

Incentive Distortions in Decentralized Systems of Governance - Why is Financing Decentralized Systems so Difficult?

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Abstract

National governments often choose to delegate tasks and burdens to lower levels in a comprehensive system of administration. Local and regional governance thereby becomes an important factor in policy implementation. This paper focuses on the incentive problem that follows from such a delegation of competences to collect taxes and do lending at the local level in a multi-level geo-administrative system. The paper uses the Danish administrative system to illustrate the actual outcomes from such incentive problems. A two-step estimation procedure will be used to derive results on the importance of incentive problems in multi-level geo-administrative systems. Setting up elaborate administrative systems will introduce agency problems that lead to inefficiencies in both local and national governance.

1. Introduction

National states are often characterized by delegation in terms of the tasks and burdens of public provision of goods and services. This may be observed in unitary states, such as the Danish, where the state delegates the task of offering local public services and the burdens of financing these to lower levels of the geo-administrative system, e.g. municipalities and counties. It may also be observed in federal states like Germany, where federal government shares competences with states within the federation, which again delegates tasks and burdens to lower levels of administration.

Complex systems of public administration seem embodied in the public sector of most countries. The motivation behind such aspirations to decentralize in real life may be many. Two theoretical arguments have been stated in the literature. One builds on a Tiebout economy. Following Tiebout (1956), individuals will respond to the decentralization of tasks and burdens related to the public provision of local public goods and services by voting with their feet. Mobile consumers will move towards the areas offering the task-burden package fitting best to their preferences. Given there are a large number of communities, i.e. variation in the task-burden relationship, the mobility of individuals may replace the invisible hand of private markets. Mobility has in the Tiebout economy solved for the problems of public goods stated by Samuelson (1954), i.e. external effects of consuming public goods. The purity of the Tiebout economy in solving such problems has though been disputed in e.g. Bewley (1981), arguing that the Tiebout economy implies assumptions that essentially transform the local public good into a private good.

The other theoretical motivation is the decentralization theorem of Oates; see e.g. Oates (1999). Decentralizing the task of providing public goods and services renders at least as high welfare as centralized provision, given there are not cost savings from centralization and no externalities in the provision of local authorities. This argument does not build on strong assumptions of mobile individuals but states precise conditions under which decentralization does at least as well as centralized provision.

These theoretical arguments are closely related to the presence of tax competition in decentralized systems. Tax competition will curtail Leviathan states, which adds to the efficiency of the administrative system, as argued in Rauscher (1997). Local authorities compete to do the job more effectively by trimming their organization and thereby collect fewer taxes. Tax competition has though been argued to imply problems in terms of providing the socially optimal level of public goods and services. Competition may make financing public goods and services that correct for market imperfections impossible and will thereby reduce welfare. A counterargument can be found in Schmidt (1999), arguing that divisible tax objects in the presence of local risks will not only respond to spatial differences in tax levels in optimising the mean-variance trade off in the return.

These kinds of arguments must be seen as essential to any analysis of the geo-administrative structure of any government. Still, the implementation of decentralized government in most states takes a number of more complex structures, which are important in respect to the benefits and drawbacks of decentralizing tasks and burdens. Here, the issue of decentralized the burdens in public provision will be in focus. The gains from decentralized provision may seem straightforward in the absence of spatial externalities and economies to scale in provision, but local financing of local public provision of goods and services will add new important aspects to be included in the overall balance. Evidence from the Danish multi-level geo-administrative system points to extensive incentive distortions embodied in the financing schemes.

The paper has five sections. The following section offers a short review on some of the arguments from the literature on incentive problems from financing schemes in multi-level governance. Section 3 takes a closer look at the Danish system and offers an example of how intergovernmental financing systems may take very complex forms and leave the agents¹ in a principal-agent relationship with distorted incentives. Section 4 presents the empirical evidence on the presence of such distortions in Denmark using a two-step estimation procedure based on non-parametric estimation method and panel estimation methods. The last section summarizes.

2. Multi-level governance – strategic interaction and incentive distortions

Most geo-administrative systems are in some way structured in several levels with each their specific spatial jurisdiction with respect to specific tasks and burdens. The basic question is, what kind of incentive problems may result from such decentralization and delegation in a multi-level geo-administrative system? A useful point of departure in laying out incentive problems is a principle of decentralization. The economic responsibility, i.e. the burden, should be decentralized to the level determining the extent of local public provision, i.e. the task. This should prevent free rider problems that may occur if individuals in some jurisdiction contribute to the financing of service levels in other jurisdictions. If such co-financing were to occur, this would imply serious incentive problems. Imposing this principle will eliminate

¹ Using the principal-agent literature on the subject, the agent would be the lower levels in the geo-administrative system, while the principal would be the central government.

some of the strategic issues in multi-level governance, but it may introduce others. Decentralized burdens will introduce the issue of tax competition. What remains is how to deal with tax competition. One approach is through a proper tax assignment. Another approach is to design an intergovernmental transfer scheme. A system of transfers between local governments and between central government and local government may be designed such as to counter distortions occurring from the decentralization of tax collection. In sense, the question is how to patch up incentive problems associated with tax competition in a geo-administrative system?

It is well known from the literature on optimal taxes, that the best tax objects are objects that are in inelastic supplied in the local economy. The ideal tax objects are accordingly rather immobile assets like property. This does not seem to be a viable route to solve the problems of strategic interaction in a multi-level system of governance, as one rather consistently observes comparably high rates of e.g. income taxes as compared to taxes on property in most developed countries. The overall financing of geo-administrative systems may be designed such as to tax sources that are in inelastic supply from the point of view of the central government, while in elastic supply at the local level. This argument would indicate a need for reforms, especially in a globalized economy that questions the first premise of the argument.

The problems associated with tax competition may also be mitigated through a set of intergovernmental transfers. Can transfers between local administrative levels or transfers between central government and local government be designed to counter such problems? The answer is affirmative. Intergovernmental transfers can be used to counter the distortions from decentralization of non-benefit taxes, i.e. taxes on externalities from strategic behaviour, see Gordon (1983). These transfers are basically to be understood as Pigouvian taxes inducing the local policy-makers to internalise the spill-over on other jurisdictions. Transfers are as such corrective taxes. Intergovernmental transfers are conditional and the central government finances a share of the expenditure of lower levels of government.

