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Central City Exploitation by Urban Sprawl? Evidence from Swiss Local Communities

Christoph A. Schaltegger [a,b], Benno Torgler[* c,b] and Simon Zemp[d]

Abstract:

This paper investigates spatial spillovers in local spending decisions between the center and the surrounding local communities by using panel data of the canton of Lucerne during the 1990s. Due to the geographical fragmentation with a major central city and some 100 small suburban local communities within a distance from 4 to 55 kilometers to the center this area represents a particularly useful database in order to test the relevance of spatial interactions in a small metropolitan area. The empirical evidence confirms strategic interactions among suburban governments and the central city only for public education, health and environmental spending. There are no spatial interactions with the central city for overall government spending.

JEL Classifications: D72, H72

Keywords: spatial spillovers, strategic interaction, central city exploitation

[a] University of St.Gallen, economiesuisse
[b] CREMA
[c] Queensland University of Technology, CESifo, NCER
[d] Distance Learning University of Applied Economics Brig/Bern; Higher School of Economics Lucerne

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 local communities 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 local communities, 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 small metropolitan area. Is

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there a strategic interaction among small 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 "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.

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[1] In Switzerland, 73.3% of the population lives in urban areas in 2000.

Since urban density influences agglomeration economies positively, a firm's total factor productivity is significantly higher in central cities than in smaller local local communities.[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. Moreover, 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).

Due to the mismatch of spending claims and revenue capacity, central cities have insufficient resources for undertaking infrastructure projects and granting tax relief. In this situation, urban fragmentation will 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 financial decline of central cities. In this logic, it may be

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[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.

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 the idea that voluntary agreements address the problems of central cities effectively. 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 local communities 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. Services 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 local communities 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. However, a considerable amount of analyses have been devoted to spatial patterns of government spending on the local level. An overview of the empirical work has been provided by Brueckner (2003). One strand of the literature focuses on the question of "tax mimicking" of neighboring local communities. According to Brueckner and Saavedra (2001), Heyndels and Vuchelen (1998), Buettner (2001) or Revelli (2001) local tax policy decisions in many countries are significantly influenced by the neighboring tax-setting policy. There is also evidence for budget-spillovers among neighboring US-states (Case, Rosen and Hines, 1993) and even for a spatial interdependence of the voting behavior (Besley and Case, 1995): Since voters use the policy performance of neighboring incumbents to assess the quality of their own incumbents, politicians are involved in a so-called

"yardstick competition". Werck, Heyndels and Geys (2008) use a similar approach to evaluate spillover effects of cultural spending for the Flemish local governments. They define central places of the cultural life and evaluate the free-riding behavior of smaller municipalities surrounding the central places. Their results show that small municipalities that border to central places tend to disregard what their smaller neighbors do, and thus a free-riding effect could compensate a positive spatial interdependence.

Our paper, in contrast, considerably differs from the previously mentioned papers since we are not interested in neighborhood effects but in the free-riding behavior of all suburban communities from one central city. Thus, if free-riding on the central city public goods is a significant behavior of suburban policy decisions, we would expect a negative correlation between spending decisions of the center as compared to the peripheric communities. Since free-riding is easier for municipalities that are close to the center than those that are far from the centre, distance to the center plays a role.

For the purposes of this paper, we will evaluate the relevance of spatial benefit spillovers from the center to the peripheric communities for a small metropolitan area, located in 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

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[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).

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 urban 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 urban 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 communities reached an agreement with the central city, changes in the territorial structure are still controversially discussed. While most local communities prefer maintaining their autonomy, the central city government as well as the superior 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 hampers economic growth. The average size of the Lucerne local communities is 3026 citizens. 89% of the local governments consist of fewer than 5'000 citizens, 6.3% of all local

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

communities 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).

