Contacting local officials, attending organizational meetings, attending commune board meetings and voting in local elections. All four aspects of civic life go down as the size of local units goes up. A similar analysis on the voter participation rate in Swiss town meetings has been provided by Kirchgässner and Pommerehne (1978).

²⁰ Gossman, Mavros and Wassmer, (1996) show in an investigation of 49 US local governments that more consolidated local government structure decreases the ability of authorities to provide local services efficiently and cost-effectively. For similar results see also Marlow and Joulfaian (1990) or Tindal (1996).

and Kirchgässner, 2001). Furthermore, the single purpose orientation of co-operation allows for flexible agreements with varying partners respecting the financial and organizational autonomy of the single commune (Zax, 1988). A frequently discussed approach which proposes to meet these requirements is the concept of Focj. This model of inter-municipal co-operation evolved by Frey and Eichenberger (1999) is an option of providing public services with varying scale in urban areas.²¹

6. Conclusions

In this paper we have investigated the existence and the intensity of inter-jurisdictional spillovers in the urban area of Lucerne. With one major central city located in a highly fragmented metropolitan area with some 100 communes with varying scale and importance this region represents a useful data base to investigate the empirical relevance of spatial benefit spillovers. Is there a strategic interaction among metropolitan governments due to spatial benefit spillovers from the central city to their suburbs?

The results of our analysis provide empirical evidence that the Lucerne central city provides benefit spillovers for the surrounding local communes in one major area: public security. In all other spending items, there is no evidence of significant and sizeable spatial spillover effects. Thus, a reshaping of the territorial organization seems not to be an adequate answer to internalize inter-jurisdictional benefit spillovers, even for such a small and fragmented urban area as the Lucerne metropolitan area. Furthermore, vertical grants from the cantonal level to the city seem not to address the problem adequately. Rather a pragmatic strategy for government authorities of urban areas is to strengthen voluntary inter-communal co-operations by single-purpose associations with flexible geographical boundaries. Moreover, promoting and allowing for voter participation is a prerequisite for attaining and maintaining political accountability of communal associations. In addition, since the optimal size for various public services considerably differs, a perfect mapping between the electoral and fiscal responsibility is difficult to achieve by territorial consolidation.

In conclusion, though it is reasonable to assume that central cities and their suburbs do not take policy decisions in isolation, the significance and importance of spatial spillovers has to be evaluated carefully. Far-reaching amalgamations in metropolitan areas in order to internalize spillover effects can also involve serious drawbacks. There are some good reasons for maintaining the autonomy of local communes while promoting the establishment of cost-

²¹ For urban agglomerations, a similar concept was developed by Dafflon and Ruegg (2001).

sharing agreements for each of those particular policy areas that are confronted with spatial spillovers. On the one hand, decentralized structures allow for better tailoring the public goods to the specific needs of different constituencies. On the other hand, decentralization supports transparency and accountability of policy decisions if accompanied by well-established rights of voter participation.

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Appendix 1: Stylized Facts on the Lucerne metropolitan area, 107 communes, 1992-2001, deflated to 1990.