Intergovernmental transfers may have other objectives than countering distortions from strategic interaction. They may reflect an attempt to obtain fiscal equalization. This may also reflect mobility. As mobile households segregate into areas inhabited

by households of similar taste and preferences, a concentration of wealthy households in some jurisdictions and a concentration of poor households in others may occur². In this type of equilibrium, the central government may want to redistribute resources from wealthy to poor jurisdictions on grounds of equity, i.e. there would be a fiscal gap between jurisdictions.

The arguments pursued until now implicitly assumes, that central government decentralizes tasks and successively acts as an arbitrator to prevent distortions. In a more elaborate set-up, where (public) goods are provided by local authorities and national authorities simultaneously and financed from taxing the same tax base, the analysis is more diverse. This diversity occurs due to a number of other reasons for the presence of a fiscal gap. The trade-offs between the gains from decentralizing the provision goods, i.e. the decentralization theorem, and the problems of e.g. tax competition from decentralizing tax collection also points to the existence of a fiscal gap. Collecting taxes should be pursued at higher levels in the geo-administrative system, whereas the provision of (public goods) should be pursued at the lower levels³. These situations are analysed in a number of articles, e.g. Boadway and Keen (1996) and Boadway and Flatters (1982). The basic problem in these models is that several levels in the public administration have the same tax base.

Boadway and Keen (1996) includes a number of mechanisms that are central to a discussion of centralization versus decentralization. The starting point is a common tax base (labour) for different levels in the geo-administrative system. Tax objects are twofold. Units of labour are both taxed by the local and national governments distorting labour supply. A 100 percent tax is furthermore levied on rents (profits) and is shared by the local and national governments according to some fixed exogenous factor. This leads to a potential vertical⁴ externality, as increasing tax rates at one

²One outcome would be that the wealthy jurisdictions have a higher provision (and quality) of the local (public) good, which will be the case if it is a normal good. Free mobility may make such an equilibrium unstable, although this need not be the case, see Besley and Coate (1991).

³At present, the potential problems that such a strategy may be conducive to the problems of economic responsibility are ignored.

⁴In addition to the usual horizontal externalities that occur due to tax competition.

level of the geo-administrative system may have adverse effects on the tax revenue of other levels. The negative effects of local tax increases on the federal tax revenue is not internalised by local governments, why federal tax rates may turn out to be negative to counter this externalities. This may imply both a negative federal tax rate and a negative fiscal gap.

The externality occurs due to distortions to the labour supply. Local taxes distort local labour supply, which reduces the tax revenue of the federal government. Another effect originates from the taxation of rents. Increases in local government taxes will distort the labour supply, which results in a reduction in rents. A share of these rents enters the tax revenue of the federal government, why federal tax revenues are reduced⁵. A lack of ability or unwillingness to internalise these effects in the optimal policies within the geo-administrative system leads to a lower marginal cost of public funding for the local authorities relative to a first-best unitary policy. This will tend to increase the activity in terms of taxes at lower administrative levels.

What is the optimal policy for the central government given these externalities? The central government can basically consider two kinds of options. It can either collect revenue from taxes on labour. Incentives with respect to the common tax base at lower levels of the administrative system must then be internalised. It can alternatively let the local authorities collect taxes, and finance the central public good through intergovernmental transfers - in sense, the central government lets the lower levels do the unpleasant job of collecting taxes⁶. The more obvious policy implication of the analysis is a transfer of funds towards the jurisdiction - or in this case the level of government in the geo-administrative system - with the highest marginal cost of public funding. Due to the distortionary effects of taxes and the lack of internalisation of these at the different administrative levels, there may be significant differences in the marginal cost of public funding at the different levels of the system.

⁵Note, that the local government only internalises the adverse effects on local tax revenues from reduced tax revenues from profits - which is a fixed share of the profits.

⁶The arguments presented here are though not motivated by such political considerations, but are based on pure efficiency arguments. In a political economy set-up, one may conjecture, that certain types of equilibria in Boadway and Keen (1996) are unstable.

Although temptingly simple, this will not in general hold. Intergovernmental transfer influence the taxes rates set by local governments and thereby the extent of the vertical externality. As the central government adjusts its transfer-policy, the states will simultaneously adjust their tax policy. The vertical externality changes - local authorities internalise the transfers they receive or have to pass on to the national government, though without internalising the effect of changes in the local tax rate on the central governments tax revenue. This will change the relative differences in marginal costs of public funding at the different administrative levels and thereby the extent of the optimal transfer. These two effects may point in two directions with respect to the optimal transfer chosen by the central government. The size and magnitude of the fiscal gap will therefore be ambiguous.

There is no easy way out of efficiency problems from tax competition. As the mechanisms in Boadway and Keen (1996) should indicate, intergovernmental transfers need neither be such a solution. Setting up geo-administrative systems may in general imply several pitfalls that have to be taken into account. Changes in the role of the central government may accordingly trigger off such mechanisms that may not improve on efficiency, why there is a warrant for carefulness. It would therefore be important to obtain some empirical evidence on the functioning of geo-administrative systems with intergovernmental transfers.

It should finally be noted, that this short review on the rich literature on fiscal federalism is by no means exhausting. There may be other mechanisms of importance, see e.g. Nechyba (1996) for an analysis in a CGE set-up. It should have indicated some of the problems present when designing intergovernmental transfers in a geo-administrative system. Before turning to the empirical evidence on the extent of distortions in the Danish geo-administrative system, a short review on the practicalities in respect to decentralized financing in Denmark will be offered, so as to facilitate a better understanding between the theoretical arguments and the actual observable distortions in the Danish geo-administrative system.

3. Decentralizing financing in Denmark

Denmark has a longstanding tradition of decentralization within the context of a unitary state. This makes it an interesting case, as it embodies both the desire of a central government to have a strong influence on overall policy development at the

national level and in the regions, while decentralizing both tasks and burdens. It should therefore embody the kinds of problems inherent in a decentralized system with modest geographies and within geographies with an overall homogenous population⁷. The financing of the public sector in Denmark does to a large extent depend on income taxes. In 1997 the share of revenues from income taxes was 46 percent, while VAT as the second most important source had a share of only 17 percent⁸. For municipalities, the most important source of financing was in 1997 again income taxes with a total share of 78 percent of total revenues. The second most important source of revenues for municipalities was transfers, which represented 15 percent of total revenues⁹. Income taxes are accordingly important to all levels in the geo-administrative system in Denmark and increasingly so as one moves downwards in the administrative system. As such, the Danish geo-administrative system should be subject to the incentive problems laid out in the previous section on multi-level government, as several levels depend on the same tax base.