Figure 1: The Lucerne metropolitan area

Lucerne central city

1 Suburban cities
2 Mid-sized suburban local communities
3 Smaller suburban local communities
4 Regional centers outside the urban area
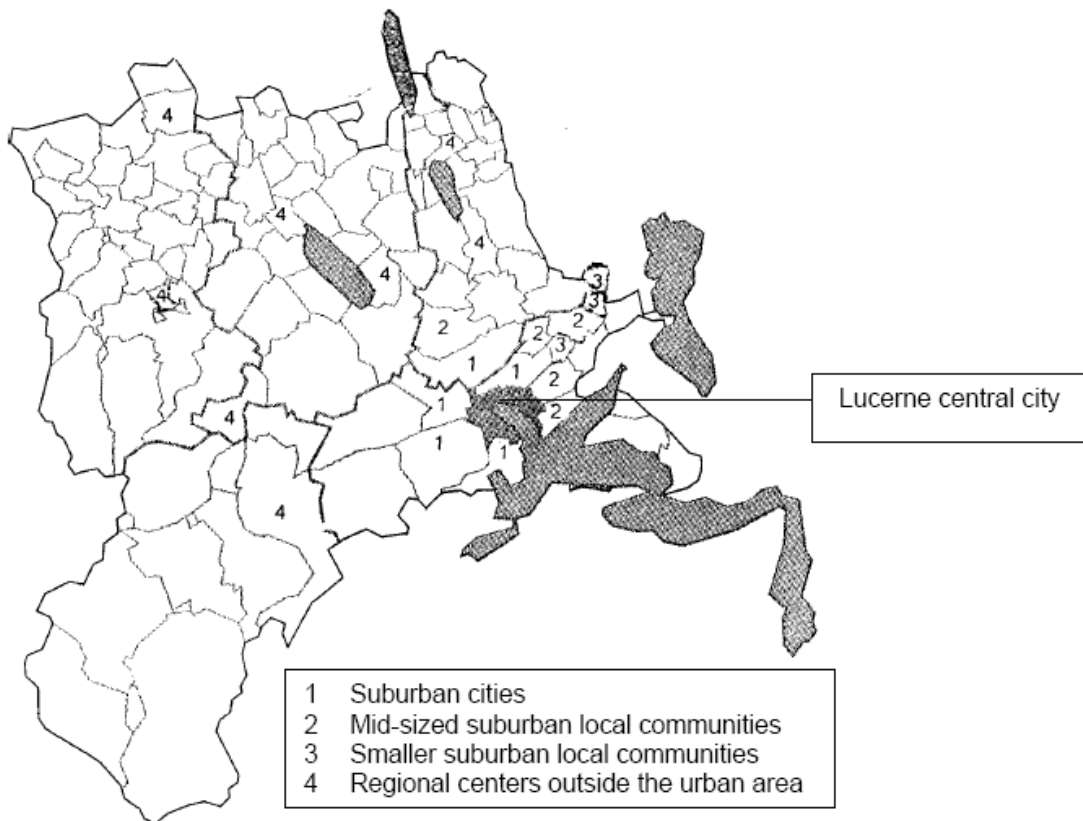
There is not only considerable variation in the size of local communities but also in population density. The highest concentration of inhabitants is situated in the southern part of the canton (see *Figure 1*). 44.5% of the canton's inhabitants live in and near Lucerne. The urban space is segmented 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 local communities 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 local communities of the metropolitan area and regional centers outside the urban space.

Independent of the size of the local communities, local authorities enjoy considerable autonomy in deciding, fulfilling and financing their tasks.[6] 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.).[7] 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 Plan[8], 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.[9] 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 inhabitants of the canton 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

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[6] In economic literature, the idea of local financial autonomy has at least two meanings. One the one hand, it implies the degree to which municipalities are able to generate, through local taxes and charges, revenue they can directly control. On the other hand, financial autonomy expresses the assignment of functions and responsibilities to local governments in the areas of fiscal and financial management and planning and implementation of investment programs. For an overview of different aspects of financial autonomy see Dafflon and Perritaz (2000).

[7] However, levels and standards determined by the canton limit the autonomy of the municipalities.

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

[9] Outside the urban space, eight regional centers fulfil functions on a lower scale for surrounding local communities or the remote rural area.

public production have not decreased equally with the population.[10] 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. It is argued that these arrangements managed to reduce the benefit spillovers to the suburban local communities by approximately one half (Merki, 2002, p. 14). Moreover, the renewed system of fiscal equalization aims to compensate the central city for urban agglomeration costs.

