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# ESSAYS ON FINNISH MUNICIPAL FINANCE AND INTERGOVERNMENTAL GRANTS

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**Abstract:** This PhD thesis is a collection of studies on Finnish municipal expenditures, revenues and intergovernmental grants. The main purpose of the study was to analyse the municipal expenditure variation between the matching grants system and the formula based grants system. The aim was also to analyse the expenditure effect of grants compared to that of taxable incomes and to reveal possible causal interrelationships between municipalities' revenues and expenditures.

The first chapter introduces the theoretical aspects of local government finance. The second chapter analyses municipal expenditures using economic and demographic factors as explanatory variables. Chapter three analyses the effect of non-institutional care on municipalities' elderly care expenditures and Finnish Social Security Institution expenditures. Chapter four examines the inter-temporal causal links between municipal own source revenue and spending decisions. Chapter five analyses the same causal links in subsections of municipalities, formed using population and economic condition as criteria.

**Key words: Grant reform, municipal expenditure variation, causality between municipal revenues and expenditures**

**Tiivistelmä** Väitöskirja koostuu Suomen kuntien menoja ja valtionosuusjärjestelmää käsittelevistä tutkimuksista. Tutkimusten tavoitteena on analysoida kuntien menojen vaihteluun vaikuttavia tekijöitä kustannussidonnaisen ja laskennallisen valtionosuusjärjestelmän aikana. Tarkoitus on myös verrata valtionosuuksien ja yksityisen verotettavan tulon välisiä menovaikutuksia sekä selvittää kuntien kokonaismenojen ja tulojen välistä ajallista riippuvuutta.

Väitöskirjan ensimmäinen luku on johdatus paikallistalouden analyysin teorioihin. Toisessa luvussa analysoidaan kuntien menojen vaihtelua käyttäen useita taloudellisia ja demograafisia muuttujia selittävinä tekijöinä. Kolmannessa luvussa selvitetään avohuollon yleistymisen vaikutuksia kuntien vanhustenhuollon menoihin sekä Kansaneläkelaitoksen menoihin. Neljännessä luvussa tarkastellaan kuntien kokonaismenojen, omien tulojen, valtionosuuksien ja lainanoton välistä ajallista riippuvuutta. Viidennessä luvussa laajennetaan luvussa neljä esitelty analyysi koskemaan kuntaryhmiä, jotka on muodostettu käyttäen asukaslukua ja taloudellista liikkumavaraa.

**Asiasanat: Valtionosuusuudistus, kuntien menoihin vaikuttavat tekijät, kuntien menojen ja tulojen välinen ajallinen riippuvuus**

# Foreword

Finnish municipal sector is presently divided into 448 municipalities that vary considerably with respect to tax base, population size, age structure and industrial structure. Although the municipalities in Finland act as independent organisations solving local problems, they are also closely integrated in the welfare state providing welfare services under strict national guidelines. Municipalities' responsibilities extend from allocation functions such as schools and health care to redistributive welfare services like income support. Therefore, municipalities form an important part of our public sector.

All municipalities irrespective of size, location or financial situation have the same service responsibilities. Therefore, the central government part-finances the municipal output through the grant system that consists of sectoral grants and revenue sharing.

The discussion about municipalities' financial situation and their service responsibilities is very intensive in Finland at the moment. It seems that a growing number of municipalities are being stretched to their limits when fulfilling their tasks. In some cases, the municipalities' capability to deliver stable basic services has been seriously questioned.

The decision-makers in municipal and central state level need more information about the factors behind the municipal expenditure variation and the effects of different policy measures on municipalities. For this purpose, this thesis is a welcome addition to the relatively unstudied area of public finance in Finland. I hope that it will be followed by increased research interest in this field.

Helsinki, October 2002

Reino Hjerppe

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Antti Moisio

# Yhteenveto

Suomessa kunnat ja kuntayhtymät vastaavat valtaosasta julkisen sektorin perus-palvelutuotannosta. Kuntasektori tuottaa ja järjestää mm. perus- ja erikoisterveydenhuollon, sosiaalitoimen ja opetus- ja kulttuuritoimen palvelut. Kuntien toiminnan laajuutta Suomessa konkretisoi esimerkiksi se, että kuntasektorin osuus kaikista julkisista kulutus- ja investointimenoista vuonna 1999 oli noin kaksi kolmasosaa.

Kuntatalouden kehitystä 1980-luvulta 1990-luvun loppuun voidaan sanoa vuoristoratamaiseksi. Pitkään jatkunut suotuisa taloudellinen kehitys katkesi 1990-luvun alun syvään lamaan, josta kuitenkin jo vuosikymmenen lopulla oli kokonaisuutena toivuttu. Keskimääräinen kehitys kätkee kuitenkin taakseen huomattavat kuntakohtaiset erot.

Kuntien valtionosuusjärjestelmä uudistettiin perusteellisesti vuonna 1993. Tällöin luovuttiin kustannussidonnaisista tehtäväkohtaisista valtionosuuksista ja otettiin käyttöön laskennalliset korvamerkitsemättömät valtionosuudet. Samalla kuntien toimintavapaus kasvoi, koska valtion ohjausta ja kontrollia vähennettiin. Kuntien toimintavapautta lisättiin myös vuonna 1995 toteutetulla Kuntalain uudistuksella. Valtionosuusjärjestelmää tarkistettiin vielä vuonna 1997, mutta tuolloin oli kyse huomattavasti pienemmästä muutoksesta.

Vuonna 1993 aloitettiin myös valtion rahoitusvaikeuksista johtuvat kuntien valtionosuuksien leikkaukset. Edellä kuvatut reformit, talouslama ja valtionosuus-leikkaukset aiheuttivat yhdessä huomattavan kuntien toiminnan tehostumisen, kun mittarina käytetään tuotettuja palveluja ja niihin kulutettua rahamäärää.

Väitöskirjan tavoitteena on tutkia kuntien menojen vaihteluun vaikuttavia tekijöitä ja kuntien menojen ja tulojen välistä ajallista riippuvuutta kahta erilaista valtionosuusajanjaksoa vertaillen. Väitöskirja jakautuu neljään erilliseen tutkimukseen ja johdantolukuun.

Ensimmäisessä tutkimuksessa selvitetään kuntien menojen vaihteluun vaikuttavia tekijöitä vuosina 1985 – 1992 ja 1993 – 1999. Erilliset periodit kuvaavat vuoteen 1993 saakka käytössä ollutta kustannussidonnaisen valtionosuusjärjestelmän ajanjaksoa ja nykyistä laskennallisen valtionosuusjärjestelmän aikakautta. Selvityksen kohteena on seitsemän menoluokkaa: kokonaiskäyttömenot, sosiaali- ja terveystoimi, opetus- ja kulttuuritoimi, yleishallinto, kirjastot, peruskoulut ja lukiot. Menoihin vaikuttavina tekijöinä testataan tulo- ja hintamuuttujia, työttömyysastetta, poliittisia voimasuhteita, taajama-astetta, ikärakennetta ja muuttoliikettä. Tutkimustulosten mukaan kustannussidonnaiset valtionosuudet olivat 1980-luvun lopulla menettäneet osan tehostaan, sillä korkeammasta hinta-subventiosta huolimatta kunnat vähensivät joitakin menojaan. Erityisesti näin

näyttää olleen opetus- ja kulttuuritoimessa, jossa kunnat alkoivat vähentää menojaan pian 1980-luvun puolivälin jälkeen hintasubvention jatkumisesta huolimatta. Tästä poikkeuksen teki sosiaali- ja terveystoimi, jossa hintasubventio lisäsi kunnan menoja. Näyttääkin siltä, että jo hyvissä ajoin ennen lama-aikaa kunnat alkoivat siirtää resursseja opetustoimesta sosiaali- ja terveystoimeen. Laskennallisen valtionosuusjärjestelmän ajanjaksosta havaittiin, että valtionosuuksilla on selvästi verotettavia tuloja suurempi vaikutus kuntien menoihin. Esimerkiksi 100 markkaa valtionosuutta aiheuttaa opetus- ja kulttuuritoimessa n. 40 mk lisäkulutuksen, kun taas 100 mk lisää asukaskohtaista verotettavaa tuloa aiheuttaa vain 2 mk menojen lisäyksen. Samansuuntaiset tulokset saatiin myös kokonaiskäyttömenojen kohdalla, jossa valtionosuudella havaittiin neljä kertaa suurempi vaikutus kuin verotettavalla tulolla. Sosiaali- ja terveystoimessa valtionosuuden vaikutus oli viisinkertainen verrattuna verotettavaan tuloon. Saatu tulos on samansuuntainen muissa maissa saatujen tulosten kanssa.

Toisessa tutkimuksessa tarkastellaan 1990-luvulla voimakkaasti yleistyneen vanhusten avohuollon vaikutusta kuntien ja Kansaneläkelaitoksen menoihin. Analysoitava ajanjakso on 1994 – 1997. Tutkimustulosten mukaan kunnat ovat avohuoltoistamisen avulla onnistuneet säästämään vanhustenhuoltoon liittyviä menojaan vuonna 1997 arviolta 61 – 83 miljoonaa markkaa. Samaan aikaan Kansaneläkelaitoksen menot ovat kasvaneet 7 – 31 miljoonaa markkaa. Kokonaistason säästö on tällöin ollut n. 30 – 76 miljoonaa markkaa.

Kolmannessa tutkimuksessa tarkastellaan Manner-Suomen kuntien kokonaismenojen, omien tulojen, valtionosuuksien ja lainanoton välistä ajallista riippuvuutta. Tutkimuksen lähtökohtana on neljä julkisia menoja ja tuloja koskevaa hypoteesia:

a) ”verota ja kuluta” -hypoteesin mukaan julkiset menot sopeutuvat aina kerättyihin verotuloihin, eli jonakin vuonna saadut tavallista korkeammat verotulot tulevat lähes poikkeuksetta kulutetuiksi, eikä niitä hyvitetä esimerkiksi alempien verojen muodossa veronmaksajille. Toisaalta hypoteesin mukainen käyttäytyminen voi johtua siitä, että varaudutaan myöhempien aikojen kasvaviin menoihin keräämällä rahastoja.
b) ”kuluta ja verota” -hypoteesin mukaan menopäätös tapahtuu ennen verotuspäätöstä. Tämä on mahdollista esimerkiksi silloin, kun jokin ennalta arvaamaton tilanne aiheuttaa lisäyksen menoissa. Tällöin jouduttaisiin kiristämään verotusta, jos muita menoja ei voitaisi nopeasti vähentää, eikä velkaantuminen olisi mahdollista. Toisaalta hypoteesin mukainen tulos voi johtua yksinkertaisesti vain siitä, että tapana on aina ensin lisätä menoja ja vasta tämän jälkeen kiristää verotusta. Tällöin päättäjät asettavat veronmaksajat aina menojen lisäyksissä ”tapahtuneen tosiasian” eteen.
c) ”menojen ja verotuksen välillä on kaksisuuntainen yhteys” - hypoteesin mukaan budjetin meno- ja tulopuoliin liittyviä päätöksiä ei voida erottaa toisistaan. Molemmat vaikuttavat toisiinsa.

d) ”meno- ja tulopäätöksillä ei ole lainkaan yhteyttä keskenään” -hypoteesi perustuu väitteeseen, että julkinen valta ei kykenisi lainkaan koordinoimaan talouttaan.

Tutkimuksessa havaitaan, että nykyisin kuntien meno- ja tulopäätösten välillä on kaksisuuntainen yhteys, kun taas ennen vuotta 1993 vallinneen kustannussidonnaisen valtionosuusjärjestelmän aikana kunnat kasvattivat ensin menojaan ja päättivät vasta tämän jälkeen verotuloistaan. Lisäksi havaitaan, että vaikka valtionosuuksien rooli rahoituksessa on pienentynyt, voidaan valtionavuilla silti edelleen vaikuttaa kuntien menokäyttäytymiseen.

Tutkimuksessa käytettyä menetelmää on aiemmin toisissa tutkimuksissa sovellettu kunta-aineistoihin USA:ssa ja Ruotsissa. Tulokset ovat menojen ja verotuksen välisten yhteyksien osalta kahdessa Pohjoismaassa saman suuntaisia, mutta tämä tutkimus tuo lisätietoa mm. kuntien velkaantumiseen liittyvästä käyttäytymisestä. Velkaantumisen osalta havaitaan, että kunnat ovat Suomessa 1990-luvun jälkipuoliskolla supistaneet lainojaan ennen kaikkea menoleikkausten, eivät niinkään kasvaneiden verotulojen ansiosta.

Neljännessä tutkimuksessa laajennetaan edellä kuvattu analyysi koskemaan kuntakoon (asukasluku) ja taloudellisen liikkumavaran perusteella jaettuja kuntaryhmiä. Kuntakoon vaikutuksen testaamista varten kunnat jaettiin neljään yhtä suureen ryhmään, joissa pienimmät 109 kuntaa muodostivat oman ryhmänsä, seuraavaksi suurimmat oman ryhmänsä ja niin edelleen aina neljännen ryhmän muodostaviin suurimpiin 109 kuntaan saakka. Taloudellisen liikkumavaran[1] perusteella samaten kunnat jaettiin neljään yhtä suureen ryhmään. Lopuksi luotiin vielä ristikkäiset kuntaryhmät, joista ensimmäisessä olivat pienet ja taloudellisesti heikot ja toisessa ääripäässä suuret ja taloudellisesti vahvat kunnat.

Tutkimuksen päätulosten mukaan kuntaryhmien välillä on selkeitä eroja taloudellisessa päätöksenteossa. Asukasluvultaan suuret kunnat poikkesivat pienistä kunnista erityisesti vanhan valtionosuusjärjestelmän aikana. Suuret kunnat ovat myös eniten muuttaneet toimintatapaansa siirryttäessä uuteen valtionosuusjärjestelmään. Taloudellinen päätöksenteko on muuttunut varovaisemmaksi, erityisesti asukaskooltaan keskimääräistä suuremmissa kunnissa. Tästä syystä merkittävät kuntiin kohdistuvat toimenpiteet kannattaisi suunnitella siten, että kuntien erot huomioitaisiin.

[1] Taloudellinen liikkumavara määritettiin tutkimusta varten neljän talousindikaattorin perusteella. Käytetyt mittarit olivat: veroprosentti, veroäyrien määrä per asukas, vuosikate ja vakavaraisuus (omavaraisuus).

# Contents

# 1. Introduction

## 1.1 Background

The public sector in Finland grew rapidly in 1970s and 1980s. For example, the government consumption per GDP grew from 19 % in 1970 to 23 % in 1990. Because of deep recession in the beginning of 1990s, the share grew as high as 25 % in 1992. Since that the share has continually diminished so that it had lowered to 21 % in 1999.

A major role in the growth of public sector was played by the municipal sector. This was because primarily the education, social welfare and health care services were increased and the bulk of these services are provided by the municipalities. To emphasise the importance of municipal sector in Finland, it is sufficient to note that in 1999 the share of municipal sector of total public sector consumption and labour force was roughly two thirds. Moreover, every fifth employee in Finland worked for a municipality in 1999.

In 1999 there were 452 municipalities in Finland whose socio-economic and political characteristics varied a great deal. Also the expenditures per capita varied considerably among the municipalities. Expenditure differences may arise from variance in various factors. For instance, some of the expenditure differences may be explained by substantial economies of scale or by income differences between the municipalities. Need factors such as morbidity and unemployment may also be behind some differences. Furthermore, differences in the political powers of municipal councils may have some effect. In addition, the incentives and norms created by central government may explain some of the municipal expenditure variation.

The discussion about municipal differences raise several questions. For example, is it possible to econometrically analyse the expenditure variation using variables describing the municipal incomes and demographic characteristics? What is the expenditure effect of different grants compared to that of taxable incomes? More importantly, is it possible to use such results to design the economic policy concerning municipalities?

Despite the considerable importance of the municipal sector in the total public sector, the economic research on municipal expenditures and local budgetary behaviour in general has been rare in Finland. This is true especially compared to other Nordic countries where the research on local government matters has been intensive (see e.g. Rattsø 1998). This thesis is an attempt to fill part of that gap.

## 1.2 Theoretical framework

### 1.2.1 The role of local governments in public sector

According to Musgrave (1959) the public sector has three basic functions: stabilisation, distribution and allocation. By guaranteeing economic stability the government can maintain stable levels of employment, prices and economic growth in general. It has been stated that of the three functions mentioned, the stabilisation function (both the fiscal and monetary operations) most clearly belongs to central level concerns. This is because the local level is too open and has too little power over prices and employment for any fiscal policy to be effective (Fisher, 1996, 27). For example, lowering taxes or giving cash grants to residents in one local jurisdiction to increase production in that area is almost certainly doomed to fail because the effects of increased consumption would leak to other areas. On the other hand, for example in Nordic countries the localities are important intermediaries for society's stabilisation policies. There are automatic mechanisms such as poverty schemes at local level that work counter-cyclically. In times of recession, the local governments borrow to finance their budgets and during economic expansion they may save into "rainy days" funds. On the other hand, municipalities also need to raise their tax rates to finance increased expenditures during recessions. All in all, the municipalities are not totally left outside of the stabilisation policy operations but their role in this function is quite small compared to central government.

Both central and local government can have a role in the allocation of resources. If the society wants to provide certain goods to the people that the private markets do not produce efficiently then there is a case for public provision. The remaining question is then which public service or good should be produced at the local and which at the central level. Some goods, like national defence, are more naturally provided by state. Others, like fire brigade, are usually locally provided goods. Much depends on which level can provide the good more economically. In his well known book called "Fiscal Federalism", Wallace Oates (1972, 35) writes:

> "For a public good – the consumption of which is defined over geographical subsets of the total population, and for which the cost of providing each level of output of the good in each jurisdiction are the same for the central or the respective local government – it will always be more efficient (or at least as efficient) for local governments to provide Pareto-efficient levels of output for their respective jurisdictions than for the central government to provide any specified and uniform level of output across all jurisdictions."

What Oates (1972) is saying in what he calls the "Decentralisation Theorem" is that goods should be provided as close as possible to the consumers if the cost of

the production is the same for the upper and lower levels of government. Of course, at this point new questions arise, such as how many municipalities are needed? How many levels of government are needed? If, for instance, the utility of some good is leaking from one municipality's area into other municipalities' residents, then the provider municipality may under-produce the good from the society's point of view. This problem can be solved for instance by moving the decision-making of the good's provision into higher level or alternatively giving grants to the providing municipality to cover its losses (Rubinfeld, 1987, 630 - 631). Also, if some municipality can export taxes, then grants or tax base equalisation funding to municipalities who are tax importers could be one solution to the municipal revenue inequality problem.

Finally, the redistribution of resources can be seen mainly as the central level function. It may be too hard a task for a single municipality to redistribute resources from rich to poor people. If some municipality would try this, it would probably cause the poor to in-migrate and rich to out-migrate from this municipality. That could result into lower than optimal redistribution from the society's point of view (Rubinfeld, 1987, 628). In practice, however, it seems that sometimes the local level does carry out redistributive operations as well. Oates (1994) has pointed out that in small scale it is possible to redistribute even locally, because local situation can be better taken into account.

The issue concerning which level of government should produce and provide services is related to the economic meaning of federalism. Oates (1972) claims that in economic terms, most if not all countries are federal. Here he separates himself from the political scientists who have a much narrower criteria for federalism. According to Oates (1972, 17), if a country has a central level and a local level who make decisions about the levels of services provided in their jurisdiction, then the country is federal. It does not matter if the central level has delegated some of the decision-making to local level as long as the local preferences determine the actual levels of services.

The main point that Oates (1972) makes about the decentralised systems is that defined as above the federal system is the most efficient one when it comes to providing public goods. An ideal system would combine the advantages of state wide public goods provision and decentralised local provision and avoid the shortcomings of each. In this perfect case, each level of government would perform the functions that it can do best. The problem of defining the most suitable level of government for each public good is one of the topics that is analysed in local government economics (see e.g. Bailey, 1999; Fisher, 1996).

### 1.2.2 Demand for local public goods and services

Until the end of 1960s most of the empirical research on local government expenditures had concentrated on estimating models like :

(1) $$EXP = \beta_0 + \beta_1 I + \beta_2 A + \beta_3 SES + u$$

where EXP is the local expenditures, I the aggregate community income, A the intergovernmental aid (all in per-capita form). In addition, SES denotes for several socio-economic variables and u the normally distributed error term. These studies have been called the "Community preference models" or "Determinants studies" (Inman, 1979; Wildasin, 1986).

Municipalities with higher per-capita income, larger fiscal bases, greater unemployment, more extensive urbanisation and higher intergovernmental grants were found to spend more on public services. Most studies found grant estimates to be statistically significant and greater than 1 (Inman, 1979, 272). In other words, one extra money unit of grants would cause the expenditures to increase more than that. The main problem with the early studies was, as Inman points out, that the models were misspecified because of omitted variables and because the lump sum grants and matching grants were not separated. In most cases matching and lump sum grants were simply summed together for estimation purposes. In addition, the simultaneity of matching grants and local expenditures was ignored.

Later work showed that much of the above mentioned problems could be solved by more accurate modelling of the local budgetary process (Barr and Davis 1966, Henderson 1968). In the improved approach it was hypothesised that a municipality could be treated like a single household or a group of identical households (Wildasin 1986, 37). The municipality was assumed to act like a person who allocated his/her resources between private composite good x and public good Z. The starting point of the modelling was as follows. Voter i = 1,…,n in municipality k = 1, …, N was assumed to have a continuous and quasi-concave utility function of the form:

(2) $$u_{ik}(x_{ik}, z_{ik}),$$

where the utility function described each voter's preferences for private goods ($x_{ik}$) and local goods ($z_{ik}$) (see for instance Wildasin 1986, 46-47, Fisher 1996, 81). Each voter's personal budget consisted of private consumption and the share that the voter had to pay for municipality's budget:

(3) $$y_{ik} = px_{ik} + \tau_{ik} T_k,$$

where $y_{ik}$ is the before tax income of voter i, p is the price for composite private good (usually normalised to one for all municipalities), $\tau_{ik}$ is the tax share of

voter i[2] and $T_k$ is the total tax collected by municipality k. The municipality k has a budget that can be written as:

$$(4) \qquad (1-m_k)q_k z_k = T_k + L_k,$$

where $m_k$ is matching aid rate, $q_k$ is price for public good and $L_k$ is the per capita amount of lump sum grants received by the municipality. Solving (4) for $T_k$ and substituting into (3) gives the final budget constraint:

$$(5) \qquad y_{ik} + \tau_{ik}L_k = x_{ik} + \tau_{ik}(1-m_k)q_k z_k.$$

The interpretation of (5) in short is that the income of the voter consists of private after tax income ($y_{ik}$) plus his/her share of the lump sum grant received by the municipality ($\tau_{ik}L_k$). This total income ought to be equal to private expenditures ($x_{ik}$) plus the voter's share of the total public expenditure that has been subsidised by the central State ($\tau_{ik}(1-m_k)q_k z_k$).

The empirical work based on (5) usually estimated price and income elasticity parameters of local public expenditures so that the difference between separate grant types was taken into account. Like in (1), the empirical models usually also consisted of socio-economic and demographic variables such as age structure, population size, etc. However, more sophisticated approach to test the effect of municipal size – the congestion effect - was developed by Bergström and Goodman (1973). This model is described in more detail below (in page 7).

As was already mentioned, most models that were tested after the early "expenditure determination" models assumed that all inhabitants in the municipality had identical preferences. For example, the so called "Dominant Party" model, where the preferences of the municipality's manager are assumed to dictate the local budgetary decision-making, implicitly use this assumption (Inman 1979, 283-285; Wildasin 1986, 37-40; Fisher 1996, 87).

The assumption of identical preferences is closely connected with the Tiebout (1956) theory about voters "voting with their feet". In this theory, the voter mobility could lead to a situation where the residents in each municipality would have the same preferences for tax and service levels. More specifically, efficient provision of public goods could be achieved by residential mobility among competing municipalities. If there were many municipalities with differing tax/service levels, the voters could "shop" among the municipalities and choose the one that will give her/him the greatest utility. The important implication of Tiebout's theory was that by moving to another locality it would be possible to

[2] The tax share ($\tau_{ik}$) of the voter may be the same for everyone in the municipality, $(n_i)^{-1}$, or it could depend on the wealth of each voter. In practice, the tax shares of voters may also vary because of the tax deductions.

reveal the preferences of the voters. So a structure of many small municipalities could act as a decentralised pricing system that would generate an optimal amount of public goods (Fisher 1996, 104). Tiebout's assumptions include perfect information, mobility of voters, large number of municipalities and no benefit or tax spillovers. Tiebout also assumed that voters' mobility is not restricted by employment opportunities. These assumptions were meant to resemble as much as possible the assumptions behind the perfectly competitive market (Fisher 1996, 106).

The Tiebout model can be criticised for its assumptions but a more severe criticism concerns the outcome of the theory, namely the efficient amount of local public goods. If, for example, the local public goods are financed by proportional local income tax, then the voters in low income/lower spending municipalities could be better off when moving to high income/higher spending municipality. If this would happen, then people with different public service demands would enter the municipality and the amount of spending would no longer be the efficient amount (Fisher 1996, 110).[3]

Undoubtedly the best known model of local fiscal choice is the "median voter" model. It is based on political science theory about the majority voting equilibrium. The main hypothesis in this approach is that the determination of the level of public services is done by pairwise voting over a set of alternatives in a municipal referendum. The process then continues until some alternative cannot be defeated by any other alternative. It has been shown that if the preferences of the voters are single peaked, and if there is no strategic voting and the choices are one dimensional, then the voter with the median of the preferences will be the decisive one. This result is sometimes called the "Bowen equilibrium" because Bowen (1943) along with Black (1958) was the first to present the result. One of the advantages of the median voter model is that it allows one to analyse the local public expenditures using the preferences and budget constraint of a single individual. Moreover, this approach does not require the assumption of same preferences for everyone in the municipality.

A key problem with median voter models has been the identification of the median voter. Bergstrom and Goodman (1973) presented five conditions to solve this problem (Fisher, 1996, 83):

i) individual i's tax price in municipality j ($\tau_i q_j$) is constant elasticity functions of income $y_i$ ($\tau_i q_j = w y_i^{\xi}$), where w is a constant > 0 and $\xi$ is the elasticity of tax price with respect to income, also assumed > 0,

[3] The "minimum lot" -solution to this was presented by Hamilton (1975). In this case, the locality could prevent free riding by imposing limits to the in-migrants, for example by setting a minimum requirements for houses that are built in that municipality.

ii) all individuals have some form of demand for public goods, which depends only on that individual's tax price and income and which has constant price ($\delta$) and income ($\varepsilon$) elasticities,

iii) given the elasticities, $\varepsilon$, $\delta$ and $\xi$, it must never be that $\varepsilon + \delta\xi = 0$. In other words, when $\varepsilon + \delta\xi > 0$, then the demand rises with incomes and when $\varepsilon + \delta\xi < 0$ the demand falls with income. This ensures that the quantity demanded is a monotone function of income. If at some point $\varepsilon + \delta\xi = 0$, then the desired expenditure is either a U-shaped or inverted U-shaped function of income. This would mean that the median voter may not be the one with median income,

iv) all individuals vote in a majority vote based on their actual demand (no strategic voting),

v) the distribution of income for all population subgroups in any one community is proportional to the distribution of income for those subgroups in all other communities.

The key condition was the iii) where the income and preferences of the voters were tied together. If the demand of local public goods was to increase or decrease with income, then the person with median incomes would be the median voter.

In empirical studies based on median voter model local spending has been explained by median voter's tax price, median voter's income, municipality's population size and some socio-economic and demographic variables (Bergstrom and Goodman, 1973; Borcherding and Deacon, 1972). The demand for municipal public good was defined using Cobb-Douglas function as (Bergstrom and Goodman, 1973):

(6) $$cq^{\delta}\tau_i^{\delta}y_i^{\varepsilon}n_i^{\gamma(1+\delta)},$$

where c is constant, q is the unit price for public good, $\tau_i$ the tax share of the median voter, $\varepsilon$ and $\delta$ are income and price constant-elasticity parameters, $y_i$ is the median income, n is the population, $\gamma(1+\delta) = \alpha$ is the elasticity of demand with respect to population in a municipality. The effect of population included also the price-element because population size was assumed to influence the price of the local public good that entered the utility function. Bergstrom and Goodman (1973) then estimated a following function for U.S. municipalities:

(7) $$\ln E_i = c_i + \delta_i \ln \tau_i + \varepsilon_i \ln y_i + \alpha_i \ln(n_i) + \sum_{s=1}^{k} \beta_i l_i ,$$

where $E_i$ was the expenditures of the municipality i and l's consist of some socio-economic and demographic variables.[4] Borcherding and Deacon (1972) estimated a similar model except that they used per capita expenditures from U.S. State level and they assumed that each taxpayer bears a fixed per capita share of the tax burden, $(n_i)^{-1}$.

The main results from these studies were that local expenditures in general seemed to depend negatively on the tax price and positively on the income of the median voter. In addition, Bergstrom and Goodman (1973) found evidence for congestion so that when the size of the municipality reached certain limit, the local expenditures started to rise. Moreover, they found that renters voted for more public expenditures than house-owners and that people aged over 65 demanded more public services. Their results showed no statistically significant relationships between expenditures and mean household size, percent of population less than 18 years old or level of education.

Wildasin (1986) points out that the person with median income is not, in general, the median voter. As a result, one cannot presume that regression analysis of the model like (7) would always be justified. In general, the median voter model has been criticised for not describing the reality in municipalities. One of the best known alternative models is the so called bureaucracy model that is based on Niskanen's (1971) theory about the budget maximising behaviour of local bureaucrats. In this theory the bureaucrats have some control over the budget decision-making. This is in contrast to the assumption made in median voter model that the government is simply a tool that implements voters' preferences. According to the bureaucracy model the government officials have decisive power because they have more information than the voters. The information of the bureaucrats include information on the preferences of the voters and true amount of tax and grant revenues and cost of production. The bureaucrats can also control the voting agenda, i.e. they select the choices over which the voters vote (Romer and Rosenthal, 1979).

Romer and Rosenthal (1979) argued also that median voter model may suffer from so-called "multiple fallacy" or "fractile fallacy". Multiple fallacy means that the amount of public good Z selected in municipality may be merely positively correlated to the amount desired by median voter. For instance, if the actual Z is 80 % of the amount wanted by median voter, regression models like that in (7) will not identify this problem. In the "fractile fallacy" case, the municipality may choose to spend the amount desired by $60^{th}$ percentile voter instead of median voter's desired amount. This could occur, for example, if the voter participation rates differ with incomes.

[4] Bergstrom and Goodman (1973) assume uniform prices across municipalities. Therefore, in (7) q is affecting only the constant term $c_i$. Note also that they assumed $p = 1$.

Median voter models have also been criticised for ignoring the heterogeneity of the voters' preferences and incomes. For instance, Todò-Rovira (1991) used US city expenditure data to test a model that took the dispersion of incomes of the voters and progression of taxes into account. Todò-Rovira found, first, that income dispersion of the voters matters when explaining the local expenditures and second, that the quantity available of local public goods in each city is unlikely to be the median quantity demanded and especially, unlikely to be the quantity demanded by the individual with median income. In addition, Aronsson and Wikström (1996), using Swedish data, tested the median voter model against a general statistical alternative, finding no support for the superiority of median voter model.

Several alternative approaches to median voter model have been developed in order to take the local and central level politics better into account. Especially in Nordic countries[5] the researchers have based their work on the political economy of local government rather than median voter model. In general, these studies use local and central government political variables as explanatory variables to local government expenditures. These variables include share of socialists in local council, fragmentation of political structure of the local councils (Herfindahl-index) and measures of political strength (see e.g. Borge, 1995; Borge and Rattsø, 1997; Falch and Rattsø, 1997).

### 1.2.3 Local government finance

Municipalities finance their expenditures by own source revenues, grants received from upper level of government and loans. Own source revenues consist mainly of tax revenues, but also of user fees and other incomes such as interest incomes. There are several types of grants available, the main types being matching grants and lump sum grants. Municipalities borrow money usually to finance large investments but they may also borrow for their operational purposes, depending on the budget rules set in laws. In the following, the tax revenues and grants are discussed briefly.

#### Tax revenues

Generally, the need for municipal own source revenues is determined by the expenditures and the amount of grants received. In a simple budget framework, where the user fees are ignored, the residents of municipality k need to pay taxes that total $T_k = (1-m_k)q_k z_k - L_k$. The total tax payment will be divided by all taxpaying residents within that municipality. In case of proportional municipal income tax each taxpayer's share is the share of his or her tax base in the total tax base of the mu-

[5] In Nordic countries, the local government faces multidimensional decision-making, developed party systems and representative democracy.

nicipality. Similarly, in case of property tax the tax share is the share of property value per total property value in the municipality.

The fact that households and companies may move relatively easily from one municipality to another may create tax competition between municipalities. The effects of tax competition to municipal expenditure may be negative if municipalities fear that overtaxing would result in out-migration. This may cause the municipalities to under-produce the public goods (Wildasin 1986, 133-134).

Taxation in one municipality may also generate costs for non-residents if the municipalities are able to export taxes to other jurisdictions. Tax exporting may lower the effective marginal cost of local public goods and thus encourage municipalities to increase their spending inefficiently (Oates, 1972; Ladd, 1975). Wildasin (1986) points out that if the municipalities optimise their tax structure, then the marginal cost should be unaffected by tax exporting. But if the range of tax instruments for municipalities is restricted, then the marginal cost can be affected.

The existence of intertemporal decision-making in municipalities has also been studied, especially after the papers by Friedman (1978) and Barro (1979). Friedman (1978) suggested that governments do not behave intertemporally but that they rather respond passively to changes in their current resources. Friedman's point was that new tax revenues will simply lead to new spending, the so called "tax and spend" hypothesis. Barro (1979) made a completely different point by claiming that increased taxes and borrowing result from increased government spending, the "spend and tax" hypothesis. Both of these hypotheses are against the median voter model's assumption that the decisions about spending and taxation are made simultaneously.

The results of empirical studies on the dynamic interrelationships between local government expenditures, own source revenues and grants have been mixed. It seems that the results are largely dependent on country, time period and grant regime. For example, using annual US data for 171 municipal governments over the period 1972-80, Holtz-Eakin, Newey and Rosen (1989) found unidirectional causality from revenues[6] to expenditures. Dahlberg and Johansson (1998, 2000), using annual data for 265 Swedish municipalities over the time period 1974–87 found the opposite causal relation.

**Intergovernmental grants**

As can be seen from Figure 1, there are number of grant types that are available for central government's use. A *categorical grant* is given from State to a mu-

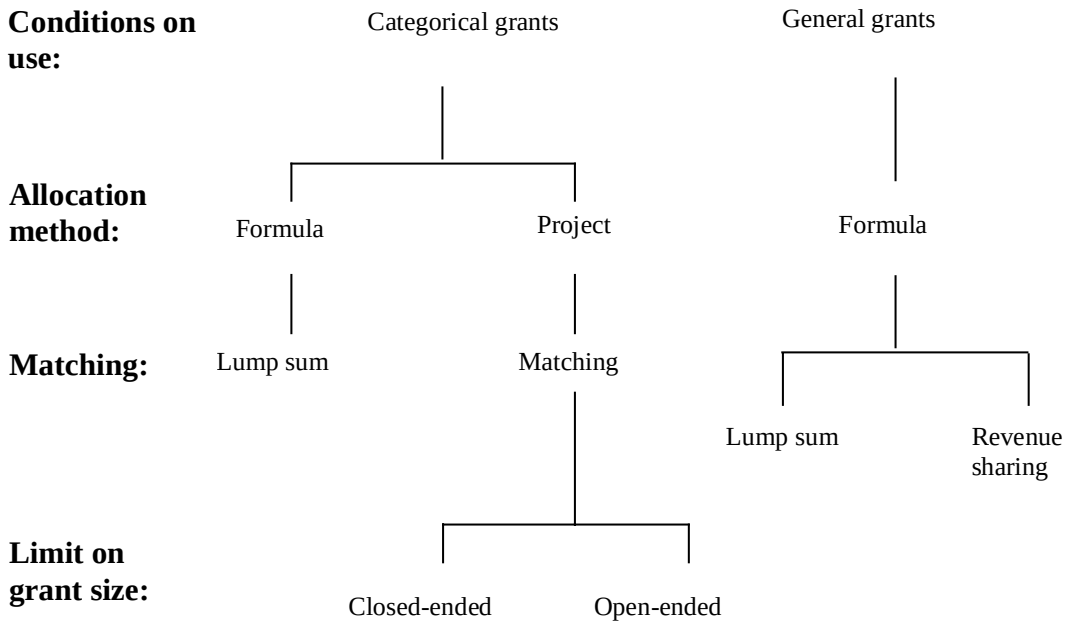
[6] In the causality analysis for local governments, the term "revenue" means just own source revenues and grants are treated separatedly.

nicipality for a specific purpose. In this case there are some conditions on the use of grant. In contrast, the *general grant* is given from State to municipality with no restrictions on its use.

The grants can be further classified as *formula* and *project* allocated grants. Categorical grants are usually allocated by both formula and project method but a general grant is mostly formula allocated. The grants allocated using formula method are given on the basis of some specific characteristics of the municipality. For example, the grant for schools may be partially based on travel distances or population density to take the transportation costs into account. The project allocation method means that grants are evaluated on case-by-case basis.

If the State requires that the grant receiving municipality shares the cost of providing a public service or good, then the grant is a *matching* grant. For example, if the State agrees to pay 50 % of municipality's health-care operating expenditures and the municipality pays the rest itself, the grant is matching. A matching grant can be either closed-ended or open ended depending whether there is a limit on the funding level or not. A fixed amount of grant from State to municipality would be a *lump sum* grant. A lump sum grant can be either general or categorical grant, depending whether there are some conditions on its use. For example, the State may require that the grant is used on specific service or that the municipality should first produce certain amount of public good before it is eligible to the grant. If there are no such restrictions, then the lump sum grant is general.

*Figure 1 Types of intergovernmental grants (adapted from Fisher 1996, 209)*



The main reasons mentioned in the theoretical literature for using grants from State to municipalities have been the public good benefit spillovers from one municipality to another, the production of merit goods and the revenue sharing between municipalities (Musgrave-Musgrave 1973, 608-614). Benefit spillovers arise when the sphere of influence of some public good is larger than the area of the producing municipality. For example, benefits from education, cultural and sports services provided by one municipality may easily leak to other municipality residents. The spillover effect may result in too low a level of public goods. This happens if all municipalities choose the public good level that is locally optimal (marginal benefit = marginal cost) and the external benefit is ignored. If this is the case, the matching grants could be used to correct this by reducing the unit price of the good from q to q(1-m). By choosing appropriate matching rate m, the State can internalise the benefit spillover generated by municipality (Wildasin 1986, 121-124).

According to the merit good theory the State can classify goods as merit goods and demerit goods. The State wants to support the production and consumption of merit goods and do the opposite for demerit goods. A typical example for merit good include various forms of cultural and educational services, such as opera, special schools, etc. If the State wants to encourage the municipalities to produce these services, then the categorical grants seem the most suitable tool.

The revenue sharing grants provide additional resources to municipalities with small per capita tax base. The funds used for these purposes can be collected through state taxes and/or fees paid by wealthier municipalities. The system can also be a zero sum tax base equalisation between municipalities .

The expected effects of grants to local spending are positive. If this were not the case, the grants would only have a local tax relieving effect. Figure 2 presents a graphical illustration of municipality's budget constraints under separate grants. In the figure it is assumed that the municipality chooses between composite good X (vertical axis) and public good Z (horisontal axis)[7]. Composite good X includes private goods and those public goods that are not receiving grants. The initial position of the municipality is such that it can choose between any amounts of X and Z along the budget line AF.[8] Let us assume that the municipality's highest indifference curve[9] touches the budget line in point J1 so that the amounts selected are X1 and Z1.

[7] In the figure it is assumed that the budget constraints are net of state taxes, which are partly used to finance also the grants.

[8] Note that constant prices are assumed to be able to draw the budget constraints as straight lines.

[9] Indifference curves are not drawn to keep the presentation as clear as possible. As usual, the indifference curves are the "community indifference curves", where it is assumed that they reflect the welfare of the community as a whole. In addition, it is assumed that grants have no redistributional effects. See e.g. King (1984, 89) for detailed discussion.

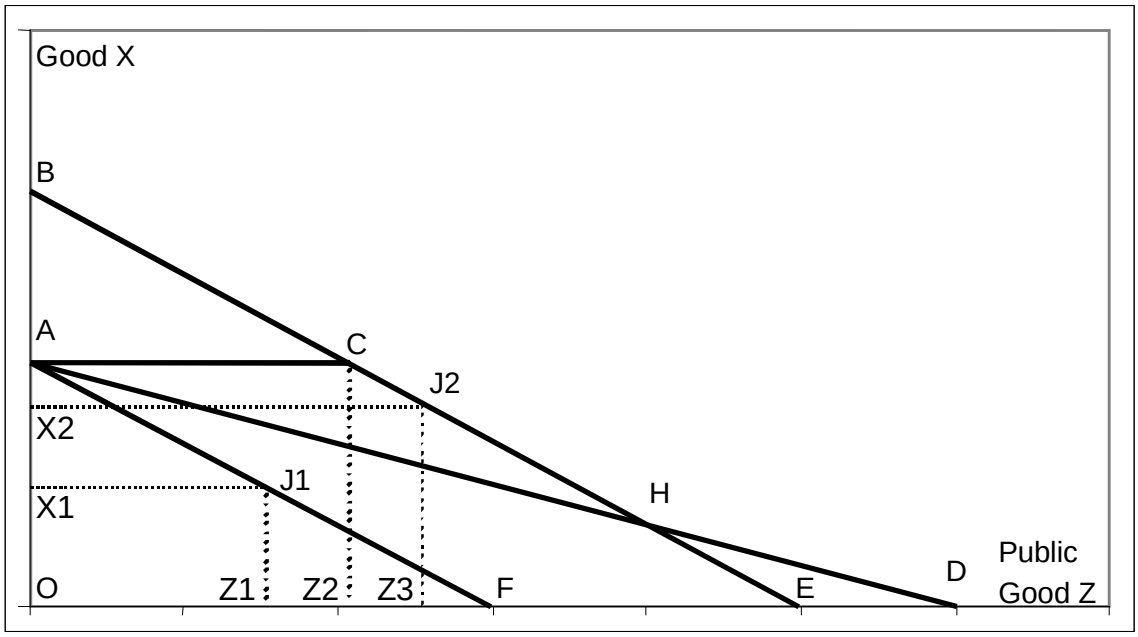
If the municipality receives a *general lump sum grant* the budget line simply shifts from AF to BE. As there is no restrictions on its use, the municipality can freely use the grant money. However, if the income elasticity of both goods is greater than zero (i.e. the goods are normal goods) then the new optimal point is such that the expenditure on both X and Z will increase.