Variable		Mean	Std. Dev.	Min	Max	Observations
General expenditure per capita	overall	4009.29	972.7397	2257	9179	N = 1070
	between		881.2067	2584.6	7720	n = 107
	within		419.8034	2094.29	7704.89	T = 10
Administration per capita	overall	432.7636	109.8774	250	866	N = 1070
	between		102.8694	275.5	760.2	n = 107
	within		39.74943	234.2636	649.7636	T = 10
Security per capita	overall	121.0664	54.60303	60	752	N = 1070
	between		46.88737	80	531.6	n = 107
	within		28.31209	31.46636	661.4664	T = 10
Education per capita	overall	1487.029	439.2824	827	4954	N = 1070
	between		395.1833	1039.1	3833.7	n = 107
	within		195.228	451.329	2689.829	T = 10
Culture and Recreation per capita	overall	55.66542	81.38602	0	662	N = 1070
	between		79.6713	5.4	555.9	n = 107
	within		18.15511	-74.23458	235.1654	T = 10
Public Health per capita	overall	55.19907	109.8543	4	900	N = 1070
	between		106.4683	8.4	642.9	n = 107
	within		28.7732	-322.0009	328.9991	T = 10
Welfare per capita	overall	605.1215	384.2838	66	2325	N = 1070
	between		358.5775	262.2	2008.6	n = 107
	within		142.0517	-330.7785	1292.321	T = 10
Traffic per capita	overall	131.0785	69.58514	-35	523	N = 1070
	between		64.52196	54.4	459.8	n = 107
	within		26.72185	-29.9215	275.9785	T = 10
Environment per capita	overall	263.5477	139.2735	44	1092	N = 1070
	between		113.8043	93	744.5	n = 107
	within		80.96133	-287.8523	979.9477	T = 10
Economy per capita	overall	40.71963	97.2188	0	1165	N = 1070
	between		96.43764	5.4	998.4	n = 107
	within		15.15172	-113.6804	207.3196	T = 10
Finance per capita	overall	817.0701	442.7347	26	5259	N = 1070
	between		301.3371	88.3	1754.6	n = 107
	within		325.5371	-408.8299	4809.17	T = 10
Distance to the center in kilometers	overall	26.51402	11.94418	0	55	N = 1070
	between		11.99478	0	55	n = 107
	within		0	26.51402	26.51402	T = 10
Population	overall	3188.121	6641.911	164	59840	N = 1070
	between		6668.215	177.5	58091.3	n = 107
	within		155.7203	1876.821	4936.821	T = 10
Unemployment in percent	overall	.8877477	.6960896	0	4.4	N = 1070
	between		.4792705	.225	2.777	n = 107
	within		.5067291	-.8672523	2.882748	T = 10
Acreage In km2	overall	13.35729	15.21216	1.11	108.09	N = 1070
	between		15.2766	1.11	108.09	n = 107
	within		0	13.35729	13.35729	T = 10
Population density	overall	298.2983	437.8325	15.93	3789.74	N = 1070
	between		439.4252	16.259	3678.995	n = 107
	within		15.1143	193.1113	409.0433	T = 10
Foreign residents in percent	overall	9.20583	6.690247	0	65.39116	N = 1070
	between		6.331515	.4755158	30.48332	n = 107
	within		2.238041	-9.173495	53.28954	T = 10
Population < age of 20 in percent	overall	31.66664	72.70743	4.4	41.5	N = 1070
	between		22.72509	17.11	37.41	n = 107
	within		1.577331	2.801449	38.73145	T = 10

Population > age of 65 in percent	overall	12.26804	5.414743	2.5	65.3	N =	1070
	between		3.233265	4	22.39	n =	107
	within		4.353557	-1.301963	62.04804	T =	10
Altitude in meters over sea	overall	563.4766	105.9274	418	884	N =	1070
	between						
	within						
Communal parliament dummy = 1	overall	.046729	.2111564	0	1	N =	1070
	between		.212051	0	1	n =	107
	within		0	.046729	.046729	T =	10
Size of cabinet Number of seats	overall	4.476636	.8795121	3	5	N =	1070
	between		.883238	3	5	n =	107
	within		0	4.476636	4.476636	T =	10
Financial strength used fiscal equalization formula	overall	77.27009	31.39922	25	395	N =	1070
	between		30.43614	29.3	294.8	n =	107
	within		8.206793	23.47009	177.4701	T =	10

Appendix 2: Spatial benefit spillovers for all spending items in the Lucerne metropolitan area, 107 communes, 1992-2001, deflated to 1990.