4. Empirical investigation

In order to test for the presence of spatial interactions in the Lucerne metropolitan area, the following equation is estimated.[11] In equation 1, the index i refers to the local communities within the territory of the canton of Lucerne ($i = 1,\ldots, 107$), and the index t refers to the fiscal year ($t = 1992,\ldots, 2001$). e_{it} represents the public spending decision by a commune i in year t.

$$e_{it} = \delta w e_{jt} + X_{it}\gamma + td_t + cd_{i} + \varepsilon_{it}.$$ (1)

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[10] Similar observations in the US context are made by Ladd (1994).
[11] A similar approach can be found in Brueckner (2003).

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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. td_t represents a set of 10 fixed time-dummies in order to control for time-specific effects common to all local communities in a given year (e.g. business cycles). Finally, cd_i is a set of 107 fixed communal dummies in order to control for community-specific effects.

In our case parameter δ is of interest. It measures the spillover effects between the city of Lucerne (the center) and the other local communities 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 local communities. Hence, we assume symmetric reaction functions of the communes with the center. In contrast, one could argue that the center acts as the Stackelberg-Leader. In this case, the center would not care about the reaction of nearby communities when formulating own policy changes. We would therefore have to exclude the policy decisions of communes in the reaction function of the center. However, casual observation does not support the notion of such a game. Many city governments try to persuade neighboring communities in contributing to the costs for new infrastructure programs within the city. Depending on the result of negotiations, the city government adjusts its own policy decision. This is particularly the case for

many investment projects of the city of Lucerne.[12] In addition, low migration costs within the urban area of Lucerne compel the central city authority to adjust the tax/service package if nearby communities improve their attractiveness. Thus, we assume the government of the central city not to take policy decisions in isolation and consequently not to act as a Stackelberg-Leader.

As known from the literature on spatial econometrics, three major issues must be addressed when estimating equation (1).[13] According to Brueckner (2003, p. 183) these are (1) endogeneity of the e_js, (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, some authors use an instrumental variables (IV) method.[14] 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 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 they regress we_{jt} on X_{it} and wX_{it}. The fitted values $\hat{w}e_{jt}$ are then used as instruments for we_{jt}. The IV approach yields consistent parameter estimates. A further approach is to assume that spatial interactions occur with a time lag. Thus, the

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[12] The most recent project financed from funds of the central city and the surrounding municipalities is the ice-rink "Swiss life arena". Discussions between the central city and the suburbs regarding the construction of a new indoor swimming pool for the whole region are under way.

[13] A review on spatial econometrics is given by Anselin (1988).

[14] 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).

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). In our case, the Wu-Hausman test confirms endogeneity of the e_js with a value of 18.9 for the F-test. Nevertheless, we do not use IV estimates due to the problem of suitable instruments. Instead, we use panel data, where all time-invariant community characteristics, observed or unobserved, are represented by community-specific intercepts (Brueckner, 2003).

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 or again to rely on panel data fixed-effects to eliminate spatial error dependence.

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 the following, we display results for the two-way fixed effects estimation technique.

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 local communities 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) (see *Appendix 1*).[15]

Figure 2 shows the average public spending of all 107 local communities 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 local communities average around 4000 CHF per capita. For overall public spending there is hardly any other spatial pattern observable in *Figure 2*.

The estimation results for general expenditure are presented in *Table 1*. Column 1 displays time and community fixed-effects estimates for all 107 communities in Lucerne. Column 2 shows the same equations where we dropped the observations for the city of Lucerne, the central city. In our context, the spatial spillover variable is of interest.