Decentralized tasks and burdens has been a long withstanding characteristic of the Danish federal system. Since a major reform of the geo-administrative system in 1970¹⁰, tasks have gradually been decentralized and burdens have to a large extent followed. Municipalities and counties should ideally finance their own activities by levying taxes. At a first glance, the implied decentralization of fiscal policies does seem impressive. Not only were municipalities and counties given autonomy with respect to a wide range of tasks to be pursued by the public sector, they were also given autonomy to finance these activities by fixing income taxes. This indicates a considerable decentralization of fiscal policies and public regulation. This has lead to a comparably large autonomy and spread in tax rates across Danish municipalities and counties.

⁷ The diversity in language, culture and identity is considered rather modest.

⁸ The data required to do these calculations can be found in "Statistiske Efterretninger: Nationalregnskab, offentlige finanser og betalingsbalancen 1998:23" published by Statistics Denmark.

⁹ The source for the later calculations is "Statistiske Efterretninger: Nationalregnskab, offentlige finanser og betalingsbalance: 1998:11" published by Statistics Denmark.

¹⁰ The reform initiated in 1970 (Kommunalreformen) lead to a drastic reduction in the number of municipalities and counties. This was seen as facilitating an increased ability to pursue tasks in public provision and the accompanying burdens at the lower levels of the geo-administrative system.

Income taxes set by municipalities range from 15.5 percent to 22.8 percent in the year 2000, a difference of 7.3 percentage-points. The corresponding difference for the sum of county and municipality income tax percentages is 8.3 percentage-points ranging from 26.5 percent to 34.8 percent. The difference therefore becomes wider as the income taxes levied by counties are included. Although tax rates vary, it should be stressed that the central government attempts to counter large tax increases at the lower levels of the geo-administrative system. An annual agreement between central government, LGDK and Danish Regions¹¹ imposes an upper bound on the increases of the average tax rate across all municipalities and counties. Tax rates may accordingly develop differently across municipalities and counties but with the restriction of an aggregate bound on the average tax increase. Tax rates do not give the full picture with respect to decentralized financing in Denmark. A set of compensation schemes is also of crucial importance.

In terms of compensation schemes, the Danish system embodies both a set of vertical¹² and a set of horizontal¹³ compensation schemes¹⁴. The vertical compensation schemes reflect the desire to decentralize tasks by the central government. The transfers are as a starting point determined according to the municipalities or counties share of the total tax base of the previous year. This sum is adjusted through three principles – the extended principle of aggregate balance¹⁵, a budget warranty scheme¹⁶ and an adjustment according to the changes in prices and wages. The first principle of adjustment compensates the lower levels of the geo-administrative system for tasks that have been decentralized during the year. The second principle of adjustment concerns the risk associated with the in tax bases. Counties and municipalities can choose either to apply budget procedures that are based on a tax base guaranteed by the central government or it can choose to apply budget procedures based on a decentralized tax base estimate¹⁷. Vertical transfers are

¹¹ LGDK represents the Danish municipalities and Danish Regions represents the Danish counties.

¹² Bloktilskud

¹³ Mellekommunale udligningsordning

¹⁴ For an elaborate exposition in Danish on the different schemes see e.g. Indenrigsministeriet (2001a), Indenrigsministeriet (2001b), Indenrigs- og sundhedsministeriet (2003a) and Indenrigs- og sundhedsministeriet (2003b).

¹⁵ DUT – Det Udvidede Totalbalanceprincip.

¹⁶ Budgetgarantiordningen.

¹⁷ In the first case, the Ministry of the Interior forecasts the tax base of each county or municipality using the tax base of the previous years and a common discount rate. If the actual tax base was to

furthermore adjusted to accommodate general price and wage increases in the society. Apart from these three types of adjustments, municipalities with a very moderate tax base will receive a minor additional adjustment and there exists some reimbursements on specific expenditures delegated to the lower levels of the geo-administrative system. These vertical transfers are in general neutral in terms of the redistribution of funds in between municipalities.

The horizontal transfers are on the other hand leads to a high degree of redistribution. This scheme is to ensure sufficient revenues to counties and municipalities with a weak tax base as compared with the expenditure requirements. The horizontal transfer scheme attempts to alleviate such inequalities in the revenue-expenditure relationship. It consists of two types of transfers. One transfer relates to the differences in needs. It removes revenues from municipalities with moderate needs measured by some objective criteria and transfers funds to municipalities with needs above the average. The transfer is determined by computing the average cost structure across all municipalities corrected with 1) a 7.5 mill. DKK fixed expense¹⁸; 2) the age structure in the municipality relative to the national average and 3) the social structure in the municipality relative to the national average. These corrected expenses are compared to the average expenses across all municipalities, and the transfer is 45 percent of the difference and an additional transfer of 40 percent of the difference within the metropolitan area. The transfer is therefore independent of the actual expenses of a given municipality, but takes its starting point in the average expenses across all municipalities and corrects with respect to a number of measures that in the short-term lies beyond the influence of the individual municipality, e.g. the share of 7-16 years old. This emphasis on objective criteria must be interpreted as an attempt to prevent distortionary effects of the transfer.

Redistribution in-between municipalities furthermore include horizontal transfers motivated by differences in the tax base. The tax base of Danish municipalities consists of the income generated by residents and the taxation of some kinds of property. Differences in the average tax base across all municipalities and the tax base of a given municipality is reduced through a transfer of 40 percent of the difference.

deviate from the guaranteed, the counties or municipalities will either make payments to or receive payments from the central government.

¹⁸ This base allowance should benefit the small municipalities.

Municipalities with very low tax bases - below 90 percent of the average tax base - are given a transfer of 45 percent of the difference, such that there is progression in the transfer scheme. The municipalities in the metropolitan area are subject to additional redistribution. Any variation in the tax base of the 50 municipalities in the metropolitan area is reduced by an additional transfer of 40 percent of the differences within the metropolitan area. There is accordingly an extensive horizontal redistribution motivated by differences in the tax base. These transfers may be expected to result in considerable distortions. To counter some of these distortions, there is an additional rule ensuring an increase in the post-transfer tax base of at least 10 pct. of the increase in the pre-transfer tax base for a given municipality.