Appendix 2: administration expenditure, 107 Swiss communes, 1992-2001.								
expenditure	OLS Coef.	t	OLS Coef.	t	IV Coef.	t	OLS (lag) Coef.	t
spillover			-.012178	-0.22	-.014128	-0.26		
spillover (t-1)							-.015989	-0.28
population	-.231658	-8.29	-.229608	-7.30	-.229280	-7.37	-.230026	-7.25
unemployment	-.002990	-0.37	-.002796	-0.36	-.002765	-0.36	-.001632	-0.21
geographical size	.001753	2.84	.001736	2.75	.001734	2.79	.001776	2.75
density	.000124	6.14	.000123	5.10	.000123	5.14	.000124	5.01
foreign residents	-.001553	-1.56	-.001591	-1.62	-.001597	-1.65	-.001645	-1.67
population < 20	-.004283	-1.98	-.004219	-1.97	-.004209	-2.00	-.004444	-2.02
population > 65	-.001097	-1.94	-.001127	-2.02	-.001132	-2.05	-.001076	-1.13
altitude	.000058	0.73	.000057	0.71	.000057	0.72	.000056	0.72
parliament	.097259	2.55	.102034	2.42	.102799	2.48	.103257	2.37
seats in cabinet	.004410	0.32	.004052	0.29	.003995	0.29	.004365	0.31
financial strength	.001204	8.17	.001229	6.38	.001233	6.46	.001220	6.57
time fixed effects	Yes		Yes		Yes		Yes	
observations	1070		1070		1070		963	
R-squared	0.557		0.557				0.557	
Hansen J-statistic					12.581	(p-value = 0.182)		
number clusters	107		107		107		107	

For notes see Table 1.

Appendix 2: education expenditure, 107 Swiss communes, 1992-2001.								
expenditure	OLS Coef.	t	OLS Coef.	t	IV Coef.	t	OLS (lag) Coef.	t
spillover			-.088823	-1.00	-.081637	-0.92		
spillover (t-1)							-.078028	-0.87
population	.011444	0.30	.028133	0.71	.026783	0.69	.019632	0.50
unemployment	.005247	0.54	.006832	0.73	.006704	0.73	.010813	1.13
geographical size	-.001018	-1.53	-.001158	-1.67	-.001146	-1.68	-.001193	-1.66
density	.000127	2.63	.000114	2.26	.000115	2.32	.000114	2.27
foreign residents	-.000251	-0.23	-.000562	-0.48	-.000537	-0.47	-.000685	-0.58
population < 20	.008358	2.27	.008880	2.41	.008838	2.44	.008987	2.48
population > 65	.001436	1.58	.001187	1.44	.001207	1.48	.002191	1.29
altitude	.000209	1.87	.000200	1.82	.000201	1.85	.000201	1.84
parliament	-.146684	-2.10	-.107710	-1.38	-.110863	-1.42	-.114743	-1.45
seats in cabinet	.002774	0.23	-.000138	-0.01	.000098	0.01	.002040	0.17
financial strength	-.000215	-1.03	-.000019	-0.07	-.000034	-0.13	-.000034	-0.13
time fixed effects	Yes		Yes		Yes		Yes	
observations	1070		1070		1070		963	
R-squared	0.348		0.354				0.325	
Hansen J-statistic					8.984	(p-value = 0.439)		
number clusters	107		107		107		107	

For notes see Table 1.

Appendix 2: security expenditure, 107 Swiss communes, 1992-2001.

expenditure	OLS Coef.	t	OLS Coef.	t	IV Coef.	t	OLS (lag) Coef.	t
spillover			-.321857	-5.41	-.320443	-5.48		
spillover (t-1)							-.308955	-5.29
population	-.138176	-4.51	-.086444	-2.84	-.086671	-2.89	-.079011	-2.64
unemployment	.002787	0.25	.007687	0.73	.007666	0.74	.007272	0.69
geographical size	.001934	3.12	.001494	2.18	.001496	2.22	.001419	2.09
density	.000237	7.74	.000193	9.06	.000193	9.17	.000196	9.15
foreign residents	-.002384	-2.24	-.003312	-3.15	-.003308	-3.19	-.003341	-3.12
population < 20	-.007798	-3.02	-.006190	-2.54	-.006197	-2.57	-.005488	-2.23
population > 65	.001314	1.64	.000547	0.83	.000550	0.85	.001836	1.55
altitude	-.000055	-0.62	-.000079	-0.92	-.000079	-0.94	-.000082	-0.93
parliament	-.065605	-1.30	.053962	1.18	.053436	1.18	.043366	0.96
seats in cabinet	.002528	0.21	-.006474	-0.55	-.006435	-0.56	-.003748	-0.32
financial strength	-.000504	-2.28	.000100	0.44	.000098	0.43	.000074	0.31
time fixed effects	Yes		Yes		Yes		Yes	
observations	1070		1070		1070		963	
R-squared	0.348		0.385				0.3940	
Hansen J-statistic					12.732	(p-value = 0.175)		
number clusters	107		107		107		107	

For notes see Table 1.