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

Figure 2: Per capita local public spending and distance from the center in km., 107 local communities, 1992-2001, mean values
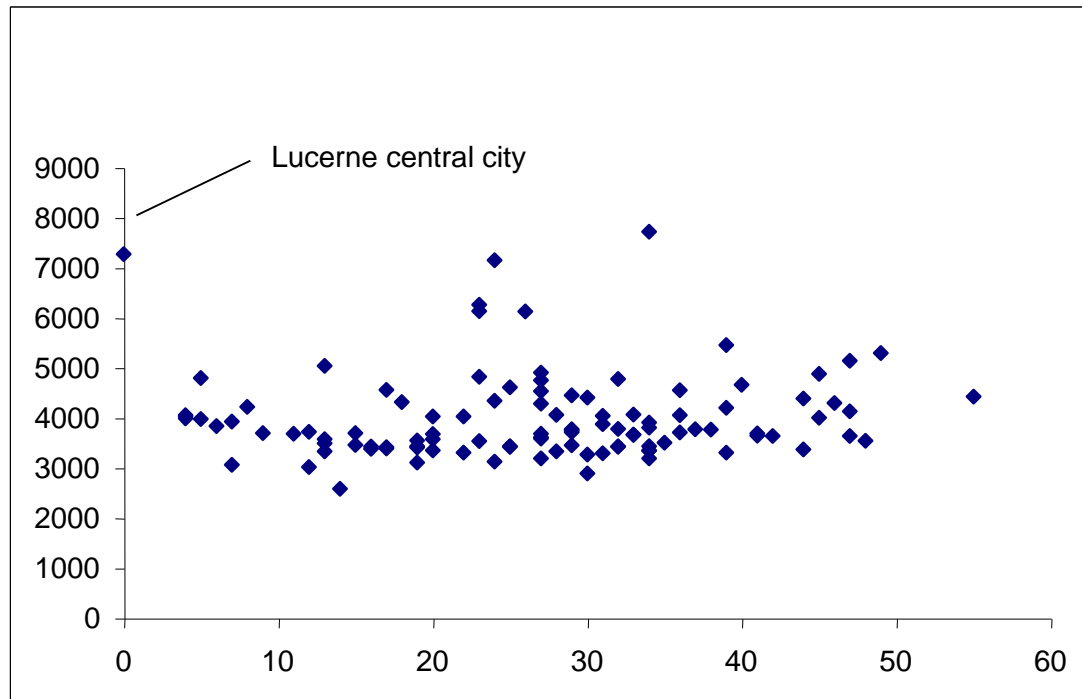
The results show that overall horizontal fiscal interactions between the local communities and the center in the Lucerne metropolitan area are not of importance on a convenient level of significance. In column 1 the spillover coefficient is approximately 1.1 with a t-value of 1.83. This implies that an overall increase of public spending in the center has a slightly positive and significant impact on the expenditure decisions of neighboring local communities in the Lucerne metropolitan area. Hence, the hypothesis that surrounding communities free-ride on the central city's public goods in the Lucerne metropolitan can be rejected in the case for general spending. In contrast, there rather seems to be a mimicking of spending patterns between the central city and the suburban communities.

Table 1: General Government Spending, 107 Swiss local Communities (canton of Lucerne), 1992-2001

	All communities	All communities without central city
Spillover	1.109*	0.857
	(1.83)	(1.36)
Population	-0.484***	-0.552***
	(5.27)	(5.48)
Unemployment	-0.0006	-0.0002
	(0.18)	(0.06)
Population density	0.0001	0.0003*
	(0.89)	(1.78)
Foreign residents	-0.0004	-0.0004
	(0.72)	(0.75)
Population < 20	-0.0000	-0.0000
	(0.18)	(0.19)
Population > 65	-0.0006**	-0.0006**
	(2.30)	(2.29)
Financial strength	0.054**	0.054**
	(2.10)	(2.14)
Observations	1070	1060
Time fixed effects	Yes	Yes
Community fixed effects	Yes	Yes
F-Test	32.45	31.71

Notes: dependent variable is per capita public spending for 107 local communities over 1992-2001. All financial data are deflated to the year 1990