The Danish multi-level geo-administrative system consists of a number of delegations and compensation schemes that lead to a number of incentive problems. One is the very pure effect of decentralizing the collection of taxes. This in itself leads to a number of incentive problems as described in section 2. The vertical transfers should add to these distortions in the form of externalities, as described in e.g. the contributions of Boadway and Keen (1996). Several levels in the geo-administrative system have joint tax bases, as central government, counties and municipalities all collect taxes from labour income. The vertical transfers of the Danish geo-administrative system does to a lesser extent reflect the desire to prevent such distortions but reflects the desire to adjust for the fiscal gap occurring from an extensive delegation of tasks to lower levels that is not matched by a complete autonomy to set tax rates. The horizontal transfer scheme should also lead to incentive problems. The transfer scheme has characteristics that are similar to a progressive income tax scheme on personal income and should embody some of the same distortions to behaviour. Having focussed on the details of the financing of the Danish geo-administrative system, what remains is to present evidence on the distortions occurring from this rather complicated system¹⁹.

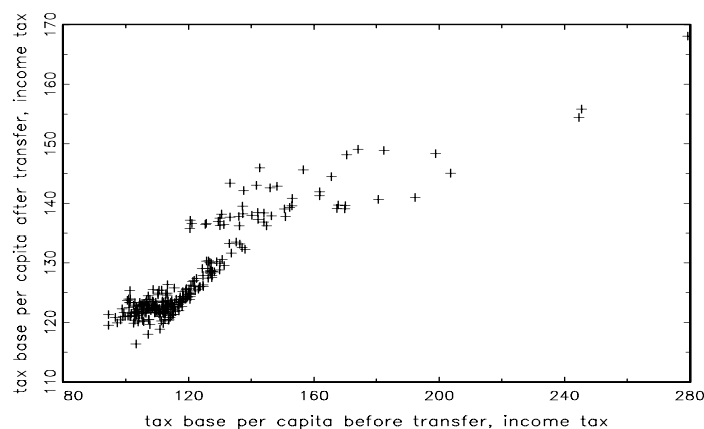
¹⁹ It may be mentioned, that the system in terms financing also incorporates some restrictions on the lending of the lower levels of the geo-administrative system. There are also restrictions on sell-and-lease-back constructions. These details will though be of secondary importance to the strategic interaction in the geo-administrative system.

4. Does Decentralization and Transfers Schemes Produce Incentive Distortions?

Is there any evidence of incentive distortions in the Danish geo-administrative system? The present section provides evidence of such incentive distortions through an empirical analysis of the outcomes of the intergovernmental transfer scheme in Denmark. It will initially be necessary to recognize, that the functional relationships reflecting incentive distortions may take many forms. In this sense, it will be necessary to use flexible empirical methods in the analysis, see e.g. Horowitz (1998) for an excellent exposition on non-parametric and semi-parametric estimation methods. These methods have the advantage of not superimposing strong assumptions on the functional relationship, while on the other hand facing the problem of a graphical presentation of the results, which reduces the dimensionality of the analysis.

The previous section laid out the richness of the inter-governmental transfers present in the Danish geo-administrative system. From the theoretical discussions, one may expect such transfers to lead to incentive problems. These problems should be reflected in the relationship between pre-transfer and post-transfer tax bases at the lower levels of the geo-administrative system. Figure 1 presents a cross plot between the per capita income tax base before transfers and after transfers. The data in figure 1 is the cross plot for 2002.

Figure 1: Tax base of Danish municipalities before and after transfers 2002



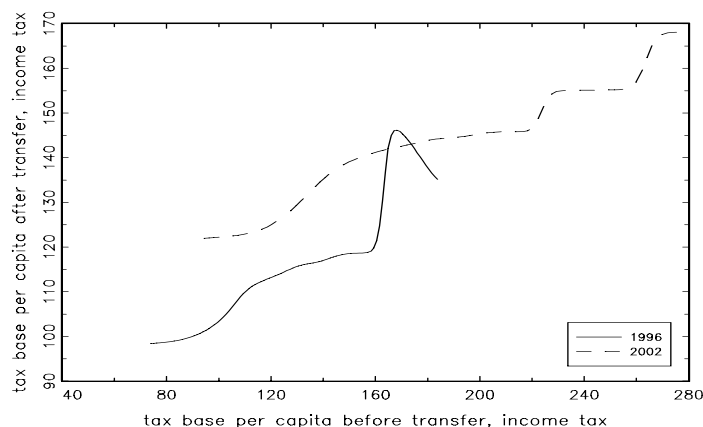
Source: The Danish Ministry of the Interior, Kommunale Nøgletal 2003

An inspection of figure 1 indicates the problems present in extensive redistribution schemes in geo-administrative systems. Problems parallel those occurring from taxation in labour markets may also be relevant in multi-level governance situations. Most types of tax schemes do lead to incentive problems, as they make agents in principle-agent relationships “misbehave” in some manner. Progressive taxation on labour income may e.g. lead to incentive problems due to the reduced return from increased efforts. Some of these arguments may also be relevant for the implicit taxation of municipalities in a multi-level geo-administrative system. The Danish system of intergovernmental transfers reflects some of the problems parallel to the incentive problems in labour markets. Figure 1 illustrates, that for the municipalities with the very lowest per capita tax bases before transfers, increasing the before transfer tax base does lead to quite considerable increases in the after transfer tax base. For this group of municipalities, there would seem to be few incentive problems in terms of incentives to promote growth in the per capita tax base. At and around 125.000-130.000 DKK, this relationship between the before and after transfer tax base seems to come to a halt. For a group of mid-range municipalities, not only does the redistribution scheme of inter-governmental transfers reduce the tax base after transfers relative to the tax base before transfers, but any attempt to increase the tax base before transfers leads to virtually no increases in the tax base after transfers. This should lead to incentive problem within the transfer scheme. For municipalities with a high tax bases before transfers, there is also a considerable reduction to the tax base after transfers, but there are indications that increasing the tax base before transfers does render some of the gains to the high-end municipalities.

Taking figure 1 at face value, the geo-administrative systems in Denmark with its extensive redistribution between municipalities may be expected to result in important incentive problems. It should though be noted, that figure 1 only is a cross-plot for the year 2002. The extent to which such incentive problems are stable across time would also be of interest. To facilitate an analysis of the changes in structure of the incentive problems, the non-parametric estimation of non-linear structures as displayed in figure 1 can be used, see Horowitz (1998) or Horowitz and Lee (2002) for a methodological introduction. Using these methods, one can extract a functional relationship, which can be illustrated graphically. Using the Nadaraya-Watson method

to perform the nonparametric estimations²⁰, the following relationship between the per capita tax base before and after transfers is found for the years 1996 and 2002.