Appendix 2: health expenditure, 107 Swiss communes, 1992-2001.

expenditure	OLS Coef.	t	OLS Coef.	t	IV Coef.	t	OLS (lag) Coef.	t
spillover			.369599	0.81	.347925	0.77		
spillover (t-1)							.498025	1.01
population	.347726	3.72	.285924	3.43	.289548	3.53	.276705	3.41
unemployment	.009440	0.40	.003866	0.15	.004193	0.17	.008001	0.31
geographical size	-.000807	-0.50	-.000275	-0.15	-.000306	-0.17	-.000214	-0.11
density	.000099	1.16	.000153	1.39	.000149	1.38	.000179	1.54
foreign residents	-.006415	-1.62	-.005364	-1.23	-.005426	-1.27	-.006162	-1.40
population < 20	.006967	0.78	.005060	0.58	.005172	0.60	.006255	0.70
population > 65	.001484	0.77	.002390	1.15	.002337	1.14	.006765	1.73
altitude	.000308	1.00	.000335	1.12	.000334	1.13	.000264	0.87
parliament	.649771	2.15	.508384	1.66	.516675	1.71	.440693	1.34
seats in cabinet	-.079429	-1.96	-.068709	-1.84	-.069337	-1.89	-.064022	-1.70
financial strength	.000441	0.56	-.000276	-0.21	-.000234	-0.17	-.000668	-0.48
time fixed effects	Yes		Yes		Yes		Yes	
observations	1070		1070		1070		963	
R-squared	0.438		0.444				0.456	
Hansen J-statistic					11.454	(p-value = 0.246)		
number clusters	107		107		107		107	

For notes see Table 1.

Appendix 2: culture and recreation expenditure, 107 Swiss communes, 1992-2001.

expenditure	OLS Coef.	t	OLS Coef.	t	IV Coef.	t	OLS (lag) Coef.	t
spillover			.149081	0.53	.142414	0.51		
spillover (t-1)							.108511	0.39
population	.188530	1.54	.163903	1.27	.164951	1.30	.170734	1.34
unemployment	.018141	0.66	.013760	0.51	.013860	0.52	.018726	0.71
geographical size	.002916	1.06	.003117	1.15	.003108	1.16	.003450	1.29
density	.000249	1.93	.000265	2.22	.000264	2.24	.000265	2.25
foreign residents	.002208	0.47	.002882	0.60	.002864	0.60	.002237	0.46
population < 20	-.020253	-2.28	-.020525	-2.33	-.020492	-2.36	-.022837	-2.65
population > 65	-.002503	-0.97	-.002059	-0.83	-.002075	-0.84	-.004660	-1.08
altitude	.000328	1.11	.000352	1.19	.000352	1.20	.000372	1.25
parliament	-.175746	-1.36	-.223290	-1.37	-.220890	-1.37	-.221891	-1.38
seats in cabinet	.036613	0.85	.040196	0.92	.040014	0.93	.040764	0.93
financial strength	.000371	4.28	.003861	3.54	.003873	3.61	.003766	3.61
time fixed effects	Yes		Yes		Yes		Yes	
observations	1070		1070		1070		963	
R-squared	0.543		0.546				0.557	
Hansen J-statistic					15.306	(p-value = 0.083)		
number clusters	107		107		107		107	

For notes see Table 1.