However, spatial spillover effects for general expenditure do not provide information as to whether any specific kind of public task creates spatial spillovers between the central city and the peripheric communities. 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 communities in the Lucerne metropolitan area. Most interestingly, the existence of spatial spillovers varies considerably in size and significance across the different spending items. In a majority of spending categories, spatial interactions between the central city and the peripheric municipalities do not play an important role, as in the case of administration, security, culture and recreation, welfare, traffic, economy and finance spending. However, there is an indication of an urban sprawl in some politically important and controversially discussed policy fields. In the case of education, health and environment spending, the spillover effect are significant. The estimated coefficients for culture and recreation with a value around -5.8 and a t-value around 4.4 indicate that an increase of central culture and recreation spending by 1 % will be anticipated by the surrounding local communities with a decrease of their own culture and recreation spending by 5.8 %. In the case of public health spending the respective value is 6.5 % and for environmental spending the value accounts for 4.7 %. This result indicates that a cost-sharing agreement between the benefiting local communities and the center in the case of public education, health and environmental 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. 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 some important exceptions.

5. Policy implications

Empirical evidence presented in this paper suggests that spatial benefit spillovers from the central city to suburban local communities do not play an important role for overall spending in the case of Lucerne, but for important specific spending in the fields of public education, health and environmental spending.[16] Note however, that these public expenditure items account for almost 50 % of all local per capita spending in the canton Lucerne between 1992 and 2001. Thus, it is crucial to find cost-saving inter-jurisdictional agreements in those policy fields which are confronted with spatial benefit spillovers between the center and the surrounding communities.

- A possible approach to compensate for 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 Schneider, 2001 for the German

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[16] Note that our empirical analysis does not evaluate the presence of spatial spillovers from the central Lucerne city to local communities outside the canton Lucerne. Some observers argue that these local communities benefit most from the central city. However, the integration of several local communities outside the cantonal territory of Lucerne in our analysis would be arbitrary.

Länderfinanzausgleich and Borck and Owings, 2003 for the case of Californian counties). Special compensations and matching grants often fail to internalize benefit spillovers adequately.[17]

- 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 local communities, 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 local communities and the central city are not only motivated to fulfill the contract but also to monitor each other.[18] A common strategy of central cities to enforce an agreement with the nearby local communities 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).[19]

- 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

[17] 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.
[18] On the other hand, Heinz (2000) reports from experience of Western European countries where negotiations between the central city and the surrounding local communities did not succeed.
[19] However, the Swiss constitution doesn't make possible to tax non-resident employees who daily commute to the centre.

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 local communities 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-voters in the political decision making process.[20] 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

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[20] 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).

another public task. As a consequence, some inter-jurisdictional spillovers are internalized by chance, while new external effects are created (Frey and Eichenberger 2001).[21]

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.[22] 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 public resources and the decreasing number of innovations in the provision of public services. 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.[23]

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 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

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

[22] 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).

[23] 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).

(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.[24]

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 local communities 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 local communities in some important areas: public education, health and environmental spending but not for the overall public spending. For the other spending items, there is no evidence of significant and sizeable spatial spillover effects. Thus, a huge 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

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

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 local communities while promoting the establishment of cost-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 local communities, 1992-2001, deflated to 1990.