In case of *lump sum categorical* grant the use of the grant is tied with some specific public good. In practice, as the amount of categorical lump sum grant reduces the amount of funds needed from own revenue sources, the grant's effect does not differ from the general grant. However, if the State sets a condition that the municipality must produce certain level of public good to be eligible to the grant, the situation may be different. In this case the budget constraint will be the kinked line ACE in Figure 2. King (1984, 90) notes that the condition on lump sum grant has a meaning only if the municipality would otherwise consume between the line BC. In this case the grantee would prefer general lump sum grant over the conditional lumps sum grant.

In case of *open ended matching grant* the original budget line becomes AD because there are no limits set on the amount that the good Z is subsidised for. Provided Z is not a Giffen good then each increase in the matching rate would raise the purchases of Z.

The kinked line AHE describes the *closed-ended matching grants*. The kink H in the budget line means that up to the point H the grant is a matching grant, i.e. the grant reduces the price of additional amount of Z. From point H onwards the municipality would have to pay 100 % of the marginal cost of an additional unit of Z.

*Figure 2* *Illustration of municipality budget lines in case of lump sum and matching grants*




The effects of open ended matching grants on municipal expenditures can in general be said to be more stimulative than the effects of lump sum grants (Bradford and Oates, 1971; Inman, 1979; Fisher and Papke, 2000). This is because matching grants have both price and income effects but lump sum grants have only the income effect. This applies even in case when the increase in income with lump sum grants is large enough to allow the municipality to choose the same expenditure than with matching grants. It can be shown theoretically that matching and lump sum grants have equal income effects, but that as the matching grant reduces the price of the granted good, the consumption is stimulated even more (Fisher 1996, 213).

A famous empirical finding called "the flypaper effect" means that lump-sum grant has a greater local government expenditure effect than an equal amount increase in residents' taxable income. The flypaper effect is inconsistent with the traditional view in economics that public spending should reflect income elasticities and not depend on the source of the income (King, 1984, 89; Bailey, 1999, 233). The flypaper effect has been widely tested in empirical research and most times the effect has been verified (Inman 1979; Hines and Thaler, 1995; Oulasvirta, 1996). The best known explanations of the flypaper effect claim that voters' imperfect information causes the effect (Filimon, Romer and Rosenthal, 1982). Lack of information is said to be due to bureaucrats who dominate the decision-making process (Romer and Rosenthal, 1979; Holtz-Eakin, 1992; Strumpf, 1998). In addition, the simple fact that resources on hand (grants) are easier to consume than resources that need

to be raised (tax revenues) may be behind the flypaper effect (Hines and Thaler, 1995).

Despite of almost overwhelming evidence of the flypaper effect in the empirical studies, some researchers have claimed that misspecification of the type of grant, incorrect statistical modelling or inappropriate functional form of the estimated model explains the flypaper effect (King, 1984, Hamilton, 1983; Moffit, 1984; Becker 1996). However, much of this critic has been shown to be either erroneous or not significant (Wyckoff, 1991; Hines and Thaler, 1995).

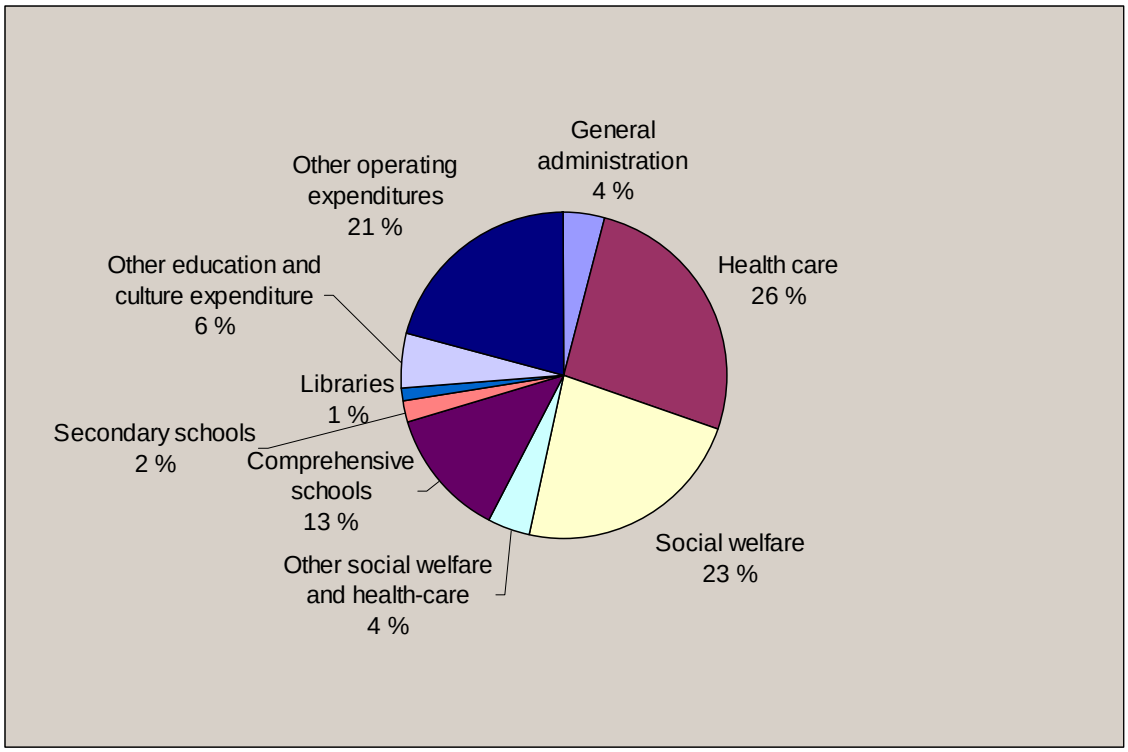
## 1.3 The Finnish local public sector

The Finnish local sector differs from other countries and especially from the US, where most of the theories of local public finance have been developed. These differences are more closely discussed in section 1.3.4. The first three subsections concentrate describing the Finnish case.

### 1.3.1 Municipal functions and finance – an overview

In Finland, the municipalities produce and deliver most of the social welfare, health care, educational and cultural services. In 1999 these services made up about 75 % of all municipal operating expenditures. In social welfare and health care the municipalities take care of health centres and district hospitals, care for the elderly, care of the handicapped and the mentally ill, and social work in general. In the educational sector, the municipalities are responsible for funding and operating elementary and secondary schools, high schools and vocational high schools, among others (Figure 3).

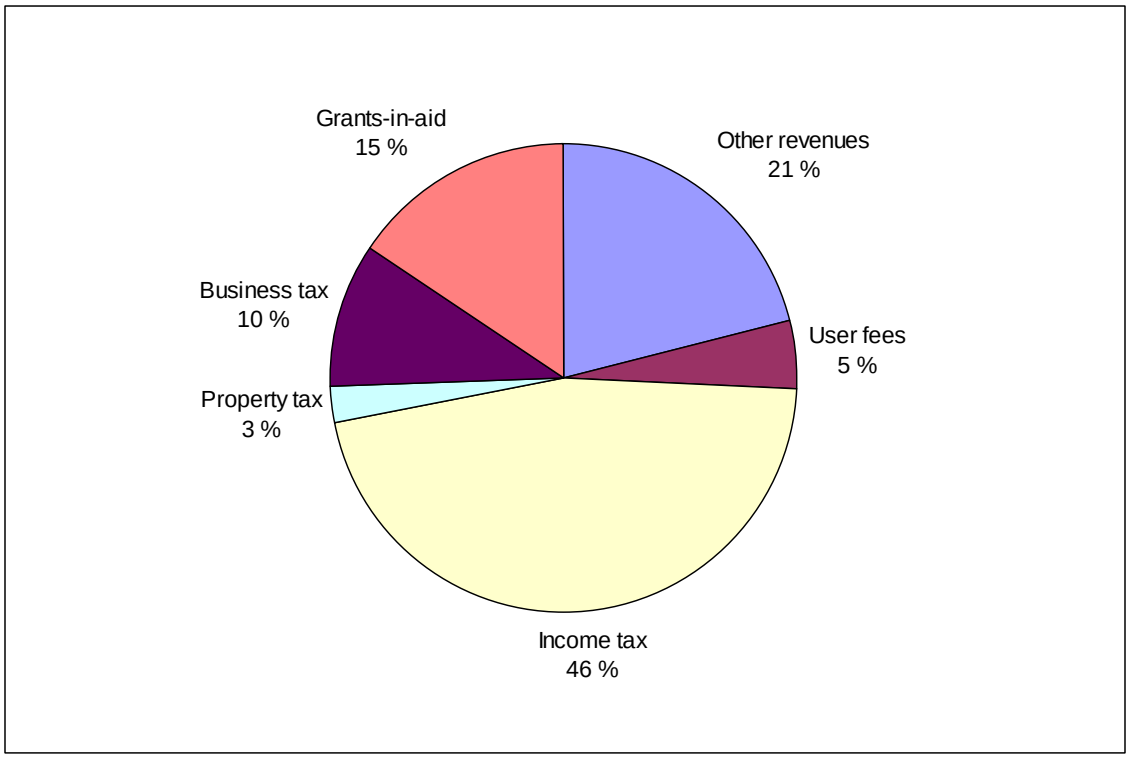
*Figure 3 The distribution of municipal operating expenditures in 1999*




Municipalities in Finland have a strong formal independence that is based on legislation (Constitution) and independent taxation rights. On the other hand, a major share of municipalities' expenditures is defined yearly by the Parliament and Government when deciding about the State budget and possible changes in basic service levels.

The main source of finance for municipalities is tax revenues, that make up more than a half of the total income (Figure 4). The State grants to municipalities have decreased considerably in the latter half of 1990s due to economic recession and central State financing problems. In 1999 the grants made up only about 15 % of all municipal incomes. User fees share is 5 % of total revenues. New loans made up about 3 % of total budget finance.

*Figure 4 The distribution of municipal revenues in 1999*




### 1.3.2 The reform of the grant system[10] in 1993 and in 1997

In 1992 nearly 99 % of all grants to municipalities were of the matching type. The grant rates were scaled using a so called "capacity classification" where the municipalities were divided into 10 groups based on an evaluation of their economic situation. The main criteria for classification included tax base per capita (50 % weight), financial condition of the municipality, population density and unemployment rate (Oulasvirta, 1996, 1997). Separate matching-grant rates were applied for each service category for the 10 classes. The higher the municipality was ranked in the classification, the less state support (because of lower matching

[10] Grants for operating expenditures. In addition to these, municipalities are also entitled to grants for investments. The system for investment grants is not described here at length because the thesis analyses only operating expenditures and grants. The share of investment grants of total grants from State to municipal sector varied in 1997 - 1999 between 6 – 8 %. At present, the investment grants for both education and culture and social and health sectors are based on two matching rates that depend on the municipality's per capita tax base. If the tax base is at most 90 % of the country average, then the rate is 50 %, otherwise it is 25 %. The decisions about state funded investments for social and health sector are made so that the government decides yearly the maximum amount of investment projects and total funding on investments. Municipalities send applications to either central government or province administration depending of the size of the project. For small projects (FIM 2 – 25 million) the funding goes through the province administration, where the final decisions of grant projects are made. For projects above FIM 25 million, the decision is made by the central government. For education and culture investment projects, the municipality sends an application to province level state administration where the ranking of the projects is made. The Ministry of Education and Culture then decides about the funding on basis of these lists.

rate) it received. Evaluation of the classification was carried out annually and the decisions about each municipality's position in the classification were based on this evaluation. The main purpose for the classification was to guarantee an equal potential for municipalities to provide the basic services. In sum, the grant system served a dual role: a tax base equalisation system and a matching grant system put together.

In 1993 a new grant system based on general grants and formula based sector grants was introduced (a more detailed discussion of the grant reform is provided in the second chapter of the thesis). Since the beginning of 1993 the main sector grants for educational and cultural as well as social welfare and health care services became formula-based. At the same time, the importance of general grants was considerably increased by transferring money from sector grants to general grants. A separate tax base equalisation (in other words, a revenue sharing) formula aimed at equalising the tax bases of the municipalities was introduced in 1996 as a third component of the system.

In 1997 the needs criteria of the formula-based system were revised. The calculatory costs for social welfare were still based on the age structure (93 % weighting), but some changes were made in the unemployment and morbidity factors used. As for health care, the age structure had a 75 % weighting and the morbidity factor was revised. The main change in education sector grant system was that the grants began to be paid directly to bodies providing the education service. The providers consisted mainly of municipalities and/or private producers. Previously, the grants were paid to pupils' home municipalities. The grant formulas were based on per pupil amounts.

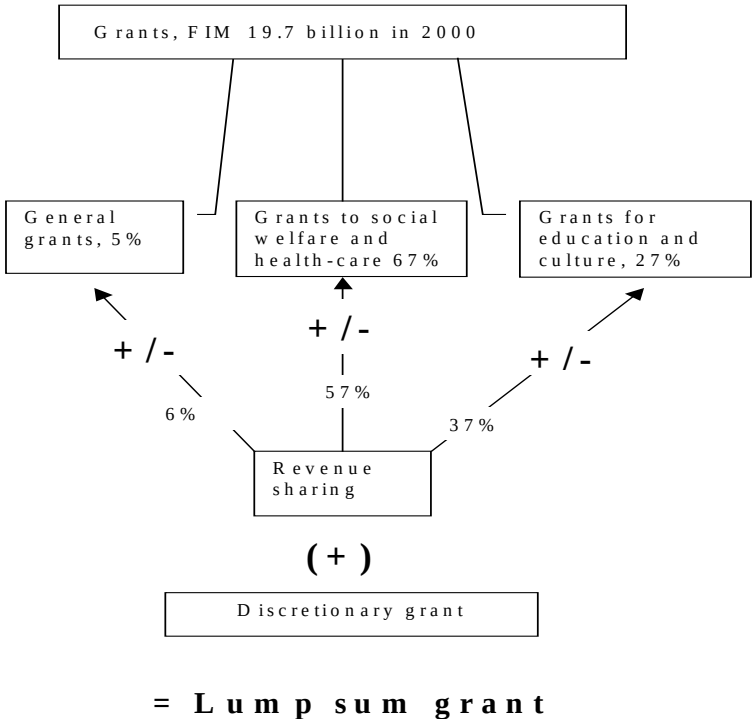
The revenue sharing system was also fine tuned in the 1997 reform. The revenue sharing started to be financed among the municipalities so that municipalities above the equalisation limit pay a fee and those below the limit receive funding. In practice, the money transactions of the revenue sharing are operated through the sector grants so that fees are collected by reducing the sector grants and positive payments are added to sector grants. If positive, the transfers are paid to municipalities so that 6 % of the amount is paid through general grants, 57 % through social welfare and health-care grants and 37 % through education and culture grants. If negative, the amount is reduced from the three grant types using the same percentages (see also Figure 5). In practice, the system has meant that for some municipalities the education and culture grant has been negative. Since the 1997 reform the grant system has prevailed.

The basis of the present grant system is presented in Figure 5. In addition to formula based sector grants, the general grants and the revenue sharing grants, some municipalities are also granted the so called discretionary grants. It is given to municipalities who have extraordinary difficulties to finance their expenditures.

There is no clear formula for this grant, but rather the grant is based on consideration of the situation by Ministry of Interior.

Finally, these grants are summed together and paid to municipalities as a single amount. The grants, as was already explained, are not earmarked.

*Figure 5 The structure of Finnish operating grant system as in 2000*




### 1.3.3 Macroeconomic development and municipal fiscal behaviour

During 1985-1990 municipalities' tax base was continuously growing and municipal expenditures increased rapidly. In fact, between 1986 and 1989 the economy suffered from overheating.

Between 1990 and 1994 Finland faced a severe economic slump during which GDP fell cumulatively by more than 10 %. The recession drove the public sector into serious deficit. From 1990 until the mid-1990s the public debt, which consisted mainly of central government debt, increased from about 15 % to 60 % of GDP (for a detailed discussion about the Finnish economic recession in 1990s, see e.g. Kiander, 2001).

The recession created difficulties for the municipalities. As unemployment rate rose from less than 4 % at the end of the 1980s to over 16 % in 1994, the tax revenues of municipalities decreased and at the same time their welfare expenditures (income support) increased. Municipalities reacted to the decreasing tax

base by raising tax rates, increasing fees for health care and social welfare services, borrowing, by holding back investments and restraining the health care and social welfare costs. Municipal salary expenditures were reduced by discharging the part-time labour force and by laying off full-time employees.

After 1994 the economy began to recover and the tax revenues of municipalities gradually rose, enabling them to reduce their loans. However, much of the increase in revenues was balanced out by grant reductions during the years 1993-1998. Between 1993-1998, central government grants to municipalities were cut by over 33 % in real terms[11].

Differences between municipalities in their rate of recovery after the recession have been large. The first regions to recover economically were those in which a large proportion of GDP came from exports. After 1994, domestic migration from rural municipalities and smaller towns increased, especially to Southern Finland. The number of growth centers was limited to about dozen, where fast growing information technology companies were located. Regional development and migration in Finland in 1990s have been analysed in number of studies (Kangasharju, 1998; Loikkanen et al, 1998; Pekkala, 2000; Tervo, 2000a; Tervo, 2000b; Ritsilä, 2001).

The municipalities with negative net migration tried to cope with a smaller tax base and less favourable population age structure. At the same time the municipalities with positive net migration have been struggling with increases in the demand for public services. The actual effect of migration to municipalities depends on the characteristics of in- and out-migrants. For example children and elderly people cause more expenditures and create less tax revenues than people aged 25 – 60. Migration also affects the grants of the municipalities because they are per capita based. The total effects of net migration to municipalities are then difficult to define (Lankinen, 1998; Kallio et al, 2001).

Figure 6 shows the development of indexed operating expenditures, tax revenues, grants and loans. The figure illustrates how municipal expenditures increased steadily in real terms until 1991, and how the recession forced the municipalities to cut expenditures. One must note that the expenditure figures are not fully comparable for the whole period. To be exact, there are actually three separate data periods: 1985-1992, 1993-1995 and 1997-1999. In 1993 the change in the grant system meant also changes in ways that the expenditures were entered in the bookkeeping. In 1997 the grant system was modified and at the same time the bookkeeping system was changed again.

[11] In 1985 the arithmetic mean value for share of grants covering operating expenditures among municipalities was 42.2 %, and in 1999 the share was 37.8 %. The weighted means were 30 % for 1985 and 24 % for 1999.

Municipal tax revenues decreased temporarily during the period 1991-1993[12]. Since 1994, tax revenues have increased due to higher tax rates, improving employment and increasing yield from company tax[13]. Grants were cut during 1993-1998 and in real terms they have somewhat diminished even after that. Figure 6 also shows that municipalities used borrowing to cope during the years 1991-1993, but soon after the recession the loan stock was reduced to a level below the starting point[14].

*Figure 6* *Local government economic indicators between 1985-1999 (calculated from 1990 priced per capita figures, arithmetic means, 1985 = 100)*

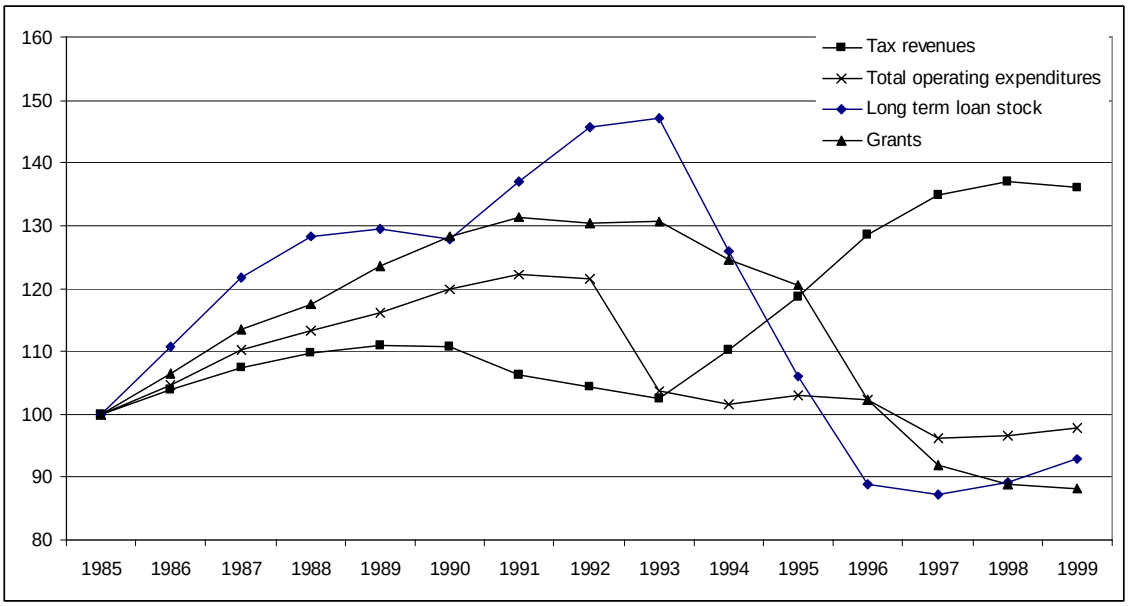



Figure 7 shows the development of subcategory expenditures. The two break points in the data are marked with dotted lines. The figure reveals that at the beginning of the recession (1991) all expenditures except those of the social welfare

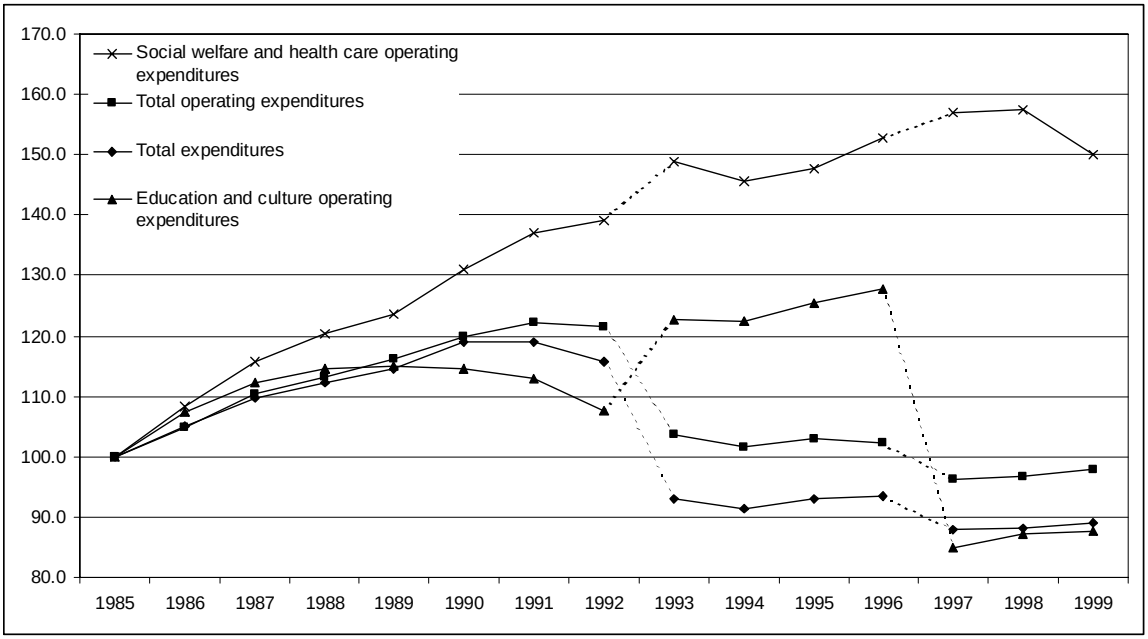
[12] Tax revenues are comparable over the whole period.

[13] Before 1993 municipalities could tax corporate income directly. This meant that the tax rate for corporate income was the same rate that was locally decided for personal income. In 1993 the corporate taxation was reformed so that corporate income began to be taxed with a fixed 25 % national rate. By 1999 the corporate income tax rate rose to 29 %. A share of the total corporate income tax revenue is paid to municipalities. The share in 1999 was slightly less than 40 % of the total corporate tax income pot. Each municipality's share of the total municipal share is calculated on the basis of the respective tax yield in each municipality. However, for companies operating in several municipalities, the number of personnel in various locations is used to divide corporate income of multi-plant companies among municipalities. This source has yielded an increasing sum of tax revenue for local governments during the strong upswing in the national economy during the latter half of 1990s. In 1993 (last year with negative GDP growth) this source gave FIM 1.8 billion and in 1998 FIM 11.4 billion to municipalities. The respective shares of all tax revenues were 1.2 % and 16.4 % (Loikkanen et al, 2000).

[14] There have been slight changes in the way the loan stock figures have been entered the bookkeeping; the difference is not as big as it is for the expenditures, however.

and health care sectors decreased. However, social welfare and health care expenditures also decreased temporarily in 1994. The education and culture expenditures started to decrease in 1989 and began to gradually rise after 1994. The last three years have meant an increase in this category's expenditures.

*Figure 7 The development of main municipal expenditures between 1985 - 1999*




Note: the years marked with dotted line denote a break point in the data.

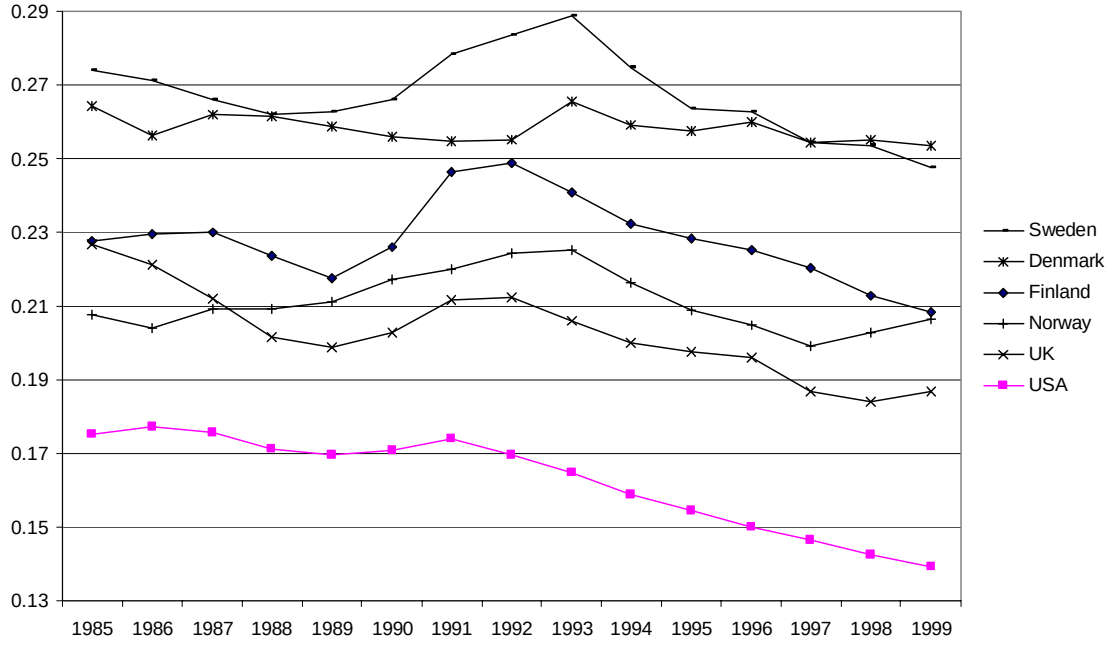
### 1.3.4 The unique Finnish local government?

Most of the local public finance theories have been developed in the USA. This has of course much influenced the European research on the topic. However, the European countries and the Nordic countries especially differ considerably from the North America in their federal structure. This may affect the research issues in several ways. In the following, some characteristics that separate the Finnish case from many other countries, especially from the USA, are discussed. Much of what has been said before about this topic concerning the Nordic countries applies directly to Finland (Söderström, 1991; 1998). However, in some ways the Finnish local government differs also from the other Nordic countries.

The first thing to note is that in Finland - like in Nordic countries in general - the public sector is large compared to the USA and United Kingdom (Figure 8). Moreover, the local public sector produces and provides most of the basic public services. The Finnish National Accounts show that in 1999 local sector's share of total public consumption in Finland was 62 %. According to the OECD Revenue

Statistics (2001), in 1999 the Finnish municipalities' share of total tax revenues was 21.6 %, whereas in United Kingdom the share was 4.1 % and in the USA 12 %. In Sweden the share was 30.6 %, in Norway 18 % and in Denmark 31.9 %. In sum, in Nordic countries the local sector is responsible of a greater share of public services and the localities are also much more dependent on own source revenues than their North American counterparts.

*Figure 8* *Government consumption per GDP in Nordic countries, UK and USA (Source: OECD, Economic Outlook No 69)*




The main source for total municipal revenues in Finland is the local income tax (as shown in Figure 4). This contradicts the traditional theories concerning the taxation of mobile factors of production, where the efficient local taxation is based on benefit taxes and taxes on immobile resources (Oates, 1972, Goodspeed, 1999 and 2000). According to the orthodox view the extensive use of income taxation may lead to inefficient allocation of resources across jurisdictions. Tax competition among the municipalities may also increase as a result of the use of income taxes. In addition, as the central level also uses income taxes, this may lead to vertical tax competition (Goodspeed, 2000).

The fact that the grant systems in Nordic countries often include relatively efficient revenue sharing may diminish the distortionary effects of use of income taxes at local level. This is because the benefits from tax competition between the municipalities are diminished.

In the Nordic countries the municipalities are more extensively involved in redistribution than municipalities in the UK or the USA. This is because the Nordic municipalities take care of the income support and other social welfare programmes. This may be against the traditional division of government duties (Musgrave, 1959), but on the other hand it may improve the efficiency of the redistributive policies.

The median voter model may not fit in the Finnish setting very well because Finnish municipalities operate in a political environment that is characterised by a multi-party system and multidimensional decisions. Moreover, municipal referendums are rare in local political decision-making and at most they have only an advisory status. Therefore, a simple expenditure determination model that uses mean statistics and that takes the political powers of the main parties into account may be sufficient in the Finnish case. This issue is discussed in Chapter 2 of this thesis.

## 1.4 The scope, organisation and main results of the thesis

This thesis consists of four empirical essays and a common introduction. Each essay is self-contained and can therefore be read independently. However, the separate chapters are closely linked with each other by the main theme: The Finnish municipal budgetary behaviour under two separate grant regimes. Chapter 2 and 3 present static fixed effects models of local government expenditures. Chapters 4 and 5 examine the intertemporal aspects of municipal budgetary decision-making, utilising GMM estimators and test procedures. The main questions addressed in the study are:

1. Which economic, demographic and socio-economic factors determine the municipal per capita expenditures? (Chapter 2, Chapter 3)

2. What were the price and income elasticities of the municipal expenditures under the matching grants period? (Chapter 2)

3. Is the “flypaper effect” at work under the present (formula based) grant system? (Chapter 2)

4. What is the expenditure effect of the enlarged non-institutional elderly care for municipal sector and the public sector in general? (Chapter 3)

5. Are the municipalities behaving intertemporally when deciding about their budgetary matters? (Chapter 4, Chapter 5)

6. Do the own source revenues lead expenditures in municipal budgets or vice versa? (Chapter 4, Chapter 5)

7. Are small or economically weak municipalities behaving differently from large or rich municipalities when deciding about own source revenues, expenditures and borrowing? (Chapter 5)

Questions 1 and 5 – 7 are analysed separately for the matching grant period and the formula based grant system and results are compared between the two regimes.

The purpose of the study is to clarify the factors influencing the municipal expenditures and revenues of Finnish municipalities both in static and dynamic setting. Several hypotheses presented in the theoretical and empirical literature on local government expenditures and revenues are being tested in this thesis. In Finland, these topics have not been covered by many studies. A short description of empirical studies that are close to the themes of this thesis is given below. After that, the results of the thesis are summarised.

### 1.4.1 Previous empirical studies

Most Finnish studies on municipal expenditures that have been performed until recently have had either a narrower scope or a different research methodology compared to this thesis. For example, some studies have concentrated on municipal political decision-making and many of them are based on questionnaires (see e.g. Oulasvirta, 1996; Oulasvirta, 1997; Karila, 1998). Other studies examine some specific service category expenditures using econometric techniques (e.g. Kirjavainen and Loikkanen, 1992; Moisio, 1994; Häkkinen and Luoma, 1995, Oulasvirta, 1996; Oulasvirta, 1997; Moisio, 1998; Järviö and Luoma, 1999; Häkkinen and Moisio, 2000). In addition, some studies describe the formula based grant system and measure the effect of cuts in grants (Alho and Salo, 1998; Karhu et al, 1999; Laasanen, 1999; Karhu et al, 2000).

There have been two Finnish studies that have compared the two municipal grant systems in Finland. Oulasvirta, (1996, 1997) did a survey in 1991 and in 1994 to principal actors in the municipal budget process. Oulasvirta studied the opinions about the grant system under the matching grant system (1991 survey) and under the formula based grants system (1994 survey). He found that the reform of the grant system changed the distribution of power inside the municipalities. Especially the politically weaker groups lost power (Oulasvirta, 1996, 293). The main winners of the reform in this respect were the municipalities' central administration managers. Oulasvirta (1996, 1997) performed also a municipal expenditure-determinant study using cross-section data for year 1991. The main findings were that general grants stimulated municipal expenditures more than private taxable income (the so called flypaper effect). The strengths of the study were that it was able to show that the flypaper effect extended to Finland and that the effect may depend upon the distribution of power between various grades of local officials. The possible limitations of the study were, first, that the data used in the expen-

diture-determination estimations covered only one year (1991) and therefore the fixed effects of the municipalities could not be controlled for. Second, during 1991 most of the grants were actually matching grants. Therefore, Oulasvirta (1996) could only use a small share of (general) grants in his analysis to test the flypaper effect.

Laasanen (1999) compared the allocation of grants in the new and the old grant systems by using grant criteria from 1997 and the data from 1991. The calculated grants were then compared to grants that the municipalities actually obtained in 1991 to define the winner and loser municipalities. Laasanen found that there was a significant change in the amount of grants that the municipalities received. More specifically, the losers were found to be located in the northern and eastern parts of Finland and the winners in southern parts of the country. Municipalities with population under 5000 in southern Finland were found to win in the reform. Moreover, municipalities with large share of old people and small share of children were winning. No difference was found when comparing the municipalities using economic indicators. The strength of the study was that it showed that the grant system reform had considerable effects on revenue distribution among the municipalities. The limitation seemed to be the way that the effect of other variables than those used in the analysis was controlled for.

Abroad, the econometric studies on the local government expenditures and budgetary behaviour have been more common than in Finland. Therefore, a full list of interesting papers would be difficult to present. Of course, this thesis has been influenced by a vast number of papers that could be called expenditure-determination studies and papers utilising the median voter model. Some of these papers were referenced in the previous section of this introduction and in the following chapters of this thesis. The important aspect of dynamics in municipal budgetary behaviour has been analysed by Holtz-Eakin, Newey and Rosen (1989), Borge and Rattsø (1993), Dahlberg and Johansson (1998, 2000) to name some of the most influential ones for this thesis.

### 1.4.2 Main results of the thesis

This thesis studies the expenditure behaviour of 436 municipalities during 1985 – 1999. The period has been divided into two parts, 1985 – 1992 and 1993 – 1999, in order to compare the matching and formula based grant periods. The comparison of the grant regimes is done in chapters 2, 4, and 5. In chapter 3 the data used is limited to 1994 – 1997 and therefore it concentrates on the formula-based grant regime. The two grant regimes are interesting because they are so different. The data for 1985 – 1992 describes a period where the municipalities' services were continuously enlarging (except year 1992), and where the grants stimulated municipal spending in a generous way. Also municipalities' own source revenues increased continuously up to 1991. The second period of the study (1993 – 1999)

is a contrary to the first data period in many ways. The grant reform ended the use of matching grants and this meant that the link from expenditures to grants was cut. In addition, the State had to reduce the grants because of the budget problems due to deep recession in 1991 – 1993. The recession hit of course the municipalities as well. The role of own source revenues in the municipal finance grew considerably. All this has resulted in an interesting phase in municipal finances that could be analysed in this thesis.

In chapter 2, two separate issues are analysed. First, the expenditure response of Finnish municipalities to price and income changes during the matching grants period (1985 – 1992) is examined. Seven expenditure categories are analysed using fixed effects model. The price and income elasticity estimates are then compared to similar estimates in other studies. Especially, the effects of closed-ended matching grants are studied. No such analysis has been performed before this in Finland. According to the results, positive price elasticity parameters existed for education expenditures under the matching grants system. For the social welfare and health care sector, price elasticity was negative. These results reflect the fact that municipal educational expenditures on average started to diminish in 1988/9 at the same time that the social welfare and health expenditures continuously increased. The price faced by the municipalities, however, measured as the share that the municipalities needed to finance from their own source revenues plus loans was continuously diminishing. So the question is, why did the municipalities cut their education expenditures even though the price was falling? One answer to this may be that the grants for education services used to be closed-ended. In case the municipalities originally spent more to education than was needed to receive maximum grants, and the municipalities reduced their expenditures, this may result in the positive price elasticity. Another explanation may be that as all prices were changed simultaneously and by equal percentage points, we may actually have only income effect of the price change. Whatever the reason, the results show that the effect of grants in case of education was not what the grantor had wanted if the meaning was to increase the level of service. The same effect could probably have been achieved by using specific lump sum grants.

The second research subject in chapter 2 deals with the existence of the so-called “flypaper effect” under the first seven years of the formula-based grant period (1993-1999). Again, seven expenditure categories are being analysed utilising fixed effects estimation technique. The study is interesting because in Finnish discussion it has repeatedly been claimed that grants no longer have a significant role in municipal finance, and especially, that they have lost all of their steering effects. The results show that the grant effect on most expenditures studied was larger than that of private taxable income. More specifically, the effect of grants is found to be four to twenty times larger than the effect of taxable income. The results therefore clearly support the well-known “flypaper effect”.

Also several other variables describing political, demographic and socio-economic characteristics are analysed in chapter 2. The main questions set forth are the following: Are the expenditure differences explained by substantial economies of scale? What is the role of political control in municipal councils? What is the effect of different age groups? The results of this analysis can help one to better understand the considerable expenditure variation between the municipalities. A comparison between the results obtained for the two periods is made. According to the results, during the matching grants period the political process seemed to matter less than in the formula-based grants period. These results can probably be largely explained by increased budget orientation in local politics during the latter period. Somewhat surprisingly, it appears that migration effects on the expenditures studied did not increase, even though the level of migration considerably increased. The degree of urbanisation seemed to explain the expenditures for the matching grants period but not so well for the years after the grant reform. During the years 1985-1992, a higher degree of urbanisation seemed to be connected with lower education and higher social welfare and health expenditures. Lastly, the age group effects were found to be according to expectations so that the oldest and youngest increase expenditures more than other groups.

Chapter 3 analyses the municipal elderly care expenditures. This section is closely connected with chapter 2 because it specifically analyses one subcategory of expenditures. The separate analysis is performed because of the specific characteristics of the elderly care. In addition, the expenditures of Finnish Social Security Institution are analysed.

The chapter starts by noting that during the latter part of the 1990s the municipalities changed their service structure in elderly care from institutional based care to non-institutional care. Why did this happen? One obvious reason is that the change in grant regime from matching to formula-based grants gave the municipalities more freedom to decide about their operations. Even more influential reason is, however, that the non-institutional care is much cheaper for the municipalities. At the same time, the Finnish Social Security Institution expenditures have increased. This is because Social Security Institution pays medical refunds, housing allowances and basic pensions to elderly who are receiving non-institutional care. Therefore, the total effect of the structural change has not been known. So far there have been no studies comparing the expenditure effects of municipal sector and Social Security Institution. The chapter presents new evidence about the effects of the non-institutional elderly care for public sector in Finland. According to the results, the municipalities have indeed saved money by altering their care for elderly service structure from institutional to non-institutional care. In addition, the expenditures of Social Insurance Institution have increased. The approximate benefit of the structural change for the municipal sector in 1997 was between FIM 61 and 83 million and the loss of Social In-

surance Institution was between FIM 7 and 31 million. The difference, FIM 35 – 76 million, was the total saving for public sector.

In chapter 4 the interesting question of the inter-temporal links between municipal own source revenue and spending decisions is under study. Often, it is assumed simply that local government's decisions about spending during a given period depend only on resources available in that period. But if municipalities do behave intertemporally, then it is difficult for the State to influence the municipalities by using temporary policy measures. Therefore, the information about the direction of the Granger-causality between own source revenues and expenditures may give important information for the policymakers. Following the work of Holtz-Eakin, et al. (1989) the intertemporal relationship between Finnish municipal expenditures, own source revenues, grants and long term loans are being analysed. Moreover, the situation during the matching grants and formula-based periods is compared. This kind of analysis has not been done before in Finland. The results show that, first, there are important dynamic interrelationships between the variables in question. Second, it is found that during the matching grants period, expenditures Granger-cause own revenues uni-directionally, whereas during the formula based grants system the own revenues and expenditures Granger-cause each other. The grants Granger-cause expenditures during both periods. In the end of the 1990s municipalities have been able to pay off their loans primarily by cutting expenditures and not by increasing own source revenues.

Chapter 5 continues the analysis of the previous section so that the municipalities are divided into four population groups, four groups using economic condition and to four cross-groups using both population and economic condition. The results obtained are used to consider whether the budgetary decision-making differs between different types of municipalities. Again, the periods of the matching grants and formula-based periods are compared. To my knowledge, no such analysis has been carried out before, except in paper by Dahlberg and Lindström (1998) who grouped municipalities using geographical location and sub-periods. The main findings are that the grant system reform has resulted in more careful economic decision-making among the municipalities. For instance, the largest municipalities that used to have "spend and tax" causality now have "simultaneous" causality between expenditures and own source revenues. Another finding is that the smallest municipalities seem to be careful in their budgetary process irrespective of the grant system. The implications of the results are that the reaction to specific central state measures may differ considerably between separate groups of municipalities.

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# 2. Determinants of expenditure variation in Finnish municipalities

## 2.1 Introduction

A basic model of fiscal policy states that changes in unconditional lump sum grants and private incomes affect local government expenditures equally (Bradford & Oates, 1971a, 1971b). However, many empirical studies have shown that grants stimulate local public spending more than private incomes. This finding has been called the "flypaper effect", because money seems to stick where it first hits. Other empirical findings have been that local public services are price and income inelastic and that local expenditures depend negatively on the tax price and positively on income. Inman (1979) surveyed the early studies on the topic and Hines & Thaler (1995) summarised the more recent literature.

In Finland, intergovernmental grants are used to transfer funds from central state to municipalities, whose task is to deliver most of the public health, social welfare and educational services. In 1985 the intergovernmental grants on average covered 33 % of total municipal gross operating expenditures, but at present the share of grants has decreased to 24 %. As a result, the importance of revenues from the own sources of municipalities has grown considerably.

From the beginning of the 1970s until 1993 the grants to municipalities mostly consisted of specific categorical matching grants. In 1993 the grant system was fundamentally reformed so that the direct link between expenditures and grants was removed. The reform meant that specific formulas were taken into use to define the need and circumstantial factors of the main service categories. The grants are then paid to municipalities with no earmarking, i.e. the municipalities can independently decide on the final allocation. Therefore, they are in effect general lump sum grants with some minor exceptions.