Figure 2: Tax base of Danish municipalities before and after transfers 1996/2002



Source: The Danish Ministry of the Interior, Kommunale Nøgletal 2003

Using these estimates on the relationship between the per capita tax base of Danish municipalities before and after transfers, it seems clear that the relationship changes over time. One aspect is the more compressed curve in 1996 relative to 2002. The variance in the per capita tax base before transfers has increased, leading to a corresponding increase in the per capita tax base after transfers. The second aspect concerns the slope of the curves. As the estimation methods is sensitive to the choice of bandwidth, one should be careful not to interpret the changes in the slope to harshly. Still, there is a tendency for the 1996 curve to be positively sloping over larger parts of the support than the 2002 curve. The 2002 curve has relatively long stretches with a moderate slope as compare to the 1996 curve. This will be interpreted as reflecting changes in the incentives present in the transfer schemes between the different municipalities.

²⁰ As specified in Koning (1996) based in Silvermann (1986) and Härdle (1990). The kernel used under the estimation procedures was the Gaussian kernel and the bandwidth to define the smoothness for the nonparametric estimation was:

$$h = \frac{0.9 \min(s, IQR / 1.34)}{n^{1/5}}$$

where h is the bandwidth, s is the sample standard deviation, IQR is the inter-quartile range of the data points and n is the sample size. The results in figure 2 are based on a bandwidth twice h to get sufficiently smooth functions. Alternatively the estimation procedure attempts to capture more details in the data, resulting in a very non-smooth function.

Figure 2 indicates the importance of considering the distortions originating from the intergovernmental transfer scheme. The changing functional forms in figure 2 results from one of two factors. It may reflect changes in the objective criteria defining eligibility for a given municipality. It may also reflect changes in the incentive structure present in the transfer scheme. The first factor would be in accordance with the policy aims and do not represent incentive distortions, while the later factor does reflect incentive distortions. To get a more accurate impression of the importance of these factors, it will be necessary to turn to multivariate analysis. Considering the structure of the data including both a cross section and a time series dimension, the panel estimation methods will be used to allow for any possible unobserved heterogeneity among the municipalities. The present analysis will only consider the time period from 1996 and onwards, as the Danish intergovernmental transfer scheme in between municipalities was changed significantly from 1995 to 1996. Any comparison of figures before and after 1996 calls for caution.

Using multivariate analysis allows for several covariates. These variables may be chosen using different approaches. One approach would be to include actual expense variables on a number of specific variables measuring the socio-economic structure in the different municipalities. This would leave the analysis very close to the actual calculations of the intergovernmental transfers. It would furthermore internalize productivity differences in the cost structure across Danish municipalities. Given the subject of analysis is the distortion from intergovernmental transfers, which may result in these productivity differentials, such an approach does not seem appropriate in an explicit analysis of distortions in the transfer scheme.

An alternative approach will be used here. This approach includes structural measures on a number of policy areas, where the Danish municipalities have important decentralized tasks to pursue. These tasks can be laid out into the following seven areas: 1) labour markets, 2) housing, 3) schooling, 4) child care, 5) care for the elderly, 6) integration of immigrants (refugees) and 7) social assistance. For each of these seven areas, the analysis will use one or more covariates to determine whether the variation in these variables explain the observable variation in the outcome of the intergovernmental transfer scheme.

The issue of an appropriate estimation strategy is furthermore of importance. Given the diverse functional relationship between the per capita tax base before and after transfers, it would be tempting to use non-linear estimation methods to capture such a relationship²¹. In the present context, the aim is though to focus on the distortions originate from the transfer scheme. Such distortions would not be identifiable using traditional non-linear methods. The present analysis accordingly uses a two-step approach. The first step identifies the distortions in terms of non-linearity and constructs a measure for this non-linearity. Two measures will be offered in the first step. One measure is defined as the slope of the curves in figure 2 evaluated at each observed per capita tax base before transfers (SLOPEINC). This slope would indicate what is to be gained for the municipality from a marginal increase in the per capita tax base before transfers. The other measure takes its point of departure in the OLS regression between the per capita tax base before and after transfers. The observed deviation from the OLS-line is interpreted as a measure of the distortions implicit in the transfer scheme (DIFFINC). The OLS-line is interpreted as the policy aim in terms of redistribution. A 45-degree line could have been used instead, although this would have implied the absence of redistribution in the policy aims of the transfer scheme. The OLS-line is interpreted as the politically accepted trade off between redistribution and distortions²². Any deviation from the “OLS-policy” must originate from non-intended distortions in the system. Each of the two measures – SLOPEINC and DIFFINC - is calculated for a given municipality in a given year. The second measure (DIFFINC) is based on the OLS-line for a given year.

The second step performs the panel estimation and includes a number of structural measures for the seven types of tasks pursued by Danish municipalities and the two measures for the distortion (SLOPEINC/DIFFINC) as covariates. Data is available for the period 1996-2002 for 275 Danish municipalities. The data was collected from the database Indenrigsministeriet (2003c) that contains a number of indicators on the activities and structure of the Danish municipalities. Table A1 in the appendix summarizes the measures used in the panel regressions.

²¹ E.g. ML-estimation of a non-linear functional form.

²² The OLS-line may be interpreted as the minimum distortion redistribution scheme, as linear schemes will in most cases distort the least amongst the set of redistribution schemes.

The analysis will use panel estimation methods that controls for unobserved heterogeneity not captured by the covariates. One of the troublesome issues when using panel data estimation methods concerns the proper specification of the unobservable individual heterogeneity. What is the structure of the unobservable heterogeneity and how should it be specified so that it is uncorrelated with the observable covariates²³? Unobserved heterogeneity can be modeled through a number of alternative specifications. The two most commonly used are the fixed effects models and the random effects models. The first model assumes that the unobservable heterogeneity can be captured by a non-stochastic term specific to the individual, while the other assumes that it can be captured by a stochastic term with iid properties. There are obviously a number of extensions to these models, see e.g. chapter 14 and 15 in Greene (2000) or Baltagi (1995). The modeling approach used to obtain the present results, initially compares the fixed effects with the random effects specification. It then compares the best of these models with the results from a model allowing a more general specification of the stochastic nature of the unobservable heterogeneity.