Appendix 2: traffic expenditure, 107 Swiss communes, 1992-2001.

expenditure	OLS Coef.	t	OLS Coef.	t	IV Coef.	t	OLS (lag) Coef.	t
spillover			.254164	1.46	.264331	1.56		
spillover (t-1)							.290647	1.66
population	-.249040	-3.65	-.196556	-2.99	-.198151	-3.07	-.203944	-3.18
unemployment	.019024	0.86	.004121	0.25	.003968	0.25	.007397	0.44
geographical size	.003097	1.97	.004854	4.71	.004867	4.81	.004674	4.71
density	.000107	1.43	.000172	3.23	.000173	3.32	.000177	3.45
foreign residents	.000508	0.20	.000731	0.38	.000760	0.40	.000671	0.34
population < 20	-.002026	-0.44	-.005247	-1.38	-.005297	-1.41	-.002978	-0.77
population > 65	-.000150	-0.11	.002496	1.31	.002520	1.34	.005909	1.28
altitude	-.000450	-2.33	.000401	2.49	.000401	2.52	.000388	2.43
parliament	.129834	1.37	.161006	1.47	.157318	1.47	.150061	1.39
seats in cabinet	.013407	0.52	.026669	1.08	.026947	1.10	.031560	1.31
financial strength	.001882	3.45	.001577	3.48	.001558	3.49	.001490	3.46
time fixed effects	Yes		Yes		Yes		Yes	
observations	1070		1070		1070		963	
R-squared	0.300		0.419				0.428	
Hansen J-statistic					9.391	(p-value = 0.402)		
number clusters	107		107		107		107	

For notes see Table 1.

Appendix 2: welfare expenditure, 107 Swiss communes, 1992-2001.

expenditure	OLS Coef.	t	OLS Coef.	t	IV Coef.	t	OLS (lag) Coef.	t
spillover			-.170609	-1.00	-.174606	-1.04		
spillover (t-1)							-.153789	-0.92
population	.235821	3.06	.266940	2.89	.267669	2.94	.263149	2.90
unemployment	.014058	0.61	.017109	0.77	.017180	0.79	.021577	1.02
acreage	.002865	1.79	.002603	1.63	.002597	1.66	.002311	1.48
geographical size	.000125	2.11	.000099	1.31	.000099	1.32	.000094	1.24
foreign residents	-.000935	-0.36	-.001510	-0.55	-.001523	-0.57	-.002040	-0.78
population < 20	.003169	0.74	.004139	0.95	.004161	0.97	.003924	0.86
population > 65	.002878	1.13	.002416	0.96	.002405	0.96	.003903	1.11
altitude	-.000014	-0.06	-.000028	-0.12	-.000028	-0.12	-.000038	-0.16
parliament	-.230294	-3.31	-.158008	-1.67	-.156315	-1.67	-.161923	-1.72
seats in cabinet	-.013556	-0.58	-.018980	-0.74	-.019107	-0.76	-.017234	-0.68
financial strength	-.000850	-2.66	-.000486	-1.11	-.000477	-1.10	-.000526	-1.24
time fixed effects	Yes		Yes		Yes		Yes	
observations	1070		1070		1070		963	
R-squared	0.421		0.425				0.392	
Hansen J-statistic					9.780	(p-value = 0.369)		
number clusters	107		107		107		107	

For notes see Table 1.

Appendix 2: environment expenditure, 107 Swiss communes, 1992-2001.

expenditure	OLS Coef.	t	OLS Coef.	t	IV Coef.	t	OLS (lag) Coef.	t
spillover			.316562	1.81	.345834	2.00		
spillover (t-1)							.326791	1.88
population	-.249040	-3.65	-.295545	-4.13	-.299845	-4.26	-.309969	-4.35
unemployment	.019024	0.86	.014629	0.67	.014222	0.67	.018603	0.83
geographical size	.003097	1.97	.003488	2.35	.003524	2.43	.003728	2.59
density	.000107	1.43	.000146	2.25	.000149	2.35	.000148	2.31
foreign residents	.000508	0.20	.001364	0.54	.001443	0.59	.001366	0.54
population < 20	-.002026	-0.44	-.003484	-0.76	-.003619	-0.80	-.003167	-0.68
population > 65	-.000150	-0.11	.000537	0.40	.000601	0.46	.001854	0.85
altitude	-.000450	-2.33	-.000428	-2.25	-.000426	-2.27	-.000443	-2.36
parliament	.129834	1.37	.021354	0.19	.011324	0.10	.018853	0.17
seats in cabinet	.013407	0.52	.021528	0.82	.022279	0.86	.021321	0.78
financial strength	.001882	3.45	.001335	2.24	.001284	2.18	.001240	2.15
time fixed effects	Yes		Yes		Yes		Yes	
observations	1070		1070		1070		963	
R-squared	0.300		0.310				0.277	
Hansen J-statistic					10.941	(p-value = 0.280)		
number clusters	107		107		107		107	