This paper focuses firstly on the expenditure response of Finnish municipalities to price and income changes during the matching grants period, and secondly on the existence of the "flypaper effect" in the formula-based grant period. Two separate panel data sets are used: the last eight years (1985-1992) of the matching grants period and the first seven years (1993-1999) of formula-based period. Seven expenditure categories are analysed.

The results revealed small positive price elasticity parameters for aggregated operating expenditures and educational expenditures under the matching grant system (1985-1992). A clear distinction from this result was the social welfare and health care sector, where the price elasticity was negative. One reason for positive price effects may have been closed-ended grants. If the high spending mu-

nicipalities spent beyond the upper limit of the grant, the matching grants in effect became lump sums, leaving only the income effect. Another important point to make is that the largest source for change in price-variables was when single municipality's classification changed. In that case, however, all prices changed. This would leave us only with income effect of the price change, and this would explain the positive coefficient.

The income elasticity coefficients for the matching grants period were positive and below one, so all of the services studied in this period were found to be income inelastic normal goods.

For the formula-based grants period (1993-1999), the results lend strong support to the well-known "flypaper effect". This is because the estimated grant parameters were clearly larger than the income parameters for most of the expenditure categories studied. The yearly cross-section estimations suggest that the effect of grants on expenditures diminished towards 1999.

The organisation of this chapter is as follows. In section 2.2 the theoretical aspects of the research issue are discussed. In 2.3 the empirical model and the data are presented. Section 2.4 presents the results of the estimations and section 2.5 the summary and conclusions.

## 2.2 Theoretical considerations

Local fiscal choice over public services and private goods has traditionally been viewed as utility maximisation subject to budget constraints. A continuous, quasi-concave utility function u(x,Z), representing a municipality's preferences for private goods (x) and local service outputs (Z), has usually been assumed. The local budget constraint can be represented by $px + (1-m)qz = I + L$, where m is the matching aid rate, I is the aggregate community income, L is the size of lump sum grants and p and q are prices (Wildasin 1986, 37).

Unless the preferences of all residents are identical, the key question is whose preferences are actually defined by u(x,Z)? Is it the resident, civil servant or the controlling political party? The most common way to model the demand for local public expenditures has been the median voter model first introduced by Bowen (1943) and Black (1958) and further developed and empirically tested by Bergstrom and Goodman (1973) and Borcherding and Deacon (1972).

The median voter model was developed for referendum majority voting situations. Politicians who seek to attain and maintain their power will offer and provide public good levels equal to the level demanded by the median voter. In this way, the median voter model can be seen as a public sector analogy to perfect competition in private markets (Todò-Rovira, 1991).

The assumptions for the median voter model are fairly restrictive even for majority voting, however. The key assumptions are that a) the preferences of the voters are single peaked, b) voters vote according to their true preferences (no strategic voting) and c) the issues voted on are one dimensional (this guarantees that local budgets are one dimensional issues: is there more or less spending?) (Inman, 1979). Voters are also assumed to be fully informed.

Despite the severity of the assumptions, the median voter model represents a powerful tool for empirical analysis of local public expenditures. More specifically, the median voter model allows one to analyse the local public expenditures using the preferences and budget constraints of a single individual. In practice, median voters have usually been defined as those with median incomes, but this assumption requires the expenditures to be a monotonic function of income (Bergstrom and Goodman, 1973).

A number of empirical applications have emerged since the median voter model was first introduced. The two best-known examples are those of Borcherding and Deacon (1972) and Bergstrom and Goodman (1973). In both of these the Cobb-Douglas function was used to describe the production technology as well as the preferences of the median voter. The demand for expenditures can be presented as (Wildasin 1986, 46-47):

(8) $$E_i = b_i f(\alpha_i) c^{(1+\delta)} n_i^{\gamma(1+\delta)} [\tau_i(I)]^{\delta} I^{\varepsilon},$$

where $E_i$ is the per capita expenditure in municipality i, $b_i$ is the opinion or taste parameter, $f(\alpha_i)$ is a function of jurisdiction specific characteristics, c is the cost of producing public goods, $\delta$ is price elasticity[15], $\gamma$ is a fixed parameter describing congestion (if $\gamma = 1$ the good is private good), $n_i$ is the population in municipality i, and $[\tau_i(I)]$ is the tax share of the taxpayers in the municipality. Each taxpayer is assumed to bear a fixed per capita share of the tax burden. The tax share can then be written as $(n_i)^{-1}$. Finally, $\varepsilon$ denotes the income elasticity parameter.

Using the demand in (8) and taking the logarithms on both sides, Borcherding and Deacon (1972) estimated the following median voter model (Wildasin 1986, 47):

(9) $$\log E_i = \beta_0 + \beta_1 \log c_i + \beta_2 \log n_i + \beta_3 \log I_{im} + \beta_4 \log f(\alpha_i) + u_i$$, where

$\beta_0 = \log b_i$

$\beta_1 = (1+\delta)$

[15] In general, the price of a local public good for the municipality is the production costs minus grants. In this study, a price variable is constructed for the matching grant period using a simple formula: $\left(1 - \frac{\text{matching grants}}{\text{operating expenditures}}\right)$. Defined this way, the price variable describes the share of the local public expenditures that is financed by the municipal taxpayers.

$$\beta_2 = \gamma(1+\delta) - \delta - 1 = (\gamma - 1)(1+\delta)$$

$$\beta_3 = \varepsilon,$$

where $I_{im}$ is the median income. The demographic variables in the models of Borcherding and Deacon (1972) include urbanisation and land area. The main results of both Borcherding and Deacon (1972) and Bergstrom and Goodman (1973) were that local expenditures in general appear to depend negatively on the tax price and positively on the income of the median voter.

In sum, the median voter model forms a theoretical basis for many empirical studies concerning local government expenditures. Therefore, it is also discussed in some detail in this paper. However, the median voter model is not used here because Finnish municipalities operate in a very different political environment than is assumed in the median voter model. More precisely, the local politics in Finland is based on a multi-party system. Referendums are extremely rare in local political decision-making in Finland and even when they are used they only have an advisory status. The budget decisions made by local councils are most times multidimensional and municipal spending decisions in Finland are consequently made using a very different method to that behind the median voter model.

Instead of strict median voter model, a model that better reflects the Finnish municipal decision-making framework is used. Here, the demand for municipal expenditures is assumed to depend on a number of economic, political and demographic variables so that the demand of public expenditures can be defined as:

$$E_z = z\left(\underset{+}{income},\ \underset{-}{price}, \underset{-}{n}, \underset{-}{dens}, \underset{-}{urb}, \underset{?}{age}, O\right), \tag{10}$$

where *income* is private taxable income, *price* is the tax price of public goods to the municipality, *n* is population of the municipality, *dens* is the population density, *urb* is the degree of urbanisation, *age* is the age structure and *O* denotes other demographic and economic variables.

The +/- signs in (10) denote the expected sign of the variable's effect on demand. Higher private incomes are expected to increase the demand for local public goods. Similarly, higher prices of municipal public goods are believed to decrease demand for them.

It is well known from public finance literature that an open-ended matching grant is expected to increase government expenditure on an aided service more than a lump sum grant providing the same expenditure possibility (Fisher, 1996, 213). There has also been evidence that one additional money unit of lump-sum grant money has a greater government expenditure effect than an additional one money unit increase in residents' income (see Hines and Thaler, 1995 and the references therein). This result is known as the "flypaper effect", because "money sticks where it hits" (see Appendix, Table 11 for a summary of the empirical results).

The flypaper effect has been widely studied, and some claim that the empirical result in question arises from incorrect statistical modelling or misinterpretation of the results (Hamilton, 1983, Hines and Thaler 1995). Others, who support the idea of the flypaper effect, say that it results from the domination by bureaucrats of the decision-making process (for example Romer and Rosenthal, 1979; Holtz-Eakin, 1992), from inadequate information about the median voter (for example Strumpf, 1998) or simply because resources on hand (grants) are easier to consume than resources that need to be raised (Hines and Thaler, 1995).

The effects of population size, density and urbanisation on expenditures depend on the expenditure type. For example, a higher density may increase the demand for street and road maintenance, but a low density may increase the per capita costs for schools. Generally, the assumption here is that there are such economies of scale that the effect of these variables on per capita expenditure is negative. Age structure also increases the expenditures at both ends because of the demand for day-care and schools for the young and care for the elderly, together with the demand for health care services. These exceed the local public expenditure needs of the working age population. Higher unemployment increases the costs for the municipality as was already noted above.

## 2.3 Empirical framework

### 2.3.1 The role of Finnish local government and the evolution of the grant system

In Finland, the local government produces and provides most of the social welfare, health care, educational and cultural services. These services make up about 70 % of all municipal expenditures. Some typical examples of social welfare and health care sector services are health centres and district hospitals, care for the elderly, the handicapped and the mentally ill, and social work in general. In the educational sector, the local government is responsible for funding and operating elementary and secondary schools, high schools and vocational high schools, among others.

Municipalities in Finland have considerable legislative and economic independence and at present they cover on average less than 25 % of their total net operating expenditures with state grants. This grant share has decreased considerably since the 1980s. The main source of finance for municipalities is tax revenues, which make up more than a half of the total income. Fees make up approximately one fourth of total revenues. Finnish municipalities are not tied by balanced-budget laws, so it is possible for municipalities to finance operating expenditures by borrowing. During the year 2000, new loans made up 3 % of total budget finance.

From the beginning of the 1970s until 1993 the grants to municipalities mostly consisted of specific categorical matching grants. In 1992 nearly 99 % of all

grants to municipalities were of the matching type. Revenue sharing between municipalities was sought after by using a capacity classification system under which the municipalities were divided into 10 groups based on an evaluation of their economic situation[16]. Separate matching-grant rates were applied for each service category for the 10 classes (see Table 1). The higher the municipality was classed, the less state support it received. Evaluation of the classification was carried out annually and the decisions about each municipality's position in the classification were based on this evaluation.

The purpose of the capacity classification system was to guarantee a firm financial base for all municipalities. Equality among the citizens located in different municipalities was one of the most important principles in grant policy. In practice this meant that the matching rates of the grants were highest in those municipalities with the lowest population densities, lowest tax bases and highest tax rates. Between the years 1980-1992 an increasing number of the municipalities ended up in the lowest 4 groups in the classification, to whom the highest matching rates were applied.

*Table 1 The capacity classification and corresponding matching grant percentages in some services[17] in 1992*

| Capacity class | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Basic schools, upper secondary schools, libraries, current expenditure | 86 | 82 | 78 | 74 | 70 | 66 | 62 | 59 | 55 | 51 |
| - investment costs for these | 78-94 | 70 | 62 | 54 | 46 | 38 | 30 | 22 | 14 | 6 |
| Vocational schools, current costs, apparatus costs | 86 | 82 | 78 | 74 | 70 | 66 | 62 | 59 | 55 | 51 |
| - investment costs for these | 51 | 49 | 47 | 45 | 43 | 41 | 39 | 37 | 35 | 33 |
| Social welfare and health care | 66 | 62 | 57 | 53 | 50 | 46 | 43 | 39 | 35 | 29 |
| Culture, sport and youth activities, current costs | 75 | 71 | 67 | 63 | 59 | 55 | 51 | 47 | 43 | 39 |
| Museums, current costs | 42 | 39 | 36 | 33 | 30 | 27 | 24 | 21 | 18 | 15 |
| Open colleges | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 | 70 |

Figure 9 presents the municipality's budget line AF. In this setting, the municipality chooses between composite good X[18] and public good Z. Line AD describes the effect of matching grant and line ACE the effect of closed-ended

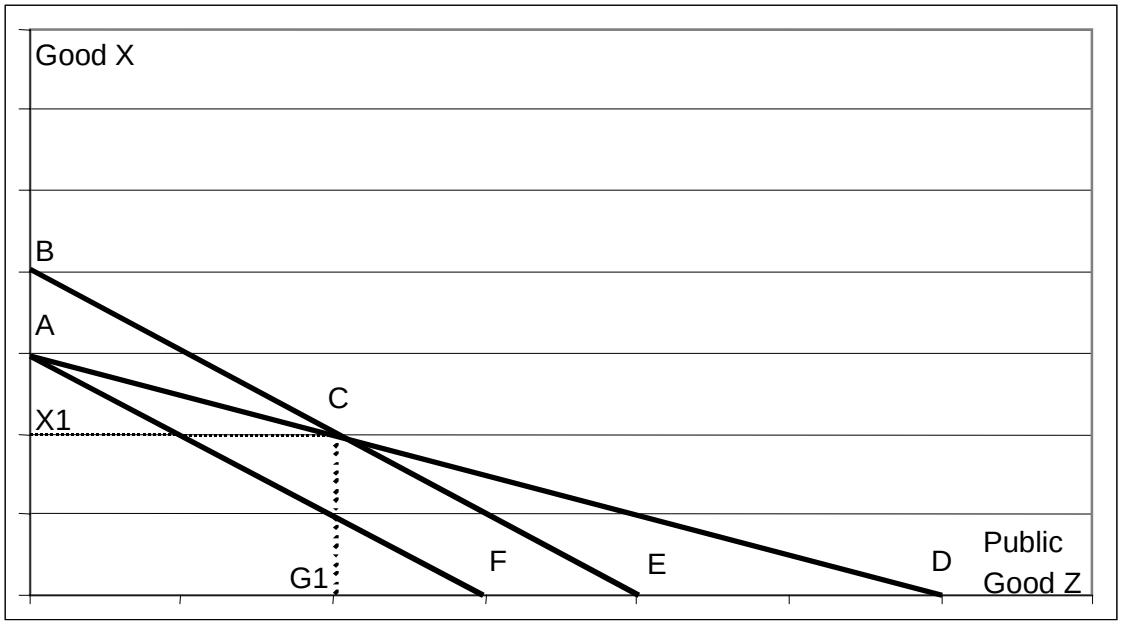
[16] The following factors were taken into account for each municipality: net expenditures and tax incomes per capita, the growth/decrease of the population, the local tax rate compared to the average tax rate in all municipalities and some special circumstances creating an extraordinary burden on the municipality's economy.

[17] Oulasvirta 1996, p. 107.

[18] Composite goods that include private goods and the public goods that do not receive grants. In the figure it is assumed that the budget constraints are net of state taxes, which are also partly used to finance the grants.

matching grants. During the matching grants period in Finland the grants for social welfare and health care could be classified as open ended matching grants (line AD in Figure 9) because there were no tight rules to constrain the operating costs of municipalities. Although the number and quality of personnel in social and health sector was monitored in the same way as in the education sector, the operational constraints could not be as tight as in education sector. For example, the number of treatments could not be controlled in the health sector whereas in schools the number of teaching hours was tightly planned in advance. This distinction makes the education sector a "purer" example of a sector financed by closed ended matching grants. Line ACE describes the grants for education and culture, because according to the norms and rules at the time, the municipalities could hire only a fixed number of teachers in proportion to the number of pupils to receive the grant.

*Figure 9* *Graphical representation of the grants from central government to municipalities in Finland during 1985-1992*




By the end of the 1980s the matching grant system was under severe criticism. The main target of the criticism was the capacity classification system. It was claimed that the classification handled municipalities with similar financial bases differently and it seemed to favour municipalities that organised their services inefficiently. It was also said that because the system leaned so heavily on matching grants, the municipalities were not always encouraged to look for the least expensive way to organise their services. Therefore, the per capita expenditure differences between municipalities could no longer be explained solely by demographic factors and needs. Rather, it seemed that the per capita amount of grants had become an important factor that explained differences in per capita

expenditures[19]. The costs and efficiency of different services varied considerably between municipalities and service units[20]. The complexity and variety of the matching rates in different services had also become an administrative problem.

Finally, at the beginning of the 1990s the planning of a fundamental reform began. Consequently, during the 1990s several grant system reforms took place. The first and most important was the reform of 1993, when the main sector grants for educational and cultural as well as social welfare and health care services became formula-based. At the same time, the importance of general grants was considerably increased by transferring money from sector grants to general grants. The structure of the new grant system as well as the factors used in defining the need for state assistance can be seen from Table 2. The calculatory costs of the main municipal services were estimated yearly in advance by the associated ministries (for a detailed presentation of the formulas used, see the appendix). Several variables describing needs and special circumstances were used in the calculations. Between the years 1993-1995 the classification of the municipalities still remained an integral part of the grant system. For example, the grant for sector j for municipality i was the outcome of calculatory costs and grant share rates in the following way:

$$\text{grant}_{ij} = CC_{ij} \times \text{Class}_{ij}, \tag{11}$$

where $\text{grant}_{ij}$ is the grant in sector j for municipality i, $CC_{ij}$ is the calculatory cost in sector j for municipality i, and $\text{Class}_{ij}$ is the grant share rate used in sector j for municipality i (for rates, see Table 3). The grants of separate sectors were summed and paid to each municipality as one sum. The sector grants were therefore in effect lump sum grants.

The next notable change to the grant system was made at the beginning of 1996 when the classification system was abandoned. The change applied only to 1996 because a more fundamental reform of the grant system was introduced in 1997. The main idea of the 1996 reform was simply to get rid of the classification system. For education and culture service grants this meant that the State financed 57 % of the calculatory costs for all municipalities[21]. For social welfare and health care grants the classification coefficients were simply dropped and no general state share percentage was introduced, i.e. the grant was simply the unit price multiplied by the number of units (for details, see the appendix).

As for the revenue sharing, the following formula was introduced as a replacement for the classification[22]:

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[19] See, for example, Järviö, M-L. and Luoma, K. 1999, Moisio 1994, Moisio 1998 and Oulasvirta 1996.

[20] See Kirjavainen, T. & Loikkanen, H. 1992, Häkkinen and Luoma 1995.

[21] Law for educational and cultural service finance and planning 1448/ 1995.

[22] Oulasvirta 1996, 170 (notation modified).

(12) $TE_i = t \times [(EL_i \times T) - T_i]$,

where $TE_i$ is the per capita tax base equalisation payment to the municipality or a compensation fee from the municipality to the equalisation fund, t is the mean tax rate of all municipalities, $EL_i$ is the equalisation limit for municipality i (the limit varied between 85 and 95 %, but for most municipalities the limit was 85 %)[23], T is the average per capita tax base of all municipalities and $T_i$ the tax base of municipality i. Using the average tax rate avoided providing incentives to increase the local tax rates because of the system itself.

*Table 2 The grant system in 1993-1996* [24]

| **Grant** | **Factors used in the calculation of the grant** |
|---|---|
| Social welfare and health care services (the share of this sector's grants from total grants in 1993 was 50.5 %) | - classification of the municipalities (abandoned 1996)<br>- age-class distribution<br>- a parameter describing sickness in the municipality<br>- area of the municipality<br>- population density<br>- unemployment level<br>- a special coefficient for small municipalities in the coastal area |
| Education and cultural services (share 28.9 %) | - classification of the municipalities (abandoned 1996)<br>- number of students<br>- number of hours of lessons<br>- population in the municipality<br>- percentage of Swedish speakers |
| General grants (share 14.9 %) | - classification of the municipalities (abandoned 1996)<br>- area of the municipality<br>- population density<br>- percentage of Swedish speakers |

[23] For municipalities with a population density less than 1 person/square kilometre or if the municipality was a so-called island municipality, the limit was 95 %; for municipalities with a population density between 1 – 1.9 the limit was 91 %; for population densities between 2 – 6.9 the limit was 88 % and for population densities above 6.9 the limit was 85 %.

[24] The table describes the grants intended to cover the municipalities' operating expenditures. The grants to investments continued to be matching and the matching rate depended on the classification of the municipalities. In 1996, however, as the classification system was abandoned, the matching rate of the investment grants depended on the municipalities' tax base compared to the average tax base.

*Table 3* *Grant percentages in separate classification groups during 1993-1995*[25]

| | Sector | | | |
|---|---|---|---|---|
| Class | Education | Cultural services | Social welfare and health care services | Investments |
| 1 | 60 | 40 | 45 | 70 |
| 2 | 60 | 40 | 45 | 65 |
| 3 | 60 | 40 | 45 | 60 |
| 4 | 60 | 40 | 45 | 55 |
| 5 | 60 | 40 | 45 | 50 |
| 6 | 57 | 37 | 42 | 45 |
| 7 | 54 | 34 | 39 | 40 |
| 8 | 51 | 31 | 36 | 35 |
| 9 | 48 | 28 | 33 | 30 |
| 10 | 45 | 25 | 30 | 25 |

In 1997 the needs criteria of the formula-based system were revised. The calculatory costs for social welfare were still based on the age structure (93 % weighting), but some changes were made in the unemployment and sickness factors (see appendix). As for health care, the age structure[26] had a 75 % weighting and the morbidity factor[27] was revised.

The main change in education sector grant system was that the grants began to be paid directly to municipalities providing the education service. Previously, the grants were paid to pupils' home municipalities.

A new element to define the grant from the calculatory costs was the so-called municipal self-financing share. For example, for *education and culture* services the following formula was used to define the self-financing share:

$$\text{(13)} \qquad \textit{Municipal per capita self-financing share} = \frac{\left(\sum_{i=1}^{n}\sum_{j=1}^{k} CC_{ij}\right)\times(1-SF)}{N},$$

where i denotes the municipality, j is the sector that the calculatory costs are defined for[28], $CC_{ij}$ is the calculatory cost for municipality i for service j, SF is the state financing share (in 1997 the state share was 24.2 % for social welfare and

[25] Oulasvirta 1996, 163.

[26] A new age group in the age classification was those over 85 years of age.

[27] The morbidity factor was defined as the proportion of persons under 55 years of age unable to work, standardised with respect to age and sex.

[28] For welfare and health care, the sub-categories of services are welfare and health care. For education and culture, there are several sub-categories such as comprehensive schools, secondary schools, vocational schools, libraries, open colleges and museums, theatres, and so on.

health care and 57 % for education and culture) and N is the total population of Finland.

After the self financing share of the total education and health care sector was defined, the grant for municipality i's education and culture was simply the sum of the education and culture calculatory expenditures for municipality i minus the per capita self-financing share.

The revenue sharing system[29] was also changed so that the formula for municipality i became:

(14) if $Tax_i > (0.9 \times Tax)$, i pays $\min[\{0.4 \times (Tax_i - (0.9 \times Tax))\}, (0.15 \times Tax_i)]$

if $Tax_i < (0.9 \times Tax)$, i receives $(0.9 \times Tax) - Tax_i$,

where $Tax_i$ is the calculatory per capita tax income[30] of municipality i and Tax is the average per capita calculatory tax income of all municipalities.

In practice, the fees for revenue sharing were collected by reducing the grants, and positive payments were added to sector grants. The positive and negative transfers have been executed so that 6 % of the revenue sharing goes through general grants, 57 % through social welfare and health care grants and 37 % through education and culture grants. The system has meant that for some municipalities the education and culture grant, for instance, has been negative. Since the 1997 reform the system has prevailed.

### 2.3.2 Empirical specification and data

The purpose of this paper is to estimate and test models explaining municipal per capita expenditures. Using the data for the last eight years (1985-1992) of the matching grants period, price and income elasticity parameters are estimated for seven expenditure categories. Similarly, using data for the first seven years (1993-1999) of the formula-based period, the effects of grants and private incomes on expenditure categories are estimated to test the existence of the "flypaper effect". This issue can be examined only for the formula-based data period, because in the previous period there were practically no lump sum grants, whereas most of the grants for the latter period were of the lump sum type. For the matching grants period the following model is fitted[31]:

[29] In 1999, 347 municipalities out of 436 received revenue sharing payments and 89 municipalities had to pay to the revenue sharing fund.

[30] $Tax_i = t \times T_i$, where $T_i$ is municipality i's tax base and t is the (weighted) average tax rate in Finland. Similarly, $Tax = t \times \Sigma T_i$.

[31] The expenditure, price and grant variables are logged to obtain the elasticity parameter estimates.

$$(15) \qquad \ln E_i = a + b_1 \ln price_i + b_2 \ln income_i + \sum_i f_i age_i + \sum_j g_j O_j \ ,$$

where $E_i$ is the per capita expenditure of public service i. As was described in section 2, *price* is defined as (1- $G_i/E_i$)*100, where $G_i$ is the grant per capita for service $E_i$[32]. *Income* is total taxable income per capita[33]. *Age groups* include the relative proportions of people in the 10 separate age groups and O is the vector of other demographic and political variables.

For the formula based grants period, the estimated equation is formulated as follows:

$$(16) \qquad E_i = a + b_1 income + b_2 G_i + \sum_i f_i age_i + \sum_j g_j O_j \ ,$$

where $G_i$ is the grants per capita for the specific expenditure ($E_i$); other variables are as previously. Price is omitted because during this period the grants were formula-based and grants of this kind are not expected to have price effects.

The data, which was obtained from Statistics Finland, covered 436 municipalities[34] and 15 time periods (years). Table 4 lists the variables used in the estimations.

[32] Note that $G_i/E_i$ is used as the subsidy rate instead of figures in Table 1. In the Table 1 case, however, the administrative figures would be used, which would ignore the changes in municipalities' expenditures. In addition, if figures in Table 1 were used, there would be almost no within variance in the variable, which would make the estimation less meaningful.

[33] Tax base consists mainly of the income tax base, but business and property tax bases are also included.

[34] All municipalities except those in the autonomous Åland islands.

*Table 4 Variables used in the estimations*

| Symbol | Variable description |
|---|---|
| $E_2$ | Total gross operating expenditures per capita |
| $E_3$ | Gross expenditures on education and culture services per capita |
| $E_4$ | Gross expenditures on social welfare and health care per capita |
| $E_5$ | Gross expenditures on general administration per capita |
| $E_6$ | Gross expenditures on libraries per capita |
| $E_7$ | Gross expenditures on comprehensive schools per capita |
| $E_8$ | Gross expenditures on secondary schools per capita |
| $G_2$ | Grants for operating expenditures per capita |
| $G_3$ | Grants for education and culture per capita |
| $G_4$ | Grants for social welfare and health care services per capita |
| Soc % | The share of socialist representatives in the municipality council |
| Centre % | The share of Centre party representatives in the municipality council |
| Coalition % | The share of Coalition party representatives in the municipality council |
| U % | The unemployment rate of the municipality |
| Urban | Measure for urbanisation of the municipality |
| Netm % | Net migration, per cent of the population |
| Income | Total taxable income per capita |
| $Price_i$ | Price variable for separate expenditures, used only in the estimations for period 1985-1992[35]. Price is measured as $(1- G_i/E_i)*100$. |
| P-3 | Per cent of people less than three years old |
| P4-6 | Per cent of people aged between 3 and 6 years |
| P7-15 | Per cent of people aged between 7 and 15 years |
| P16-18 | Per cent of people aged between 16 and 18 years |
| P19-24 | Per cent of people aged between 19 and 24 years |
| P25-39 | Per cent of people aged between 25 and 39 years |
| P40-60 | Per cent of people aged between 40 and 60 years |
| P61-74F | Per cent of females aged between 61 and 74 years |
| P61-74M | Per cent of males aged between 61 and 74 years |
| P75-F | Per cent of females aged 75 years and older |
| P75-M | Per cent of males aged 75 years and older |
| D9294 | Dummy variable for recession years 1992-1994 |
| D9799 | Dummy variable for years 1997-1999 |
| D85 – D99 | Year dummies |

The *total operating expenditure ($E_2$)* and several sub-categories of local public expenditures are used as dependent variables. Aggregate per capita operating expenditures are divided first into more general categories such as *education and culture ($E_3$)* and *social welfare and health care ($E_4$)* expenditures. Expenditures on subcategories such as *general administration ($E_5$)*, *libraries ($E_6$)*, *comprehensive schools ($E_7$)* and *secondary schools ($E_8$)* are also explained. The expenditures

[35] After 1993 (formula based grant period) the value of price variables are defined to be 1.

under examination are gross expenditures, i.e. the role of operating incomes such as fees and user charges is not taken into account. The main reasons for not using net expenditures are that the possibilities to utilise fees and charges as income sources differ considerably between the municipalities. For instance, the largest cities often have the largest fee and charge incomes that would make their net expenditures lower than for other types of municipalities. This could diminish the comparability of expenditures, especially in case of total operating expenditures. All per capita expenditures are entered in the form of natural logarithms. Expenditures are measured at 1995 prices using the local government expenditure price index calculated by Statistics Finland (Hemmilä and Kauhanen, 1997). The figures have also been adjusted to take into account the fact that small municipalities often provide health care and educational services via the joint authorities of municipalities[36].

Per capita *grants for operating expenditures ($G_2$), grants for education and culture ($G_3$),* and *grants for social welfare and health care services ($G_4$)* consist of matching grants for 1985-1992 and formula-based grants for 1993-1999. For the formula-based period, grant variables also include the revenue sharing figures because the revenue sharing is divided between sector grants and general grants. All grant variables have been transformed into natural logarithms for 1985-1992, but not for 1993-1999. This is because during the latter period the grants for some municipalities in some years were negative due to the peculiar way of dividing the revenue sharing into the sector grants[37].

The models also include a measure of *urbanisation (urban)* to test the economies of scale as well as differences between municipalities in demographic characteristics. Urbanisation is measured as the proportion of the population living in an urban area and is calculated every five years by Statistics Finland (in the data period used, the urbanisation has been measured in 1985, 1990 and 1995). *Net migration (Netm %)* is measured as a percentage of the inhabitants in the municipality. Expenditure needs are measured using *age groups* and *unemployment rate (U %)*. The relative size of age groups under 7 years of age in the total population describes the need for day care, age groups 7-15 measure the need for school services and age groups 61-74 and 75 and older describe the need for health care and social welfare services for the elderly. In the last two age groups, males and females are considered separately because of the shorter life expectancy of males. Unemployment creates need for municipal social welfare assistance.

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[36] The municipality specific figures for grants to joint authorities of municipalities were obtained from Statistics Finland. These figures cover over 90 % of the grants directed to the joint authorities of municipalities. The grant figures in question were then added to each municipality's grant figures. Expenditures were also modified using the separate grant data.

[37] Due to the cuts in grants the grant for education and culture can be negative even if the municipality receives funding from tax revenue sharing. Grants were cut between years 1993 and 1998 for the social and health sector and between 1993 and 1999 for the education and culture sector. For more details about grant cuts, see the appendix.

Decisions in the municipalities are made by elected political representatives in the municipal council. Elections are held every four years; for the data period of this study the elections were in 1984, 1988, 1992 and 1996. The interesting question of voting and political factors is defined by using the relative share of the three main political parties in the municipality council: the *share of socialist (Soc %)*[38], *Centre Party (Centre %)* and *Coalition Party representatives (Coalition %)*. The political structure of a council is directly reflected in the municipal board. As the board is the organ that makes the proposals, there is no opposition versus government situation in Finnish municipal councils.[39] Therefore, the use of relative shares of the main political parties as explanatory variables is justified.

*Income* is defined as the total taxable income per capita, because in this paper the (private) income effect and price effects for the matching grants period are tested. For the formula-based grants period, the effects of grants and private income are compared. The role for other income sources, such as fees collected, is left out of the study.

Three *prices* are used: $Price_2$ is defined using $G_2$ and $E_2$, $Price_3$ is calculated using $G_3$ and $E_3$, and $Price_4$ is defined using $G_4$ and $E_4$. As there are no separate grant data for $E_5$, $E_6$, $E_7$ and $E_8$, $Price_3$ is used when explaining $E_6$, $E_7$ and $E_8$. Similarly, $Price_2$ is used when explaining $E_5$.

As was already noted above, the data covering years 1985-1999 has been divided into two periods, making it more consistent within periods. In addition, the data for total operating expenditures was adjusted by adding the expenditures and grants of the federations of the municipalities into each municipality's expenditure and grant figures.[40] Also, the figures for grants were modified so that the grants of the secondary and primary schools administrating the service were divided according to each student's home municipality[41]. This is because the grants were paid directly to the municipalities in which the schools operated during years 1997-1999. Despite of all these adjustments, some data comparability problems still remain for period 1993 – 1999. The main source of inconsistencies is the reform of the bookkeeping system in 1997. However, the effect of these changes can be controlled for by using year dummies, and this has been done in this paper.

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[38] The sum of shares of representatives of the Social Democratic and socialist parties.

[39] In practice in local politics some opposition situations may nevertheless exist. However, in these cases the effect is included in the error term and for the part that the effect is fixed it is eliminated by the estimation method.

[40] Federations are used primarily by small and medium-sized municipalities, mainly for health care and education services such as health centres, hospitals, secondary schools and vocational schools. The data used in the adjustments for years 1985 – 1992 was obtained from Statistics Finland.

[41] The adjusted data was obtained from Association of Finnish Local and Regional Authorities.

*Table 5* *Descriptive statistics. Variation among 436 municipalities and over time (1985-1999). The variable Price is summarised for the period 1985-1992*

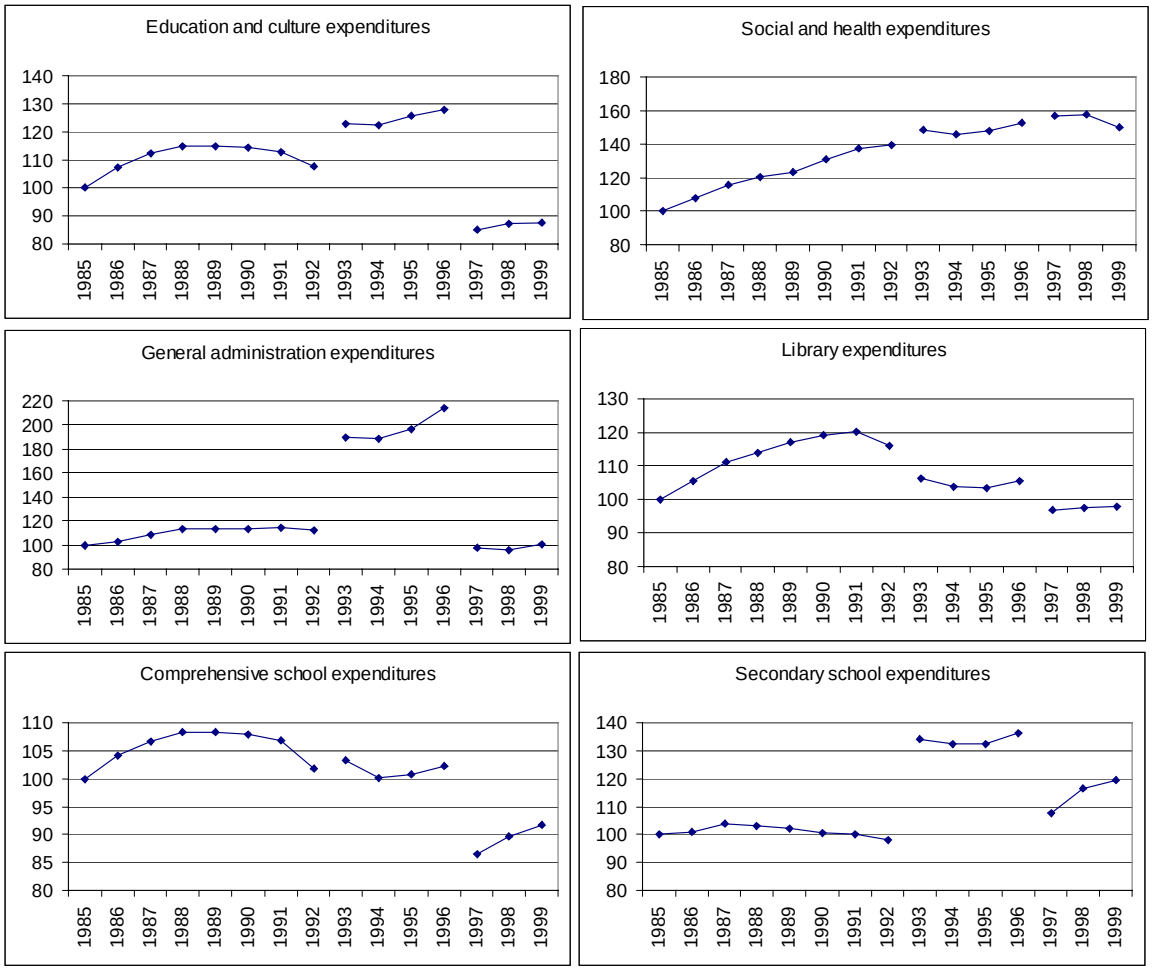
| Variable | Mean | Min | Max | SD | SD (Within groups) | SD (Between groups) |
|---|---|---|---|---|---|---|
| $E_2$ | 20285.0 | 11529.3 | 38827.0 | 3576.1 | 2093.7 | 2902.2 |
| $E_3$ | 33784.0 | 9203.9 | 118374.2 | 9644.9 | 5434.6 | 7976.6 |
| $E_4$ | 8940.9 | 3912.9 | 16044.6 | 1683.4 | 1314.5 | 1052.7 |
| $E_5$ | 1269.8 | 385.8 | 6056.0 | 634.6 | 549.1 | 318.4 |
| $E_6$ | 247.8 | 68.2 | 1694.6 | 82.4 | 47.7 | 67.2 |
| $E_7$ | 3222.2 | 1066.2 | 11987.2 | 924.2 | 382.4 | 842.2 |
| $E_8$ | 461.7 | 0.2 | 2013.7 | 290.3 | 114.1 | 267.3 |
| $Price_2$ | 55.8 | 27.3 | 87.2 | 10.2 | 2.1 | 10.0 |
| $Price_3$ | 44.9 | 16.4 | 75.2 | 10.0 | 3.0 | 9.6 |
| $Price_4$ | 62.5 | 40.6 | 84.7 | 8.9 | 2.5 | 8.6 |
| Income | 44064.9 | 16331 | 167292 | 13318 | 10351.7 | 8388.7 |
| $Grants_2$ | 9043.1 | 510.1 | 21118.1 | 2899.0 | 1382.0 | 2551.1 |
| $Grants_3$ | 2652.0 | -1542.9 | 9978.7 | 1244.6 | 815.7 | 941.0 |
| $Grants_4$ | 3573.0 | -304.4 | 8473.1 | 1252.8 | 881.8 | 890.9 |
| $Grants_5$ | 41.0 | 0.0 | 1715.9 | 81.2 | 57.7 | 57.2 |
| Urban | 55.9 | 0.0 | 99.0 | 22.4 | 4.6 | 22.0 |
| P-3 | 4.9 | 0.8 | 10.0 | 1.0 | 0.5 | 0.8 |
| P4-6 | 3.9 | 0.8 | 7.8 | 0.8 | 0.4 | 0.7 |
| P7-15 | 12.2 | 6.3 | 21.5 | 1.9 | 0.7 | 1.7 |
| P16-18 | 3.9 | 0.8 | 7.3 | 0.6 | 0.4 | 0.5 |
| P19-24 | 7.0 | 2.4 | 12.3 | 1.4 | 1.1 | 0.9 |
| P25-39 | 20.2 | 9.9 | 30.7 | 2.8 | 1.9 | 2.1 |
| P40-60 | 27.1 | 16.0 | 37.8 | 2.8 | 2.2 | 1.7 |
| P61-74F | 7.7 | 2.1 | 13.3 | 1.7 | 0.5 | 1.6 |
| P61-74M | 6.2 | 1.8 | 12.7 | 1.5 | 0.6 | 1.4 |
| P75-F | 4.6 | 1.1 | 10.7 | 1.5 | 0.5 | 1.4 |
| P75-M | 2.3 | 0.4 | 6.0 | 0.8 | 0.3 | 0.7 |
| Soc % | 31.0 | 0.0 | 74.4 | 13.8 | 3.2 | 13.5 |
| Centre % | 37.1 | 0.0 | 100.0 | 20.5 | 3.5 | 20.3 |
| Coalition | 16.6 | 0.0 | 47.6 | 10.5 | 2.8 | 10.1 |
| Netm | -0.2 | -7.0 | 9.2 | 1.1 | 0.8 | 0.6 |
| U % | 12.5 | 0.6 | 33.9 | 7.0 | 6.0 | 3.6 |

Figure 10 shows the development of subcategory expenditures. There were two break points in the data: the 1993 grant reform and the 1997 grant reform and bookkeeping rule[42]. These have affected some expenditures more than others, as can be seen from Figure 10. The years 1985-1992, 1993-1996 and 1997-1999

[42] The reform of bookkeeping rules changed the way some expenditures were entered in the accounting.

have been separated in order to clarify the differences between the data periods. The figures also reveal that at the beginning of the recession (1991) all expenditures except those of the social welfare and health care sectors decreased. However, social welfare and health care expenditures also decreased temporarily in 1994. The education and culture expenditures began to decrease in 1989 (probably due to decreasing comprehensive and secondary school expenditures) and began to gradually rise after 1994. The last three years have meant an increase in this category's expenditures. It appears that administrative expenditures increased rather dramatically during 1993-1996. The expenditures on libraries were reduced between 1992-1995, but since then the development for this service seems to have been fairly stable.

*Figure 10* *Index for six local government expenditure categories (1990 prices, 1985 = 100)*



### 2.3.3 The estimation methods

The municipal expenditures were analysed mostly using fixed effects regression method for panel data. However, also cross-section and random effects models were fitted. The fixed effects analysis took both the time (years) and cross-section variation of the municipalities (436 localities) into consideration. The econometric analysis of panel data is described in detail in the econometrics literature (Hsiao, 1986 and Baltagi 1995) so the methodological issues are discussed here only briefly.

In general one can state that panel data provides several advantages compared to the mere cross-section or time series data. These are, among others, the larger number of the degrees of freedom and a decrease in the effects of multicollinearity and heteroscedasticity due to the wider material. In addition, the omitted variable problem, which is the usual problem of the regression analysis, is easier to solve when using panel data. For instance, in the regression analysis the effects of the excluded variables are included in the residual of the model. If, however, the excluded variables correlate with explanatory variables in the model, the regression coefficients will be biased and inconsistent. Because in the panel data the cross section- and time spans are combined, the effects of the excluded variables can be divided into three groups:

i) *Individual and time invariant factors.* In the case of municipalities this kind of a variable could be for example a distance between the centre of the municipality from the capital city. The land area of the municipality is another example. Those variables are easy to measure. The example of the hard to measure- types of variables could be for instance an own tradition or way of action of the municipality.

ii) *Time variant common factors.* The macroeconomic variables such as interest rate, prices and so on are common to the municipalities but change over time. The hard to measure type of variable could be for instance a general (macroeconomic) atmosphere or expectation.

iii) *Individual and time variant factors.* For example the operating surplus and tax base of the municipality change every year and vary according to the municipality. An example of hard to measure- type of variable can be the know-how of the workers of the municipality. This changes during time and there are big differences in know-how between the municipalities.

Usually it is supposed that the single excluded variables do not have a large effect on the estimates but that added up they form a problem. The problems caused by the excluded variable types mentioned in the above list could be reduced with the help of the so-called fixed effects or random effects models. In these models the effects of the excluded variables are included in the constant term. The time invariant effects (case i above) can be excluded by differencing

the data once or by adding individual dummies. The time variant common factors can be controlled by adding time (year) dummies in the model (case ii). The remaining problem of course are the variables described in case iii). Like in every regression modelling, special attention should be paid to model specification. The models used in this study have been tested using Preusch-Pagan test. In addition, the usability of fixed effects model compared to random effects model has been tested using the Hausman test. For details, see Hsiao (1986).