The analysis is conditional on the observations of 275 Danish municipalities. The endogenous variable in the estimations will be the per capita tax base after transfers in a given municipality, as this indicates the outcome of the transfer scheme. The model may therefore be specified as:

$$TBAT_{it} = \alpha + TBBT_{it} + S_{it}\beta_1 + D_{it}\beta_2 + \mu_i + v_{it} \quad (1)$$

Where $TBAT_{it}$ is the per capita tax base after transfers of the i^{th} municipality at time t , α is the intercept, $TBBT_{it}$ is the per capita tax base before transfers, S_{it} is a matrix of structural indicators within the seven groups of tasks performed by Danish municipalities, D_{it} is one of the two distortion measures SLOPEINC or DIFFINC, μ_i is the individual unobservable effect for each municipality and v_{it} is the remainder error term. This equation attempts to explain how the per capita tax base after

²³ If the unobservable heterogeneity turns out to be correlated with the observable covariates in the model, this results in a misspecification that would reduce the significance of the parameter estimates for the observable covariates.

transfers is determined and if the distortions measured by the non-linearity in the relation between the pre and after transfer tax base has any explanatory power, i.e. does the non-linearity of the system matter for the outcome of the transfer scheme, when controlling for the structure of the municipality. The equation therefore extends the analysis in figure 1 and 2.

A fixed effects specification assumes that μ_i is a fixed constant for each municipality, while the random effects specification is obtained by assuming that μ_i is stochastic with iid properties²⁴. The estimation results for the random effects specification will not be shown²⁵, but comparing the two models using a Breusch-Pagan test rejects the absence of individual effects and a Hausman test rejects that the random effects term and the observable covariates in the random effects specification are orthogonal. The later supports the fixed effects specification, as the random effects specification assumes orthogonal covariates relative to the random effects term. The Breusch-Pagan test rejects a simple OLS specification. This overall lends itself to the fixed effects specification.

A more general specification of the unobservable individual effects may furthermore be proposed, such that the unobservable heterogeneity is captured in the covariance matrix of the error terms rather than by an additive term in the model specification. The estimated model has the following specification:

$$TBAT_{it} = \alpha + TBBT_{it} + S_{it}\beta_1 + D_{it}\beta_2 + v_{it} \quad (2)$$

The error term v_{it} will represent a generalization in two respects. One concerns the autoregressive structure of the error terms, which allows for a more general specification in the time dimension of the data, i.e. a first-order panel specific autoregressive error terms specification with a dynamic error term structure of $v_{it} = \rho_i v_{it-1} + \varepsilon_{it}$. This introduces a dynamic structure into the model, where error terms depend on previous realizations. It furthermore introduces heterogeneity through the autoregressive parameter that is specific to the municipality. The other

²⁴ I.e. $E(\mu_i)=0$, $E(\mu_i^2)=\sigma_{\mu}^2$, $E(v_{it}\mu_i)=0$ and $E(\mu_i\mu_j)=0$. The structure of v_{it} is for both specifications $E(v_{it})=0$, $E(v_{it}^2)=\sigma_{v_{it}}^2$ and $E(v_{it}v_{jt})=0$.

²⁵ For reference, the result from the estimation of the fixed effect model can be found in appendix A2 together with the Breusch-Pagan and Hausman test statistics.

extension concerns heterogeneity in the cross-sectional dimension. The error term ε_{it} will be allowed to have a variance term that is specific to the municipality, i.e. the temporal variance-covariance matrix will have the specification²⁶:

$$\begin{bmatrix} \sigma_1^2 I & 0 & \cdot & \cdot & \cdot & \cdot & 0 \\ 0 & \sigma_2^2 & \cdot & \cdot & \cdot & \cdot & 0 \\ \cdot & \cdot & \cdot & & & & \\ \cdot & \cdot & & \cdot & & & \cdot \\ \cdot & \cdot & & & \cdot & & \\ \cdot & \cdot & & & & \cdot & \\ 0 & 0 & \cdot & \cdot & \cdot & \cdot & \sigma_{275}^2 I \end{bmatrix} \quad (3)$$

Estimating this type of model can be done through the use of GLS estimation. As the parameters of the error terms structure are unknown, it will be necessary to use FGLS. Three sets of estimations will be presented. A benchmark model will exclude the distortion measures defined previously but will include a “level” variable indicating the per capita tax base before transfers (TBBT). The second set of models will include both the level variable in the form of per capita tax base before transfers and one of the two distortion measures. Finally, a set of models will exclude the level variable but include one of the two distortion variables. Table 1 summarizes the findings from such estimations.

The parameter estimates in table 1 are in general remarkably significant. This is so for both the measures of distortions and the measures of tasks pursued by Danish municipalities. Comparing the estimation results in table 1 with the estimation results in table A2 indicates that the significance of the parameters of the covariates depends on the stochastic specification of the unobservable heterogeneity. More covariates have insignificant parameter estimates in the fixed effects model (table A2) than in the model with autocorrelation and heterogeneity in the variance-covariance structure (table 1). The later model specification will be preferred here, as the possibility of a collinear relationship between the unobservable individual effects in the fixed effects model with the observable covariates may be the cause of the insignificant parameter estimates in table A2.

²⁶ The properties of ε_{it} are in general $E(\varepsilon_{it})=0$, $E(\varepsilon_{it}^2)=\sigma_i^2$ and $E(\varepsilon_{it}\varepsilon_{js})=0$

Table 1: Models with first-order panel specific autocorrelation and heterogeneity