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Variable                        |      Mean   Std. Dev.       Min        Max |   Observations
--------------------------------+------------------------------------------+----------------
General expenditure     overall |   4009.29   972.7397       2257       9179 |   N =      1070
per capita              between |             881.2067     2584.6       7720 |   n =       107
                        within  |             419.8034    2094.29    7704.89 |   T =        10
                                |                                            |
Administration          overall |  432.7636   109.8774        250        866 |   N =      1070
per capita              between |             102.8694      275.5      760.2 |   n =       107
                        within  |             39.74943   234.2636   649.7636 |   T =        10
                                |                                            |
Security                overall |  121.0664   54.60303         60        752 |   N =      1070
per capita              between |             46.88737         80      531.6 |   n =       107
                        within  |             28.31209   31.46636   661.4664 |   T =        10
                                |                                            |
Education               overall |  1487.029   439.2824        827       4954 |   N =      1070
per capita              between |             395.1833     1039.1     3833.7 |   n =       107
                        within  |              195.228    451.329   2689.829 |   T =        10
                                |                                            |
Culture and Recreation  overall |  55.66542   81.38602          0        662 |   N =      1070
per capita              between |              79.6713        5.4      555.9 |   n =       107
                        within  |             18.15511  -74.23458   235.1654 |   T =        10
                                |                                            |
Public Health           overall |  55.19907   109.8543          4        900 |   N =      1070
per capita              between |             106.4683        8.4      642.9 |   n =       107
                        within  |              28.7732  -322.0009   328.9991 |   T =        10
                                |                                            |
Welfare                 overall |  605.1215   384.2838         66       2325 |   N =      1070
per capita              between |             358.5775      262.2     2008.6 |   n =       107
                        within  |             142.0517  -330.7785   1292.321 |   T =        10
                                |                                            |
Traffic                 overall |  131.0785   69.58514        -35        523 |   N =      1070
per capita              between |             64.52196       54.4      459.8 |   n =       107
                        within  |             26.72185   -29.9215   275.9785 |   T =        10
                                |                                            |
Environment             overall |  263.5477   139.2735         44       1092 |   N =      1070
per capita              between |             113.8043         93      744.5 |   n =       107
                        within  |             80.96133  -287.8523   979.9477 |   T =        10
                                |                                            |
Economy                 overall |  40.71963    97.2188          0       1165 |   N =      1070
per capita              between |             96.43764        5.4      998.4 |   n =       107
                        within  |             15.15172  -113.6804   207.3196 |   T =        10
                                |                                            |
Finance                 overall |  817.0701   442.7347         26       5259 |   N =      1070
per capita              between |             301.3371       88.3     1754.6 |   n =       107
                        within  |             325.5371  -408.8299    4809.17 |   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            overall | .8877477   .6960896          0        4.4 |   N =      1070
in percent              between |             .4792705       .225      2.777 |   n =       107
                        within  |             .5067291  -.8672523   2.882748 |   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       overall |   9.20583   6.690247          0   65.39116 |   N =      1070
in percent              between |             6.331515  .4755158   30.48332 |   n =       107
                        within  |             2.238041  -9.173495   53.28954 |   T =        10
                                |                                            |
Population < age of 20  overall |  31.66664   72.70743        4.4       41.5 |   N =      1070
in percent              between |             22.72509      17.11      37.41 |   n =       107
                        within  |             1.577331   2.801449   38.73145 |   T =        10
                                |                                            |
Population > age of 65  overall |  12.26804   5.414743        2.5       65.3 |   N =      1070
in percent              between |             3.233265          4      22.39 |   n =       107
                        within  |             4.353557  -1.301963   62.04804 |   T =        10
                                |                                            |
Financial strength      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 local communities, 1992-2001, deflated to 1990.

Education Government Spending, 107 Swiss local Communities (canton of Lucerne), 1992-2001		
	All communities	All communities without central city
Spillover	-5.814***	-4.09***
	(4.38)	(2.94)
Population	-0.153*	-0.014
	(1.81)	(0.15)
Unemployment	0.009***	0.007**
	(2.95)	(2.48)
Population density	-0.0001	-0.0004***
	(0.78)	(3.09)
Foreign residents	-0.001*	-0.0009*
	(1.92)	(1.86)
Population < 20	-0.0000	-0.00001
	(0.77)	(0.74)
Population > 65	-0.0000	0.0000
	(0.00)	(0.02)
Financial strength	-0.008	-0.009
	(0.32)	(0.38)
Observations	1070	1060
Time fixed effects	Yes	Yes
Community fixed effects	Yes	Yes
F-Test	107.62	109.17
Notes: dependent variable is per capita public spending for 107 local communities over 1992-2001. All financial data are deflated to the year 1990		