## 2.4 Results and interpretation

### 2.4.1 The matching grants period

The results for fixed-effect panel estimations on seven expenditure categories are presented in Table 6[43]. For all models except one (social welfare and health care) the price elasticity coefficient seems to be positive with statistically significant parameter values.[44] For instance, the interpretation of the results for the first column of Table 6 is that a 10 % decrease in price[45] reduces the expenditures by 0.7 %. In other words, when the municipality receives more grants so that its cost share drops by 10 %, the municipality would in fact lower the per capita expenditure by 0.7 %. Hence, if the State increased the matching rate of the grants (i.e. decreased the municipalities' cost share), the municipalities would leave the service level unaltered or slightly diminish it. The effect of lowered price would only be to shift the cost share from local governments to the State. This effect seems to be largest for secondary school expenditures, where a 10 % decrease in price would decrease the expenditures by 3.2 %. In contrast, for social welfare and health care expenditures, a decrease in price of 10 % would increase the expenditures by 4.5 %.

The yearly cross-section estimations give a somewhat different picture of the price elasticity parameters compared with the panel data estimations. The results for the price variable (see Figure 11), when fitting the model for separate expenditure types, show that the yearly price effects are negative for total operating expenditures and those of education and culture, social welfare and health care, and comprehensive and secondary schools. For general administration and li-

[43] The dependent variables as well as the price and income variables are entered as natural logarithms in order to obtain the elasticity parameter estimates. The other variables, which enter as proportions or shares, have not been logged.

[44] The data development of the variables in question was presented in Figure 10: the aggregate education and culture expenditures and especially the comprehensive school expenditures began to diminish in real terms since 1988/9. As the price has also gradually fallen over this period, then during the last half of the period the expenditures and price have both fallen. The estimations for sub-periods 1985-1989 and 1990-1992 both resulted in positive price estimates for education, however (estimations are not reported here).

[45] The price is defined as $(1-\frac{total\ grants\ for\ operating\ expenditures}{operating\ expenditures})$.

braries, the cross-section estimates were not significant. The highest negative values of price elasticity parameters are found on secondary schools and social welfare and health care, where a 10 % increase in price will lead to a reduction of more than 10 % in expenditures. The values of the elasticity parameters appear to diminish towards the year 1992.

Why do the cross-section estimates differ so much from the panel estimates? One must note that the advantage of panel data sets and the estimation methods lies in their ability to control for individual heterogeneity. Not controlling for these unobserved individual specific effects may lead to bias in the resulting estimates. The panel estimates and the cross section estimates are therefore two different things. However, the fact that the price estimates were negative when using cross-section data suggests a need to look more closely into this matter.

*Table 6 Fixed effects estimation results for period 1985-1992*

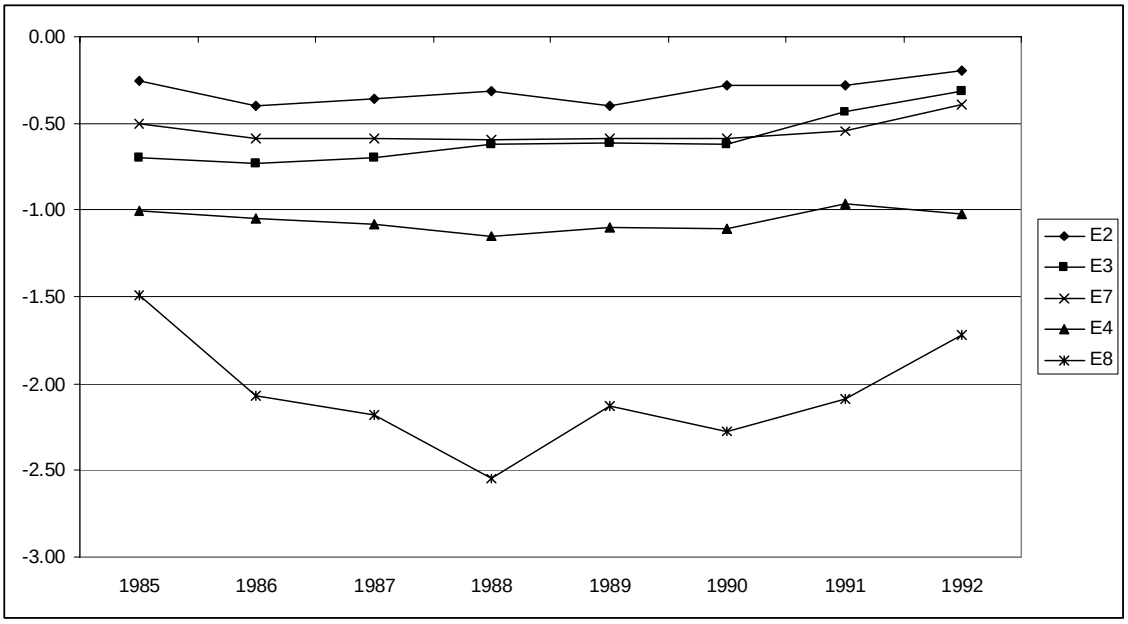
| | $LnE_2$ | $LnE_3$ | $LnE_4$ | $LnE_5$ | $LnE_6$ | $LnE_7$ | $LnE_8$ |
|---|---|---|---|---|---|---|---|
| Lnprice[46] | 0.072 | 0.233 | -0.454 | 0.096 | 0.331 | 0.210 | 0.322 |
| | (2.56)* | (10.14)** | (10.70)** | (1.86) | (7.98)** | (8.50)** | (4.49)** |
| Lninc | 0.351 | 0.313 | 0.456 | 0.270 | 0.396 | 0.193 | 0.388 |
| | (7.92)** | (6.77)** | (6.64)** | (4.73)** | (5.94)** | (5.52)** | (2.84)** |
| U % | -0.001 | -0.005 | 0.002 | -0.003 | -0.002 | -0.005 | -0.002 |
| | (2.69)** | (10.82)** | (4.42)** | (3.21)** | (1.90) | (11.21)** | (1.11) |
| Urban % | 0.001 | -0.001 | 0.001 | 0.001 | -0.002 | -0.001 | 0.002 |
| | (4.10)** | (3.00)** | (3.89)** | (1.63) | (2.62)** | (2.42)* | (1.12) |
| Soc % | -0.000 | -0.001 | 0.000 | 0.000 | -0.001 | -0.000 | -0.003 |
| | (0.23) | (1.03) | (0.13) | (0.00) | (0.48) | (0.36) | (1.43) |
| Centre % | 0.001 | 0.001 | 0.001 | 0.003 | 0.002 | 0.002 | -0.001 |
| | (4.52)** | (2.06)* | (2.07)* | (3.02)** | (2.09)* | (3.62)** | (0.34) |
| Coalition % | -0.000 | -0.001 | -0.000 | 0.001 | -0.000 | -0.001 | 0.003 |
| | (0.42) | (1.60) | (0.40) | (0.80) | (0.40) | (1.11) | (0.88) |
| Netm % | -0.004 | -0.005 | -0.004 | 0.002 | -0.001 | -0.005 | 0.005 |
| | (3.48)** | (3.37)** | (2.73)** | (0.77) | (0.46) | (3.29)** | (0.59) |
| P-3 | 0.039 | 0.010 | 0.034 | 0.001 | 0.030 | 0.002 | -0.096 |
| | (9.88)** | (1.99)* | (6.72)** | (0.15) | (2.64)** | (0.35) | (3.98)** |
| P4-6 | 0.042 | 0.025 | 0.033 | 0.026 | 0.062 | 0.022 | -0.084 |
| | (9.86)** | (4.71)** | (5.73)** | (3.03)** | (4.91)** | (3.87)** | (2.90)** |
| P7-15 | 0.035 | 0.032 | 0.028 | -0.007 | 0.058 | 0.038 | -0.096 |
| | (10.42)** | (6.81)** | (6.34)** | (1.11) | (6.38)** | (7.63)** | (4.60)** |
| P16-18 | 0.009 | 0.020 | 0.004 | -0.009 | 0.016 | 0.023 | 0.095 |
| | (2.17)* | (3.55)** | (0.71) | (1.07) | (1.59) | (3.93)** | (3.86)** |
| P19-24 | 0.001 | 0.011 | -0.009 | -0.004 | 0.018 | 0.014 | -0.026 |
| | (0.49) | (3.05)** | (2.38)* | (0.69) | (2.38)* | (3.91)** | (1.54) |
| P40-60 | 0.029 | 0.022 | 0.035 | 0.022 | 0.025 | 0.011 | -0.012 |
| | (18.64)** | (9.88)** | (17.70)** | (6.61)** | (5.44)** | (4.97)** | (1.27) |
| P61-74M | 0.034 | 0.012 | 0.039 | 0.021 | 0.059 | 0.001 | -0.079 |
| | (8.81)** | (2.43)* | (7.70)** | (2.61)** | (4.62)** | (0.12) | (2.92)** |
| P61-74F | 0.016 | 0.014 | 0.022 | 0.013 | -0.005 | 0.009 | 0.070 |
| | (3.96)** | (2.51)* | (4.35)** | (1.52) | (0.46) | (1.45) | (2.44)* |
| P75-M | 0.047 | 0.043 | 0.067 | 0.015 | 0.044 | 0.020 | -0.072 |
| | (7.75)** | (5.40)** | (8.40)** | (1.14) | (2.32)* | (2.45)* | (1.50) |
| P75-F | 0.043 | 0.030 | 0.045 | 0.033 | 0.046 | 0.025 | -0.025 |
| | (9.67)** | (5.27)** | (7.88)** | (3.49)** | (3.21)** | (4.22)** | (0.82) |
| Cons | 3.616 | 2.711 | 3.600 | 2.591 | -2.466 | 3.965 | 2.539 |
| | (6.83)** | (5.03)** | (4.30)** | (3.63)** | (2.95)** | (9.13)** | (1.41) |
| $R^2$(total)[47] | 0.95 | 0.97 | 0.93 | 0.89 | 0.84 | 0.97 | 0.95 |
| $R^2$(within) | 0.76 | 0.42 | 0.82 | 0.23 | 0.22 | 0.25 | 0.12 |

Robust t-values in perenthesis. * means 5 % significance, ** for 1 % significance. The results of statistical tests performed are presented in Appendix, Table 12.

[46] The price variable constructed for E2 is used also when explaining E5. In the same way, price for E3 is used for E6, E7 and E8.

[47] When calculating this, the group effects are estimated and affect the total sum of squares of the model under consideration. The second $R^2$ (below) is calculated so that the effects of the groups are fixed and unestimated quantities are subtracted out of the model before the fit is performed.

*Figure 11 The price elasticity estimates from cross-section estimations*




There are at least four possible explanations for the positive price effects in the panel data case[48]: first, the result may arise from the effect of closed-ended grants. As was already explained above, closed-ended grants were used for education and cultural services, where the municipality could hire only a fixed number of teachers in proportion to the number of pupils to receive the grant. A higher matching rate would therefore not lead to significant changes in the level of these services, but would rather go into the consumption of other goods. This could be the case if, for example, the municipality produced the public goods at level that maximise the grants, i.e. all the grant eligible posts were filled (in Figure 9, this would be the point C in the kinked budget line ACE). In case of falling prices (as a result of lowering classification) the municipality would be able to lower taxes or increase other than grant eligible expenditures by just producing the same amount of public good as before (point C in Figure 1). The municipality could even reduce the grant eligible expenditures a bit as the results in this paper suggest but the reason for this is difficult to imagine. The situation would be different if the municipality originally produced more public good that was needed to receive the maximum level of grants (between points C and E in Figure 1). In this case, a small reduction in public good could lead to significant increase of funding for other public goods or tax reduction.

The second possible explanation comes from the fact that the lowering of the municipality's classification was because the economic situation of the municipality had deteriorated. In this case, the municipality may have reduced its

[48] Fixed effects models control for the municipality-specific effects, such as land area, travel time and costs, wage differences, and even quality of public sector labour force.

spending simply because the lowered price did not fully compensate the weakened economic situation. However, the fact that the municipalities at the same time increased their social and health-care expenditures speaks against this interpretation.

The third explanation for the positive price coefficient deals with the system of price changes in the municipalities. As was already mentioned, the biggest source for price variation came from changes in single municipalities' classification. This meant that all prices of local public goods changed at the same time. For example, when all prices are lowered by the same percentage units, there is no incentive to substitute from one local public good to another. Then, with fixed private good prices, the only effect left is the income effect. Hence, the positive "price" coefficient.

The fourth explanation is an econometric one, and it deals with the fact that the variance of the price variable used in the estimations is rather low. During the matching grants period the main source of variation in the price variable for a single municipality came from the changes in either expenditures or in grants. However, as grants at that time were matching, the only source of large change in the price variable came from changes in the classification of the municipalities. This is because the matching rates were tied with the 10 classes in the classification system (see also Table 1). During 1985-1992, the matching rates were slightly changed from year to year within the classification so that the State deliberately lowered or increased the price[49]. On average, the trend appears to have been towards a lower price from 1985 to 1992: the average value of the price variable (the municipalities' cost share) for total operating expenditures was 57.7 % in 1985 whereas in 1992 it was 54.5 %. However, the biggest source for variation in the price variable was the lowering or raising of an individual municipality's classification in the system. For the group of municipalities whose classification had changed at least once (n = 143), the average value of the price variable was 63.3 % in 1985 and 58.6 % in 1992, so the price clearly decreased more in these municipalities[50]. Changes in the classification of individual municipalities were decided by a special committee in the Ministry of the Interior. The main factor in the decision-making was the tax base, but the service need and circumstantial factors such as population density and area were also considered.

To test the effect of within-variance on the estimates for the price variable, the municipalities were divided into two subgroups (estimates from Table 6 are also presented for comparison). The estimations were carried out for all seven de-

[49] The main "players" deciding the changes in the matching rates were the Ministry of Social Affairs and Health, Ministry of Education and Ministry of Finance. See also Oulasvirta (1996, 104).

[50] The same figures for the 291 municipalities whose classification at the same time have remained unaltered were 54.9 % in 1985 and 52.5 % in 1992.

pendent variables for the subgroups. The resulting price coefficients can be found in Table 7. As can be seen, even for the higher within-variance subgroup of the 143 municipalities, the price elasticity changes from positive to negative only for the total operating expenditures. However, price coefficients do have considerably different sizes in this subgroup compared to other municipalities (comparing second column results to the results in first and third columns) for total operating expenditures, social welfare and health care expenditures, general administration and libraries.

From Table 7 it can also be seen that year dummies have an effect on the price variable estimates for total operating expenditures, social welfare and health care expenditures and general administration. Year dummies actually seem to remove the growth effects that income and price variables are supposed to measure. Therefore, it seems reasonable not to use year dummies for models covering 1985-1992, because price and income variables can be said to react immediately and similarly in all municipalities to important macroeconomic changes. For this reason, the results in Table 6 were presented without year dummies. The same estimations with year dummies can be found in the appendix (Table 16)[51].

All in all, the most likely reasons for positive price effect are, first, the fact that most grants in education and culture sector can be classified as closed-ended matching grants and, second, that all local public good prices change at the same time and most times by the same amount. The econometric explanation seems less likely, because separately estimating the group with more within variance did not result in statistically significant negative price elasticity coefficients.

[51] Year dummies were mostly significant for all expenditures under study. A clear exception to this was the secondary school expenditures, however, where none of the year dummies were significant at the 5 % level.

*Table 7* *The coefficients of price elasticity in group estimations (robust t-values in parenthesis). Data period 1985-1992, fixed effects estimations*

| | Data group | | |
|---|---|---|---|
| Dependent variable | All municipalities (n = 433)[+] | Change in classification (n = 143) | No change in classification (n = 290) |
| E2, year dummies | 0.21 (7.89)** | 0.09 (2.01)* | 0.28 (8.65)** |
| E2, no year dummies | 0.07 (2.56)** | -0.07 (-1.5) | 0.17 (4.87)** |
| E3, year dummies | 0.22 (10.05)** | 0.22 (5.73)** | 0.23 (8.16)** |
| E3, no year dummies | 0.23 (10.70)** | 0.21 (5.67)** | 0.25 (8.69)** |
| E4, year dummies | -0.25 (6.22)** | -0.002 (-0.04) | -0.41 (8.26)** |
| E4, no year dummies | -0.45 (10.70)** | -0.24 (4.27)** | -0.60 (10.46)** |
| E5, year dummies | 0.22 (4.44)** | 0.11 (–1.58) | 0.34 (5.26)** |
| E5, no year dummies | 0.10 (1.86) | -0.02 (-0.23) | 0.24 (3.65)** |
| E6, year dummies | 0.32 (7.73)** | 0.24 (2.86)** | 0.37 (8.90)** |
| E6, no year dummies | 0.33 (7.98)** | 0.25 (2.95)** | 0.38 (9.27)** |
| E7, year dummies | 0.21 (8.55)** | 0.19 (3.40)** | 0.21 (9.25)** |
| E7, no year dummies | 0.21 (8.50)** | 0.18 (3.14)** | 0.23 (9.86)** |
| E8, year dummies | 0.33 (4.62)** | 0.31 (2.65)** | 0.31 (3.57)** |
| E8, no year dummies | 0.32 (4.49)** | 0.31 (2.56)* | 0.32 (3.75)** |

[+] note: column 1 shows the results for all municipalities with and without year dummies. The results without year dummies are the same as those in Table 6.

The *income elasticity coefficients* are positive and significant for all expenditure models. Private income seems to have largest effect on health care and social welfare expenditures per capita, where a 10 % increase in private taxable incomes would lead to a 4.6 % increase in the per capita expenditures. By comparison, the results suggest that a 10 % increase in incomes would lead to a 1.9 % increase in comprehensive school expenditures. The cross-section estimates of price elasticity did not differ considerably from the panel estimates and they are not presented here.

The estimates of unemployment rate (*U %*) were found significant for most models. The exception of this were the library and secondary school expenditures. Unemployment seem to increase the social and health service expenditures but to reduce the total operating expenditures, education and culture, general administration and comprehensive school expenditures. Higher unemployment rate has therefore reduced most of the municipal expenditures, probably because of the

bad economic situation in these municipalities and higher pressure on social welfare expenditures.

The coefficient for *degree of urbanisation* (share of municipality's inhabitants living in urban area) is significant for all except the general administration and secondary school expenditures. For total operating expenditures and social welfare and health care expenditures, the results suggest that higher urbanisation increases the per capita expenditures.[52] There then appear to be diseconomies of scale for these services. On the other hand, economies of scale are found for education and culture, library and comprehensive school expenditures. The effects are very small, though: a 10 percentage point rise in the urban variable, for instance, would mean at most only a 0.02 % change in the per capita library expenditures.

To test the effect of *political decision-making* on municipal expenditures, the shares of the three main parties have been included in the analysis. As can be seen from Table 6, the share of the socialist party representatives in the municipal council does not have statistically significant effect on any the expenditures under study. Thus, the general expectation of socialists being more inclined to spend on public expenditures receives no support. The case for the Centre Party is different, however, because the finding is that a 10 percentage point increase in this party's share would increase nearly all expenditures by 0.01-0.03 %. As for the third party, the Coalition Party, no statistically significant effects on expenditures was found.

*Net migration* per capita has a (small) significant negative effect on four expenditures analysed, namely on total operating expenditures and those of education and culture, social welfare and health care, and comprehensive schools[53]. It should be noted that the effect of migration is measured here only for operating expenditures. The results could change if investments were taken in to account.

There were ten *age groups*, whose effects on expenditures were tested. The group that has been left out is the 25 to 39-year-olds. This group can be assumed to be the one with least demand for public services. For clarity, the effect of a 10 percentage point increase in the share of each age group on each expenditure type is presented in Table 8. Only statistically significant results are reported. The results show that the effects of the age groups on expenditures are quite small. The largest effect on *total operating* expenditures comes from proportion of children between 3-6 years of age and from those people aged 75 or older. The smallest effect comes from age groups between 16 and 24 years. For the *education and*

[52] The squared degree of urbanisation was also tried as an explanatory variable to test the possible U-shaped relationship, this could not be verified for any of the models in Table 6, because of insignificant parameter estimates.

[53] As one can see from Table 5, during the period 1992-1999 net migration varied between –7 % and +9 % of the population, so a 10 percentage point increase would be a considerable change.

*culture* expenditures, the strongest effect comes from 4 to 15-year-olds and somewhat surprisingly also from the people aged 75 or older. For the *social welfare and health care* expenditures, the strongest effect expectedly comes from people aged 75 or older. The proportion of elderly males (for both the 61-74 and 75+ age groups) seems to increase expenditures clearly more than their female counterparts' shares. The age groups appear to explain the *general administration* expenditures rather poorly. The *library* expenditures are most strongly affected by the age groups between 3 to 15 years old as well as share of people aged between 61-74 years. As expected, the strongest effect on *comprehensive school* expenditures comes from the age group 7-15 years. Similarly, for the *secondary schools*, the most influential group in increasing the expenditures is the 16 to 18-year-olds.

*Table 8* *The effect of a 10 percentage point increase in the relative proportion of separate age groups on expenditures (only statistically significant effects reported)*

| | E2 | E3 | E4 | E5 | E6 | E7 | E8 |
|---|---|---|---|---|---|---|---|
| P-3 | 0.4 | 0.1 | 0.3 | | 0.3 | | -1.0 |
| P4-6 | 0.4 | 0.3 | 0.3 | 0.3 | 0.6 | 0.2 | -0.8 |
| P7-15 | 0.4 | 0.3 | 0.3 | | 0.6 | 0.4 | -1.0 |
| P16-18 | 0.09 | 0.2 | | | | 0.2 | 1.0 |
| P19-24 | | 0.1 | -0.09 | | 0.2 | 0.1 | |
| P40-60 | 0.3 | 0.2 | 0.4 | 0.2 | 0.2 | 0.1 | |
| P61-74M | 0.3 | 0.1 | 0.4 | | 0.6 | | -0.8 |
| P61-74F | 0.2 | 0.1 | 0.2 | | | | 0.7 |
| P75-M | 0.5 | 0.4 | 0.7 | | 0.4 | 0.2 | |
| P75-F | 0.4 | 0.3 | 0.5 | 0.3 | 0.5 | 0.3 | |

### 2.4.2 The formula-based grants period

The separate estimation of fixed effects models for the period since 1993 makes it possible to test the flypaper effect, as from 1993 onwards the grants have been formula-based lump sum grants. In contrast to models for the matching grants period, none of the variables are transformed into logarithms. This is because the grants variable is negative for some years for some municipalities[54] and if the data was logged, one would lose the information for these municipalities[55]. Moreover, the interpretation and comparability of the results to similar estimates in other studies is easier when using the concept of marginal propensities to consume[56]. Year dummies were added to the estimations, because during the 1990s there were many changes in bookkeeping regulations, statistics and economic surroundings. Using year dummies enables one to control for the macroeconomic changes that have affected all municipalities, such as changes in bookkeeping regulations[57].

The results from fixed effects estimations in Table 9 suggest that private *income* has a significant effect on all expenditures except for general administration, libraries and secondary schools. The results for the main expenditure categories (total operating exp., education and culture exp. and social welfare and health care exp.) vary between 0.01 and 0.05[58] and are slightly smaller than those found previously in studies from Finland and elsewhere (see Table 11 in appendix). The income coefficient estimate in the case of general administration expenditures is negative, although not quite statistically significant. The negative coefficient may be explained by the wealthier municipalities often also being the biggest, where the per capita administration expenditure is below average.

The cross-section estimates for the income variable (see Figure 12) show that, over time, total operating expenditures have been the most responsive to income changes and library expenditures the least responsive. The difference between effects on expenditures of social welfare and health care, and education and culture is small. All this is mostly consistent with the panel data results in Table 9. For most of the expenditure types in cross-section estimations it seems that the effect of incomes on expenditures was higher during 1994-1996 than 1997-1999.

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[54] The main reasons for negative grants are the revenue sharing system and cuts in grants.

[55] These municipalities would be among the wealthiest.

[56] Tables containing information on other studies comparing the MPC from income and grants is provided in the Appendix, Table 11.

[57] Figure 10 showed the effects of changes in the data.

[58] The interpretation of the results is that a FIM 100 increase in incomes would result in a FIM 1 to 5 increase in expenditures.

The effect of *grants* is greater than the income effect for all expenditure types except the general administration and library expenditures[59]. Also the tests measuring the statistical difference between grant and income coefficient estimates give the same result (see the Appendix, Table 13 and Table 14). The results therefore support the existence of the flypaper effect for most of the expenditure types[60]. The magnitude of the sector grant coefficients for the biggest three expenditure categories ($E_2$, $E_3$ and $E_4$) vary between 0.06 and 0.41; these figures are comparable with results obtained in other studies (see Table 11)[61]. The greatest grant effects are found on education and culture, followed by total operating expenditures. On the other hand, the grant variable does not seem to explain the general administration expenditures statistically significantly. And for the library expenditures, the grant coefficient is even negative, which suggests that cuts on library expenditures have been made in municipalities receiving higher education and culture grants. Comprehensive school expenditures seem to react more to grants than the secondary school expenditures. The cross-section coefficients of the grants variable are presented in Figure 13.[62] The estimated effects are much higher than the ones from panel data estimation.

Using sector grants as explanatory variables raises a question whether one should actually use just one grant variable (the total operating grant) in all equations. This is because the sector grants are in practice paid to municipalities in one lump sum amount, so that it is difficult for the municipalities to differentiate sector grants from the total amount. In this study the sector grants have been used as explanatory variables, but also the separate effects of grant types compared to total amount of grants have been tested (see the Appendix, Table 15). According to the test results, the main sector grants' (G3, G4) effect on the expenditures explained differ from the sum of grants (G2) and the residual grant ($G2\text{-}G_i$) in most cases. Therefore, only the coefficients of sector grant variables are reported in Table 9 and Table 10. In any case, the flypaper effect results found in this study did not depend on the grant type used.

[59] Because the grants cannot be divided into subcategories, the grants variable in the general administration equation refers to grants for total operating expenditures. Similarly, for library, comprehensive school and secondary school expenditures the aggregate education and culture grant is used as an explanatory variable.

[60] The fact that the grants variable contain also the revenue sharing payments may explain part of the result. For example, for the municipalities that are below the 90 % equalisation limit, an increase in taxable incomes may have much smaller effect on total incomes, as the grant would diminish at the same time. This effect depends totally on the level of tax rate in municipality compared to the average tax rate used in the revenue sharing calculations.

[61] See also Bergstöm et al. (1998), who found different private income and grant effects on municipal labour demand in Sweden.

[62] When these results are compared to results of income variable coefficients in Figure 12, these also clearly support the flypaper effect.

The unemployment rate (*U %*) seems to diminish the social welfare and health-care as well as the comprehensive school expenditures and to increase the general administration expenditures.

Statistically significant negative effect for the variable *urban* was found on education and culture as well as on comprehensive school expenditures.[63] Therefore, there appear to be economies of scale in these services, but not in others. This result differs from the results obtained for the matching grants period because for that period more effects of urbanisation were found.

The only statistically significant effect on the *share of socialists* in the municipal councils was found on social welfare and health care expenditures, where an increase in the share by 10 percentage points would decrease the expenditures by FIM 101 per capita. The *Centre Party share* had statistically significant negative effects on total operating expenditures and those of social welfare and health care and secondary schools. A 10 percentage point increase in the Centre Party share would reduce the total operating expenditures by FIM 162 and the social welfare and health care expenditures by FIM 165 per capita. Also secondary school expenditures would diminish by FIM 17. On the other hand, the same change in their share would increase the per capita general administration expenditures by FIM 102. For the *Coalition Party share*, the results suggest a negative effect on total expenditures so that a 10 percentage point increase in their share would diminish the expenditures by FIM 294. Also general administration expenditure would be diminished by FIM 16. In contrast, the same increase in Coalition party's share would increase education and culture expenditures by FIM 15, comprehensive school expenditures by FIM 12 and secondary school expenditures by FIM 3. The results of the political party shares may be largely explained by the fact that the Socialist and Coalition parties have larger shares in big cities whereas the Center party's share is big in rural municipalities. Often, the rural municipalities are those with the biggest economic problems. It must also be remembered that there were only two local elections held during this period so the variance in the party share variables was very low. Therefore, the results for political variables need to be interpreted with some caution.

*Net migration* significantly lowers the total per capita operating expenditures. According to the results, a ten percentage point increase in net migration would reduce the total operating expenditures by roughly FIM 632 per capita.

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[63] The urbanisation squared was also included in earlier versions of the model to test the possible U-shaped relationship between expenditures and degree of urbanisation. For all but one model the relation could not be verified because of insignificant coefficient estimates. However, for general administration statistically significant U-shaped relationship between urbanisation and expenditures was found so that the minimum general administration expenditures would be in a municipality with 52 % of the population living in urban area. However, as the U-shape - relation was so clearly insignificant for all other models, the results are not presented in Table 9 and Table 10.

The estimated *age group* effects are mostly as expected: the school age groups increase education and culture and comprehensive school expenditures whereas a higher proportion of the elderly increases total operating expenditures. A little surprising result was that the secondary school expenditure was not explained by 16-18 year old group, and that the expenditure for social welfare and health-care was not explained by the elderly groups.[64] In total, the age groups between 19 and 60 years seem to have the least positive effects on the expenditures explained.

Looking at the *year dummy* estimates, there appears to have been a structural change in 1997 in the municipal sector economy that the year dummies have been able to capture.

To obtain a picture of the effect of the years 1997-1999 on the results, the estimations were rerun using a dummy for this period as well as slope dummies for the income and grants variables. Table 10 shows the results for this estimation. The finding is that the structural change in municipal expenditure data in 1997 has little effect on the results. There are, however, statistically significant differences in the income and grant parameter estimates between the periods 1993-1996 and 1997-1999. But their effects are so small that they do not affect the main conclusions of the estimations concerning the existence of the flypaper effect.

The best explanatory power for the models in both Table 9 and Table 10 was found for education and culture expenditures (over 80 %) and the smallest (only 8 %) for library expenditures.

[64] It seems that if the unemployment rate was left out of the regression then these effects become statistically significant.

*Table 9 The results for estimations covering period 1993-1999*

| | $E_2$ | $E_3$ | $E_4$ | $E_5$ | $E_6$ | $E_7$ | $E_8$ |
|---|---|---|---|---|---|---|---|
| Income | 0.047 | 0.020 | 0.010 | -0.008 | 0.000 | 0.006 | -0.001 |
| | (4.62)** | (4.79)** | (2.43)* | (1.66) | (0.67) | (2.63)** | (1.36) |
| $G_i$ | 0.233 | 0.410 | 0.055 | -0.030 | -0.007 | 0.163 | 0.062 |
| | (3.85)** | (18.89)** | (2.54)* | (1.24) | (2.88)** | (13.58)** | (13.66)** |
| U % | -27.577 | 2.388 | -35.838 | 15.718 | 1.214 | -10.794 | 2.329 |
| | (1.88) | (0.24) | (4.43)** | (2.01)* | (1.40) | (2.24)* | (1.50) |
| Urban % | 6.474 | -17.005 | -8.841 | 6.235 | 0.726 | -7.612 | -0.408 |
| | (0.75) | (2.78)** | (1.60) | (0.97) | (1.44) | (2.12)* | (0.32) |
| Soc % | 10.859 | 4.606 | -10.060 | 7.567 | 0.472 | -1.326 | 0.110 |
| | (1.17) | (0.96) | (2.50)* | (1.94) | (1.48) | (0.54) | (0.12) |
| Centre % | -16.245 | -5.912 | -16.475 | 10.194 | -0.451 | -1.973 | -1.662 |
| | (2.11)* | (1.40) | (4.07)** | (2.50)* | (1.39) | (0.81) | (2.01)* |
| Coalition % | -29.445 | 15.187 | -5.306 | -15.596 | -0.071 | 12.309 | 2.871 |
| | (4.09)** | (3.21)** | (1.26) | (3.39)** | (0.19) | (4.40)** | (3.46)** |
| Netm % | -63.188 | -26.272 | -4.811 | -20.391 | 1.353 | -13.204 | -1.705 |
| | (2.49)* | (1.67) | (0.35) | (1.55) | (0.84) | (1.57) | (0.58) |
| P-3 | -71.169 | 119.748 | -40.080 | -150.725 | -17.567 | 41.937 | 11.227 |
| | (0.94) | (2.88)** | (0.86) | (3.67)** | (4.07)** | (1.57) | (1.14) |
| P4-6 | -65.153 | 5.049 | -28.042 | -138.971 | -7.212 | 10.415 | 9.444 |
| | (0.73) | (0.12) | (0.48) | (3.46)** | (0.72) | (0.39) | (0.88) |
| P7-15 | 27.737 | 103.645 | -73.135 | -100.692 | 0.086 | 71.522 | -29.479 |
| | (0.47) | (3.26)** | (1.74) | (3.35)** | (0.02) | (3.35)** | (3.37)** |
| P16-18 | -182.799 | 47.717 | -151.129 | -53.777 | 5.409 | -6.064 | 15.751 |
| | (1.89) | (1.18) | (3.29)** | (1.34) | (0.95) | (0.25) | (1.54) |
| P19-24 | -213.945 | 12.113 | -144.207 | -195.589 | -3.138 | 13.981 | 4.877 |
| | (3.35)** | (0.42) | (3.92)** | (6.27)** | (1.05) | (0.81) | (0.70) |
| P40-60 | 54.107 | 12.442 | -49.263 | -10.827 | -6.807 | 4.206 | -6.894 |
| | (1.23) | (0.58) | (2.01)* | (0.46) | (1.63) | (0.31) | (1.27) |
| P61-74M | -77.593 | 52.993 | -62.230 | -200.736 | -14.492 | -36.908 | 16.414 |
| | (0.62) | (0.86) | (1.12) | (4.25)** | (3.58)** | (1.31) | (1.44) |
| P61-74F | -37.676 | -35.960 | -113.936 | -208.480 | -1.316 | 14.052 | 3.462 |
| | (0.44) | (0.88) | (2.15)* | (5.26)** | (0.20) | (0.57) | (0.32) |
| P75-M | 480.211 | -228.328 | 14.318 | -141.490 | -12.785 | -65.082 | 49.939 |
| | (2.78)** | (2.03)* | (0.20) | (2.31)* | (0.88) | (1.48) | (3.46)** |
| P75-F | 349.987 | -68.890 | 95.894 | -175.190 | 0.893 | 16.660 | 24.007 |
| | (3.47)** | (1.28) | (1.81) | (3.87)** | (0.09) | (0.57) | (2.14)* |
| D94 | -131.211 | 67.971 | -128.051 | -71.818 | 0.276 | -62.864 | -10.095 |
| | (1.62) | (1.30) | (3.25)** | (1.74) | (0.07) | (3.01)** | (1.45) |
| D95 | -171.898 | 191.165 | -48.114 | 11.084 | 1.544 | -57.059 | -5.904 |
| | (1.94) | (4.21)** | (1.04) | (0.23) | (0.43) | (2.53)* | (0.78) |
| D96 | -124.166 | 210.322 | 247.443 | 194.153 | 14.395 | -64.572 | 6.736 |
| | (0.80) | (3.75)** | (3.83)** | (2.36)* | (2.74)** | (1.95) | (0.56) |
| D97 | -1,318.975 | -1,237.341 | 480.392 | -912.523 | -13.509 | -299.708 | -40.439 |
| | (6.48)** | (15.75)** | (5.85)** | (8.51)** | (1.81) | (6.80)** | (2.39)* |
| D98 | -1,439.933 | -1,094.754 | 448.815 | -888.945 | -9.600 | -199.187 | -21.719 |
| | (6.19)** | (11.36)** | (4.53)** | (7.24)** | (1.05) | (3.77)** | (1.08) |
| D99 | -1,514.4 | -1,101.6 | -92.709 | -785.362 | -6.355 | -144.751 | -15.787 |
| | (5.96)** | (9.71)** | (0.80) | (5.85)** | (0.56) | (2.31)* | (0.67) |
| Const. | 14,716.8 | 2,996.9 | 16,147.7 | 9,822.5 | 612.5 | 1,996.3 | 450.0 |
| | (3.75)** | (1.71) | (7.63)** | (5.74)** | (3.22)** | (1.75) | (0.99) |
| $R^2$ (total) | 0.91 | 0.93 | 0.89 | 0.72 | 0.77 | 0.91 | 0.91 |
| $R^2$ (within) | 0.37 | 0.84 | 0.34 | 0.58 | 0.08 | 0.46 | 0.45 |

Robust t-values in perenthesis. * means 5 % significance, ** for 1 % significance. The results of statistical tests performed are presented in Appendix, Table 13.

*Table 10 Determinants of municipal expenditures on local public service categories in 1993-1999, with year 1997-1999 dummies*

| | $E_2$ | $E_3$ | $E_4$ | $E_5$ | $E_6$ | $E_7$ | $E_8$ |
|---|---|---|---|---|---|---|---|
| Income | 0.055 | 0.009 | 0.023 | 0.036 | 0.001 | 0.007 | -0.001 |
| | (7.05)** | (2.48)* | (5.64)** | (9.37)** | (1.55) | (3.13)** | (1.72) |
| Income* D9799 | -0.004 | 0.009 | -0.018 | -0.038 | -0.000 | 0.004 | 0.002 |
| | (0.63) | (3.14)** | (5.49)** | (13.14)** | (1.04) | (2.37)* | (3.36)** |
| $G_i$ | 0.225 | 0.578 | 0.039 | -0.063 | -0.001 | 0.164 | 0.041 |
| | (6.31)** | (17.68)** | (1.32) | (3.74)** | (0.35) | (7.98)** | (6.13)** |
| Gi*D9799 | 0.054 | -0.176 | -0.062 | -0.026 | -0.005 | -0.001 | 0.027 |
| | (2.36)* | (6.57)** | (2.10)* | (2.05)* | (1.54) | (0.03) | (4.34)** |
| U % | -21.859 | -4.952 | -0.277 | 2.847 | 0.813 | -19.374 | 1.172 |
| | (1.77) | (0.62) | (0.03) | (0.42) | (1.11) | (4.41)** | (0.82) |
| Urban % | 2.455 | -7.761 | 0.851 | -0.551 | 0.766 | -9.894 | -0.491 |
| | (0.29) | (1.40) | (0.15) | (0.10) | (1.62) | (2.81)** | (0.40) |
| Soc % | 6.275 | 3.859 | -26.639 | 3.711 | 0.044 | 1.280 | -0.282 |
| | (0.70) | (0.85) | (6.78)** | (1.01) | (0.16) | (0.56) | (0.34) |
| Centre % | -16.855 | -4.047 | -5.181 | 0.747 | -0.282 | -2.741 | -0.756 |
| | (2.09)* | (1.00) | (1.26) | (0.20) | (0.89) | (1.17) | (1.01) |
| Coalition % | -24.720 | 12.949 | 4.000 | -9.034 | 0.119 | 10.189 | 3.002 |
| | (3.46)** | (2.85)** | (0.88) | (2.07)* | (0.32) | (3.66)** | (3.74)** |
| Netm % | -58.033 | -26.352 | -21.793 | -19.904 | 1.588 | -7.394 | -0.416 |
| | (2.38)* | (1.84) | (1.50) | (1.61) | (1.01) | (0.89) | (0.14) |
| P-3 | -68.502 | 102.268 | -44.692 | -118.881 | -17.751 | 32.204 | 13.161 |
| | (0.91) | (2.48)* | (0.88) | (3.07)** | (4.18)** | (1.21) | (1.40) |
| P4-6 | -60.132 | -20.458 | 15.111 | -55.060 | -6.698 | -12.681 | 11.446 |
| | (0.68) | (0.46) | (0.27) | (1.46) | (0.69) | (0.48) | (1.15) |
| P7-15 | 7.036 | 86.699 | -67.525 | -90.266 | -0.193 | 71.881 | -21.945 |
| | (0.12) | (2.83)** | (1.58) | (3.23)** | (0.05) | (3.38)** | (2.55)* |
| P16-18 | -248.190 | 66.884 | -256.699 | -85.640 | 4.999 | 23.635 | 21.977 |
| | (2.54)* | (1.67) | (5.38)** | (2.19)* | (0.87) | (0.97) | (2.17)* |
| P19-24 | -219.528 | -1.066 | -151.503 | -130.226 | -2.609 | 17.606 | 5.228 |
| | (3.48)** | (0.04) | (3.78)** | (4.46)** | (0.85) | (1.01) | (0.78) |
| P40-60 | -5.775 | 71.673 | -63.263 | -0.873 | -4.220 | 1.156 | -4.114 |
| | (0.15) | (4.08)** | (2.82)** | (0.05) | (1.13) | (0.10) | (1.06) |
| P61-74M | -155.694 | 113.036 | -147.562 | -136.973 | -11.359 | -25.223 | 18.638 |
| | (1.29) | (1.93) | (2.62)** | (3.09)** | (3.11)** | (0.93) | (1.79) |
| P61-74F | -32.178 | -34.327 | -99.254 | -131.977 | -0.485 | 2.485 | -4.890 |
| | (0.38) | (0.85) | (1.83) | (3.40)** | (0.07) | (0.10) | (0.46) |
| P75-M | 381.214 | -138.871 | -174.492 | -126.344 | -9.550 | -25.704 | 55.798 |
| | (2.39)* | (1.35) | (2.43)* | (2.08)* | (0.66) | (0.62) | (4.19)** |
| P75-F | 272.078 | -4.018 | 87.637 | -216.250 | 2.153 | 30.412 | 29.121 |
| | (2.59)** | (0.08) | (1.60) | (5.02)** | (0.20) | (1.04) | (2.69)** |
| DV9799 | -1,380.031 | -1,378.671 | 1,480.756 | 988.079 | 0.163 | -407.863 | -220.022 |
| | (3.10)** | (7.27)** | (5.85)** | (4.35)** | (0.01) | (3.43)** | (5.21)** |
| Constant | 17,786.3 | 561.7 | 15,922.3 | 7,067.8 | 475.4 | 2,106.4 | 320.3 |
| | (4.87)** | (0.37) | (7.71)** | (4.56)** | (2.74)** | (2.05)* | (0.83) |
| $R^2$(total) | 0.91 | 0.93 | 0.87 | 0.75 | 0.77 | 0.91 | 0.91 |
| $R^2$(within) | 0.37 | 0.84 | 0.23 | 0.62 | 0.08 | 0.44 | 0.45 |

Robust t-values in perenthesis. * means 5 % significance, ** for 1 % significance. The results of statistical tests performed are presented in Appendix, Table 14.