	Model 1 Benchmark	Model 2 Level + Distortion #1	Model 3 Level + Distortion #2	Model 4 Distortion #1	Model 5 Distortion #2
TBBT	0.379 (52.51)**	0.381 (52.57)**	0.396 (91.51)**		
SLOPEINC		10.301 (2.60)**		29.554 (4.73)**	
DIFFINC			9.564 (67.03)**		8.803 (33.66)**
SH0-6	-6.699 (9.19)**	-5.916 (8.24)**	-2.474 (4.70)**	-13.110 (10.59)**	-7.005 (6.24)**
SH7-16	12.042 (19.61)**	12.922 (19.37)**	11.943 (29.65)**	10.445 (11.99)**	10.419 (13.27)**
SH66+	0.400 (1.40)	0.971 (3.05)**	3.857 (15.59)**	1.192 (1.98)*	5.285 (10.71)**
SHUNEMP	-0.281 (0.67)	-0.242 (0.56)	0.339 (1.06)	-1.766 (2.84)**	-1.488 (2.42)*
SHACLAB	-5.128 (5.57)**	-4.979 (5.28)**	-4.783 (7.46)**	-13.421 (11.16)**	-15.719 (14.44)**
SHNOVOC	-3.709 (15.11)**	-3.622 (14.56)**	-1.509 (9.77)**	-6.693 (18.22)**	-5.527 (16.89)**
SHHEDU	-4.085 (15.02)**	-3.962 (14.17)**	-1.867 (11.24)**	0.884 (2.14)*	1.210 (3.17)**
HOUSALLOW	0.786 (2.06)*	0.811 (2.13)*	2.160 (9.12)**	-0.156 (0.31)	2.704 (5.88)**
CLASSIZE	-0.687 (2.15)*	-0.693 (2.11)*	0.145 (0.65)	2.890 (6.62)**	2.896 (6.72)**
LIBLEND	-0.598 (5.18)**	-0.632 (5.28)**	-0.442 (5.86)**	-1.307 (6.67)**	-0.330 (2.22)*
CAP0-2	0.648 (8.15)**	0.644 (7.69)**	0.718 (14.10)**	0.264 (2.37)*	0.446 (4.50)**
CAP3-5	0.150 (1.69)	0.134 (1.50)	0.560 (8.52)**	0.606 (5.13)**	0.853 (8.09)**
CAP6-9	-0.211 (4.24)**	-0.209 (4.17)**	-0.149 (4.46)**	-0.023 (0.31)	0.194 (3.17)**
CAPELD	0.475 (2.40)*	0.431 (2.24)*	-1.213 (7.59)**	-2.836 (8.96)**	-4.909 (16.77)**
ASYLUM	-0.009 (1.36)	-0.007 (1.27)	-0.015 (2.41)*	-0.036 (3.78)**	-0.025 (2.25)*
FOERTID	-1.315 (3.68)**	-1.278 (3.45)**	-0.866 (2.86)**	-7.990 (12.13)**	-7.287 (11.34)**
KONTHJ	3.383 (8.75)**	3.352 (8.66)**	2.469 (9.61)**	3.126 (6.35)**	2.084 (4.56)**
CONSTANT	739.109 (30.82)**	705.485 (27.94)**	472.359 (29.68)**	1,220.925 (36.87)**	1,017.091 (38.54)**
Observations/# of id	1512/237	1512/237	1512/237	1512/237	1512/237

Notes: The t-statistics can be found in the parenthesis. Significant estimates are indicated with an * for 5 percent levels and ** for 10 percent levels. The reduction in the number of panels in the panel data estimations from 275 to 237 has two origins. The data is not balanced, as there are not observations for the variables CLASSIZE, LIBLEND and CAPELD for all municipalities and for all years. In eight instances, this furthermore results in to few observations to estimate an autoregressive model.

Focusing on the parameter estimates in table 1, the redistribution within the Danish system of intergovernmental transfers becomes clear. A marginal increase of the before transfer tax base by one Danish krone will others being equal only lead to an increase of the after transfer tax base of little under 0.4 Danish kroner. The sizeable redistribution within the transfers system should lead to incentive problems. This is

very much so. Being located at a point in the transfer scheme where one of the two incentive measures takes a high value leads to a higher return from a marginal increase in the before transfer tax base in terms of the after transfer tax base. Controlling for other factors of relevance to the transfer scheme, i.e. unobservable heterogeneity and the observable structure within the municipalities, it remains a result that incentive structures within the transfer scheme is of importance. Being located at a steep part of the transfer scheme will make it more attractive to perform well in terms of increasing the before transfer tax base. Furthermore, being located at a point of the transfer scheme with a large positive divergence between the actual outcome of the transfer scheme and the linear outcome will also contribute to the incentive to perform well. The reverse is the case in the case of large negative divergences from the linear outcome. It may be noted, that the effect of the incentive measures are stabile with regards to the exclusion of the before transfer tax base in the estimation model. These results support the idea that the exact shaping of the transfer schemes will be of importance to the economic performance of local geo-administrative entities in Denmark. It is of vital importance for the economic performance, how transfer schemes are planned and implemented. Municipalities located on the flat parts of the transfer scheme should be expected to be less eager to build the economic base through e.g. service packages to firms located or to be located in the municipality or a high productivity offering high public service levels at moderate tax costs, both of which may build and increase the per capita tax base of the municipality.

Another result can be taken from the parameter estimates in table 1. Most of the included covariates in the analysis attempt to measure some real expenditure requirements, i.e. they are not the actual expenditure on a given activity pursued by the municipality but a measure for the eligibility to receive services from Danish municipalities. Given this nature of the covariates, the signs of the parameter estimates do surprise in a consistent manner. Controlling for the size of the before transfer tax base, the incentive structure and the other covariates, an increase in the share of children of age 0 to 6 years does not materialize into an actual increase in the after transfer tax base. Similar results are obtained for a number of other covariates. This indicates that the aggregate outcome of the transfer scheme deviates considerably from the policy aim of redistribution from municipalities with a low

demand pressure to municipalities with a high demand pressure. Mixing different objectives such as compensation for demographic structures and differences in the gross (before transfer) per capita tax base will therefore most likely result in a second best outcome. The transfer scheme may not only lead to distortions from the embedded incentive problems, but it may furthermore miss its policy aims of compensating for the demographic differences across different regions and municipalities. Designing transfer schemes will therefore be an important tool in both providing growth potentials and in making adequate compensations for the difference in demographic structures.

5. Discussion

Theory predicts the presence of incentive problems embedded in inter-governmental transfer schemes. Sharing tax bases across different tax jurisdictions will lead to incentive problems in much the same way that income taxes will on labour. The results in this paper on the Danish system of inter-governmental transfers confirm these problems. Transfer schemes will in themselves create incentive problems. Furthermore, mixing different policy aims into the same system of transfers will endanger the coherence between goals and outcomes. These results point to transfer schemes that obey the “one goal – one instrument” rule. This in sense follows the idea of Boadway and Keen and Boadway and Flatters. Deviating from such design principles may question the whole purpose of the transfer scheme. The transfer scheme may not reach its overall policy aim because endogenous mechanisms may exist connecting the different policy aims of the schemes that bring the outcome further away from the overall policy aim. This may be reflected in the result from the Danish intergovernmental transfer scheme. It may be a goal to compensate for the differences in demographic characteristics, but this may contribute to the distortions in an intergovernmental transfer schemes that redistribute moneys from wealthy to poor municipalities.