For notes see Table 1.

Appendix 2: economy expenditure, 107 Swiss communes, 1992-2001.

expenditure	OLS Coef.	t	OLS Coef.	t	IV Coef.	t	OLS (lag) Coef.	t
spillover			-.598223	-0.82	-.597217	-0.83		
spillover (t-1)							-.401720	-0.51
population	-.256489	-1.74	-.194792	-1.39	-.194896	-1.41	-.197220	-1.40
unemployment	-.023660	-0.84	-.017895	-0.65	-.017905	-0.66	-.019831	-0.69
geographical size	.010031	2.84	.009508	2.75	.009509	2.79	.009436	2.76
density	.000085	0.77	.000033	0.26	.000033	0.26	.000043	0.32
foreign residents	-.006708	-1.59	-.007827	-1.89	-.007825	-1.92	-.007241	-1.72
population < 20	-.017771	-1.91	-.015867	-1.75	-.015870	-1.78	-.012805	-1.46
population > 65	.005253	1.61	.004332	1.46	.004333	1.48	.010117	1.48
altitude	.000348	0.86	.000320	0.79	.000320	0.81	.000273	0.66
parliament	.020950	0.14	.163513	0.55	.163274	0.56	.129657	0.40
seats in cabinet	-.054364	-1.12	-.065090	-1.40	-.065072	-1.42	-.062480	-1.32
financial strength	.000529	0.44	.001246	0.82	.001245	0.83	.001142	0.76
time fixed effects	Yes		Yes		Yes		Yes	
observations	1070		1070		1070		963	
R-squared	0.317		0.324				0.324	
Hansen J-statistic					13.087	(p-value = 0.159)		
number clusters	107		107		107		107	

For notes see Table 1.

Appendix 2: finance expenditure, 107 Swiss communes, 1992-2001.

expenditure	OLS Coef.	t	OLS Coef.	t	IV Coef.	t	OLS (lag) Coef.	t
spillover			-.511277	-3.40	-.475779	-3.45		
spillover (t-1)							-.486578	-3.32
population	-.053796	-0.39	.036191	0.24	.029944	0.20	.038417	0.25
unemployment	-.025242	-1.25	-.017119	-0.94	-.017683	-0.99	-.018510	-1.00
geographical size	-.001065	-0.50	-.001823	-0.79	-.001770	-0.79	-.002190	-0.89
density	.000071	0.72	-2.52e-06	-0.03	2.58e-06	0.03	-5.31e-07	-0.01
foreign residents	.003312	1.43	.001678	0.76	.001791	0.83	.002080	0.90
population < 20	.004641	0.76	.007474	1.20	.007278	1.18	.009394	1.44
population > 65	.005588	1.68	.004266	1.47	.004358	1.50	.007741	1.28
altitude	.000638	2.29	.000597	2.22	.000599	2.25	.000618	2.28
parliament	-.088333	-1.26	.121714	1.28	.107130	1.19	.112420	1.21
seats in cabinet	-.023114	-0.59	-.038834	-0.96	-.037742	-0.95	-.033131	-0.82
financial strength	-.000082	-0.09	.000977	1.05	.000903	0.97	.001053	1.22
time fixed effects	Yes		Yes		Yes		Yes	
observations	1070		1070		1070		963	
R-squared	0.179		0.209				0.212	
Hansen J-statistic					18.329	(p-value = 0.032)		
number clusters	107		107		107		107	

For notes see Table 1.