*Figure 12* *Income variable coefficients from cross-section estimations 1993-1999*

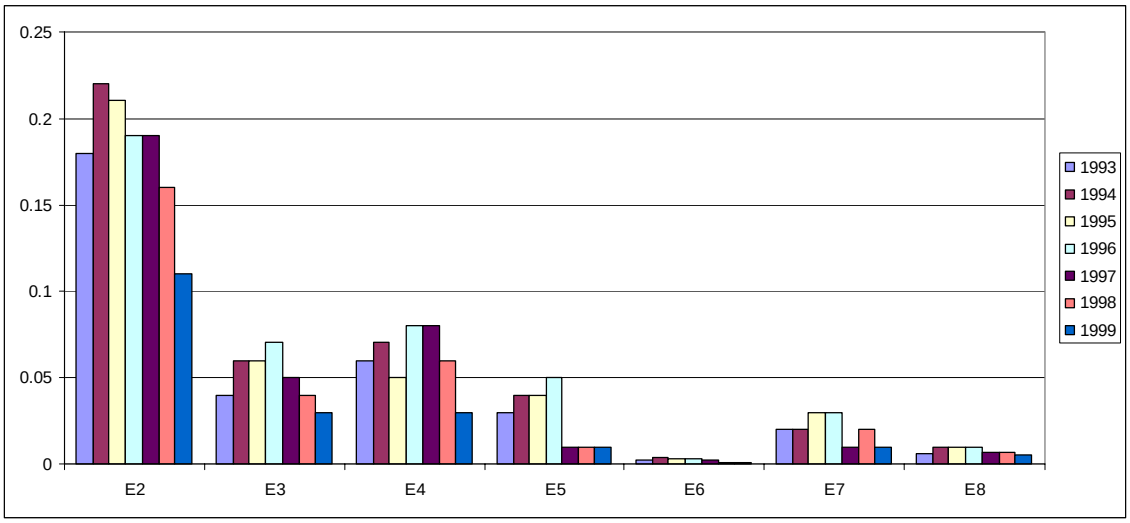
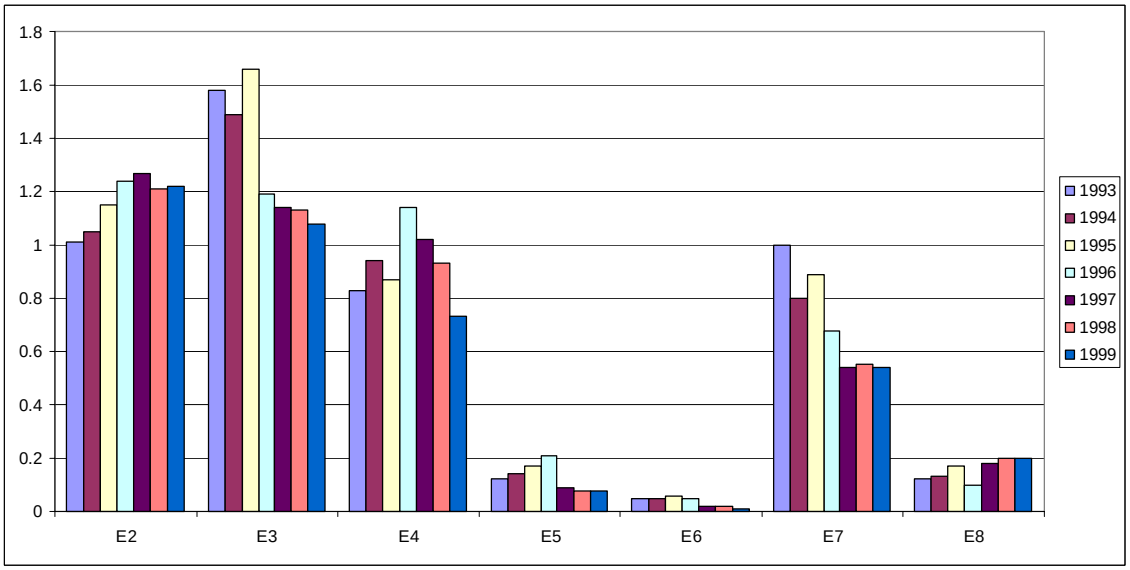



*Figure 13* *Grant variable coefficients from cross-section estimations 1993-1999*



## 2.5 Conclusions

In Finland the municipalities produce and provide most of the basic services for education and culture as well as social welfare and health care. At the end of 1999 there were 436 municipalities whose demographic and political characteristics and wealth varied a great deal. The expenditures per capita also varied considerably among the municipalities. Expenditure differences may arise from variance in various supply or demand factors. For instance, the cost differences may be largely explained by substantial economies of scale or by income differences between the municipalities. In addition, as decisions about municipal expenditures, taxation and fees are made through a local political process, differences in the political control of municipal councils may also explain some of the expenditure differences.

The main purpose of this paper was to explain municipal expenditures in Finland using the data for different political, demographic and economic variables. As there was a major institutional change in the 1990s from an almost pure matching grants system to an almost pure formula-based system, two approaches have been used to model municipal expenditures. For the matching grants system the main research focus was on price and income elasticity parameters. For the formula-based system, the main interest was in testing the existence of the "flypaper effect".

The results for the matching grants period showed that the grants had a somewhat unexpected effect on expenditures. The fixed effect regression explaining education expenditures resulted in positive *price* elasticity estimates. This suggests that the expenditures decreased at the same time as the cost of education became lower. To explain this peculiar result we need to note, first, that most municipalities already provided education services at the highest level needed to receive the maximum grant. Some of the municipalities may have spent even higher amounts than were needed to maximise the grants (there was a difference between the grant-eligible expenditures and total expenditures). If this is true, then it is likely that additional grants resulting from a higher matching rate were at least partly directed to other (grant eligible or non-grant eligible) public goods or they were used to lowering the taxes. Second, due to institutional factors, all prices changed at the same time and this leaves us only the income effect of the price change. In any case, the results show that the effect of closed-ended matching grants in case of education was not what the grantor had wanted if the meaning was to increase the level of service. The same effect could have been achieved by using specific lump sum grants.

The results for the formula-based grants period showed that the *grants* variable parameter estimates were clearly larger than those of the *income* variable for most of the expenditures studied. The results therefore support the well-known "flypaper effect". This means that grants have a higher effect on expenditures

than taxable incomes, despite the fact that the role of grants in municipal finance considerably diminished under the formula-based grant system. However, the yearly cross-section estimations from 1993 to 1999 provided evidence that the effect of grants on expenditures diminished towards 1999.

Although the results for the income and grants variables in the two periods cannot be compared, the results for demographic and political variables are comparable. The significance of the *political party share* differed between the two periods: during the matching grants period the political process seemed to matter less than in the formula-based grants period. These results can probably be largely explained by increased budget orientation in local politics during the latter period. Somewhat surprisingly, it appears that *migration* effects on the expenditures studied did not increase, even though the level of migration considerably increased.

The models used in this study explained the education and culture expenditures better than the social welfare and health care expenditures. In particular, it seems that income and the degree of urbanity explained the education and culture expenditures but less so the social welfare and health care expenditures.

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# Appendix

*Table 11* *Measures of the flypaper effect: estimates for marginal propensities to consume (Knight, 2000 and Hines & Thaler, 1995, Inman, 1979)*

| Author | Sample | MPC from income | MPC from grants | Other covariates |
|---|---|---|---|---|
| Inman (1971) | State grants to 41 cities, 1967 | 0.04 | 1.34 | None |
| Weicher (1972) | State grants to 106 school districts, 1962 | 0.02 | 0.59 | total pop., empl. rate, pop. growth, pop. density, housing characteristics, retail sales, mfg. establishments, central city pop. and mfg., percent of pop.: school-aged,< age 21, non-white, foreign |
| Gramlich, Galper (1973) | Federal grants to state and local governments, quarterly 1954-1972 (time-series) | 0.10 | 0.43 | relative price of capital, proportion of school-aged, female-headed families, robbery rate |
| Grossman (1990) | State and federal grants to 136 Virginia local governments, 1981 | 0.01 | 1.70 | median voter tax price, urban population, black population |
| Olmsted, Denzau, Roberts (1993) | State and federal grants to 344 Missouri school districts, 1980 | 0.05 | 0.58-1.15 | tax price, number of students in private school, number pupils, % pop.: urban, poor, black, homeowners, |
| Case, Hines, Rosen (1993) | Federal grants to states 1970-1985 (panel) | 0.11-0.17 | 0.65-1.04 | population density, % pop. > 65, % pop. 5-17, % pop. Black |
| Becker (1994) | Federal grants to state and local governments, 1977-1986 (panel) | 0.06 | 0.61 | tax price, lagged expenditures |
| Gamkhar, Oates (1996) | Federal grants to state governments, 1953-91 (time-series) | 0.11 | 0.62 | unemployment, share of population school-aged, percent of population urban |
| Oulasvirta, (1996) | State grants to 460 Finnish municipalities, 1991 | 0.12-0.18 | 0.89-1.24 | urban pop. %, pop. dens, area, distance, children %, youth %, elderly %, unempl. rate, death rate, socialist share in council % |

*Table 12 The test results for the Fixed effects estimations in Table 6*

| | $LnE_2$ | $LnE_3$ | $LnE_4$ | $LnE_5$ | $LnE_6$ | $LnE_7$ | $LnE_8$ |
|---|---|---|---|---|---|---|---|
| Number of obs | 3464 | 3464 | 3464 | 3464 | 3464 | 3464 | 3455 |
| F( 17, 3014) | 439.45** | 85.02** | 608.22** | 44.82** | 34.51** | 43.30** | 13.61** |
| R-squared | 0.95 | 0.97 | 0.93 | 0.89 | 0.84 | 0.97 | 0.95 |
| Adj. R-squared | 0.95 | 0.96 | 0.92 | 0.87 | 0.82 | 0.96 | 0.94 |
| Root MSE[65] | 0.04 | 0.05 | 0.05 | 0.09 | 0.13 | 0.05 | 0.25 |
| Hausman chi2( 17)[66] | 2816.4** | 17.15[x] | 2719.7** | 180.19** | 314.77** | 894.67** | 77.01** |
| Preusch-Pagan chi2(1)[67] | 5948.6** | 6421.4** | 4587.9** | 6834.2** | 5707.8** | 7018.6** | 8371.3** |

* significant at 5 % level; ** significant at 1 % level

[x] The Hausman test accepts the zero hypothesis that the fixed and random effects estimation results are same.

*Table 13 The test results for the Fixed effects estimations in Table 9*

| | $LnE_2$ | $LnE_3$ | $LnE_4$ | $LnE_5$ | $LnE_6$ | $LnE_7$ | $LnE_8$ |
|---|---|---|---|---|---|---|---|
| Number of obs | 3052 | 3052 | 3052 | 3052 | 3052 | 3052 | 2753 |
| F( 23, 2593) | 80.98** | 793.18** | 68.57** | 147.87** | 15.18** | 91.21** | 69.80** |
| R-squared | 0.91 | 0.93 | 0.89 | 0.72 | 0.77 | 0.91 | 0.91 |
| Adj. R-squared | 0.89 | 0.91 | 0.87 | 0.67 | 0.73 | 0.90 | 0.90 |
| Root MSE | 849.61 | 460.91 | 432.80 | 461.39 | 40.11 | 255.03 | 81.02 |
| Hausman chi2( 23) | 784.89** | 264.1** | 640.09** | 213.85** | 249.63** | 431.29** | 210.28** |
| Preusch-Pagan chi2(1) | 2661.2** | 1347.5** | 3736.6** | 1099.1** | 3292.9** | 2233.6** | 4261.9** |
| G2 = Income | 10.66** | - | - | 0.88[xx] | - | - | - |
| G3 = Income | - | 340.5** | - | - | 9.98** | 172.9** | 195.98** |
| G4 = Income | - | - | 4.25** | - | - | - | - |

* significant at 5 % level; ** significant at 1 % level

[xx] The test accepts the hypothesis for equal size coefficients

[65] The square root of the mean square error.

[66] Hausman tests the difference of within and random effects estimates. The zero hypothesis is that the difference in coefficients is not systematic. If an alternative hypothesis is accepted, it is usually taken to denote that within -method should be chosen or that our model is misspecified. A "*" –sign after the test parameter means that the parameters have been found not to differ statistically significantly at least 5 % level of significance. See Baltagi (1995) or Hsiao (1986) for details.

[67] Breusch-Pagan tests the existence of individual effects. If no individual effects are found, OLS regression on pooled data would be enough. A "*" after the this test parameter means that no individual effects is found at least 5 % significance level. See Baltagi (1995) or Hsiao (1986) for details.

*Table 14 The test results for the Fixed effects estimations in Table 10*

| | $LnE_2$ | $LnE_3$ | $LnE_4$ | $LnE_5$ | $LnE_6$ | $LnE_7$ | $LnE_8$ |
|---|---|---|---|---|---|---|---|
| Number of obs | 3052 | 3052 | 3052 | 3052 | 3052 | 3052 | 2753 |
| F( 20, 2596) | 95.18 | 957.31 | 44.60 | 202.84 | 16.97 | 100.33 | 85.02 |
| R-squared | 0.91 | 0.93 | 0.87 | 0.75 | 0.77 | 0.91 | 0.91 |
| Adj R-squared | 0.89 | 0.92 | 0.84 | 0.71 | 0.73 | 0.89 | 0.90 |
| Root MSE | 847.86 | 453.98 | 470.13 | 437.74 | 40.15 | 257.62 | 80.54 |
| Hausman chi2( 20) | 1239.41 | 231.26 | 505.02 | 225.98 | 1068.78 | 373.14 | 231.86 |
| Preusch-Pagan | 2467.66 | 1501.30 | 3438.07 | 1308.24 | 3223.92 | 2211.83 | 4260.24 |
| G2 = Income | 25.60** | - | - | 37.21** | - | - | - |
| G3 = Income | - | 301.59** | - | - | 0.33[xx] | 60.85** | 39.85** |
| G4 = Income | - | - | 0.28[xx] | - | - | - | - |

* significant at 5 % level; ** significant at 1 % level
[xx] The test accepts the hypothesis for equal size coefficients

*Table 15 Testing the separate effects of different grant categories*

| | E2 | E3 | E4 | E5 | E6 | E7 | E8 |
|---|---|---|---|---|---|---|---|
| Testing total sectoral grant only | | | | | | | |
| G2 = T | - | 42.25** | 15.47** | - | 0.78[xx] | 11.47** | 3.6 [xx] |
| Comparing total sectoral grant and sectoral grant in a same model | | | | | | | |
| G2 = T | - | 13.8** | 14.3** | - | 0.18 [xx] | 1.78 [xx] | 0.02 [xx] |
| G2 = G3 | - | 52.81** | - | - | 2.46 [xx] | 38.52** | 64.3** |
| G3 = T | - | 285.16** | - | - | 9.89** | 154.32** | 188.21** |
| G2 = G4 | - | - | 3.79 [xx] | - | - | - | - |
| G4 = T | - | - | 2.43 [xx] | - | - | - | - |
| Comparing total sectoral grants less specific sectoral grant and sectoral grant | | | | | | | |
| (G2-G3) = G3 | - | 310.51** | - | - | 8.48** | 170.83** | 182.38** |
| (G2-G3) = T | - | 13.8** | - | - | 0.18 [xx] | 1.78 [xx] | 0.02 [xx] |
| G3 = T | - | 288.65** | - | - | 4.51** | 107.58** | 87.62** |
| (G2-G4) = G4 | - | - | 14.3** | - | - | - | - |
| (G2-G4) = T | - | - | 4.92** | - | - | - | - |
| G4 = T | - | - | 19.1** | - | - | - | - |

* significant at 5 % level; ** significant at 1 % level
[xx] The test accepts the hypothesis for equal size coefficients

*Table 16 FE-estimation results for period 1985-1992 with year dummies*

| | lndfe2 | Lndfe3 | lndfe4 | lndfe5 | lndfe6 | lndfe7 | lndfe8 |
|---|---|---|---|---|---|---|---|
| Lnprice | 0.278 | 0.226 | -0.412 | 0.335 | 0.366 | 0.210 | 0.307 |
| | (8.65)** | (8.16)** | (8.26)** | (5.26)** | (8.90)** | (9.25)** | (3.57)** |
| Lninc | 0.048 | 0.031 | 0.050 | -0.007 | 0.063 | 0.008 | 0.158 |
| | (2.06)* | (0.90) | (1.00) | (0.12) | (0.84) | (0.23) | (0.86) |
| U % | -0.001 | -0.001 | -0.001 | -0.000 | -0.002 | -0.000 | 0.003 |
| | (2.26)* | (1.09) | (2.29)* | (0.47) | (1.08) | (0.49) | (0.98) |
| Urban % | -0.001 | -0.001 | -0.000 | 0.000 | -0.004 | -0.000 | 0.003 |
| | (2.45)* | (3.13)** | (0.52) | (0.77) | (4.83)** | (0.94) | (1.89) |
| Soc % | -0.000 | -0.000 | 0.000 | 0.000 | -0.002 | 0.000 | -0.003 |
| | (0.52) | (0.16) | (0.53) | (0.40) | (1.45) | (0.62) | (1.20) |
| Centre % | 0.001 | 0.000 | 0.000 | 0.003 | 0.003 | 0.002 | -0.001 |
| | (3.23)** | (0.89) | (0.62) | (2.65)** | (2.27)* | (3.66)** | (0.20) |
| Coalition % | -0.001 | -0.001 | -0.000 | 0.001 | 0.001 | -0.001 | 0.003 |
| | (1.27) | (2.22)* | (0.43) | (0.67) | (0.90) | (1.60) | (0.82) |
| Netm % | -0.007 | -0.005 | -0.009 | 0.002 | 0.001 | -0.004 | 0.016 |
| | (6.01)** | (2.59)** | (5.68)** | (0.70) | (0.21) | (1.88) | (1.64) |
| P-3 | 0.004 | -0.002 | -0.004 | -0.034 | -0.007 | 0.004 | -0.100 |
| | (1.14) | (0.34) | (0.76) | (3.30)** | (0.53) | (0.56) | (3.22)** |
| P4-6 | 0.007 | 0.001 | -0.011 | -0.014 | 0.008 | 0.013 | -0.077 |
| | (1.50) | (0.15) | (1.82) | (1.39) | (0.58) | (1.88) | (2.09)* |
| P7-15 | 0.010 | 0.021 | -0.000 | -0.034 | 0.024 | 0.039 | -0.089 |
| | (3.38)** | (4.06)** | (0.05) | (4.51)** | (2.47)* | (6.65)** | (3.40)** |
| P16-18 | 0.009 | 0.035 | 0.001 | -0.001 | 0.011 | 0.041 | 0.110 |
| | (2.39)* | (5.48)** | (0.17) | (0.06) | (0.96) | (5.86)** | (3.41)** |
| P19-24 | 0.001 | 0.007 | 0.001 | -0.003 | 0.002 | 0.008 | -0.002 |
| | (0.49) | (1.92) | (0.25) | (0.51) | (0.24) | (1.71) | (0.08) |
| P40-60 | -0.003 | 0.003 | -0.005 | -0.009 | -0.007 | 0.006 | -0.007 |
| | (1.60) | (0.83) | (1.58) | (1.66) | (1.02) | (1.58) | (0.37) |
| P61-74M | -0.005 | -0.009 | -0.012 | -0.010 | 0.008 | -0.007 | -0.026 |
| | (1.22) | (1.43) | (1.85) | (0.93) | (0.55) | (0.90) | (0.68) |
| P61-74F | 0.013 | 0.012 | 0.011 | 0.003 | -0.018 | 0.013 | 0.044 |
| | (3.31)** | (1.91) | (1.80) | (0.36) | (1.40) | (1.68) | (1.14) |
| P75-M | 0.001 | 0.007 | 0.006 | -0.032 | 0.035 | -0.001 | -0.043 |
| | (0.23) | (0.81) | (0.69) | (2.06)* | (1.67) | (0.10) | (0.63) |
| P75-F | 0.022 | 0.015 | 0.014 | 0.014 | 0.013 | 0.020 | -0.038 |
| | (4.92)** | (2.19)* | (2.14)* | (1.25) | (0.80) | (2.74)** | (0.97) |
| D86 | 0.044 | 0.058 | 0.077 | 0.030 | 0.048 | 0.042 | -0.006 |
| | (10.57)** | (9.82)** | (12.20)** | (3.01)** | (3.52)** | (6.89)** | (0.23) |
| D87 | 0.096 | 0.098 | 0.140 | 0.094 | 0.100 | 0.065 | 0.063 |
| | (18.83)** | (13.79)** | (17.04)** | (7.84)** | (6.22)** | (8.32)** | (1.93) |
| D88 | 0.121 | 0.127 | 0.179 | 0.139 | 0.114 | 0.079 | 0.038 |
| | (19.29)** | (14.50)** | (18.72)** | (9.53)** | (5.94)** | (8.15)** | (0.87) |
| D89 | 0.154 | 0.137 | 0.204 | 0.153 | 0.135 | 0.077 | 0.072 |
| | (19.56)** | (12.86)** | (17.17)** | (8.39)** | (5.82)** | (6.55)** | (1.27) |
| D90 | 0.188 | 0.145 | 0.259 | 0.169 | 0.170 | 0.067 | 0.053 |
| | (21.18)** | (11.70)** | (19.17)** | (8.27)** | (6.14)** | (4.84)** | (0.81) |
| D91 | 0.211 | 0.140 | 0.305 | 0.179 | 0.179 | 0.052 | 0.063 |
| | (20.95)** | (9.92)** | (18.88)** | (7.59)** | (5.76)** | (3.24)** | (0.87) |
| D92 | 0.204 | 0.103 | 0.333 | 0.159 | 0.189 | 0.007 | 0.026 |
| | (19.06)** | (6.49)** | (19.62)** | (6.18)** | (5.41)** | (0.42) | (0.32) |
| Const. | 7.964 | 6.764 | 10.063 | 6.404 | 3.354 | 6.095 | 4.352 |
| | (26.82)** | (14.96)** | (15.92)** | (8.01)** | (3.34)** | (12.36)** | (1.70) |
| R-sq. | 0.96 | 0.97 | 0.95 | 0.90 | 0.85 | 0.97 | 0.95 |

*Table 17* *Testing the recession year 1992 effect on price and income effects*

| | $LnE_2$ | $LnE_3$ | $LnE_4$ | $LnE_5$ | $LnE_6$ | $LnE_7$ | $LnE_8$ |
|---|---|---|---|---|---|---|---|
| Lnprice | 0.055 | 0.199 | -0.469 | 0.080 | 0.304 | 0.185 | 0.348 |
| | (1.96)* | (8.43)** | (11.01)** | (1.56) | (7.34)** | (7.70)** | (4.50)** |
| Lnprice *D92 | 0.217 | 0.091 | 0.115 | 0.211 | 0.097 | 0.070 | -0.074 |
| | (5.69)** | (3.99)** | (2.24)* | (2.60)** | (1.98)* | (2.61)** | (0.54) |
| Lninc | 0.377 | 0.313 | 0.479 | 0.291 | 0.393 | 0.189 | 0.369 |
| | (10.31)** | (7.62)** | (7.43)** | (5.52)** | (6.02)** | (5.75)** | (2.58)* |
| Lninc*D92 | -0.178 | -0.032 | -0.033 | -0.104 | -0.137 | -0.039 | -0.059 |
| | (4.54)** | (1.07) | (0.81) | (1.21) | (1.95) | (1.18) | (0.36) |
| U % | -0.001 | -0.003 | 0.001 | -0.001 | -0.000 | -0.003 | -0.003 |
| | (2.02)* | (5.07)** | (1.37) | (1.17) | (0.29) | (5.50)** | (0.94) |
| Urban % | 0.001 | -0.001 | 0.001 | 0.001 | -0.002 | -0.001 | 0.002 |
| | (3.86)** | (2.77)** | (3.97)** | (1.53) | (2.78)** | (2.74)** | (1.13) |
| Soc % | -0.000 | -0.000 | -0.000 | 0.000 | -0.001 | -0.000 | -0.003 |
| | (0.65) | (0.80) | (0.09) | (0.15) | (0.61) | (0.12) | (1.54) |
| Centre % | 0.002 | 0.001 | 0.001 | 0.003 | 0.002 | 0.002 | -0.001 |
| | (4.74)** | (1.79) | (2.36)* | (3.13)** | (1.75) | (3.41)** | (0.45) |
| Coalition % | 0.000 | -0.001 | 0.000 | 0.001 | -0.001 | -0.001 | 0.002 |
| | (0.24) | (1.98)* | (0.42) | (1.08) | (0.80) | (1.61) | (0.63) |
| Netm % | -0.004 | -0.005 | -0.004 | 0.002 | -0.001 | -0.005 | 0.004 |
| | (3.56)** | (2.83)** | (2.62)** | (0.90) | (0.41) | (3.14)** | (0.52) |
| P-3 | 0.036 | 0.005 | 0.033 | -0.002 | 0.027 | -0.001 | -0.093 |
| | (9.46)** | (0.90) | (6.56)** | (0.19) | (2.31)* | (0.13) | (3.97)** |
| P4-6 | 0.040 | 0.024 | 0.032 | 0.026 | 0.059 | 0.022 | -0.085 |
| | (9.44)** | (4.40)** | (5.47)** | (3.10)** | (4.75)** | (3.97)** | (3.00)** |
| P7-15 | 0.035 | -0.032 | 0.028 | -0.005 | 0.056 | 0.038 | -0.099 |
| | (10.30)** | (6.39)** | (6.13)** | (0.77) | (6.15)** | (7.85)** | (4.73)** |
| P16-18 | 0.010 | -0.041 | 0.004 | -0.006 | 0.015 | 0.024 | 0.092 |
| | (2.46)* | (6.90)** | (0.78) | (0.69) | (1.43) | (4.11)** | (3.75)** |
| P19-24 | 0.001 | 0.010 | -0.008 | -0.004 | 0.016 | 0.013 | -0.027 |
| | (0.31) | (2.77)** | (2.21)* | (0.75) | (2.07)* | (3.55)** | (1.63) |
| P40-60 | 0.027 | 0.021 | 0.033 | 0.021 | 0.025 | 0.012 | -0.011 |
| | (17.87)** | (9.82)** | (17.24)** | (6.32)** | (5.43)** | (5.22)** | (1.08) |
| P61-74M | 0.033 | 0.013 | 0.037 | 0.022 | 0.057 | 0.000 | -0.079 |
| | (8.63)** | (2.59)** | (7.51)** | (2.69)** | (4.42)** | (0.06) | (3.00)** |
| P61-74F | 0.016 | 0.014 | 0.023 | 0.012 | -0.004 | 0.010 | 0.070 |
| | (3.96)** | (2.56)* | (4.43)** | (1.51) | (0.36) | (1.61) | (2.37)* |
| P75-M | 0.045 | 0.042 | 0.067 | 0.015 | 0.042 | 0.020 | -0.073 |
| | (7.58)** | (5.19)** | (8.40)** | (1.14) | (2.21)* | (2.52)* | (1.48) |
| P75-F | 0.042 | 0.034 | 0.045 | 0.034 | 0.045 | 0.026 | -0.028 |
| | (9.54)** | (5.98)** | (7.91)** | (3.71)** | (3.14)** | (4.52)** | (0.93) |
| D92 | 1.058 | -0.023 | -0.103 | 0.271 | 1.093 | 0.128 | 0.918 |
| | (3.66)** | (0.08) | (0.37) | (0.41) | (1.72) | (0.44) | (0.69) |
| Constant | 3.487 | 5.715 | 3.480 | 2.411 | -2.226 | 4.099 | 2.695 |
| | (7.47)** | (11.51)** | (4.30)** | (3.57)** | (2.71)** | (9.86)** | (1.51) |
| $R^2$ (total) | 0.96 | 0.97 | 0.93 | 0.89 | 0.84 | 0.97 | 0.95 |
| $R^2$ (within) | 0.76 | 0.52 | 0.82 | 0.38 | 0.23 | 0.29 | 0.12 |

Robust t-statistics in parentheses, * significant at 5 % level; ** significant at 1 % level

*Table 18 Determinants of municipal expenditures on local public service categories in 1993 - 1999, with recession dummies*

| | $LnE_2$ | $LnE_3$ | $LnE_4$ | $LnE_5$ | $LnE_6$ | $LnE_7$ | $LnE_8$ |
|---|---|---|---|---|---|---|---|
| Income | 0.040 | 0.010 | 0.010 | -0.012 | 0.000 | 0.009 | 0.000 |
| | (5.54)** | (2.13)* | (2.41)* | (2.88)** | (0.84) | (5.00)** | (0.26) |
| Income* Dv9294 | -0.007 | -0.014 | 0.008 | 0.009 | 0.000 | -0.003 | -0.002 |
| | (1.12) | (3.91)** | (2.70)** | (2.40)* | (1.09) | (1.69) | (4.32)** |
| G | 0.505 | 0.835 | 0.036 | 0.177 | 0.001 | 0.239 | 0.078 |
| | (12.31)** | (44.92)** | (1.44) | (8.51)** | (0.79) | (25.89)** | (23.39)** |
| G* Dv9294 | -0.097 | 0.288 | 0.140 | -0.046 | 0.006 | 0.108 | -0.013 |
| | (4.09)** | (6.29)** | (3.00)** | (3.53)** | (0.80) | (3.31)** | (1.60) |
| U % | 31.504 | 45.077 | -22.797 | 57.198 | 1.667 | -10.448 | 2.755 |
| | (2.66)** | (5.09)** | (2.85)** | (7.16)** | (2.22)* | (2.40)* | (1.91) |
| Urban % | -2.533 | -9.966 | -10.728 | -4.622 | 0.638 | -3.959 | 0.144 |
| | (0.27) | (1.44) | (1.81) | (0.69) | (1.10) | (1.07) | (0.11) |
| Soc % | -0.409 | 10.382 | -28.786 | -3.407 | 0.082 | 1.285 | 0.165 |
| | (0.04) | (1.99)* | (7.22)** | (0.78) | (0.30) | (0.55) | (0.20) |
| Centre % | -8.061 | -17.160 | -2.002 | 14.873 | -0.483 | -5.066 | -1.445 |
| | (0.97) | (3.66)** | (0.49) | (3.50)** | (1.53) | (2.21)* | (1.87) |
| Coalition % | -23.236 | 3.897 | 2.574 | -8.911 | 0.023 | 8.755 | 2.537 |
| | (3.14)** | (0.74) | (0.56) | (1.76) | (0.06) | (3.06)** | (3.11)** |
| Netm % | -64.411 | -26.088 | -5.375 | -18.420 | 1.689 | -7.702 | -1.462 |
| | (2.48)* | (1.58) | (0.36) | (1.30) | (1.08) | (0.94) | (0.51) |
| P-3 | -95.478 | 50.515 | -49.610 | -155.271 | -17.962 | 21.476 | 8.042 |
| | (1.19) | (1.04) | (0.96) | (3.32)** | (3.93)** | (0.81) | (0.83) |
| P4-6 | -118.572 | -91.622 | -23.299 | -144.135 | -7.011 | -21.941 | 3.833 |
| | (1.29) | (1.82) | (0.39) | (3.26)** | (0.74) | (0.81) | (0.37) |
| P7-15 | -104.370 | -63.327 | -49.499 | -201.249 | -2.482 | 39.531 | -30.249 |
| | (1.71) | (1.87) | (1.14) | (6.41)** | (0.63) | (1.92) | (3.58)** |
| P16-18 | -346.246 | -46.630 | -214.587 | -169.155 | 2.798 | -6.003 | 17.344 |
| | (3.41)** | (1.01) | (4.42)** | (3.89)** | (0.50) | (0.25) | (1.73) |
| P19-24 | -308.900 | -118.264 | -136.302 | -252.468 | -4.617 | -3.273 | -0.399 |
| | (4.59)** | (3.69)** | (3.41)** | (7.40)** | (1.51) | (0.19) | (0.06) |
| P40-60 | -100.722 | -98.558 | -24.857 | -96.757 | -6.723 | -7.469 | -10.290 |
| | (2.45)* | (4.59)** | (1.07) | (4.19)** | (1.82) | (0.61) | (2.42)* |
| P61-74M | -322.503 | -78.888 | -96.801 | -326.390 | -14.516 | -35.204 | 11.437 |
| | (2.62)** | (1.22) | (1.73) | (6.46)** | (3.87)** | (1.34) | (1.10) |
| P61-74F | -29.385 | -126.994 | -120.752 | -179.624 | -2.236 | -1.240 | -5.350 |
| | (0.34) | (2.90)** | (2.19)* | (4.11)** | (0.33) | (0.05) | (0.50) |
| P75-M | 212.847 | -382.884 | -90.376 | -279.729 | -13.408 | -54.972 | 48.170 |
| | (1.33) | (3.77)** | (1.24) | (4.28)** | (0.97) | (1.40) | (3.67)** |
| P75-F | 214.955 | -166.109 | 113.754 | -266.716 | -0.734 | 17.016 | 23.728 |
| | (1.97)* | (2.97)** | (2.00)* | (5.50)** | (0.07) | (0.60) | (2.19)* |
| DV9799 | 921.848 | -396.420 | -1,201.486 | -322.797 | -31.183 | -123.126 | 154.397 |
| | (2.03)* | (1.62) | (3.77)** | (1.20) | (1.16) | (0.82) | (3.53)** |
| Constant | 22,139.336 | 11,025.985 | 15,903.847 | 13,974.408 | 664.022 | 2,523.124 | 562.247 |
| | (5.93)** | (5.91)** | (7.46)** | (7.48)** | (3.75)** | (2.42)* | (1.41) |
| $R^2$ (total) | 0.90 | 0.90 | 0.86 | 0.64 | 0.77 | 0.91 | 0.91 |
| $R^2$ (within) | 0.35 | 0.85 | 0.21 | 0.50 | 0.08 | 0.49 | 0.35 |

Robust t-statistics in parentheses,* significant at 5 % level; ** significant at 1 % level.

## The grant system in 1993 - 1996

### Health care and social welfare services

Welfare service formula (1993-1995)[68]

$$Calculatory\ cost\ for\ welfare\ services = \left( \sum_j n_{ij} g_j \right) \times Class_i \times U_i ,$$

Welfare service formula (1996-1997)[69]

$$Grant\ for\ welfare\ services = \left( \sum_j n_{ij} g_j \right) \times U_i$$

where $n_i$ is the population in municipality i, $g_j$ is the unit cost for age group j (see Table 19), $Class_i$ is the value for classification coefficient[70] for municipality i and $U_i$ is the value of unemployment parameter for municipality i.

*Table 19 Unit costs for social welfare and health care services in 1993, FIM*

| | Unit cost per person in the age group | |
|---|---|---|
| Age group | Welfare services | Health care |
| 0- 6 years | 5 237 | 776 |
| 7-64 years | 215 | 709 |
| 65-74 years | 2 180 | 1795 |
| 75 years and older | 1 993 | 2873 |

[68] Law for health and welfare services and planning (No. 733/ 1992).

[69] Law for health and welfare services and planning change (No. 1446/1995).

[70] The classification coefficients for separate classes can be seen from Table 20.

*Table 20 Classification coefficients for welfare grants*

| Class | Coefficient |
|---|---|
| 1 - 5 | 1.5 |
| 6 | 1.4 |
| 7 | 1.3 |
| 8 | 1.2 |
| 9 | 1.1 |
| 10 | 1.0 |

The *unemployment parameter* is defined as $U_i = 1 + 1{,}4 \times (UR_i - UR)/100$, where $UR_i$ is the unemployment rate in municipality i and UR is the average unemployment rate in Finland.

Health care formula (years 1993-1995)[71]

$$Grant\ for\ health\ care\ services = \left[\left(\sum_j n_{ij} g_j + s_i Bn_i\right) \times (1 + PD_i + A_i)\right] \times Class_i \ ,$$

where $s_i$ is the value of morbidity parameter in municipality i, B is constant for morbidity, $PD_i$ is population density parameter for municipality i and $A_i$ is the area parameter for municipality i.

The value for *morbidity constant* (B) was 401 FIM for year 1993.

The *morbidity parameters* ($s_i$) are defined using death rate standardised to age. The death rate for municipality i ($DR_i$) is calculated for several age groups for five year periods. Comparing this to the average death rate in Finland (DR), gives the values for morbidity in the following way:

$DR_i = DR$: $s_i = 1$

$DR_i > DR$: $s_i = (1+(DR_i/DR-1))$

$DR_i < DR$: $s_i = (1+(DR_i/DR-1))$

The values for $s_i$ varied between 0.8 and 1.25[72].

The *population density* coefficient is $PD_i = 4 \times (4 -$ population density in municipality i$)/100$, except for so-called island municipalities, whose $PD_i$ value is 0.1.

[71] Law for health and welfare services and planning (No. 733/ 1992).
[72] Government proposal (He 216, 26-27).

The area coefficient is calculated as $A_i$ = (4 × the land area of municipality i in square kilometres) / (1 250 × 100)

Health care formula (years 1996-1997)[73]

$$Grant\ for\ health\ care\ services = \left[\left(\sum_j n_{ij} g_j + s_i Bn_i\right) \times (1 + PD_i + A_i)\right]$$

**Education and cultural services[74]**

Formula for comprehensive schools

Grant for municipality i =
[(unit price of teaching/pupil × $PD_i$ × $LF_i$ × number of pupils) +
(unit cost for housing × number of pupils housed) +
(unit cost for transportation × number of pupils transported)]/0.927111 – 241.86,

where unit price for municipality i = 186.91 + 10442 × (index value for lectured hours per pupil in municipality i[75]).

Population density coefficient in municipality i is defined as
$PD_i$ = 1 + {max[1, (5-population density in municipality i)]/100} × 7

$LF_i$ is the value for language supplement that is calculated using the number of non-Finnish speaking pupils.

The figures 0.927111 and 241.86 are used to balance the calculated expenditures so that the sum of all expenditures (over municipalities) would not exceed certain budget limits.

Secondary and vocational school formula

[(unit price of teaching/pupil × number of pupils) +
(unit cost for housing × number of pupils housed) +
(unit cost for transportation × number of pupils transported)]

[73] Law for health and welfare services and planning change (No. 1446/1995).

[74] Oulasvirta 1996, 176 and the law for educational and cultural service finance and planning (No. 705/ 1992).

[75] The greater the school network and the higher the number of schools, the higher is the index. If the value of the index for a municipality is higher than 3, only 37.5 % in excess of that is taken into account.

The unit price is based on population density coefficient and number of lectured hours per pupil. The final grant calculation involves also coefficients to balance the expenditures so that the total sum of grants would match the budget limits.

Open college formula

(unit price of teaching/pupil × number of calculatory lectures held in college i) × settlement structure coefficient in municipality i[76].

College of music formula

unit price of teaching/lecture × number of calculatory lectures held in college i

Library formula

unit price per capita × settlement structure coefficient for municipality i × population in municipality i

Formulas for cultural work, (basic) art teaching, youth work, physical education

unit price per capita × population in municipality i

Museums, theatres and orchestra formulas

unit price per one year of labour × number of labour years

**General grants[77]**

Since 1993, the formula for general grants has been:

$GG \times Class_i \times PD_i \times A_i \times island_i \times LF_i + negpop_i + equalisation,$

where

GG is the average value of general grant per capita, in 1993 it was 581 FIM
$Class_i$ is the classification coefficient (see Table 21)
$PD_i$ is the population density coefficient
$A_i$ is the area coefficient
$Island_i$ is the island coefficient
$LF_i$ is the language coefficient for bilingualism
$Negpop_i$ is the coefficient for municipalities with negative population growth

[76] There were 5 groups describing the settlement structure.

[77] Law for municipal grants (No. 688/1992).

Equalisation is a coefficient to balance the changes from grant reform to municipalities

*Table 21 Classification coefficients for general grants in 1993*

| Class | Coefficient |
|---|---|
| 1 | 2.60 |
| 2 | 1.90 |
| 3 | 1.60 |
| 4 | 1.30 |
| 5 | 1.00 |
| 6 | 0.75 |
| 7 | 0.75 |
| 8 | 0.75 |
| 9 | 0.75 |
| 10 | 0.75 |

*Population density coefficient* ($PD_i$) is defined as follows:
if population density in municipality i > 6 persons per square km, $PD_i = 1$,
otherwise, $PD_i = 1 + 0.12 \times (6 - \text{population density in municipality i})$.

*Area coefficient* ($A_i$) is defined as:
if the land area of municipality i ≤ 1000 square km, $A_i = 1$,
otherwise $A_i = 1 + 0.00005 \times (\text{area of municipality i} - 1000)$.

*Island coefficient* ($island_i$):
the list of island municipalities is given in a separate law (No. 494/81). The value of the island coefficient for the municipalities in the list is 1.6, and 1 for others.

*Bilingualism coefficient* ($LF_i$):
for municipalities that are bilingual (Finnish and Swedish or Finnish and Saami speaking) the coefficient is 1.05, and for others it is 1.

*Negative population growth* ($negpop_i$) coefficient:
if the population has decreased for three consecutive years, then the municipality receives an addition in the general grant according to the formula: $0.5 \times$ (population in municipality i in the end of year t minus population in end of year t-3) $\times$ (general grants per capita + sector grants per capita).
*Equalisation:*
if the sum of general grants, sector grants (grants for social welfare, health care, education and culture) and revenue sharing is smaller than the average of comparable grants for years 1988-1990, then the coefficient is the deviation per capita

amount of general grants. If, on the other hand, the deviation is positive, the municipality gets 20 % of the general grant in the first year and a gradually increasing amount for the subsequent years. The idea of this coefficient was to reduce the possible large changes to single municipalities so that in 2000 the equalisation would be terminated.

## The grant system since 1997

### Health care and social welfare services[78]

Formula for welfare services:

$$\left( g_1 w_i n_{i1} + \sum_{j=2}^{4} g_j n_{ij} \right) + (un_i \times c_1) + \left( \frac{ur_i}{ur} \times c_2 \times n_i \right),$$

where $g_1$ is the unit cost for age group 0-6 years, $w_i$ is the labour activity coefficient in municipality i, $n_{i1}$ is the population aged 0-6 years in municipality i, $g_j$ denotes the unit costs for other age groups than 0-6 years (see Table 22), $n_{ij}$ is the population of age groups 7 years and above in municipality i, $un_i$ is the number of unemployed in municipality i, $c_1$ is a constant for cost of unemployment per unemployed[79], $ur_i$ is the unemployment rate in municipality i and ur is the average unemployment rate in Finland, $c_2$ is the constant for cost of unemployment per capita and $n_i$ is the population in municipality i. The outcome of the formula is the sum of calculated expenses for municipality i.

The *labour activity coefficient* is defined using the following formula[80]:

$$w_i = \frac{\text{The share of labour force working in service and manufacturing occupations in municipality i, \%}}{\text{The share of labour force working in service and manufacturing occupations in Finland, \%}}$$

[78] Law for health and welfare services and planning (No. 1150/1996).

[79] The value of constants $c_1$ and $c_2$ is defined yearly in the central government budget. In 1997 the values were FIM 1920 and FIM 175.

[80] This coefficient is calculated using data for t-3. The coefficient tries to capture the effect of need for day care as it is assumed that, for instance, families in a farming business do not need day-care services.