So what is the design of an “optimal” transfer scheme? This clearly depends on the extent of national policies upon which the intergovernmental transfer scheme is based. Pronounced national policies within the field of regional inequality will lead to a different outcome, relative to the situation with less pronounced policies. Delegation will imply a dependence on the local or regional potential for economic and social

development, while facilitating the gains from decentralization according to the ideas of Oates. In a strongly stylized argument, delegation to lower levels of the geo-administrative structure should therefore only be pursued in a scenario where the national policies accept regional inequality or the efficiency losses from intergovernmental transfer schemes. It may in that respect be noted, that in the later scenario, reaching the policy aim of reducing regional inequality will depend on the design of the transfer scheme. The result from the Danish transfer scheme points to potential pitfalls in reaching such aims. It may be the target of transfer schemes to reduce regional inequality, but if designed wrongly the systems may work against its targets. Incentive problems may lead municipalities at different stages of the economic and social development to emphasize the importance of promoting economic growth differently.

Finally, the results of the paper calls for a continual process of adapting transfer schemes to the policy aims at the national and local level. Given the relative importance attached by national and local policies to regional inequality, the exact design of the transfer scheme should continually be adjusted. This is the case in Denmark, where the present intergovernmental transfer scheme has come under an increasing political pressure. It seems that both national and local policies have shifted in respect to the weighting of policy objectives. The design of the future transfer scheme should therefore be interesting to observe. It remains an issue that equity comes at a cost when dealing with municipalities as economic agents.

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Appendix

Table A1: The seven main tasks of Danish Municipalities

<i>The tasks/demographics</i>	<i>The measures</i>
Demographics	Share of 0 to 6 years old in the population (SH0-6), Share of 7 to 16 years old in the population (SH7-16), Share of 66+ years in the population (SH66+)
Labour markets	Share of 25 to 64 years old without vocational education (SHNOVOC), Share of 25 to 64 years old with higher education (SHHEDU), Share of 17 to 66 years old that are full time unemployed (SHUNEMP), Share of 17 to 66 years old in active labour market schemes (SHACLAB)
Housing	Number of housing allowance receivers per 100 households (HOUSALLOW)
Schooling	Average class size (CLASSIZE), library use in the form of lending's per capita (LIBLEND)
Child care	Child care capacity per 0 to 2 years old (CAP0-2), Child care capacity per 3 to 5 years old (CAP3-5), Child care capacity per 6 to 9 years old (CAP6-9)
Care for the elderly	Capacity at homes for the elderly per 100 of age 67 years or more (CAPELD)
Integration of immigrants	Asylum applications per 10.000 residents (ASYLUM)
Social Assistance	Number of persons receiving early retirement allowances (førtidspension) per 100 persons of age 17 to 66 years old (FOERTID), Number of persons receiving social assistance (kontanthjælp) per 100 persons of age 17 to 66 years old (KONTHJ)

Table A2: Fixed effects models with iid errors

	Model 1 Benchmark	Model 2 Level + Distortion #1	Model 3 Level + Distortion #2	Model 4 Distortion #1	Model 5 Distortion #2
TBBT	0.189 (11.12)**	0.195 (11.30)**	0.361 (28.43)**		
SLOPEINC		-16.134 (1.95)		-0.622 (0.07)	
DIFFINC			10.677 (36.81)**		7.647 (22.12)**
SH0-6	-11.952 (4.97)**	-11.671 (4.85)**	-11.379 (6.82)**	-9.137 (3.63)**	-6.921 (3.25)**
SH7-16	16.013 (6.72)**	15.470 (6.46)**	4.588 (2.73)**	20.596 (8.35)**	15.417 (7.35)**
SH66+	3.361 (1.74)	3.186 (1.65)	1.877 (1.40)	8.206 (4.15)**	10.294 (6.13)**
SHUNEMP	-3.251 (2.88)**	-3.090 (2.73)**	3.708 (4.60)**	-3.795 (3.20)**	0.826 (0.81)
SHACLAB	-4.345 (2.59)**	-4.593 (2.74)**	-4.455 (3.83)**	-6.202 (3.54)**	-7.468 (5.04)**
SHNOVOC	-4.470 (5.73)**	-4.386 (5.62)**	-7.115 (13.04)**	-5.132 (6.30)**	-7.461 (10.67)**
SHHEDU	9.231 (5.25)**	9.312 (5.30)**	4.441 (3.62)**	15.977 (9.20)**	16.911 (11.51)**
HOUSALLOW	2.145 (1.27)	2.382 (1.41)	3.766 (3.21)**	2.536 (1.43)	3.936 (2.61)**
CLASSIZE	-1.331 (1.76)	-1.338 (1.77)	-1.009 (1.92)	-1.718 (2.17)*	-1.737 (2.59)**
LIBLEND	0.193 (0.52)	0.213 (0.57)	0.598 (2.31)*	0.143 (0.36)	0.399 (1.20)
CAP0-2	0.142 (0.83)	0.189 (1.09)	0.272 (2.28)*	0.123 (0.68)	0.202 (1.32)
CAP3-5	0.376 (2.12)*	0.381 (2.15)*	0.421 (3.42)**	0.468 (2.52)*	0.559 (3.54)**
CAP6-9	-0.289 (3.00)**	-0.286 (2.97)**	-0.157 (2.35)*	-0.298 (2.95)**	-0.210 (2.45)*
CAPELD	-1.195 (1.97)*	-1.181 (1.95)	-1.186 (2.82)**	-1.463 (2.30)*	-1.631 (3.03)**
ASYLUM	0.006 (0.30)	0.005 (0.27)	-0.005 (0.37)	-0.003 (0.15)	-0.016 (0.95)
FOERTID	0.252 (0.14)	0.202 (0.11)	1.828 (1.41)	-1.374 (0.71)	-1.295 (0.78)
KONTHJ	4.424 (5.26)**	4.649 (5.48)**	4.854 (8.32)**	3.054 (3.48)**	2.460 (3.32)**
CONSTANT	725.191 (10.30)**	719.963 (10.23)**	784.148 (16.04)**	720.903 (9.76)**	760.682 (12.14)**
Observations/# of id	1520/245	1520/245	1520/245	1520/245	1520/245
R-squared	0.76	0.76	0.88	0.73	0.81
Breusch-Pagan test ($\sigma_{\mu}^2=0$)	934.3**	909.9**	31.86**	2087.8**	1724.0**
Hausman	204.4**	337.5**	589.1**	797.6**	539.7**

Notes: The t-statistics can be found in the parenthesis. Significant estimates are indicated with an * for 5 percent levels and ** for 10 percent levels. The panel is unbalanced. The reduction in the number of panels in the panel data from 275 to 245 is caused by the absence of observations for the variables CLASSIZE, LIBLEND and CAPELD for some municipalities and for some years.