Traffic Government Spending, 107 Swiss local Communities (canton of Lucerne), 1992-2001		
	All communities	All communities without central city
Spillover	-2.821	-2.620
	(1.27)	(1.15)
Population	-0.478**	-0.489**
	(2.16)	(2.04)
Unemployment	0.001	0.001
	(0.18)	(0.19)
Population density	0.0004	0.0004
	(1.61)	(1.32)
Foreign residents	-0.003**	-0.003**
	(2.08)	(2.08)
Population < 20	-0.000	-0.000
	(1.11)	(1.10)
Population > 65	-0.001	-0.001
	(1.58)	(1.57)
Financial strength	0.077	0.078
	(1.24)	(1.24)
Observations	1070	1060
Time fixed effects	Yes	Yes
Community fixed effects	Yes	Yes
F-Test	8.79	8.72
Notes: dependent variable is per capita public spending for 107 local communities over 1992-2001. All financial data are deflated to the year 1990		

Security Government Spending, 107 Swiss local Communities (canton of Lucerne), 1992-2001		
	All communities	All communities without central city
Spillover	-0.399	-0.775
	(0.26)	(0.49)
Population	-1.141***	-1.298***
	(5.85)	(6.13)
Unemployment	0.008	0.010
	(1.24)	(1.39)
Population density	0.0003	0.0007**
	(1.36)	(2.27)
Foreign residents	-0.0003	-0.0003
	(0.27)	(0.31)
Population < 20	-0.000	-0.000
	(0.37)	(0.38)
Population > 65	0.0004	0.0005
	(0.88)	(0.86)
Financial strength	0.040	0.042
	(0.73)	(0.77)
Observations	1070	1060
Time fixed effects	Yes	Yes
Community fixed effects	Yes	Yes
F-Test	4.43	4.54
Notes: dependent variable is per capita public spending for 107 local communities over 1992-2001. All financial data are deflated to the year 1990		

Administration Government Spending, 107 Swiss local Communities (canton of Lucerne), 1992-2001		
	All communities	All communities without central city
Spillover	0.095	0.095
	(0.21)	(0.20)
Population	-0.669***	-0.706***
	(9.27)	(9.03)
Unemployment	-0.005**	-0.005**
	(2.13)	(2.06)
Population density	0.000	0.000
	(0.66)	(1.25)
Foreign residents	-0.001**	-0.001**
	(2.06)	(2.10)
Population < 20	0.0000	0.000
	(0.14)	(0.14)
Population > 65	-0.0001	-0.0002
	(0.74)	(0.77)
Financial strength	0.050***	0.053***
	(2.46)	(260)
Observations	1070	1060
Time fixed effects	Yes	Yes
Community fixed effects	Yes	Yes
F-Test	48.04	47.49
Notes: dependent variable is per capita public spending for 107 local communities over 1992-2001. All financial data are deflated to the year 1990		

Culture and Recreation Government Spending, 107 Swiss local Communities (canton of Lucerne), 1992-2001		
	All communities	All communities without central city
Spillover	-3.561	-3.813
	(0.82)	(0.83)
Population	-1.097**	-1.152**
	(2.56)	(2.44)
Unemployment	-0.001	-0.001
	(0.06)	(0.05)
Population density	0.001	0.001
	(1.56)	(1.34)
Foreign residents	-0.004	-0.004
	(1.61)	(1.61)
Population < 20	-0.0001	-0.0001
	(1.51)	(1.50)
Population > 65	0.0002	0.0002
	(0.20)	(0.20)
Financial strength	-0.257**	-0.254**
	(2.15)	(0.20)
Observations	1070	1060
Time fixed effects	Yes	Yes
Community fixed effects	Yes	Yes
F-Test	8.91	8.83
Notes: dependent variable is per capita public spending for 107 local communities over 1992-2001. All financial data are deflated to the year 1990		

Health Government Spending, 107 Swiss local Communities (canton of Lucerne), 1992-2001		
	All communities	All communities without central city
Spillover	6.643***	6.459***
	(4.97)	(4.71)
Population	-0.692*	-0.980**
	(1.71)	(2.22)
Unemployment	0.008	0.012
	(0.58)	(0.83)
Population density	-0.0004	0.0003
	(0.87)	(0.39)
Foreign residents	0.0002	0.0002
	(0.11)	(0.07)
Population < 20	0.000	0.000
	(1.24)	(1.21)
Population > 65	0.001	0.001
	(0.71)	(0.69)
Financial strength	0.018	0.009
	(0.16)	(0.08)
Observations	1070	1060
Time fixed effects	Yes	Yes
Community fixed effects	Yes	Yes
F-Test	8.47	8.72
Notes: dependent variable is per capita public spending for 107 local communities over 1992-2001. All financial data are deflated to the year 1990		