*Table 22 Unit costs for social welfare and health care services in 1997, FIM*

| | Unit cost per person in the age group | |
|---|---|---|
| Age group | Welfare services | Health care |
| 0 – 6 years | 22 638 | 2 751 |
| 7 – 64 years | 1 517 | 3 065 |
| 65 – 74 years | 2 759 | 7 379 |
| 75 – 84 years | 15 372 | 13 889 |
| 85 – | 42 835 | 23 376 |

Formula for health care services

$$\sum_{j=1}^{5} n_{ij} g_j + s_i d_1 n_i ,$$

where $s_i$ is the morbidity coefficient in municipality i, $d_1$ is a constant for morbidity. The value for morbidity constant is defined yearly by central state and it was FIM 1300 for 1997. Morbidity coefficient is defined as follows:

$$s_i = \frac{\text{the number of people aged 16 - 54 years on disability pension/all people aged 16 - 54 years in municipality i}}{\text{the number of people aged 16 - 54 years on disability pension in Finland /all people aged 16 - 54 years in Finland}}$$

A peripheral location also increases the grants. If the bonus for service in a remote area for some municipality is at least 3 % of the total social welfare and health care operating expenditures, and if the rural points used in municipal collective wage bargaining model are at least at level 2, then the municipality is entitled to a 5 % increase in both the social welfare and health care calculatory expenditures. If the rural points are at least 5, then the municipality is awarded a 15 % increase.

**Education and culture services**[81]

Formula for comprehensive schools[82]

Unit price =
$\{(0.4 \times UP1 + 0.6 \times UP2) \times 0{,}9517557 + 2{,}0 \times AC \times nhp_i / p_i + 3{,}5 \times AC \times nshp_i / p_i \} \times (1 + 0{,}10 \times nS_i/p_i + f_1) \times (1 + z_i)$,

where

[81] Law for educational and cultural service finance and planning (No. 1151/ 1996).

[82] Häkkinen and Moisio, 2000.

*UP1* is unit price defined using school network and number of pupils,
*UP2* is unit price defined using the population density in municipality,
*0,9517557* is the adjustment coefficient for year 2000,
*AC* is the average cost of teaching per pupil defined each year by central government,
$nhp_i$ is the number of handicapped pupils in municipality i,
$p_i$ is the total number of pupils in municipality i,
$nshp_i$ is the number of severely handicapped pupils in municipality i,
*nSi* is the number of Swedish speaking pupils in municipality i,
$f_1$ is the island municipality coefficient, and
$z_i$ is the consideration coefficient.

UP1 is defined as follows:

if PDi ≥ 5, then UP1 = (215,8 × SNFi – 1365), and
if PD < 5, then UP1 = (215,8 × SNFi – 1365)×{1 + (5 - PDi) / 100},

where $SNF_i = SNF_{i,\ 1\text{-}6}$ (school network factor for classes 1-6) + $SNF_{i,\ 7\text{-}9}$ (school network factor for classes 7-9).

SNFi, 1-6 depends on total number of pupils in classes 1-6, pi, 1-6, in a following way:

if pi, 1-6 ≥ 80, then SNFi, 1-6 = 80 × pi, 1-6,
if pi, 1-6 < 80, then SNFi is ((80-pi, 1-6) × 1,2) × pi, 1-6.

SNFi, 7-9 is defined respectively:

if pi, 7-9 ≥ 180, then SNFi, 7-9 = 140 × pi, 7-9,
if pi, 7-9 < 180, then SNFi, 7-9 = 140 + max[{(180 – pi, 7-9) × 0,6}, 60] × pi, 7-9.

*Population density* coefficient in municipality i is defined as
$PD_i$ = 1 + {max[1, (5-population density in municipality i)]/100} × 7

$LF_i$ is the value of the *language supplement* that is calculated using the number of other than Finnish speaking pupils. The figures 0.927111 and 241.86 are used to balance the calculated expenditures so that the sum of all expenditures (over municipalities) would not exceed certain budgetary limits.

UP2 is obtained from cross-section regressions where the dependent variable is expenditure per pupil and the independent variable is population density. The regressions are performed for five population density groups: population density below 1.99, 2-4.99, 5-9.99, 10-29.99 and above 30 individuals per square kilometre. As a result, five equations are used to define UP2 for five municipality groups (1998 situation):

40 717 - 6187 × population density, if population density ≤ 2

30 711 - 1184 × population density, if population density ≤ 5
27 256 - 493 × population density, if population density ≤ 10
23 502 - 117.6 × population density, if population density ≤ 30
19 974, if population density > 30[83].

Secondary school formula

unit price of teaching/pupil in school i× number of pupils in school i,

where the unit price is the previous year's mean cost of teaching per pupil in Finland. The size of the school is also taken into account.

Vocational school formula

(unit price of teaching/pupil × number of pupils in school i) +
(unit cost for housing × number of pupils housed in school i) +
(unit cost for transportation × number of pupils transported for school i) + consideration adjustment.

Open college formula

unit price of teaching/lecture × number of calculatory lectures held in college i × settlement structure coefficient in municipality i.

College of music formula

unit price of teaching/lecture × number of calculatory lectures held in college i

Library formula

unit price per capita × population in municipality i × settlement structure coefficient for municipality i

Formulas for cultural work, (basic) art teaching, youth work, physical education

unit price per capita × population in municipality i

Museums, theatres and orchestra formulas

unit price per one year of labour × number of labour years

[83] For this, instead of regression results, the pupil-weighted average of the expenditures is used.

**General grants**[84]

Since 1997, the formula for general grants has been:

$GG + island_i + Rural_i + Urban_i + LF_i + consideration_i$, where

GG is the per capita general grant decided yearly by central government,
$Island_i$ is the island supplement,
$Rural_i$ is the supplement for remote rural municipalities
$Urban_i$ is the supplement for municipalities with high level of traffic costs,
$LF_i$ is the language coefficient for bilingualism,
$Consideration_i$ supplement is for municipalities with severe difficulties.

The value for *GG* 206 was in 1997 FIM per capita.

*Island supplement* is defined as follows:
if more than 50 % of population in municipality i lives in island without solid connection (bridge or such) to the continent, then $Island_i = 3 \times GG$. For other island municipalities $Island_i = 1.5 \times GG$ or $0.75 \times GG$, depending on the degree of the island remoteness defined by separate law (No. 494/1981).

*Rural* coefficient is defined as:
if $(15000\text{-}locpop_i)/15000+(60000\text{-}regpop_i)/60000 \geq 1.5$, then $Rural_i = 3 \times GG$,
if $1 \leq (15000\text{-}locpop_i)/15000+(60000\text{-}regpop_i)/60000 < 1.49$, $Rural_i = 2 \times GG$,
if $0.5 \leq (15000\text{-}locpop_i)/15000+(60000\text{-}regpop_i)/60000 < 0.99$, $Rural_i = 1.5 \times GG$,
where $locpop_i$ is the population living within a 25-km radius from the municipal centre, and $regpop_i$ is the population living within a 50-km radius from the municipal centre.

Coefficient for $Urban_i$:
if the population in municipality i > 40 000, then $Urban_i = 1.45 \times GG$.

Coefficient for $LF_i$:
if municipality i is defined as bilingual (either Swedish or Saami speaking people living in the municipality), then $LF_i = 1.1 \times GG$.

The $consideration_i$ *supplement:*
if the municipality applies the consideration supplement because of exceptional and sudden economic problems, it can be granted some amount depending of the severity of its problems. There is no specific formula for this grant.

[84] Law for municipal grants (No. 1147/1996).

## The cuts in grants during 1993-1999

Due to the economic recession, the central government had to cut the grants to municipalities throughout 1993-1998. Altogether, the cuts in grants during these years were nearly FIM 14 billion. At the same time, the grants were reduced neutrally (by devolving functions simultaneously from local to central level) by nearly FIM 9 billion[85].

The way the grant cuts were made differed almost every year and depended on the purpose of the grant. The social welfare and health care grants were cut on a per capita basis[86] in 1993, but in 1994 they were cut so that 40 % of the reduction was made on a per capita basis and 60 % depended on the municipality's tax base. In 1995 the cuts were made by lowering the calculatory unit costs and during 1996-1998 the cuts were made again on a per capita basis. In the education and culture sector the cuts were made between 1993 and 1995 by lowering the unit costs and during period 1996-1999 on a per capita basis.

It must be noted that during the period 1993-1998 municipalities' tax incomes increased by approximately FIM 15 billion so the municipal sector was able to slightly improve its financial position on average.

As a result of the variety of methods used to cut grants, it is almost impossible to define how the cuts have affected different municipalities. It seems, however, that the cuts were most severe in the municipalities with the largest populations[87].

[85] Source: government budget proposals 1993, 1994, 1995, 1996, 1997, 1998, 1999.

[86] Same amount per capita for each municipality.

[87] See Karhu et al. 1999.

# 3. Non-institutional elderly care and the expenditures of Finnish municipalities and Social Insurance Institution

## 3.1 Introduction

Recent population estimates in Finland show that by the year 2030 over 25 % of the population will be aged 65 or older[88]. By that time the number of people aged 75 or older will more than double from the year 1998 level. The population in Finland will then be one of the oldest in Europe. This will inevitably increase pressures on pension, health care and care for elderly systems. As the working age population decreases (without massive in-migration), this will cause serious difficulties in the public finance as well.

In Finland the municipalities provide nearly all of the basic health care and social services. These services add up to about 45 percent of all municipal current expenditure and investments. Some typical examples of the health sector services are health centres and district hospitals. The main social services include care for elderly, care for handicapped and mentally ill, and social work in general. The average share of care for elderly services of total health and social welfare expenditures in the municipal sector was 13 % in 1997.

The care for elderly is a special case of a wide range of municipal services and a typical example of Finnish municipalities' duties. The State regulates the services through national legislation. State also partly finances the social and health services using grants that are defined using specific needs and circumstantial criteria. Most of the expenditures are financed using municipal tax revenues and user fees, however.

The statistics show that during the latter half of 1990s Finnish municipalities have increasingly re-organised their care for elderly towards non-institutionalised services. The reason for this is that non-institutional care is considerably cheaper for municipalities than institutional care. For example, in 1999 the average cost of one day in institutional care in the largest five cities in Finland was FIM 600.[89] The fees collected for this service type seldom cover even half of the costs.[90] In

[88] Statistics Finland, population estimates.

[89] City of Helsinki 1999, appendixes page 6. At the same time, the one day average for the whole country was FIM 460.

[90] To concretize this, an example of cost of institutional care and non-institutional care to the municipality is provided in the appendix (Figure 17) (source: State Audit Office, 2000). In short, the cost of one month of institutional care for the municipality was in 1998 on average FIM 13 800 per person. For an elderly person with with FIM 7 000 per month pension incomes, the net cost for the municipality was FIM 9 800 because the income based fee for institutional care is FIM 4 000 (80 % of after tax income). If the person

non-institutional care the clients pay themselves for their accommodation, medicines, and other care provided by municipality in their homes. The Finnish Social Insurance Institution (from now on, the abbreviation SII is used in this paper) compensates parts of these costs to elderly people through housing allowance, medicine refunds, and national pension system. As the non-institutional care has become more common, the share of the costs that clients themselves and the SII have to pay has risen and at the same time municipalities have saved money. This can also be seen from the rapid increase of the Social Insurance Institution's housing allowance and medicine refund expenditures. By increased use of non-institutional care, the municipalities have been able to pass part of their costs to SII and to the customers.

In economics it is customary to describe the local budgetary behaviour assuming that a municipality can be treated like a single household. The municipal demand for public services and goods can then be derived using the representative consumers' maximisation problem (see for instance Bergström and Goodman 1973, Borcherding and Deacon 1974). Because of this, the econometric analysis of local expenditures is often based on assumption that there is some decisive voter whose preferences dominate. Usually a continuous, quasi-concave utility function u(x,Z), representing the representative voters' preferences for private goods (x) and local service outputs (Z) has been assumed. The budget constraint of the voter is commonly based on the assumption that private consumption cannot be larger than the private income after taxes: px = (1-t)Y, where p is the price for private good x, t is the municipal tax rate and Y is the voter's before tax income. In addition, the voter's maximisation is also constrained by the municipality's budget constraint that can be written as: (1-m)qz = tY + L, where m is matching aid rate, q is price for public good and L is the amount of lump sum grants. Solving the maximisation problem and adding some socio-economic and demographic variables gives one the general municipal expenditure demand function:

$$E^z = z\left( income,\ price,\ grants, O \right), \tag{17}$$

where *income* is private taxable income, *price* is the tax price of public good to the municipality, *O* denotes demographic and socio-economic variables.

In empirical research the municipal health care and care for elderly expenditures have usually been assumed to depend on need and demand factors such as age structure and morbidity. In addition, variables describing cost differences like the

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was treated in non-institutional care, where he/she was provided home care help one hour once per day plus a nurse visit once per week plus a warm meal delivered home once per day, the production cost of all this for the municipality would be FIM 7 200 and the net cost (gross cost – user fees) FIM 4 900. Of course, the institutional care and non-institutional care cannot directly be compared. This example shows only that there is a considerable potential for the municipality to save in case the treatment is possible to organise as non-institutional care.

size of the municipality or degree of urbanisation have been used to explain the expenditures. Also economic variables like mean or median incomes in municipality and grants received have been used in econometric models (see for instance Häkkinen and Luoma 1995, McGuire et al. 1993, Gerdthamn et al. 1992).

Most results of empirical studies in Finland and elsewhere suggest that health care services are relatively price and income inelastic (Häkkinen and Luoma 1995, Inman 1979, 286-287). There is some evidence, however, also about the income elastic health-care expenditures (McGuire et al. 1993). As for other explanatory variables, the number of elderly persons in institutional care relative to the total elderly population has been found to increase the municipal expenditures for elderly care (Häkkinen and Luoma 1995). The State subsidy rate also seems to increase the expenditures even when the income level is controlled for (Häkkinen and Luoma 1995).

The purpose of this paper is to find out the cost saving effect of increased non-institutional care to municipalities and the cost increase for SII using a simple econometric expenditure determination model. So far only rough estimates have been done on this subject in Finland[91]. As the ageing of population is becoming increasingly topical issue in Finland it is important to try to measure these effects in closer detail.

The organisation of the chapter is as follows. Section 3.2 presents the theoretical background for the study. Section 3.3 describes the empirical framework of the study. Section 3.4 presents the results and section 3.5 concludes and summarises the chapter.

## 3.2 Empirical framework

### 3.2.1 The data

The data used in the analysis consisted of 436 municipalities during the period 1994-1997. The data period in question describes well the change in the municipal care for elderly service structure. The main source of the data for municipal finances[92], activities about care for elderly[93] and demographic characteristics[94] was Statistics Finland. In addition, figures on the number of people receiving old

[91] Social Insurance Institution has in 1997 estimated that the effect of enlargement of non-institutional care in 1995 was FIM 35 million for pension costs, FIM 16 million for medical treatment and FIM 4 million for rehabilitation.

[92] The amount of taxable private incomes, grants to municipalities.

[93] Expenditures and number of people in institutional care, in home help service and in care by close relatives allowance and other services, such as day centres.

[94] Population, population aged over 75, population aged over 65, area, population density of the municipality.

age care were obtained from Association of Finnish Local and Regional Authorities' statistics[95]. In addition, figures concerning Social Insurance Institution expenditures on elderly peoples' housing allowances, medicine refunds and pensions were obtained from Social Insurance Institution statistics. The data concerning Finnish Slot Machine Association allowances was obtained directly from their web site. The data covers all the 436 municipalities that existed in 1998 except the municipalities of the autonomous area of Åland islands. The money figures were deflated using consumer price index.

The municipal care for elderly in Finland consists mainly of home help services, additional services[96], sheltered housing, institutional care and care by close relatives. In addition, the day-care for elderly and service centres are becoming more common. Although most of the services are provided by municipalities themselves, they are also entitled to purchase the services from either a private provider or from a non-profit organisation.

The exact amount of care for elderly expenditures cannot be defined due to faults in the statistics. For example, the statistics of the expenditures on home help service do not describe the old persons' share because the figures also contain the expenditures for home help to disabled young persons. The same holds true for the category "other services for elderly and disabled".[97] In fact, only the expenditure information of the institutional care has been recorded separately for the old persons. The information on institutional care has its own problem, however, which is caused by the demarcation between health care and care for elderly in institutions. This is because in some municipalities the old persons' care takes place within the bed department of health centres whereas in most municipalities these people are treated in old peoples' homes. In the municipalities where the old people are taken care of in health centres, the expenditures are recorded to be the expenditures of the public health service and not the expenditures of the care for elderly (social service). The number of these municipalities varied during period 1994-97 between 19-30. Because of all this, the total expenditures of the care for elderly services are more or less based on estimates. In this work an attempt has been made to estimate the care for elderly expenditures with the help of the municipality specific information of the operation statistics. This matter is more closely discussed in the following section.

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[95] Number of clients in institutionalised care (old people's home), number of patients in hospital care.

[96] For instance cleaning, which is a not included in municipal home help service.

[97] On the other hand, from the operation statistics we know that for instance in 1997 over 70 % of the persons who received municipal home care help were aged over 65. Similarly, of the people who received other home help services over 85 % were aged over 65, and of the people who were helped by care by close relatives allowances 65 % were aged over 65 years. The statistics information on "other services for elderly and disabled" consists of several services, the most important being the sheltered housing. Over 84 % of people who live in sheltered housing are elderly. This kind of operational information is recorded for each municipality.

Figure 14 shows the development of per capita expenditures of care for elderly and disabled from year 1994 onwards.[98] Note that the analysis in this paper covers years 1994-1997. This is mainly because of municipal specific data availability problems concerning years 1993 and 1998[99]. Figure 15 shows the development in number of people treated in separate services. The institutional care and the sheltered housing form together the main part of the care for elderly services. The persons treated in institutional care have diminished during the period 1992-1998. Correspondingly, the sheltered housing has increased. The role of the non-profit organisations has been important in establishing the sheltered housing. In many cases the sheltered housing units have been at least partly financed by the Finnish Slot Machine Association (FSMA). Even though the municipality is never directly the recipient[100], the support from FSMA has lowered the costs of the municipality thanks to a new (non-institutional care -based) service structure.

[98] Health care expenditures are excluded.

[99] For 1993 there were problems with the quality of the data and the 1998 figures were not available at a municipal level when performing this analysis.

[100] By law, only non-profit organisations are entitled to FSMA support.

*Figure 14* *The expenditure for care for elderly in 1993-1998 (Source: Statistics Finland, Association of Finnish Local and Regional Authorities, Ministry of Social Affairs and Health).*

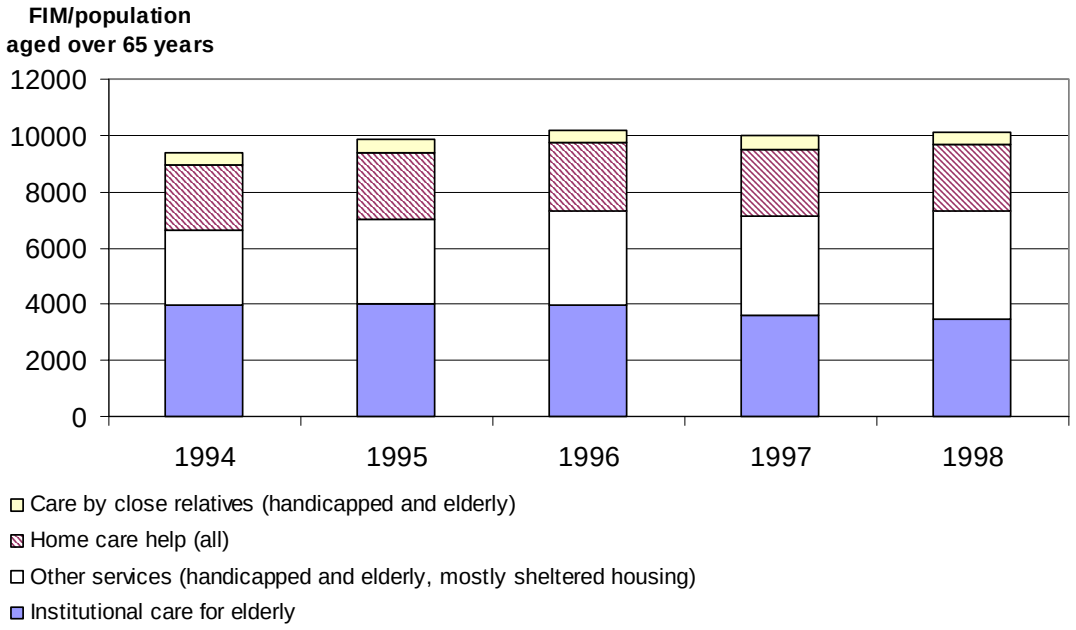
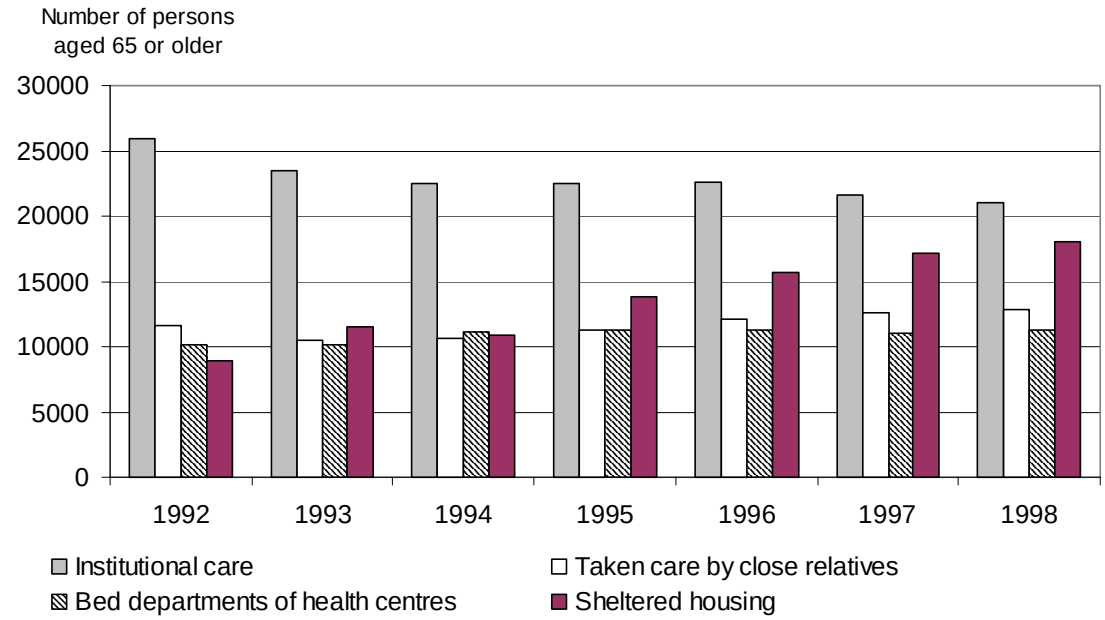



*Figure 15* *The number of persons in different types of care for elderly services (Source: Statistics Finland, Association of Finnish Local and Regional Authorities, Ministry of Social Affairs and Health).*



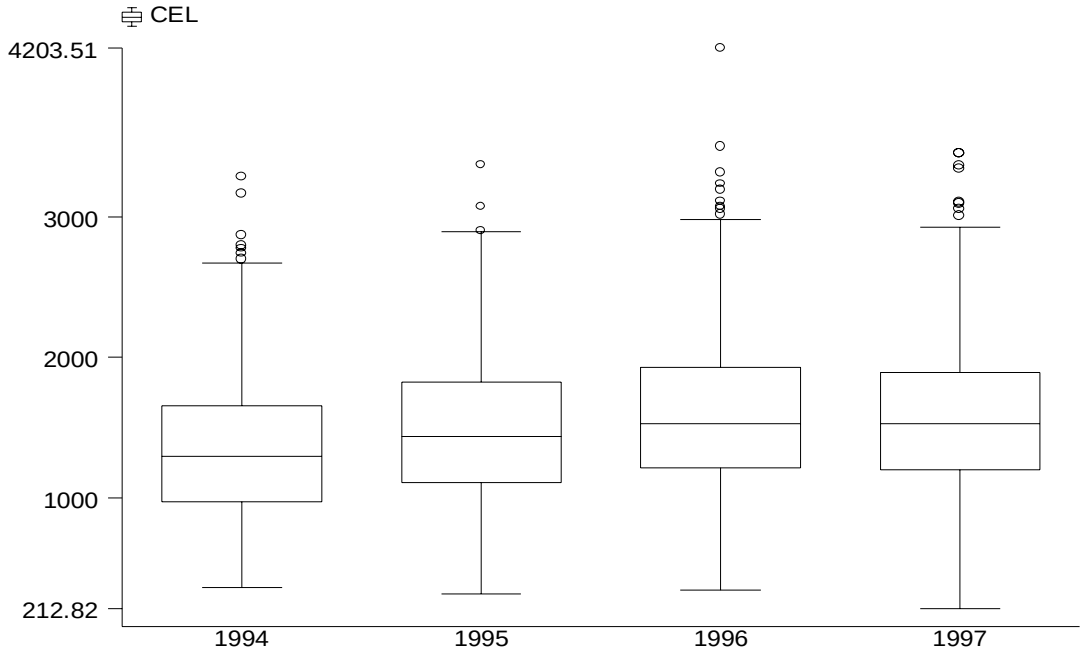
Between 1994 and 1996 the fixed-price expenditures of the care for elderly increased in three out of four municipalities (see Table 23). In 1997 the expenditures decreased in more than half of the municipalities. However, it needs to be noted that a major change in intergovernmental grant system and in the bookkeeping law were implemented that year. These reforms may have affected so that the expenditures have seemingly lowered. Year dummy-variables are used to control for these changes in econometric analysis.

*Table 23* *The municipalities divided into groups on the basis of changes in their total per capita care for elderly expenditures (non-institutional care + institutional care)*

| | Number of municipalities | | | | |
|---|---|---|---|---|---|
| | Year | | | | |
| Change % | 1994 | 1995 | 1996 | 1997 | 1998 |
| < -10 | 27 | 19 | 14 | 89 | 19 |
| -10 - -4.99 | 31 | 11 | 24 | 72 | 26 |
| -5 - -0.01 | 64 | 36 | 46 | 94 | 66 |
| 0 - 4.99 | 77 | 98 | 89 | 69 | 116 |
| 5 - 9.99 | 92 | 100 | 114 | 42 | 103 |
| >10 | 145 | 172 | 149 | 70 | 106 |
| Increased | 314 | 370 | 352 | 181 | 325 |
| Decreased | 122 | 66 | 84 | 255 | 111 |
| All | 436 | 436 | 436 | 436 | 436 |

The dispersion of municipalities' care for elderly expenditures has been remarkable. For example in 1996 the highest expenditures per inhabitant were over 4000 FIM and the lowest only slightly above 200 FIM (see Figure 16).

*Figure 16 The dispersion of care for elderly expenditures (FIM, per capita in 1995 prices) in the municipalities in 1994-1997*




The line in the middle of the box represents the median of the data. The box extends from the 25th to 75th percentile (the interquartile range, IQR). The line emerging from the box (below) is 25th percentile – 1.5×IQR, and above the box it is 75th percentile + 1.5×IQR. Observed points more extreme than these are individually plotted (Stata 7.0 Graphics Manual, 2001, p. 35).

### 3.2.2 Variables and hypotheses

This section describes the variables used in the analysis and the hypotheses concerning each variable. The explanatory variables for the models used were chosen on the basis of other studies on care for elderly expenditures as well as the conceptual framework described in section 2. All money figures are in FIM per capita form if not stated otherwise. The variables were deflated using the consumer price index. All variables extend over i = 1, …, 436 municipalities and t = 1994, …, 1997 years.

Dependent variables (all in per capita form):

| | |
|---|---|
| $E_{it}$: | Total municipal expenditures of care for elderly, net of user fees, |
| $Med_{it}$: | Medicine refunds of SII for people aged 65- and older, |
| $Housing_{it}$: | Housing allowances of SII for people aged 65- and older, |
| $Tot_{it}$: | Pension expenditures and housing allowances of SII for people aged 65- and older. |

As described in the previous section, the municipal expenditures of the care for elderly ($E_{it}$) consists of four components: a) the expenditures of the old persons' institutional care, b) the support of the care by close relatives, c) the home help services and d) other services. The problem with the data at hand is that this information also contains the expenditures of other population groups, such as young disabled persons. Therefore, for the estimation purposes the data has been modified so that for each municipality the share of the over 65-year-old using each service has been taken into consideration.[101] This attempts to remove other population groups, above all the disabled persons' share of the expenditures. Net expenditures are used because this paper tries to estimate net expenditure effects of changes in municipal service care for elderly structure for municipal sector and SII.

Summing housing allowance and pension data form the $Tot_{it}$ variable. The reason for doing this is that the housing allowance of elderly people depends on pensions of the person. In addition, they are normally paid to the recipient at the same time.

Independent variables:

| | |
|---|---|
| $Inst75y_{it}$: | The share of persons aged 75 years and older who are in institutional care (%), of all persons aged 75 or older,[102] |
| $Grant_{it}$: | The State grant to municipalities for social welfare and health-care per capita, |
| $T_{it}$: | Municipal tax base per capita[103], |
| $Sickness_{it}$: | The persons aged 65 or older who are treated in hospital per all persons aged 65 or older, |
| 75-$y_{it}$ %: | The share of person's aged 75 or older of total population in municipality, |
| $N_{it}$: | Population at the end of the year, |
| $NSA_{it}$: | The National Slot Machine Association aid (per capita) to care for elderly services, |
| $DVInst_{it}$: | Dummy variable for municipalities whose institutional care is zero.[104] |

[101] For example, the amount of elderly people share of home care help costs have been calculated using the information on the total expenditure on home care help and the share of elderly people of total home care help receivers. This has been done for each municipality as follows: if the share of elderly home care help receivers in municipality i is 90 %, then 90 % of the municipality's total expenditure on home care help is considered to be the elderly people's share of the expenditures. The expenditures of care by close relatives' allowance, sheltered housing (other services) have been estimated in the same way.

[102] The share of 75-year-old and older is used because institutional care is rare for people between 65 and 74. In addition, the data for the age group used was the only one available.

[103] Taxable incomes.

[104] The most likely explanation for this is that the expenditures in question are recorded as health care expenditures.

The expected signs of independent variables when explaining the dependent variables are summarised in Table 24. Variable $Inst75y_{it}$ is expected to increase municipal expenditures of care for elderly ($E_{it}$) and to decrease the three SII expenditures ($Med_{it}$, $Housing_{it}$, and $Tot_{it}$). This is primarily because institutional care is more expensive for municipalities than non-institutional care. The expenditures of SII are expected to decrease because the SII refunds to medical expenses and housing expenditures decrease as institutional care increases.

The relationship between State grants and municipalities' per capita expenditures is expected to be positive. This is mainly because the effect of increase in income to expenditures is usually positive. In addition, the municipalities that are given the highest grants are expected to have higher costs. For example, the need criteria used to calculate the grants takes the age structure[105], morbidity, unemployment, population density and rurality into account[106]. Having said all that, it seems reasonable to expect that the need for SII medicine refunds and housing allowances would also be higher in municipalities receiving more grants and that the pension expenditures would be lower.

*Table 24 The expected signs of independent variables when explaining the four dependent variables*

| | **Dependent variables** | | | |
|---|---|---|---|---|
| **Independent variable** | $E_{it}$ | $Med_{it}$ | $Housing_{it}$ | $Tot_{it}$ |
| $Inst75y_{it}$ | + | – | – | – |
| $Grants_{it}$ | + | + | + | – |
| $T_{it}$ | + | + | – | – |
| $Sickness_{it}$ | + | – | ? | – |
| 75-$y_{it}$ % | + | + | + | + |
| $N_{it}$ | – | (–) | (–) | (–) |
| $NSA_{it}$ | – | + | + | ? |

Per capita taxable incomes ($T_{it}$) are expected to increase the care for elderly expenditures because income effect is usually positive when explaining municipal expenditures. Private income level is also assumed to increase medicine refunds because residents in wealthier municipalities may use more expensive medicines. Housing allowances are only granted to low income people, therefore a negative sign is expected. Similarly, the pension expenditures of SII are expected to be smaller in municipalities with higher average incomes because high average income is related to large number of working age people. In addition, the pensions

[105] The grants for social welfare are defined mainly according to the age structure. The high share of children as well as high share of elderly people will increase the grants.

[106] Previous studies in Finland suggest that grants have an increasing effect on health care expenditures (Häkkinen and Luoma, 1995).

that SII pays are income related so that people with low pensions from employee pension schemes get more basic pension.[107]

The higher the share of elderly people in hospital treatment ($Sickness_{it}$) the higher is the expected care for elderly expenditure of municipality. The effect on SII expenditures is thought to be mainly negative because hospital treatment is institutional care. No clear expectation can be made about housing allowances, however.

The higher the share of elderly people ($75\text{-}y_{it}$ %) in the municipality the higher are the expected per capita care for elderly expenditures of the municipality. The same applies for SII expenditures.

Higher number of inhabitants ($N_{it}$) are expected to be associated with lower per capita costs of the municipal elderly services, hence, the negative signs. This variable measures the scale effects because the municipalities that have large population are expected to be able to utilise scale economies. It is more difficult to see the relationship between population with the SII expenditures, however. Therefore the negative signs are marked with parentheses.

The grants from National Slot Machine Association (NSMA) are expected to decrease the municipalities' expenditures but to increase SII medicine refunds and housing allowances. This is because the NSMA support is usually used to build sheltered housing units which helps municipalities to reduce their institutional care.

## 3.3 The results

The results of fixed effects regressions are shown in tables 3-6. Each table shows two alternative specifications. The first model is the fixed effects model that removes the municipality fixed specific effects. In the second model, also the period effects are controlled for, in other words there is dummy for each year.

The model for care for elderly expenditures (Table 25) explains 90 % of the net expenditure variation. The explanatory power does not rise with the including of time effects, but on most of the parameter estimates and their statistical significance they seem to have a considerable effect. Especially the parameter estimates for variables $Inst75y_{it}$, $T_i$, $75\text{-}y_{it}$% seem to react strongly to inclusion of year dummies in the model. This is probably because the year dummies take the effect of time variation of the dependent variable that also $Inst75y_{it}$, $T_i$, $75\text{-}y_{it}$% are trying to determine.

[107] All retired Finnish citizens are entitled to basic pension of SII. Most of the retired people also receive pensions from employee pension scheme, which is maintained by private employee pension insurance companies. The basic pension is higher for people with very low level of employee pensions.

The estimation results show also that the net expenditures of the care for elderly are best explained by the share of the over 75-year-old persons in the institutional care of total number of municipality's 75-year-old persons, the tax base and density.

The results can be interpreted so that a one percentage point increase in the share of over 75-year-olds in institutional care, of all 75-year-olds, will add the municipality's net expenditures of the care for elderly by FIM 8.5 – 11.7 per inhabitant. One must remember that the variable being explained is the total expenditures of the care for elderly and that the coefficient therefore represents the total effect[108]. To concretise the effect, let us assume a hypothetical Finnish municipality with population of 3000 of whom 250 persons are aged over 75 and of those altogether 18 persons are treated in institutional care. This would be the situation in a typical small Finnish municipality. Now, if one over 75-year-old person moves to institutional care, the annual net expenditures of the care for elderly would increase between FIM 10140 and FIM 13920 in this municipality[109]. In other words, by keeping this person in non-institutional care the municipality would save annually between FIM 10 236 and 14 040.

As for the next explanatory variable, there seems to be small statistically nonsignificant positive connection with the State grants[110] and the care for elderly expenditures (the estimates are significant only at 10 % level). For example, FIM 10 000 increase in the social welfare and health care grants increase the care for elderly expenditures by FIM 200 – 300 per capita. The smallness and statistical insignificance of the effect may be partly because the grant variable used is the grant for the aggregate social welfare and health care of which the share of elderly care expenditures are only 13 %. Unfortunately, more detailed grant variable for this model was not available.

According to the results, the higher the tax base of the municipality, the higher are the per capita expenditures of the care for elderly. When the time effects are controlled, the estimate is not significant. In any case, the effect is very small. For example, an increase of 10 000 FIM to the per capita taxable incomes of the municipality would mean about FIM 100 - 200 higher per capita care for elderly expenditures.

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[108] When the 75-year-old person moves to institutional care, she or he increases the expenditures of the institutional care but reduces the other expenditures of the care for elderly.

[109] In this hypothetical municipality a 1-percentage point increase in number of elderly people in institutions would mean 2.5 persons increase. Therefore one person increase (from 18 to 19 persons) in institutional care would then mean 0.4 percentage point change. Hence the total yearly increase in expenditures from this one new person in institution for this municipality would be $3000 \times 11.7 \times 0.4$ = FIM 14 040 in year 1995 price level (for model in first column).

[110] Grants for social welfare and health care services per expenditures.

The old persons' share of the inhabitants was not statistically significant. No evidence for the share of elderly in the municipality to increase the per capita expenditures of the care for elderly was therefore found.

The number of inhabitants of the municipality did not have statistically significant explanation power so the scale economies issue remains a question mark. For this variable, also the squared form was tested and no statistical significance was found. The support of Finnish Slot Machine Association does not seem to have a statistically significant effect on the expenditures of the care for elderly, either.

*Table 25 Models explaining the per capita expenditures (net of user fees) of municipal care for elderly*[111]

| | Municipal specific fixed effects | | Municipal and time specific fixed effects | |
|---|---|---|---|---|
| | Coefficient | t-value[112] | Coefficient | t-value |
| $Inst75y_{it}$ | 11.69 | 2.02* | 8.53 | 1.42 |
| $Grant_{it}$ | 0.03 | 1.87 | 0.02 | 1.62 |
| $T_i$ | 0.02 | 11.53* | 0.01 | 1.63 |
| $Sickness_{it}$ | 1.36 | 1.79 | 1.50 | 1.98* |
| $75\text{-}y_{it}$ % | 43.59 | 1.62 | 12.48 | 0.44 |
| $N_{it}$ | -0.004 | -0.96 | -0.001 | -0.21 |
| $NSA_{it}$ | -0.01 | -0.19 | 0.002 | 0.03 |
| $DVInst_{it}$ | -427.17 | -5.42* | -433.19 | -5.56* |
| Constant | -264.26 | -1.05 | 890.21 | 2.54* |
| $R^2$ | 0.896 | | 0.902 | |
| $R^2$ adj. | 0.861 | | 0.869 | |
| Preusch-Pagan[113] | 1117.1 | | 1282.3 | |
| Hausman[114] | 200.0 | | 49.9 | |

[111] Following the procedure in Chapter 2, also the sum of operating grants were used to explain the expenditures. The tests reject the hypothesis of equal size parameters of $Grant_{it}$ and total operating grants – variable for the model where only municipality fixed effects are controlled for. However, the tests accept the hypothesis of equal size coefficients for the model where also the time effects are controlled. Similarly, the tests reject equal coefficient hypothesis between $Grant_{it}$ and the residual grant variable (total operating grants - $Grant_{it}$) for the model with only municipality effects controled but the hypothesis is accepted for the model where also time dummies are incuded. However, as none of these model variants changed the results for $Inst75y_{it}$ significantly, we trust the model in Table 25. The test results in question can be obtained from the author.

[112] Robust t-values. One star means 5 % level significance, two stars 1 % level significance.

[113] Breusch-Pagan tests the existence of individual effects. If no individual effects are found, OLS regression on pooled data would be enough. A "*" after the this test parameter means that no individual effects is found at least 5 % significance level. See Baltagi (1995) or Hsiao (1986) for details.

[114] Hausman tests the difference of within and random effects estimates. The zero hypothesis is that the difference in coefficients is not systematic. If an alternative hypothesis is accepted, it is usually taken to denote that within -method should be chosen or that our model is misspecified. A "*" –sign after the test parameter means that the parameters have been found not to differ statistically significantly at least 5 % level of significance. Again, see Baltagi (1995) or Hsiao (1986) for details.

The possible problem of endogeneity of the variables *Inst75y*$_{it}$ and $E_{it}$ (the dependent variable) needs some attention. Namely, the variables *Inst75y*$_{it}$ and $E_{it}$ may be decided simultaneously by the municipalities and as a result of this the estimates may be biased and inconsistent[115]. The intuition behind the simultaneity is apparent: high care for elderly expenditures may induce the municipalities to reduce the expensive institutional care. And the other way round: municipalities that decrease their use of institutional care are able to reduce their expenditures.

If the endogeneity existed, one ought to model *Inst75y*$_{it}$ in a separate equation and use instrumental variable estimation to solve the system. The main problem, however, would be to find suitable instrument(s) for *Inst75y*$_{it}$. More specifically, one would need a variable that would correlate with *Inst75y*$_{it}$ but not have the possible problem of *Inst75y*$_{it}$ – the correlation with the error term. Although it is difficult to select a good instrument among the variables used in the present model framework, it is even harder to find one outside the model. However, a following system is formulated to take account of the possible endogeneity:

$$Inst75y_{it} = a_1 + a_9 NSA_{it} + a_{10} DVInst_{it} + u_1$$

$$E_{it} = b_1 + b_2 Inst75y_{it} + b_3 Grant_{it} + b_4 T_i + b_5 Sickness_{it} + b_6 75\text{-}y_{it}\ \% + b_7 Density_{it} + b_8 N_{it} + b_{10} DVInst_{it} + u_{2,}$$

where $Inst75y_{it}$ is explained by the National Slot Machine Association grants plus the dummy variable for those municipalities whose institutional care is zero. Institutional care can be assumed to depend on NSA grants because they are directed to support the services other than institutional care.

After performing several tests to verify the endogeneity in both panel and cross-section framework, no clear conclusion can be made. The augmented Durbin–Wu–Hausman test regression test[116] rejects the endogeneity of $Inst75y_{it}$ in the panel model and for years 1994-1995 of the cross-section models. On the other hand, endogeneity is accepted for cross-section 1996 and 1997 (see the appendix, Table 29). Because of this, the estimation procedure is continued using fixed effects instrumental variable model. The results of the estimations are reported in the appendix (Table 30). According to the results, none of the right hand side variables are significant. The value of coefficient for $Inst75y_{it}$ is very large and negative. To test the possibility of a weak instrument problem (see Trostel et al. 2002; Bound et al. 1995), a test for validity of the instruments is performed.[117] The results approve the independence between $Inst75y_{it}$ and the instruments by a

[115] Greene (2000), p. 652-655.

[116] Davidson and MacKinnon (1993) and http://www.stata.com/support/faqs/stat/endogeneity.html.

[117] This test is an F-test on excluded instruments in the reduced form $Inst75y_{it}$ equation. The meaning of the test is to ensure that $Inst75y_{it}$ is correlated with the instruments once other controls are included.

sults approve the independence between $Inst75y_{it}$ and the instruments by a wide margin.[118]

Based on tests of endogeneity and validity of instruments the conclusion is then that either the endogeneity problem does not exist or that the instruments available are too weak to perform well enough. Therefore, the model in Table 25 is retained.

The next dependent variable to be analysed was the medicine refund expenditures of Social Insurance Institution (Table 26). The model used was the same as the one for the care for elderly expenditures. The coefficient of determination for the medicine refund expenditure model was better than in the models in Table 25. Taking time effects into account improved the coefficient of determination but also the coefficient estimates and their statistical significance changed considerably. According to the Hausman test the random effects model would have been better than the fixed effects model. Here only the results of the fixed effects model are reported, however, because fixed effects model suits better for the purpose of this study[119].

According to the results, there is a negative relationship between the institutional care and the medicine refund expenditures of Social Insurance Institution. This result is according to expectations. For example, if one elderly person in the previously defined 3000 inhabitant municipality moves from non-institutional care to an institution, then the medicine refunds of SII will reduce between FIM 324 to 1188 per year[120]. This wide variance of the results depend whether the time effects were taken into consideration or not. Therefore, the results should be interpreted with some caution.

The parameter estimate for State grants seem to depend strongly of whether the year dummies are in the model or not. Grants do seem to increase the medicine refunds, though, a result which was expected in advance.

An increase in tax base by 10 000 FIM per capita would increase the yearly per capita medicine refunds by 10 - 100 FIM. Again, the result depends greatly whether time effects are controlled for or not. The dependence of the growth of medicine refunds on the taxable income base of the municipality could be because in higher income municipalities the old persons simply may use more expensive medicines and/or more medicines in general.

[118] $F(1, 1300) = 0.04$ with significance level 0.84.

[119] We wanted specifically to control for the fixed municipality specific effects.

[120] For example, for first column, $0.4 \times -0.99 \times 3000 = -1092$. The value 0.4 comes from the fact that 1 person moving into institutional care in the example means 0.4 percentage point change.

*Table 26* *The results of the model explaining the per capita medicine refund expenditures of the Social Insurance Institution*

| | Municipal specific fixed effects | | Municipal and time specific fixed effects | |
|---|---|---|---|---|
| | Coefficient | t-value | Coefficient | t-value |
| $Inst75y_{it}$ | -0.99 | -3.08* | -0.27 | -0.85 |
| $Grant_{it}$ | 0.004 | 3.33* | 0.01 | 8.81** |
| $T_i$ | 0.01 | 17.39** | 0.001 | 1.41 |
| $Sickness_{it}$ | 0.02 | 0.23 | -0.03 | -0.43 |
| $75\text{-}y_{it}$ % | 28.11 | 8.39** | 17.36 | 6.67** |
| $N_{it}$ | -0.003 | -7.3** | -0.001 | -3.55** |
| $NSA_{it}$ | 0.004 | 1.05 | 0.01 | 2.18* |
| $DVInst_{it}$ | -1.62 | -0.34 | -8.82 | -1.95 |
| Constant | -225.51 | -12.17** | 129.48 | 5.16** |
| | | | | |
| $R^2$ | 0.950 | | 0.968 | |
| $R^2$ adj. | 0.933 | | 0.957 | |
| Preusch-Pagan | 704.78 | | 1736.70 | |
| Hausman | 11.60* | | 88.49 | |

As expected, the share of the elderly is the strongest explanatory variable in the model. Using again the example of the 3000 inhabitant municipality, one new over 75-year-old person in the population would mean between FIM 1562 and 2529 increase in the medicine refunds of SII to that municipality[121].

Most of the other explanatory variables were not found statistically significant. The population size seems to explain the expenditures in question well but the effect is small. The support of the Finnish Slot Machine Association as this variable had a small statistically significant positive effect on the medicine refunds in the second model formulation.[122] The effect is relatively small, though. The interpretation of this result is that an additional grant of 1000 FIM from the Finnish Slot Machine Association increases the Social Insurance Institution medicine refunds by 10 FIM per capita. What does this result mean? The interpretation may be that as the FSMA grants help the municipalities to increase their non-institutional care, they also increase the refund expenditures of SII.

The third dependent variable under study was the Social Insurance Institution housing allowance directed to the old persons (Table 27). These expenditures were statistically significantly explained by the share of over 75-year-old persons

[121] As the share of 75-year old persons in the example originally was 6.66 %, one new person of that age in the municipality population would mean approximately 0.03 percentage point increase. Therefore, $0.03 \times 3000 \times 28.11 = 2529$.

[122] In a model in which both the time effects and the municipality effects have been taken into account.

in institution of all 75-year-old people, sickness and by the share of over 75-year-olds people. The per capita tax base explained the expenditures only when the time-specific effects were not controlled. The inclusion of the time dummies to the models did not increase the coefficient of determination.

An increase in institutional care reduced the SII housing allowances for elderly. In the 3000 inhabitants' municipality example, the old person who moved to institution reduced the yearly expenditures by FIM 684 to 804. The hospital treatment (Sickness) reduced the housing allowance costs of SII. The growth of the old persons' share in the population increased the housing allowance costs. For example, one percentage point growth of the population share of over 75-year-olds means between FIM 5.6 to 6.6 growth of housing allowance costs per capita.

The State grants, population size and support of the Finnish Slot Machine Association did not seem to have statistically significant effect on the housing allowance costs of Social Insurance Institution.

*Table 27* *The results of the models explaining the per capita housing allowance expenditures of Social Insurance Institution*

| | Municipal specific fixed effects | | Municipal and time specific fixed effects | |
|---|---|---|---|---|
| | Coefficient | t-value | Coefficient | t-value |
| $Inst75y_{it}$ | -0.66 | -3.00** | -0.58 | -2.53** |
| $Grant_{it}$ | -0.0001 | -0.21 | 0.001 | 0.68 |
| $T_i$ | 0.001 | 4.46** | -0.0001 | -0.42 |
| $Sickness_{it}$ | -0.20 | -5.02** | -0.19 | -4.87** |
| $75\text{-}y_{it}$ % | 6.55 | 4.17** | 5.55 | 3.46 |
| $N_{it}$ | 0.0003 | 1.41 | 0.0005 | 2.83 |
| $NSA_{it}$ | -0.004 | -1.21 | -0.003 | -1.06 |
| $DVInst_{it}$ | 5.12 | 1.29 | 4.65 | 1.16 |
| Constant | 80.83 | 7.22** | 120.72 | 7.25** |
| | | | | |
| $R^2$ | 0.978 | | 0.978 | |
| $R^2$ adj. | 0.970 | | 0.971 | |
| Preusch-Pagan | 1945.3 | | 2055.6 | |
| Hausman | 44.2 | | 99.3 | |

Finally, the results of the model that explained the pensions and housing allowances paid to elderly by Social Insurance Institution (Table 28). The results imply that the growth in the variable $Inst75y_{it}$ by one percentage point reduced the pension and housing allowance expenditures of SII as much as FIM 4 per capita when the time effects were controlled. However, one must treat this result with

some carefulness because without controlling the time effects the estimated coefficient was left so clearly below statistical significance.

The growth of the elderly persons' relative share increased the pension and housing allowance expenditures of the SII. The sickness reduced pension and housing expenditures of SII. The grants seem to expand the expenditures in question, however, this result is found only for the first model formulation. The support of the Finnish Slot Machine Association did not get statistically significant parameter estimates. The higher the number of inhabitants in the municipality, the higher are SII costs – this result is significant only when the time effects are not controlled.

*Table 28* *The results of the model explaining the per capita pension and housing allowance expenditures of Social Insurance Institution*

| | Municipal specific fixed effects | | Municipal and time specific fixed effects | |
|---|---|---|---|---|
| | Coefficient | t-value | Coefficient | t-value |
| $Inst75y_{it}$ | -0.03 | -0.02 | -4.10 | -2.38** |
| $Grant_{it}$ | 0.03 | 5.32** | 0.01 | 1.25 |
| $T_i$ | -0.02 | -15.29** | -0.002 | -1.15 |
| $Sickness_{it}$ | -2.32 | -7.03** | -1.92 | -6.62** |
| $75\text{-}y_{it}$ % | 127.25 | 7.61** | 170.78 | 12.95** |
| $N_{it}$ | 0.01 | 2.80** | 0.001 | 0.44 |
| $NSA_{it}$ | 0.02 | 0.78 | 0.01 | 0.39 |
| $DVInst_{it}$ | -34.03 | -1.05 | 1.72 | 0.06 |
| Constant | 3651.37 | 34.54** | 2338.97 | 17.71** |
| | | | | |
| $R^2$ | 0.995 | | 0.997 | |
| $R^2$ adj. | 0.994 | | 0.996 | |
| Preusch-Pagan | 1686.7 | | 1717.8 | |
| Hausman | 924.1 | | 2253.3 | |

## 3.4 Summary and conclusion

The population in Finland is rapidly changing from one of the youngest to one of the oldest in Europe. Despite of this, there has not been many studies that have examined the economic effects of elderly care services for the public sector. One reason for this is the poor quality of the data. The expenditure data collected from the municipalities seldom separates the social welfare expenditures for services that are directed to the elderly. This study attempted to construct a realistic expenditure data for the elderly care in social welfare.

This study focused on the expenditure effects of increased non-institutional care to both the municipal sector and to Social Insurance Institution. In order to accomplish this, an expenditure determination model was used to explain the expenditures of the municipal care for elderly in 1994 – 1997. The empirical model contained a variable describing the service structure of care for elderly as well as several economic and demographic variables of the 436 municipalities. The same model was used also to explain the relevant Social Insurance Institution expenditures.

According to the fixed effects estimation results, during the late 1990s the municipalities have been able to save money by altering their care for elderly service structure from institutional to non-institutional care. It was also found that because of this development the medicine refund, housing allowance and pension expenditures of Social Insurance Institution to the elderly people have increased.

The information obtained from estimations together with municipality-specific data on the share of elderly persons in institutional care made it possible to approximate the aggregate expenditure effects[123]. According to these calculations, the benefit for the municipal sector in 1997 was between FIM 61 million and FIM 83 million.[124]

For the expenditures of the Social Insurance Institution the approximation is that the effect[125] of increase in municipal non-institutional care was between FIM 7 and 31 million in 1997.[126] These estimates lack the medical expenditures of private doctor visits and travel expenditures as the data for these was not available.

The total gain of the non-institutional care in care for elderly services defined as municipalities plus Social Insurance Institution appears then to have been be-

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[123] The calculation of the municipality specific cost savings was made as follows. First it was calculated how many percentage points the institutional care of the 75-year-olds was changed in each municipality from 1996 to 1997. Then, using the estimated coefficients (11.7 and 8.5) from Table 25, and the number of population in each municipality i the final estimate of the cost change from 1996 to 1997 was calculated from the following formula:

$$\sum_i 11.6 \times percentage\ point\ change\ in\ institutional\ care\ from\ 1996\ to\ 1997_i \times population\ 1997_i$$

The institutional care was defined as the sum of the over 75-year-old people in old peoples' homes and health centre bed departments.

[124] The estimated saving applies to the expenditures of the social welfare of the elderly. When non-institutional care becomes more common in the care for elderly, the non-institutional health care costs of municipalities will also increase. The savings made in social welfare side will therefore be partly balanced out by increasing health care expenditures. But as the elderly people are not recorded separately in the health care expenditure statistics it has not been possible to analyse this effect exactly in this paper.

[125] The sum of medicine refund, housing allowance and pension payments.

[126] The estimate is fairly near the estimate made by Social Insurance Institution for the year 1996 which was FIM 55 million and which in addition to pension, housing allowance and medicine refund expenditures contained also other compensation for medical treatment.

tween FIM 30 and 76 million. These figures describe the total saving of the increased non-institutional care to public sector.[127] The possible reasons for this saving are numerous. First, the elderly persons receive less intensive municipal services in non-institutional care. Second, the services that are provided in non-institutional care are considerably cheaper for the municipalities to produce. Third, the increased supply of sheltered housing has improved the efficiency of municipal non-institutional care.[128]

Other estimation results in the study can be summarised as follows. The larger the tax base of the municipality grows, the higher are also the care for elderly expenditures. The higher salaries in wealthier municipalities can at least partly explain this result. It is found also that the wealthier the municipality, the higher are the medicine refund expenditures for the Social Insurance Institution.

The grants variable estimates were not statistically significant in municipality expenditure model. The estimated coefficients were positive and larger than those of taxable income, though.

The financial support of the Finnish Slot Machine Association to municipalities' care for elderly sector does not seem to affect municipal expenditures on the care for elderly. Instead, the results suggest that the support of the Finnish Slot Machine Association increase the medicine refunds of Social Insurance Institution.

The age structure or the population of the municipality did not perform very well in explaining the variation in net expenditures of the care for elderly of municipalities. The share of above 75-year-old persons did explain the expenditure categories of Social Insurance Institution, however.

[127] The estimated effects for municipal expenditures were net of user fees.

[128] These results do not take changes in quality of elderly care into account. It has been stated, that the quality and intensity of elderly care in general has diminished in the 1990s (Vaarama et al 1998; Vaarama et al 1999).

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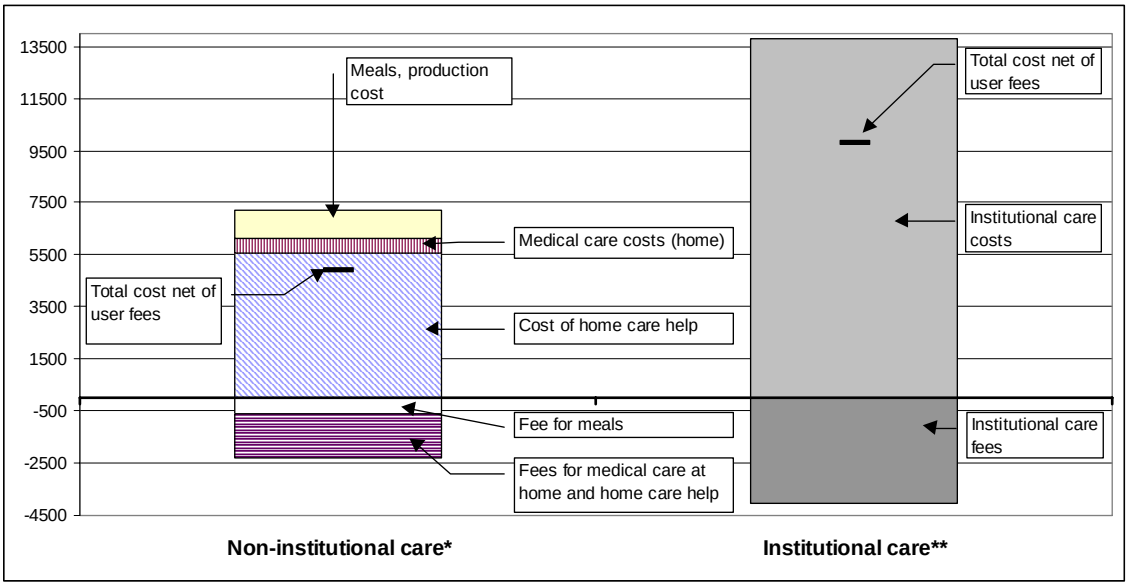
# Appendix

*Figure 17* *An example of net costs of non-institutional and institutional care for the municipality. In the example, the person has FIM 7000 pension incomes (example adapted from State Audit Office, 2000)*




* In this example, the municipality provides home care help 7 hours/week and the nurse visits once per week. Also, one warm meal is delivered to customer's home every day. Municipality charges income progressive fees from the customer so that the net cost (production costs – fees) of these services are FIM 4900/month. The fees used in the calculations were country averages.

** In institutional care the person pays 80 % of his/her net income (pension – taxes) as fee for the municipality. The municipality takes care of all the costs. The net cost of institutional care for the municipality is FIM 9800/month. The gross cost, FIM 13800, was the country average in 1998.

*Table 29 Durbin–Wu–Hausman endogeneity test results for Inst75y$_{it}$*

| Fixed effects | |
|---|---|
| (1994-1997) | F(1, 1299) = 0.04 |
| Cross-sections | |
| 1997 | F(1, 426) = 4.26* |
| 1996 | F(1, 426) = 4.27* |
| 1995 | F(1, 426) = 0.20 |
| 1994 | F(1, 426) = 0.22 |

* test accepts the endogeneity hypothesis at a 5 % significance

*Table 30 Models explaining the per capita expenditures (net of user fees) of municipal care for elderly, fixed effects IV regression*

| | Coefficient | t-value |
|---|---|---|
| Inst75y$_{it}$* | -128.55 | -0.17 |
| Grant$_{it}$ | 0.07 | 0.29 |
| T$_i$ | 0.02 | 0.39 |
| Sickness$_{it}$ | 0.45 | 0.09 |
| 75-y$_{it}$ % | 0.005 | 0.09 |
| N$_{it}$ | 10.20 | 0.06 |
| DVInst$_{it}$ | -756.29 | -0.42 |
| Constant | 1628.95 | 0.16 |

*Instrument for Inst75y$_{it}$ is NSA$_{it}$

# 4. Spend and tax or tax and spend? Panel data evidence from Finnish municipalities during 1985 - 1999

## 4.1 Introduction

Several interesting questions have been raised by political scientists and economists about the inter-temporal links between government taxing and spending decisions. An understanding of the possible causal relations of government revenues and expenditures is of obvious importance: if it is possible to intervene to control one of the variables (spending or taxation) directly, would that provide control over the other variable? Four main hypotheses have been advanced in the literature:

**"Tax and spend"**. The most well known advocate of this thought is Milton Friedman (1978), who argued that raising taxes will simply lead to more expenditures. According to Friedman, expenditures adjust up or down, to whatever level that can be supported by revenues. On the other hand Wagner (1976) and Buchanan and Wagner (1977) have argued that concentrating taxation on direct instead of indirect taxes would lead people to demand lower expenditures.

**"Spend and tax".** Barro (1979) said that increased taxes and borrowing result from increased government spending. Barro does not approve the idea of Buchanan and Wagner, that deficit spending itself would create the fiscal illusion that enables politicians to irresponsibly spend public funds. In addition, Peacock and Wiseman (1979) argued that increased expenditures result from crises, and that increased expenditure levels tend to persist even after the crisis is over.

**"Spending and taxation are decided simultaneously".** The ideas of fiscal synchronisation of revenues and expenditures have their theoretical background in Lindahl's model of benefit taxation and the median voter rule (Black 1948). For example Meltzer and Richard (1981) explained the size of government by using a model in which revenues and expenditures change concurrently. Nor do they accept the theory of fiscal illusion in their model.

**"Revenues and expenditures change independently of each other".** A fourth alternative is that the revenues and expenditures do not have any causal interdependence with each other. This could be the case if, for instance, the budget process was seriously affected by divergent interests and agendas. Hoover and Sheffrin (1992) point out that in the US, the period since 1970s has been marked with attempts to create causal interdependence between spending and taxing decisions.

These hypotheses have direct implications concerning the time series properties of expenditures and revenues. Under the first hypothesis past levels of own source revenues help predict current expenditure levels. Under the second hypothesis past expenditures help predict current own source revenues. The issue is then whether own source revenues Granger-cause expenditures or expenditures Granger-cause own source revenues. Granger causality test is a normal F-test to define if the lags of independent variable X and lags of dependent variable have explanatory power in explaining the dependent variable Y. If the lags of X do not explain Y, one can conclude that X does not Granger cause Y.

During the last two decades, there have been several attempts to determine the direction of causation between spending and taxation. Almost all of the existing empirical studies on the subject have considered the United States' case. Most of the studies have been done using aggregate federal or aggregate state-local expenditure and revenue data. The results are mixed so that it seems difficult to draw any clear conclusions about them.

The empirical evidence seems to support the "tax and spend" hypothesis in papers published by Manage and Marlow (1986), Ram (1988a), and Hoover and Sheffrin (1992). Manage and Marlow (1986) using annual federal data (1929-82) from the US found evidence for bi-directional causality but also for unidirectional causality from revenues to expenditures. Ram (1988a) using annual (1929-83) and quarterly (1947-83) US data for both federal and state-local government sectors found causality running from revenue to expenditure in federal data, but predominantly from expenditure to revenue in data for the state-local government. Hoover and Sheffrin (1992) using quarterly federal US data (1950-89) found that before the 1960s the taxes appear to cause spending, but after the late 1960s taxes and spending are causally independent.

The "spend and tax" hypothesis was supported by Anderson, Wallace and Warner (1986) and von Furstenberg, Green and Jeong (1986). Anderson, Wallace and Warner (1986) found using annual federal data over the time period 1946-83, that expenditures cause revenues. Von Furstenberg, Green and Jeong (1986) found using quarterly US data for 1954-82, that total expenditure lead taxes.

There are major problems, however, when trying to define the causal relations between expenditures and revenues with aggregate federal data as von Furstenberg, Green and Jeong (1986) and Holtz-Eakin, Newey and Rosen (1989) point out. Because central government is involved in stabilisation activities, it is possible that this could in certain cases bias the results severely towards accepting the spend-and-tax hypothesis. One then ought to try to adjust the data so that the business cycle effects of the data would be diminished. The remaining problem in that case is how to measure the timing and severity of the business cycles.

The second problem concerning aggregate time series data is that in some studies it has been assumed that the time-series data used are stationary.[129] According to the recent advances in time-series analysis this is questionable and could lead to spurious results. Therefore, yet another set of studies have examined whether revenues and expenditures are co-integrated. For instance Bohn (1991) using US budget data from 1790 to 1988 found evidence that "tax changes signal substantial spending changes", whereas the "spend and tax" hypothesis did not get support from his analysis. Hondroyiannis and Papapetrou (1996) using data for central government in Greece for 1957-93 found that expenditures lead revenues.

Although using aggregate state-local data avoids the problem of stabilisation activities, this type of data faces yet another problem, which Holtz-Eakin, Newey and Rosen (1989) mention, namely the adding up of local governments. Bearing in mind that each local unit may differ with respect to the functions they perform, their budgetary processes and the political environments in which they operate, the adding up is questionable.

In sum, the empirical evidence concerning the question of inter-temporal relations between government taxing and spending decisions seems problematic. This is because the consideration of stationarity of the time series has varied much in different papers, and because the stabilisation activity of central government has been taken into account in only few studies. In addition, the aggregation of local government data is not without problems.

The method developed by Holtz-Eakin, Newey and Rosen (1988) enables one to use Vector Autoregression (VAR) techniques on panel data from individual local governments to study the inter-temporal links between own source revenues[130] and expenditures. Hence, neither stabilisation issues nor aggregation problems impede interpretation of the results. In addition, the stationarity of the time series is not an issue in panel data context.

There are to my knowledge three studies, where unaggregated state-local data have been used to test the Granger-causality between taxation and spending decisions using the VAR-method developed by Holtz-Eakin, Newey and Rosen (1988). Using annual US data for 171 municipal governments over the period 1972-80, Holtz-Eakin, Newey and Rosen (1989) found unidirectional causality from own source revenues to expenditures. Dahlberg and Johansson (1998) using

[129] The writers in different papers have tried to take possible nonstationarity into account in various ways: for instance Ram (1988a) adds a time trend to the estimation equations to secure stationarity, whereas Anderson, Wallace and Warner (1986) first regress each variable against time and constant. The time series are differenced until time is insignificant. In other papers the possible problem of nonstationarity is handled by differencing the data once, or in some papers the stationarity issue is not mentioned at all.

[130] In this chapter the term "revenue" always means "own source revenue" when the local governments are discussed. In specific, revenues are separated from grants. Usually, the term "own source revenues" is used in the text, but when there is no chance for misunderstanding, just the term "revenue" is used to avoid duplication.

annual data for 265 Swedish municipalities over the time period 1974–87 found that expenditures cause own source revenues. Moisio and Kangasharju (1997) concluded that evidence from annual (1985-92) data for 460 Finnish municipalities supports a bi-directional causality between own source revenues and spending.

The results in these studies are easier to compare, because the method is exactly the same. Still, the results do vary a lot. The reason for this lies probably partly in the differences of the fiscal structure and partly in differences in historical factors, political correlations of the fiscal process, and characteristics of the budgetary process itself.[131] Especially important are differences in tax bases, for instance in USA the main tax source for local governments is property taxation, whereas in Finland it is income taxation. The effect of change in tax incomes may then differ considerably in these two cases, because property tax income is over time more stable source of income than income taxation. In addition, some countries may have more binding rules for local government deficits than others. Further, some countries may have matching grant system in place whereas in others the role of matching grants may be small or non-existent. In different time periods these things may differ even within a country. All this leads one to assume that the comparison between Finland and Sweden would be most appropriate. Still, my general conclusion is that in this context due to country specific factors, a full comparability between any two countries is difficult.

In this paper the analysis of Moisio and Kangasharju (1997) is deepened by using four equation VAR (expenditures, own source revenues, grants and loans) for 436 municipalities[132] to test the Granger-causality between the variables. In addition, two separate time periods, 1985-92 and 1993-99, are being compared. Using two time periods makes it possible to compare the causal links of own source revenues, expenditures, grants and loans of Finnish municipalities in two different fiscal settings. In the first data period, the municipalities' grants consisted mostly of earmarked categorical matching grants, whereas in the second data period the grants are mostly formula based specific grants with no earmarking. As was discussed in the introductory chapter of the thesis, the economic theory and empirical evidence suggest that the general grants' effect on local expenditures differs from the effect of specific matching grants. At least in Sweden, this result seems to extend from static to dynamic framework (Bergstöm et al. 1998).

But how does all this affect the causality analysis results? First, the grant reform may change the reaction time and even direction of causality between own reve-

[131] This has been noted also by Ram (1988b) in a study where 22 countries were compared.

[132] In Moisio and Kangasharju (1997) three equation VAR was used (expenditures, own source revenues, grants). This is problematic, however, as the Finnish municipalities are able to finance deficits by borrowing.

nues, expenditures and grants. This may happen because the general grants give municipalities more independence so that the municipalities may become more able to concentrate on the provision of services. But as the freedom increases also the risks for the municipalities increase because general type of grants do not guarantee certain state share of the expenditures. This may affect so that municipalities become more risk averse and careful in their decisions.

The main findings of my study are that during 1985-92 there was a unidirectional causal link from expenditures to own source revenues, but during the period 1993-99 there was a bi-directional causal relation between own source revenues and expenditures. For the first period the results are then more in line with Barro's view than that of Friedman's view. For the latter period the evidence supports the simultaneous decision process. As for the grants, it is found that in both periods grants cause expenditures and own source revenues and also revenues and expenditures cause grants. Loans seem to cause expenditures and revenues and revenues and expenditures cause loans during 1985-92. During 1993-99, loans cause expenditures but expenditures and revenues do not cause loans.

The chapter is organised as follows. In section 4.2 the econometric model and estimation procedure is described. Section 4.3 comments on the data used and section 4.4 contains the empirical estimates. Section 4.5 presents the summary and conclusion as well as discussion and ideas for future research.

## 4.2 Econometric model

In order to empirically investigate the effects described above, I estimate dynamic panel data regressions using the method developed by Holtz-Eakin, Newey and Rosen (1988). The method estimates vector autoregression equations using panel data, which is different from usual causality testing framework, where time series data is used. For N cross-sectional units observed over T periods, the method essentially involves regression of the form:

$$(18) \qquad y_{it} = \alpha_0 + \sum_{l=1}^{m} \alpha_l y_{it-l} + \sum_{l=1}^{m} \delta_l x_{it-l} + f_i + u_{it},$$

$$i = 1, \ldots, N \text{ and } t = m+1, \ldots, T,$$

where $\alpha$, $\delta$ are parameters, m is a lag length, $f_i$ is a possible individual effect and $u_t$ is an error term. The individual effect summarises the influence of unobserved variables, which have a persistent effect on the dependent variable.[133] The omission of this individual effect results in inconsistent estimates if it is correlated to

[133] For example, a municipality's expenditures each period might be affected by its geographical location or its "political make-up" (Holtz-Eakin, Newey and Rosen 1989).

other right hand side variables. A common way to delete the individual effect by using time means is not appropriate here, as this would result in inconsistent estimates (Holtz-Eakin, Newey and Rosen, 1988; Nickell, 1981). To eliminate the individual effect, Holtz-Eakin, Newey and Rosen (1988) suggest instead using an instrumental variable estimator to the first differenced equation[134]:

$$(19) \qquad y_{it} - y_{it-1} = \sum_{l=1}^{m} \alpha_l (y_{it-l} - y_{it-l-1}) + \sum_{l=1}^{m} \delta_l (x_{it-l} - x_{it-l-1}) + (u_{it} - u_{it-1}),$$

$$i = 1, \ldots, N \text{ and } t = (m+2), \ldots, T.$$

To ensure the identification of the parameters in equation (19) there must be sufficient number of instrumental variables. The number of instrumental variables needed can be defined using the orthogonality conditions:

$$(20) \qquad E[y_{is} u_{it}] = E[x_{is} u_{it}] = [\, f_i \; u_{it}] = 0 \qquad (s < t).$$

The orthogonality conditions in (20) can be used to identify the parameters of (19) since the disturbance term $v_{it}$ (= $u_{it} - u_{it-1}$) will be uncorrelated with $y_{it-s}$ and $x_{it-s}$ for $s \geq 2$. The equation for each time period t has 2m right hand side variables. To identify the parameters, there must be at least this many instrumental variables. The 2(t-2) variables [$y_{it-2}$, …, $y_{i1}$, $x_{it-2}$, …, $x_{i1}$] are available as instrumental variables to estimate the equation for the time period t. Thus, to have at least as many instrumental variables as right hand side variables, it must be so that $2(t-2) \geq 2m$, or $t \geq m+2$. This means that given our assumed lag structure, it is impossible to estimate the equations for time periods before t = m+2. According Holtz-Eakin, Newey and Rosen (1989), an efficient estimator can be formed in three steps:

1. Estimate parameters for each period t using 2SLS estimation. The number of instruments grows with t. This step gives us consistent estimates of all parameters in the model. The residuals from each estimation are saved.

2. Using residuals from step 1. and the matrix of instrumental variables, the consistent estimate of the covariance matrix is calculated.

3. Using the estimated covariance matrix and all the observations available, the GLS estimator is formed to estimate the entire parameter vector.

Holtz-Eakin, Newey and Rosen (1988) give explicit formulas. Most importantly, they show that in this model linear constraints concerning i) parameter stability over time, ii) lag length and iii) causality can be tested in a conventional way,

[134] The problem with using the first difference in this context is that ($u_{it} - u_{it-1}$) and ($y_{it-1} - y_{it-2}$) are correlated because $y_{it-1}$ depends on $u_{it-1}$. The solution to this problem is to use instrumental variable method, in which the number of the instruments used changes over time (Eakin, Newey and Rosen, 1988 and 1989).

i.e. by noting that the difference in the constrained and unconstrained sum of squared residuals has a $\chi^2$ distribution.

As for the question concerning parameter stability, in equation (19) it is assumed that parameters are stable not only across individuals, but over time as well. Similarly, each individual effect is assumed time invariant. A more general model would allow all of the parameters to depend on time period. Allowing time varying parameters makes identification more difficult, though. According to Holtz-Eakin, Newey and Rosen (1989), it is still possible to use the same estimation procedure. The procedure defining the assumption of parameter stability is: a) choose a relatively large value of m to be sure to avoid truncating the lag structure inappropriately, b) estimate the model with and without parameter stability; and finally, c) compare the sums of squared residuals.

Similarly, the question of the correct lag length m can be tested by starting with relatively large m and then shortening the lag and testing by using the change in squared residuals. The testing continues with successively smaller lag lengths until one is rejected by data, or m = 0.

The causality testing in the case of time stable parameters (equation 19) is simply a test of joint hypothesis $\delta_1 = \delta_2 = \ldots = \delta_m = 0$. In the model with time varying parameters the same procedure can be applied.

When testing the hypotheses of parameter stability over time, lag length and causality of the variables, a repeated test procedure is used, where the models are estimated in unrestricted and restricted form[135] and the residual sum of squares from both estimations (noted by Q and $Q_R$) are compared by using the formula from F-test:

(21) $$L = Q_R - Q.$$

Q and $Q_R$ are both $\chi^2$ distributed when N grows. L is also $\chi^2$ distributed and its degrees of freedom are equal to the degrees of freedom of $Q_R$ minus the degrees of freedom of Q. The degrees of freedom for Q are equal to the number of instrumental variables minus estimated parameters.

In this paper causality is examined in terms of 'Granger causality'. The Granger causality test is a common way to measure causality between variables. In this test a normal F-test is used to define causality if the lags of independent variable X and lags of dependent variable have explanatory power in explaining the dependent variable Y. If the lags of X do not explain present Y, one can conclude that X does not Granger cause Y. Before doing tests of causality, one must first determine the correct lag length.

[135] As Holtz-Eakin et al. (1988) point out, it is imperative to use the same covariance matrix when estimating the restricted and unrestricted models.

In the present paper the VAR-model in practice consists of four equations, where the left hand side variable is in turn total expenditures, total own source revenues, total grants received from state and the amount of loans. The estimation and nested testing procedures in practice are described in fourth section.

## 4.3 Data

The source of the data used is Statistics Finland. The data contains information on 436 municipalities during the period 1985-99[136]. The variables used in the estimations are total expenditures, total own source revenues, total grants and long term loans of the municipalities. Own revenues include all taxes and user fees. The grants variable consists of matching and lump sum grants and grants for investments. Lagged grants are included as right hand side variables for two reasons: firstly, theoretical considerations and earlier econometric work suggest that grants affect municipalities' expenditures differently than own source revenues. Secondly, grants variable has been included because I wanted to test the so called "flypaper effect". Flypaper effect means that an increase of one unit of exogenous general grant money stimulates municipal spending more than one money unit increase in municipal own source revenue. The reasons presented for the flypaper effect have comprised voters' asymmetric information and/or local bureaucrats' tendency to maximise budget.[137] Much of the previous evidence of the flypaper effect has come from cross section analyses of municipalities. Holtz-Eakin, Newey and Rosen (1989) argue that in dynamic framework the interpretation of the flypaper effect is that grants Granger-cause municipalities' expenditures.[138]

All variables are converted into real per capita figures using consumer price index so that the period 1985-92 amounts are converted to 1990 prices and period 1993-99 amounts are converted to 1995 prices. All variables are transformed to natural logarithms before estimations. Time dummies are added to control for possible trends and macroeconomic factors that are common to all municipalities.

The data has been divided into two periods for estimations. Namely, the time periods 1985-92 and 1993-99, are being compared. Using two time periods makes it possible to compare the causal links of own source revenues, expenditures, grants and loans of Finnish municipalities in two very different fiscal settings. In the first data period the municipalities' grants consisted almost totally of earmarked categorical matching grants, whereas in the second data period the grants

[136] All municipalities existing in 1999 excluding municipalities located in the autonomous area of Åland islands.

[137] See for example Filimon, Romer and Rosenthal 1982, Wyckoff 1991 and Hines and Thaler 1995.

[138] Holtz-Eakin, Newey and Rosen (1989) argue also that the separation of matching and lump sum grants in dynamic causality testing framework is not essential, because "the existence of matching rates puts no restrictions on the way in which current expenditures respond to past innovations".

due to major grant system reforms in 1993, 1996 and 1997 are now mostly formula based specific grants with no earmarking.[139]

There are also other considerable differences between the two periods. The first period consists of years mainly of economic boom that ended in 1990. From the year 1990 to 1993 Finland faced a severe economic crisis during which GDP fell cumulatively more than 10 percent. The recession drove the public sector into serious deficit. From 1990 to the mid 1990s the public debt, which consisted mainly of central government debt, increased from about 15 % of GDP to 60 % of GDP.

It is obvious that the recession also caused difficult times for the municipalities. As the unemployment rate rose from less than 4 percent in the end of 1980s to over 16 percent in 1994, the municipalities' tax incomes decreased and at the same time the welfare expenditures increased. Municipalities reacted to the decreasing tax base by raising tax rates, increasing fees for health and welfare services, borrowing, by holding back investments and restraining the health and welfare costs. Municipal salary expenditures were reduced by discharging the part time labour force and by laying off full time employees.

In 1994 the economy started recovering and the municipalities' tax incomes began to rise gradually. Municipalities were able to reduce their loans. However, the increasing revenues were balanced out by grant reductions during the years 1993-98. Between the years 1993-98, central government grants to municipalities were cut by over 33 % in real terms. The average level of local tax rate has not declined after the recession.

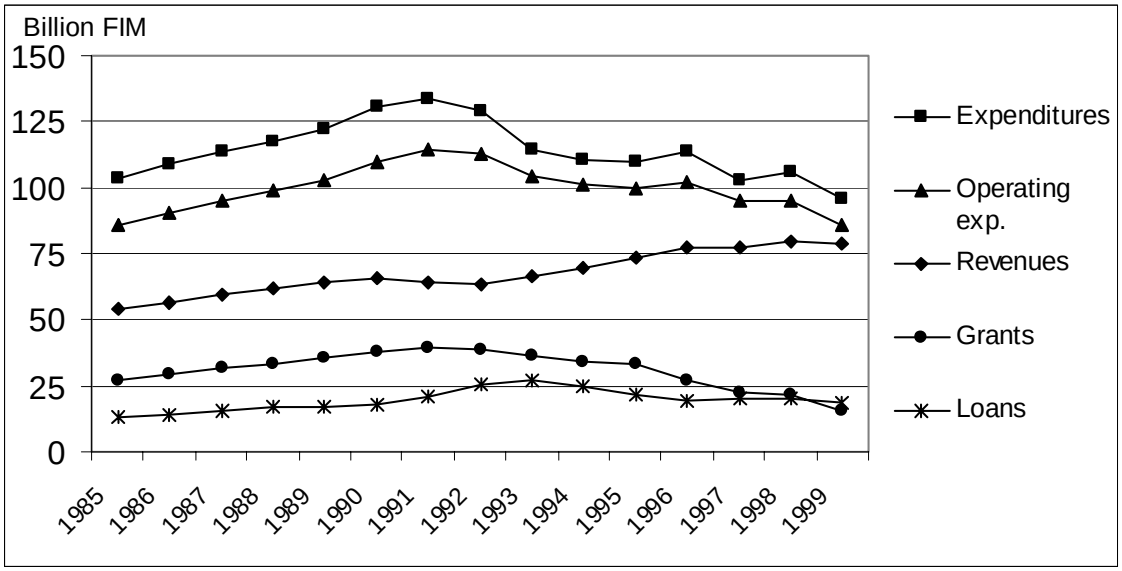
Differences between municipalities' rate of recovery after the recession have been large. The economic recovery first began in regions where large share of GDP comes from the export industry. After 1994, domestic migration from rural municipalities and smaller towns especially to Southern Finland increased. Those municipalities with negative net migration have been trying to cope with smaller tax base and less favourable age structure of population, at the same time when the municipalities with positive net migration struggle with increases of public service demand.

Figure 18 summarises the development of the variables used in this study. As mentioned, municipal expenditures increased steadily in real terms until the beginning of 1990s, thereafter expenditures have been mostly on a downward slope. It is worth noting that real municipal total expenditures were in 1999 lower, and operating expenditures at the same level than they were in 1985. Municipal revenues decreased temporarily during the recession period, and after the

[139] The grant reform has been described in Koski 1996, Oulasvirta 1996 and Loikkanen, Moisio, Oulasvirta, 2000. In Loikkanen et. al. there is also a description of the grant cuts during the years 1993-98.

mid 1990s revenues increased due to higher tax rates and improving employment as well as increased yield from company tax. Grants were cut during 1993-98 and in real terms they have somewhat diminished even after that. Municipalities used borrowing to cope with the beginning of the recession, but the level of loans has now returned to pre-recession level. In the present situation municipalities finance a much larger share of their expenditures from their own revenue sources than in the mid 1980s.

*Figure 18 Aggregated municipal Expenditures, Revenues, Grants and Loans (1990 prices)*




## 4.4 Results

The focus of the study is on dynamic interrelationships among four variables: expenditures, own source revenues, grants and loans. Each variable will have its own equation in the system. First, I estimate the model with expenditures on the left hand side and on the right hand side of the equation are its own lags and lags of other three variables and year dummies. The same is done to each variable. The results of the estimations are used to investigate parameter stability over time, lag length and finally the causation.

The estimations and tests are carried out in the following steps: first, the unrestricted model with no assumption of parameter stability over time is estimated and the overall model validity is tested. After that, the model is re-estimated using the assumption of time invariant parameters. This assumption is tested against the hypothesis of time variant parameters. In the third step using the model selected, the correct lag length is tested starting from the longest lag allowed by the data. Finally, the causation is tested by dropping each right hand variable at a time.

As the data has been divided into two separate periods, the respective results of the estimation are also reported in their own subsections, 4.4.1 and 4.4.2. First, the results of the estimations performed using data for years 1985 – 1992 are presented. I call this data period "the matching grant period" because approximately 99 percent of the grants to municipalities were specific matching grants during that time. The results for the latter data period, 1993 – 1999, are presented in the section called "the formula based grant period". In the end of the section, the results are discussed and a comparison of the results for the two periods is done.

### 4.4.1 The data period of the matching grant system (1985 - 1992)

The results[140] of the expenditures equation for the years 1985-92 are presented in Table 31. Looking at the results, the most general model has Q value 14.4 with 24 degrees of freedom.[141] The $\chi^2$ value is 33.2, so the most general model is accepted as the starting point[142]. I next restrict the model by assuming time invariant parameters: $Q_R$ value is now 60.6 with 60 degrees of freedom. The L value is then 46.2 with 36 degrees of freedom[143]. At the 0.10 level of significance the critical value is 47.2 and therefore the hypothesis of time invariant parameters is accepted.

Next, the results relating to lag length are investigated, conditional on assumption that parameters are time invariant. The first question is whether the data will allow the lag length to shorten from three to two. When m = 2 is imposed, the value of Q is 66.8. Comparing this to the value of Q in line ii) of Table 31, it can be found that L = 6.2 and has 4 degrees of freedom[144]. The critical value of the $\chi 2$ distribution at the 0.10 level is 7.8. Therefore the restriction that two lags in each variable is enough is accepted. The testing then continues to test if lag length m = 1 would be accepted. When the expenditure equation is estimated with one lag, the Q value is 71.4 and comparing to the m = 2 situation the L

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[140] All estimations are carried out using White's (1980) covariance matrix estimator to get consistent estimates of the standard error.

[141] The degrees of freedom are calculated by subtracting the total number of estimated parameters from the total number of instrumental variables (see Holtz-Eakin et al 1988 and Holtz-Eakin et al 1989 for more detailed description). For the year 1992 there are 6 years available for instrumental variables, which means $6 \times 4 = 24$ plus constant, altogether 25 instrumental variables. For the year 1991 the years 1985-1989 are usable, so we get $(5 \times 4)+1= 21$ instrumental variables and so on. The total number of instruments is then 24+21+17+13= 76. Because there are 13 parameters for each estimated year (4m + 1), the degrees of freedom for Q are 76 - 52 = 24.

[142] Holtz-Eakin et al (1989) stress that inferences about causality will be incorrect if the lag length or parameter constancy is wrongly chosen. To avoid these type II errors, they suggest that 0.10 level of significance be used in testing the parameter stability and lag length, and 0.05 level of significance when testing the causality.

[143] There are 36 degrees of freedom because the 12 parameters for each of 1989 through 1991 are constrained equal to their 1992 values.

[144] There are 4 degrees of freedom because 1 lag is reduced for each of the four variable compared to situation in line ii).

value is 4.6, which means that m = 1 is also accepted. Now there is still the possibility that the lag length could actually be m = 0. Testing this hypothesis (see line v) in Table 1) against the m = 1 model gives Q value of 117.9; the L value is then 46.5 which is larger than the $\chi 2$ critical value so the data rejects this hypothesis by a wide margin.