Welfare Government Spending, 107 Swiss local Communities (canton of Lucerne), 1992-2001		
	All communities	All communities without central city
Spillover	0.122	0.873
	(0.12)	(0.83)
Population	0.426**	0.647***
	(2.47)	(3.46)
Unemployment	0.008	0.005
	(1.33)	(0.84)
Population density	0.000	-0.001**
	(0.01)	(1.97)
Foreign residents	0.000	0.001
	(0.52)	(0.61)
Population < 20	0.000	0.000
	(0.12)	(0.16)
Population > 65	-0.001***	-0.001***
	(2.77)	(2.76)
Financial strength	0.017	0.018
	(0.36)	(0.37)
Observations	1070	1060
Time fixed effects	Yes	Yes
Community fixed effects	Yes	Yes
F-Test	99.52	100.07

Notes: dependent variable is per capita public spending for 107 local communities over 1992-2001. All financial data are deflated to the year 1990

Environment Government Spending, 107 Swiss local Communities (canton of Lucerne), 1992-2001		
	All communities	All communities without central city
Spillover	-4.740***	-4.164***
	(3.65)	(3.08)
Population	-1.230***	-1.029***
	(4.32)	(3.29)
Unemployment	-0.004	-0.006
	(0.43)	(0.57)
Population density	-0.000	-0.001
	(0.15)	(1.16)
Foreign residents	0.000	0.001
	(0.37)	(0.39)
Population < 20	0.000	0.000
	(0.15)	(0.16)
Population > 65	0.0005	0.005
	(0.61)	(0.60)
Financial strength	0.080	0.077
	(1.01)	(0.96)
Observations	1070	1060
Time fixed effects	Yes	Yes
Community fixed effects	Yes	Yes
F-Test	29.49	29.29

Notes: dependent variable is per capita public spending for 107 local communities over 1992-2001. All financial data are deflated to the year 1990

Economy Government Spending, 107 Swiss local Communities (canton of Lucerne), 1992-2001		
	All communities	All communities without central city
Spillover	-3.086	-3.172
	(1.48)	(1.50)
Population	-0.733*	-0.983**
	(1.96)	(2.44)
Unemployment	-0.008	-0.0065
	(0.63)	(0.49)
Population density	0.001***	0.002***
	(2.99)	(3.77)
Foreign residents	0.002	0.002
	(1.19)	(1.13)
Population < 20	-0.000	-0.000
	(0.53)	(0.53)
Population > 65	0.001	0.001
	(1.23)	(1.20)
Financial strength	-0.053	-0.053
	(0.51)	(0.50)
Observations	1070	1060
Time fixed effects	Yes	Yes
Community fixed effects	Yes	Yes
F-Test	3.55	3.69

Notes: dependent variable is per capita public spending for 107 local communities over 1992-2001. All financial data are deflated to the year 1990

Finance Government Spending, 107 Swiss local Communities (canton of Lucerne), 1992-2001		
	All communities	All communities without central city
Spillover	1.016	0.600
	(1.19)	(0.69)
Population	-0.746**	-1.222***
	(2.03)	(3.06)
Unemployment	-0.019	-0.016
	(1.49)	(1.22)
Population density	-0.003	0.001
	(0.65)	(1.47)
Foreign residents	0.001	0.006
	(0.36)	(0.29)
Population < 20	0.000	0.000
	(0.30)	(0.29)
Population > 65	-0.002*	-0.002*
	(1.84)	(1.85)
Financial strength	0.279***	0.282***
	(2.7)	(2.76)
Observations	1070	1060
Time fixed effects	Yes	Yes
Community fixed effects	Yes	Yes
F-Test	9.94	10.31

Notes: dependent variable is per capita public spending for 107 local communities over 1992-2001. All financial data are deflated to the year 1990