Conditional on m = 1 and time invariant parameters, the testing of causality can now begin. To test whether own revenues cause expenditures, the expenditure equation is simply estimated without own source revenues, and the increase in $\chi 2$ test statistic is evaluated. The Q value when revenues are excluded is 71.7; the L value is then 0.5 with one degree of freedom, which means that the hypothesis of non-causality is accepted. Hence, own source revenues do not cause expenditures.

Next, the causality from grants to expenditures is tested. The Q value is 79.3, L value is 7.9 and the hypothesis of non-causality is now rejected. Dropping the loans from the expenditure equation gives Q value 92.4 and L value of 21.0, so the hypothesis of non-causation is rejected by a wide margin.

To summarise the expenditure equation results, I found that during the period of matching grant system, the municipal expenditures can be described by a dynamic process which has only one year lags. The estimated parameters taken as a group are time invariant. Most importantly, one can reject the hypothesis that own source revenues caused expenditures. Grants cause expenditures so that changes in previous year grants cause the present expenditures to change. The stimulating effect of matching grants to expenditures already verified in previous studies (Oulasvirta 1996, Moisio 1998) is the most likely explanation for the causality. This also means that the flypaper effect is verified in the sense that past grant increases seem to cause future expenditure increases. Finally, I find also that past loans cause present expenditures.

*Table 31 The expenditures equation 1985 – 1992 (T = 8, N = 436)*

| | Q | L | $Df_Q$ | $Df_L$ | $\chi^2$ | Accept? |
|---|---|---|---|---|---|---|
| i) Time varying parameters, m = 3 | 14.4 | | 24 | | 33.2 | YES |
| ii) Time invariant parameters, m = 3 | 60.6 | 46.2 | 60 | 36 | 47.2 | YES |
| iii) m = 2, given ii) | 66.8 | 6.2 | 64 | 4 | 7.8 | YES |
| iv) m = 1, given ii) | 71.4 | 4.6 | 68 | 4 | 7.8 | YES |
| v) m = 0, given ii) | 117.9 | 46.5 | 72 | 4 | 7.8 | NO |
| vi) drop revenues, given iv) | 71.7 | 0.5 | 69 | 1 | 3.8 | YES |
| vii) drop grants, given iv) | 79.3 | 7.9 | 69 | 1 | 3.8 | NO |
| viii) drop loans, given iv) | 92.4 | 21.0 | 69 | 1 | 3.8 | NO |

Next, the results of the revenues equation are presented. As the test procedure was already described above in detail, I will therefore just briefly summarise the results which are reported in Table 32:

a) m = 3 seems to be at least sufficient to describe the dynamic process of the municipalities' own source revenues (line i)

b) given m = 3, the hypothesis of time invariant parameters is rejected (line ii),

c) one can reject the hypothesis that m = 2 (line iii),

d) expenditures, grants and loans cause own source revenues (lines iv-vi)

The most important result is that expenditures cause own source revenues. As I just found above that the own source revenues did not cause expenditures, I therefore find evidence that during 1985 – 1992 the data supports Barro's "spend and tax" hypothesis. This result is easy to accept, because municipalities' services were expanding rapidly during the data period used. Own source revenues may then just have followed the pace of increasing expenditures. The result that grants cause revenues, can be explained at least partly by the income effects of the matching grants: changes in amount of grants have changed the need for own source revenues. Finally, loans are found to cause own source revenues which can be explained so that the possibility to borrow has given the municipalities more room for manoeuvre in the own source revenue side.

All in all, the dynamic process as a whole seems to be very different in the expenditure and own source revenue equations, as there are clear differences in the parameter stability and lag length in the expenditures and revenues equations.

*Table 32 The revenues equation 1985 – 1992, (T = 8, N = 436)*

| | Q | L | DfQ | DfL | $\chi 2$ | Accept? |
|---|---|---|---|---|---|---|
| i) Time varying parameters, m = 3 | 22.7 | | 24 | | 33.2 | YES |
| ii) Time invariant parameters, m = 3 | 143.0 | 120.3 | 60 | 36 | 47.2 | NO |
| iii) m = 2, given i) | 94.0 | 71.3 | 40 | 16 | 23.5 | NO |
| iv) drop expenditures, given i) | 73.8 | 51.1 | 36 | 12 | 21.0 | NO |
| v) drop grants, given i) | 76.6 | 53.9 | 36 | 12 | 21.0 | NO |
| vi) drop loans, given i) | 101.6 | 78.9 | 36 | 12 | 21.0 | NO |

Table 33 contains the results for the grant equation. As was mentioned above, most of the grants during 1985-92 were matching grants. Therefore it is perhaps a little trivial to present the results for the grants. The results are presented for checking reasons, however. In short, the results are following:

a) m = 3 seems to be at least sufficient to describe the dynamic process of the municipalities' grants (line i),

b) given m = 3, the hypothesis of time invariant parameters is rejected (line ii),

c) one can reject the hypothesis that m = 2 (line iii),

d) expenditures, own source revenues and loans cause grants (lines iv-vi).

The result that expenditures cause grants is obvious in the matching grant system and needs no further discussion. The second result that own source revenues cause grants can be explained by the so called classification of the municipalities, which was an integral part of the grant system at that time. Until 1996 the municipalities were divided into 10 different groups to define the grants[145] for each municipality. Revenues were taken into account when defining each municipality's group in the system, and that may be the reason why the causality from revenues to grants is verified. Lastly, the result that loans cause grants may have the same explanation, because the financial situation on the whole was evaluated for the classification.

*Table 33 The grants equation 1985- 1992 (T = 8, N = 436)*

| | Q | L | DfQ | DfL | $\chi 2$ | Accept? |
|---|---|---|---|---|---|---|
| i) Time varying parameters, m = 3 | 23.9 | | 24 | | 33.2 | YES |
| ii) Time invariant parameters, m = 3 | 116.1 | 92.2 | 60 | 36 | 47.2 | NO |
| iii) m = 2, given i) | 65.2 | 41.3 | 40 | 16 | 23.5 | NO |
| iv) drop expenditures, given i) | 68.0 | 44.1 | 36 | 12 | 21.0 | NO |
| v) drop revenues, given i) | 70.0 | 46.1 | 36 | 12 | 21.0 | NO |
| vi) drop loans, given i) | 64.3 | 40.4 | 36 | 12 | 21.0 | NO |

Finally, in Table 34 the loan equation results are presented. The main results are:

a) m = 3 seems to be at least sufficient to describe the dynamic process of the municipalities' loans (line i),

b) given m = 3, the hypothesis of time invariant parameters is rejected (line ii),

c) one can reject the hypothesis that m = 2 (line iii),

d) expenditures, revenues and grants cause loans (lines iv-vi).

The results suggest that all the three variables cause loans. The expenditures may cause loans simply because expenditures are financed at least partly by borrowing. The own source revenues and grants may cause loans for the same reason.

[145] The matching rates of the grants, to be precise.

*Table 34 The loans equation 1985 – 1992 (T = 8, N = 436)*

| | Q | L | DfQ | DfL | $\chi 2$ | Accept? |
|---|---|---|---|---|---|---|
| i) Time varying parameters, m = 3 | 26.1 | | 24 | | 33.2 | YES |
| ii) Time invariant parameters, m = 3 | 192.2 | 166.1 | 60 | 36 | 47.2 | NO |
| iii) m = 2, given i) | 112.7 | 86.6 | 40 | 16 | 23.5 | NO |
| iv) drop grants, given i) | 123.7 | 97.6 | 36 | 12 | 21.0 | NO |
| v) drop revenues, given i) | 129.2 | 103.1 | 36 | 12 | 21.0 | NO |
| vi) drop expenditures, given i) | 121.2 | 95.1 | 36 | 12 | 21.0 | NO |

### 4.4.2 The formula based grants data period (1993 – 1999)

Next, the same procedure of tests for the parameter stability, lag length and Granger-causation are performed on expenditures, own source revenues, grants and loans in the latter period (1993-99). First, the results of the expenditures equation are presented in Table 35. The main findings are:

a) lag length of three is at least sufficient to characterise the data (line i),

b) given m = 3, the hypothesis of time invariant parameters is rejected (line ii),

c) one can reject the hypothesis that m = 2 (line iii),

d) revenues, grants and loans cause expenditures (lines iv-vi).

The test statistic rejects the expenditure equation with three lags. This could mean that a longer lag structure would be needed to describe the expenditures properly. However, as the data does not allow for a longer period, and because the test rejects the model only by a small margin, the testing procedure is continued.

The own source revenues cause expenditures during the formula based grant period. This probably reflects the increased importance of municipalities' own source revenues in the municipal finance during the latter part of the 90s. The grants cause expenditures, so the flypaper effect is at work. Also loans still cause expenditures.

*Table 35 The expenditures equation 1993 – 1999 (T = 7, N = 436)*

| | Q | L | DfQ | DfL | $\chi 2$ | Accept? |
|---|---|---|---|---|---|---|
| i) Time varying parameters, m = 3 | 19.7 | | 12 | | 18.5 | NO |
| ii) Time invariant parameters, m = 3 | 117.5 | 97.8 | 36 | 24 | 33.2 | NO |
| iii) m = 2, given i) | 98.2 | 78.5 | 24 | 12 | 18.5 | NO |
| iv) drop revenues, given i) | 116.4 | 96.7 | 21 | 9 | 16.9 | NO |
| v) drop grants, given i) | 82.9 | 63.2 | 21 | 9 | 16.9 | NO |
| vi) drop loans, given i) | 69.8 | 50.1 | 21 | 9 | 16.9 | NO |

Table 36 presents the results for the revenues equation. The main findings are:

a) lag length of three is at least sufficient to characterise the data (see line i),

b) given m = 3, the hypothesis of time invariant parameters is rejected (line ii),

c) one must accept the hypothesis that m = 2 (line iii),

d) one can reject the hypothesis that m = 1 (line iv),

e) expenditures and grants cause own source revenues (lines v-vi),

f) loans do not cause own source revenues (line vii).

Expenditures are found to cause own source revenues. This means that there is a bi-directional causality between revenues and expenditures, which suggests that taxing and spending decisions are made simultaneously in the municipalities. This finding differs from the one made during matching grants period. The result that grants cause own source revenues mean that changes of grants received by municipalities in 1990s have caused the municipalities to change own source incomes. The evidence suggests also that loans do not have any causal effect on own source revenues.

*Table 36 The revenues equation 1993 – 1999 (T = 7, N = 436)*

| | Q | L | DfQ | DfL | $\chi 2$ | Accept? |
|---|---|---|---|---|---|---|
| i) Time varying parameters, m = 3 | 7.2 | | 12 | | 18.5 | YES |
| ii) Time invariant parameters, m = 3 | 41.7 | 34.5 | 36 | 24 | 33.2 | NO |
| iii) m = 2, given i) | 23.7 | 16.5 | 24 | 12 | 18.5 | YES |
| iv) m = 1, given iii) | 107.2 | 83.5 | 36 | 12 | 18.5 | NO |
| v) drop expenditures, given iii) | 40.7 | 17 | 30 | 6 | 12.6 | NO |
| vi) drop grants, given iii) | 42.5 | 18.8 | 30 | 6 | 12.6 | NO |
| vii) drop loans, given iii) | 27.4 | 3.7 | 30 | 6 | 12.6 | YES |

Table 37 summarises the estimation results for the grants equation. The findings are the following:

a) lag length of three is at least sufficient to characterise the data (see line i),

b) given m = 3, the hypothesis of time invariant parameters is rejected (line ii),

c) one can reject the hypothesis that m = 2 (line iii),

d) expenditures and own source revenues cause grants (lines iv-v),

e) loans do not cause grants (line vi).

Expenditures and own source revenues cause grants in the present system probably because of the tax base equalising system[146] and because in the present grant formulas, the circumstantial factors that may cause higher spending are taken into account. These circumstantial factors are for instance low population density, remoteness, index for sickness of population and unemployment. Loans are not found to cause grants.

*Table 37 The grants equation 1993 – 1999, (T = 7, N = 436)*

| | Q | L | DfQ | DfL | $\chi 2$ | Accept? |
|---|---|---|---|---|---|---|
| i) Time varying parameters, m = 3 | 9.6 | | 12 | | 18.5 | YES |
| ii) Time invariant parameters, m = 3 | 65.2 | 55.6 | 36 | 24 | 33.2 | NO |
| iii) m = 2, given i) | 36.2 | 26.6 | 24 | 12 | 18.5 | NO |
| iv) drop expenditures, given i) | 40.1 | 30.5 | 21 | 9 | 16.9 | NO |
| v) drop revenues, given i) | 32.5 | 22.9 | 21 | 9 | 16.9 | NO |
| vi) drop loans, given i) | 17.1 | 7.5 | 21 | 9 | 16.9 | YES |

Finally, the results of the loans equation are presented in Table 38. The findings are:

a) lag length of three is at least sufficient to characterise the data (line i),

b) given m = 3, the hypothesis of time invariant parameters is rejected (line ii),

c) one must accept the hypothesis that m = 2 (line iii),

d) one can reject the hypothesis that m = 1 (line iv),

e) expenditures cause loans (line v),

f) own source revenues and grants do not cause loans (lines vi-vii).

The evidence suggests that during 1993-99 loans have been caused by expenditures alone. Bearing in mind that on average, municipalities have reduced their loans at the end of the 1990s, the bi-directional causality of loans and expenditures suggests that loan cuts have been at least partly financed by expenditure cuts.

[146] The tax base equalising system guarantees 90 % of the average tax base to all municipalities. In other words, when municipality's tax base is lower than 90 % of the average, then the municipality will receive a lump sum grant of the amount of the difference. The municipalities with over 90 % of the tax base finance the system. More detailed description of the present grant system can be found in Loikkanen, Moisio and Oulasvirta (2000).

*Table 38 The loans equation 1993 – 1999, (T = 7, N = 436)*

| | Q | L | DfQ | DfL | $\chi 2$ | Accept? |
|---|---|---|---|---|---|---|
| i) Time varying parameters, m = 3 | 7.0 | | 12 | | 18.5 | YES |
| ii) Time invariant parameters, m = 3 | 20.9 | 13.9 | 36 | 24 | 33.2 | YES |
| iii) m = 2, given ii) | 26.8 | 6.8 | 40 | 4 | 7.8 | YES |
| iv) m = 1, given iii) | 37.3 | 10.5 | 44 | 4 | 7.8 | NO |
| v) drop expenditures, given iii) | 33.5 | 6.7 | 42 | 2 | 6.0 | NO |
| vi) drop revenues, given iii) | 28.1 | 1.3 | 42 | 2 | 6.0 | YES |
| vii) drop grants, given iii) | 28.1 | 1.3 | 42 | 2 | 6.0 | YES |

### 4.4.3 Comparison of the two periods

In this section the results of the two previous subsections are discussed. The differences of the estimation results in the "matching grants period" and "formula based grant system" are compared by discussing each equation in turn.

The results of expenditure equations for the two time periods differ considerably. The main two differences are:

a) The data for 1985-92 suggests a unidirectional causality from past expenditures to present own source revenues, whilst the data for 1993-99 suggests that there is a bi-directional causality.

b) The expenditure model fitted for the former period suggests that one year lags are enough and the data for the years 1993-99 indicates that at least three year lags are needed to describe the dynamic process.

The first observation means in practice that during the matching grant system the expenditures were clearly altered first and own source revenues then followed, whilst during the formula based grants system the two variables cause each other. The second observation means that in the first data period the decisions on expenditure changes were made faster than in the latter period.

Much of the results can be explained by observing first, that during the matching grant period the municipalities often planned the increases in their services simply by calculating how much the state would pay for the eventual expenditures. In other words, the matching rate stimulated municipalities to increase their spending. With rapidly expanding service supply, it must have been difficult for any municipality to correctly forecast their future spending. Municipalities therefore probably made too optimistic budgets concerning both own source revenues and expenditures[147]. Municipalities were then bound to raise their taxes afterwards. Second, during the previous grant system, municipalities were divided

[147] One can then argue that the classical budget maximisation and asymmetric voter information were at work.

into 10 groups based on evaluations of their economic ability. The matching rates were higher for those municipalities that were evaluated to be the poorest. Some municipalities may then have tried to strategically raise their expenditures in order to be moved to a group with higher matching rate.

Third, during the latter period the grant system was altered so that the connection between grants and municipal expenditures was abolished. After the grant reform in 1993 the municipalities began to receive grants based on special formula that took municipalities' needs and circumstances into account. At the same time municipalities' freedom to allocate their funding also increased. Fourth possible reason for the difference is that the grants were reduced considerably cut during the period 1993-98.

As a result of all that, the importance of municipalities' own source revenues in financing the expenditures has increased considerably. This is the most likely reason for the result that municipalities in the latter data were found to define their expenditures and revenues simultaneously.

The differences in dynamic processes suggest that nowadays the municipalities' expenditures are affected by changes in own source revenues and grants from much longer period than before.

Finally, the similarities in the two expenditure equations are that both grants and loans cause expenditures. In other words, the flypaper effect in the sense that past grants predict the future expenditures is verified in both grant systems. The evidence that loans cause expenditures may be true for separate reasons. For instance, during the first data period both expenditures and loans were growing, whereas during the latter period both were diminishing.

As for the revenues equations, the differences are smaller because during both periods expenditures and grants caused own source revenues. This suggests that expenditures and grants simply are the most important determinants of municipal own source revenues irrespective of the grant system or even the fiscal setting in general. The difference between the periods is that during the latter period loans do not cause own source revenues whereas the former data suggests that they do. Also the dynamic process is one year shorter during the latter period.

Grants are caused by expenditures, own source revenues and loans in the first period but not by loans during the latter period. This may be explained by differences in the tax base equalisation schemes and other grant system differences in the two periods.

Loans are caused by all three right hand side variables in the first period but only by expenditures in the latter period. In the former period loans were used both to build the increasing municipal service structure and to cope with the first years of

the recession. In the latter period the municipalities' strategy seems to have been to decrease the loans as much as possible from the peak of the beginning of 1990s. After the mid 1990s the repayment of loans together with decreased interest rates have reduced the municipal total expenditures.

The evidence that during the period 1993-99 loans have been caused only by expenditures raises some questions about how the cuts on municipalities' loans have been achieved in 1990s. It is somewhat surprising that own source revenues do not cause loans, because the general belief has been that increased own source revenues have made it possible for the municipalities to reduce their loans.

## 4.5 Summary and conclusions

In this paper I have investigated the dynamic inter-relationship between municipal expenditures, own source revenues, grants and loans in Finland. The main reason for starting this research was because the data that was available offered a unique possibility to compare the dynamic interrelationships in two very different grant systems. Therefore two separate time periods, 1985-92 (matching grant system) and 1993-99 (formula based grant system) were selected for this study.

The main findings of the investigation are that during the matching grant system expenditures cause own source revenues, whereas own source revenues do not cause expenditures. During the formula based grant system a bi-directional causality between expenditures and grants is discovered. Therefore, Barro's hypothesis of "spend and tax" is supported in the matching grants system, whereas in formula based system the evidence supports the fact that revenues and expenditures are decided concurrently.

Grants cause expenditures during both data periods, so the hypothesis of flypaper effect is supported during both estimation periods. Loans cause expenditures and own source revenues in the matching grant system, but in the formula based system loans cause only expenditures.

The policy implication from this study is that during the matching grant system (1985-92) the best way for central government to influence municipalities' expenditures would have been to alter the grants (by changing the matching rates) given to municipalities. The adjustment of expenditures would have been quick - only one year. The best way for the central state to affect municipalities' own source revenues, if direct measures were unavailable, would have been to try to alter the municipalities' expenditures and/or grants. The adjustment period needed for the change would have been clearly longer than in the expenditures case.

As for the latter period (1993-99), the policy implications are the same in that the central state should alter the formula based grants in order to affect municipalities' expenditures. The other possibility would be to change municipalities' own source revenues. According to the results, restricting municipalities' right to borrow would also affect the expenditures. More importantly, this would presumably happen without any effect to own source revenues. The adjustment time is clearly longer than in the 1980s as grants, own source revenues and loans cause expenditures with at least three year lags.

In addition to the above, the results indicate that there are clear differences in the dynamic processes between periods and separate equations. The results show also, that the stability of the estimated parameters in the latter period especially is not self-evident and needs to be tested.

An interesting future topic of research would be to investigate the dynamic interrelationships between these four fiscal variables using separate groups of municipalities. Especially interesting would be to find out if there are differences between poor and rich municipalities in the causality. The work concerning these issues has already begun.

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# 5. On local government spending and taxation behaviour - effect of population size and economic condition

## 5.1 Introduction

A great deal of research in economics has focused on inter-temporal household consumption and business investment decisions. In these models it is assumed that the agent's current decisions depend on expectations about the future economic environment.[148]

However, as Holtz-Eakin, Rosen and Tilly (1994) point out, much of the analysis of local government spending has typically ignored such issues. Analysis of local government has generally assumed that all spending during a given period depends only on resources available in that period.

The lack of research on local government inter-temporal fiscal behaviour is surprising because the share of responsibility of local governments in the public sector as a whole is very large in many countries.[149] In Finland, for instance, the local government (municipalities) takes care of most of the social, health and educational services. In the social and health sector some typical examples of these services are health centres and district hospitals, care for the elderly, the handicapped and the mentally ill, and social work in general. In the educational sector, the local government is responsible for funding elementary and secondary schools, high schools and vocational high schools, among others.

Furthermore, the municipalities in Finland have considerable legislative and economic independence and they cover less than 25 % of their total net operating expenditures with state grants. Finnish municipalities are not tied by balanced-budget laws as, for instance, are their counterparts in US, so it is possible for municipalities to finance operating expenditures by borrowing.[150] Moreover, it is well known that Finnish municipalities raise reserve funds not only for future investments but also for "rainy days". Consequently it is not far-fetched to suggest that Finnish municipalities smooth their consumption over time.

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[148] Hall (1978) and Mankiw (1987) are examples of important authors on the consumption function. Summers (1981), Abel & Blanchard (1986) have discussed intertemporal models of business investment.

[149] See for, example, Holtz-Eakin, Rosen and Tilly (1994) describing the US situation, and Dahlberg and Lindström (1998) for the Swedish system.

[150] In fact, Holtz-Eakin et al. (1994) point out that even in the US, where there are tight rules for balanced budgets, the state or local government can experience deficits because budgets are based on estimated revenues and expenditures.

If municipalities do smooth their consumption, then it is difficult for the central government to influence the municipalities by using temporary policy measures. Such measures have in Finland been temporary cuts in grants, temporary changes in taxation rules and changes in business tax revenue sharing between the central state and municipalities. It is clear that if one wants to understand the local budgetary process, and to rationally influence local fiscal choices, one must be able to predict the effects of policy on the behaviour of local governments.

A number of studies have shown that there are important dynamic interrelationships between government expenditures, revenues and grants. However, most of these studies have concentrated on aggregated central government expenditures and revenues,[151] while only a handful have tested the causality between expenditures and revenues in disaggregated local government data. Using the vector autoregression (VAR) estimation and testing procedure for panel data developed by Holtz-Eakin et al. (1988), the Granger causality between revenues, expenditures and grants has been examined by several authors (Holtz-Eakin et al. (1989), Dahlberg & Johansson (1998), Moisio & Kangasharju (1997) and Moisio (2000)). Four hypotheses have been proposed regarding the inter-temporal links between government revenues and expenditures:

**"Tax and spend"**. The most well known advocate of this thought is Milton Friedman (1978), who argued that raising taxes will simply lead to more expenditures. According to Friedman, expenditures adjust up or down to whatever level can be supported by revenues. If this hypothesis is true, there is little chance of success in attempting to reduce debt by raising more taxes, as most of the new income would go towards increased consumption. On the other hand, this type of behaviour can be regarded as a careful budget policy, as the funds are accumulated before spending occurs.

**"Spend and tax".** According to Barro (1979), increased taxes and borrowing result from increased government spending. One example of this type of behaviour that has been proposed by Peacock and Wiseman (1979) is when expenditures first increase because of a crisis, but then tend to persist even after the crisis is over. Without crisis, this type of behaviour can be taken as a rather careless budgetary policy, because expenditures are raised before the funding is determined. If, however, a municipality foresees an increase in future own source revenues, this may explain the behaviour.

**"Spending and taxation are decided simultaneously".** The idea of fiscal synchronisation of revenues and expenditures has its theoretical background in Lindahl's model of benefit taxation and the median voter rule (Black 1948). A

[151] See, for instance, Moisio (2000) or Dahlberg and Johansson (1998) for a summary of the relevant literature.

budgetary behaviour following this hypothesis can be considered efficient, because both revenues and expenditures have a causal effect on the other variable.

**"Revenues and expenditures change independently of each other".** A fourth alternative is that revenues and expenditures do not have any causal interdependence. This could be the case if, for instance, the budget process was seriously affected by divergent interests and agendas. Hoover and Sheffrin (1992) point out that in the US, the period since the 1970s has been marked by attempts to create causal interdependence between spending and taxing decisions. This is clearly the most unwanted alternative, as controlling the expenditures seem to be difficult.

Using annual US data for 171 municipal governments over the period 1972-80, Holtz-Eakin, Newey and Rosen (1989) found unidirectional causality from own source revenues to expenditures. Dahlberg and Johansson (1998), using annual data for 265 Swedish municipalities over the time period 1974–87 found that expenditures cause own source revenues. In a subsequent study, Dahlberg & Johansson (2000) used a different method, namely the GMM bootstrapping method, for the annual data from 1979-1987, finding that expenditures are caused by own source revenues.[152] Moisio and Kangasharju (1997) concluded that evidence from annual (1985-92) data for 460 Finnish municipalities supports a bi-directional causality between own source revenues and spending.

Moisio (2000) extended the work of Moisio & Kangasharju (1997) so that two separate panel data sets, one covering the years 1985-1992 and second for the years 1993-1999, were compared.[153] In addition, the loan equation was included in the system to solve the omitted variable problem. After the change, the VAR model consisted of expenditures, own source revenues, grants and loans equations. The results of Moisio (2000) suggested that during the matching grants period (1985 - 1992), there was a uni-directional Granger causation from own source revenues to expenditures, whereas during the formula based grants system (1993 - ) there was a simultaneous relation between own source revenues and expenditures.

The purpose of this study is to continue the analysis of Moisio (2000) by performing causality analysis for subgroups of municipalities. The following subgroups are considered: i) four groups defined by population size, ii) four groups

[152] They also note that "the dynamic structures found when bootstrap critical values were used are not as extensive as the ones found in studies relying on asymptotic critical values" (asymptotic critical values are used in this paper, as well as in the papers by Holtz-Eakin et al. (1989) and Dahlberg & Johansson (1998)).

[153] The data for 1985-1992 represents the matching grants period while that for 1993-1999 describes the formula-based grant period. The data includes all municipalities except those in the autonomous Åland islands.

defined by economic condition[154], and iii) four groups defined by population and economic condition together.

Size is often cited as a key factor when discussing the efficiency of municipalities. Often, the debate on the optimal size of municipalities tries to find a balance between economies of scale and various tastes of taxpayer-voters. Large municipalities are said to be more efficient with services where the scale matters. On the other hand, the fact that decision-makers in small municipalities are closer to the people is said to improve their efficiency. Small municipalities have also been claimed to be more flexible in adjusting their service structure. For instance, in a study concerning municipal labour demand in the US, Holtz-Eakin and Rosen (1991) found that the municipal sector in general was rationally forward looking, but when the analysis was carried out separately for small and large municipalities, the rationality applied only to the small municipalities. According to the authors, the public sector labour unions may prevent the large municipalities from reacting optimally to changes in economic conditions. Borge and Rattsø (1993) studied the effects of population size on the speed of adjustment of the services structure in Norwegian municipalities. They found that large municipalities experienced stronger inertia than the smaller ones. In a further study, Borge, Rattsø and Sørensen (1995) tested the effect of political pressure groups and mass media on this sluggishness. Their findings were that the speed of adjustment was seriously affected by political pressure groups in separate municipalities. More specifically, they found that strong interest groups associated with declining sectors were able to block the adjustment process. Finally, in a study on the determinants of municipal labour demand in Sweden, Bergström, Dahlberg and Johansson (1998) found that the adjustment process of municipal labour demand was slower in large municipalities.

Much of the reasoning behind using size to classify the municipalities also applies to the economic condition. A weak economic condition can seriously constrain a municipality's freedom of action. Similarly, a sound economic base can considerably ease a municipality's ability to operate and develop its service structure. Poor and rich municipalities also presumably have different abilities to bear financial risks. Poor municipalities may be expected to be risk averse, whereas the wealthier municipalities can be relatively risk neutral.[155] A municipality may face many potential financial risks, especially in countries like Finland where a large share of municipalities' incomes consists of income taxation and company tax.

What results are expected for Finland? Differences in risk bearing abilities may cause spending and taxing decisions to be made differently in small and large or

[154] This is defined more closely below.

[155] In the size context, the risk bearing abilities of small municipalities compared with large ones can probably be described as small when being risk averse and large when being risk neutral.

poor and rich municipalities. For instance, it is possible that large and/or wealthy municipalities can be more confident in financing their investments, because they are better situated in the loan markets. Therefore, these municipalities may be more inclined towards “spend and tax” decision-making. Correspondingly, the small and/or poor municipalities may behave in a “tax and spend” manner. In the periods of economic recession and boom these differences may be emphasised.

There are number of reasons why the results obtained with Finish data may differ from those found, for example, in the US. Firstly, Finnish municipalities finance most of their expenditures by income taxation and business tax. In the US the main tax source for local governments is property taxation. The effect of a change in tax bases to municipal budget behaviour may then differ considerably between these two cases, because property tax income is a more stable source of income than income taxation. The fact that most of the functions of Finnish municipalities are predetermined by laws and central state regulations may also affect the results. The less the municipalities have possibilities to affect their own budgets, the less important is their own decision-making behaviour. Over the time period 1985-1999 the state control over the municipalities has varied. For instance, during the matching grant period the municipalities used to be rather tightly controlled by state norms and regulations. However, when the new formula-based grant system was adopted in 1993, most of the regulations and norms were abandoned. From then on, the municipalities can be said to have been much more able to affect the expenditures and the quality of the services. Therefore, the finding of Moisio (2000) that during the matching grants period there was a “spend and tax” causality and during formula-based grants system “simultaneous” causality, is also understandable. Nevertheless, the municipalities have always had a possibility to determine their budgets within the limits of their own source revenues, grants received and the possibilities to borrow. The main purpose of this paper is to reveal the links between these variables under two separate grants systems for subgroups of municipalities.

The main findings of this paper suggest that there are important differences between the subgroups of municipalities in the causality between own source revenues and spending. Especially the small and large municipalities are found to behave differently, so that small municipalities seem to be more careful in their budgetary behaviour. Therefore, it can be said that the reaction to specific central state measures may also differ considerably between different groups of municipalities. The two separate periods analysed differ from each other with an apparent shift towards a higher level of caution among the municipalities, especially the largest ones. The explanation for greater carefulness may be partly in the increased importance of own source revenues in municipal finance. Also cuts on grants may have made the municipalities more alert.

The chapter is organised as follows. In section 5.2 the econometric method is described, in section 5.3 the data used in the estimations is described and in sec-

tion 5.4 the results of the empirical investigations are presented. Section 5.5 gives the conclusions and a summary of the results.

## 5.2 Econometrics

The estimation method for dynamic panel data used in this paper was developed by Holtz-Eakin, Newey and Rosen (1988).[156] The method estimates vector autoregression equations using panel data, which is different from the usual causality testing framework, where time series data is used. For N cross-sectional units observed over T periods, the method essentially involves regression of the form:

$$(22) \qquad y_{it} = \alpha_0 + \sum_{l=1}^{m} \alpha_l y_{it-l} + \sum_{l=1}^{m} \delta_l x_{it-l} + f_i + u_{it},$$

$$i = 1, \ldots, N \text{ and } t = m+1, \ldots, T,$$

where $\alpha$ and $\delta$ are parameters, m is a lag length, $f_i$ is a possible individual effect and $u_t$ is an error term. The individual effect summarises the influence of unobserved variables, which have a persistent effect on the dependent variable.[157] The omission of this individual effect results in inconsistent estimates if it is correlated with other right hand side variables. The common way to delete the individual effect by using time means is not appropriate here, as this would result in inconsistent estimates (Holtz-Eakin, Newey and Rosen, 1988; Nickell, 1981). To eliminate the individual effect, Holtz-Eakin, Newey and Rosen (1988) instead suggest using an instrumental variable estimator for the first differenced equation[158]:

$$(23) \qquad y_{it} - y_{it-1} = \sum_{l=1}^{m} \alpha_l (y_{it-l} - y_{it-l-1}) + \sum_{l=1}^{m} \delta_l (x_{it-l} - x_{it-l-1}) + (u_{it} - u_{it-1}),$$

$$i = 1, \ldots, N \text{ and } t = (m+2), \ldots, T.$$

To ensure the identification of the parameters in equation (23) there must be a sufficient number of instrumental variables, which can be defined by using the orthogonality conditions:

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[156] This method is similar to the GMM estimator proposed by Arellano & Bond (1991). The only difference between the estimators is the weighting matrix used in the first step (Dahlberg & Johansson, 2000).

[157] For example, a municipality's expenditures in each period might be affected by its geographical location or its "political make-up" (Holtz-Eakin, Newey and Rosen 1989).

[158] The problem with using the first difference in this context is that $(u_{it} - u_{it-1})$ and $(y_{it-1} - y_{it-2})$ are correlated, because $y_{it-1}$ depends on $u_{it-1}$. The solution to this problem is to use the instrumental variable method, in which the number of instruments used changes over time (Eakin, Newey and Rosen, 1988 and 1989).

(24) $E[y_{is}u_{it}] = E[x_{is}u_{it}] = [\ f_i\ u_{it}] = 0 \qquad (s < t).$

The orthogonality conditions in (24) can be used to identify the parameters of (23) since the disturbance term $v_{it}$ ($= u_{it} - u_{it-1}$) will be uncorrelated with $y_{it-s}$ and $x_{it-s}$ for $s \geq 2$. The equation for each time period t has 2m right hand side variables. To identify the parameters, there must be at least this many instrumental variables. The 2(t-2) variables $[y_{it-2}, \ldots, y_{i1}, x_{it-2}, \ldots, x_{i1}]$ are available as instrumental variables to estimate the equation for the time period t. Thus, to have at least as many instrumental variables as right hand side variables, $2(t-2) \geq 2m$, or $t \geq m+2$. This means that given our assumed lag structure, it is impossible to estimate the equations for time periods before $t = m+2$. According Holtz-Eakin, Newey and Rosen (1989), an efficient estimator can be formed in three steps:

a) Estimate parameters for each period t using 2SLS estimation. The number of instruments grows with t. This step gives consistent estimates of all parameters in the model. The residuals from each estimation are saved.

b) Using residuals from step 1 and the matrix of instrumental variables, the consistent estimate of the covariance matrix is calculated.

c) Using the estimated covariance matrix and all the observations available, the GLS estimator is formed to estimate the entire parameter vector.

Holtz-Eakin, Newey and Rosen (1988) give explicit formulas. Most importantly, they show that in this model linear constraints concerning i) parameter stability over time, ii) lag length and iii) causality can be tested in a conventional way, i.e. by noting that the difference in the constrained and unconstrained sum of squared residuals has a $\chi^2$ distribution.

As for the question of parameter stability, in equation (23) it is assumed that parameters are stable not only across individuals, but over time as well. Similarly, each individual effect is assumed time invariant. A more general model would allow all of the parameters to depend on time period. Allowing time varying parameters makes identification more difficult, though. According to Holtz-Eakin, Newey and Rosen (1989), it is still possible to use the same estimation procedure. The procedure defining the assumption of parameter stability is: a) choose a relatively large value of m to be sure to avoid truncating the lag structure inappropriately, b) estimate the model with and without parameter stability; and finally, c) compare the sums of squared residuals.

Similarly, the question of the correct lag length m can be tested by starting with a relatively large m and then shortening the lag and testing by using the change in squared residuals. The testing continues with successively smaller lag lengths until one is rejected by data, or $m = 0$.

The causality testing in the case of time stable parameters (equation 23) is simply a test of joint hypothesis $\delta_1 = \delta_2 = \ldots = \delta_m = 0$. In the model with time varying parameters the same procedure can be applied.

When testing the hypotheses of parameter stability over time, lag length and causality of the variables, a repeated test procedure is used, where the models are estimated in unrestricted and restricted form[159] and the residual sum of squares from both estimations (noted by Q and $Q_R$) are compared by using the formula from the F-test:

(25) $$L = Q_R - Q.$$

Q and $Q_R$ are both $\chi^2$ distributed when N grows. L is also $\chi^2$ distributed and its degrees of freedom are equal to the degrees of freedom of $Q_R$ minus the degrees of freedom of Q. The degrees of freedom for Q are equal to the number of instrumental variables minus estimated parameters.

In this paper, causality is examined in terms of 'Granger causality'. The Granger causality test is a common way to measure causality between variables. In this test a normal F-test is used to define causality if the lags of independent variable X and lags of dependent variable have explanatory power in explaining the dependent variable Y. If the lags of X do not explain present Y, one can conclude that X does not Granger cause Y. Before performing tests of causality, one must first determine the correct lag length. It needs to noted that the testing procedure tests the existence of causality between X and Y variables, not the sign of causality. The results obtained do not enable one to carry out comparisons of the strength of causality, either.

In the present paper the VAR model consists of four equations, where the left hand side variable is in turn total expenditures, total own source revenues, total grants received from the State and the amount of loans. The estimation and nested testing procedures in practice are described in the fourth section.

The focus of this paper is on subgroups of municipalities. The previous analysis in Moisio (2000) combined information from all 436 municipalities and controlled for municipality-specific effects using fixed effect modelling. With subgroups, however, one has the opportunity to control for the type of fixed effect that might explain potential differences.[160] The remaining municipality specific effects are still controlled for in the usual way.

[159] As Holtz-Eakin et al. (1988) point out, it is imperative to use the same covariance matrix when estimating the restricted and unrestricted models.

[160] See also Dahlberg & Lindström (1998).

## 5.3 Data

The data was obtained from Statistics Finland and covers 436 municipalities over the period 1985-99.[161] The following variables are considered: total expenditures (including both operating expenditures and investments), total own source revenues (proportional income taxes, property taxes, business taxes and user fees[162]), total grants (including matching and lump sum grants and grants for investments) and long-term loans of the municipalities. Although this study is mainly focused on the causal links between spending and revenue decisions, the causal links from and to grants and loans are also considered. There are number of reasons for including grants in the analysis. Theoretical considerations and earlier econometric work suggest that grants affect municipalities' expenditures differently to own source revenues. In addition, inclusion of the grants variable gives one the opportunity to test the so-called "flypaper effect". This effect means that an increase of one unit of exogenous general grant money stimulates municipal spending more than an increase of one money unit in municipal own source revenue.[163] Holtz-Eakin, Newey and Rosen (1989) argue that in a dynamic framework the interpretation of the flypaper effect is that grants Granger-cause municipalities' expenditures.[164]

Loans have been included in the analysis because Finnish municipalities are not tied to balanced-budget laws, so it is possible for municipalities to finance operating expenditures by borrowing.[165] Although not considered a good practice, over the years there have been several examples of municipalities that have temporarily financed their operating expenditures by borrowing. Therefore, if loans were not included in the estimated VAR-system, the model would suffer from an omitted variable problem.

The data is divided into two time periods for the analysis: the years 1985-92 and 1993-99. Using two time periods makes it possible to compare the causal links of own source revenues, expenditures, grants and loans of Finnish municipalities in two very different fiscal settings. In the first period the municipalities' grants consisted almost entirely of earmarked categorical matching grants, whereas

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[161] All municipalities existing in 1999, excluding those located in the autonomous Åland islands.

[162] The own source revenues used here are the final revenues. It is to be noted that when the municipalities determine their budgets, they only have estimates of future expenditures and tax revenues available. Nor can they be totally sure about their fee incomes. The estimated and actual tax revenues may therefore differ considerably.

[163] See, for example, Filimon, Romer and Rosenthal (1982), Wyckoff (1991) and Hines and Thaler (1995).

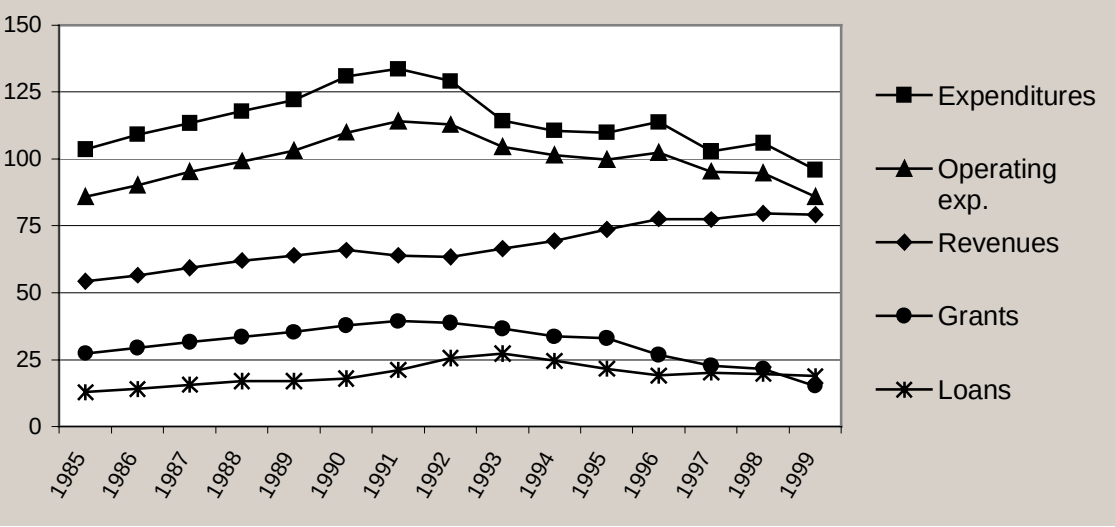
[164] Holtz-Eakin, Newey and Rosen (1989) argue also that the separation of matching and lump sum grants is not essential in the dynamic causality testing framework, because "the existence of matching rates puts no restrictions on the way in which current expenditures respond to past innovations".

[165] Since the beginning of 1997 municipalities have been compelled by Local Government Act to balance their budgets within three year planning period. This means that no municipality can have a budget deficit more than three years in a row.

during the second period, due to major grant system reform in 1993, the grants are mostly formula-based specific grants with no earmarking.

A severe economic recession hit the Finnish economy in 1991 and recovery from this started after 1993. The recession drove the total public sector into serious deficit.[166] Figure 19 summarises the development of the variables used in this study on an aggregate level. Municipal expenditures increased steadily in real terms until the beginning of the 1990s; thereafter, expenditures have been mostly on a downward slope. Real municipal total expenditures in 1999 were at a lower level than in 1985. Municipal own source revenues decreased temporarily during the recession but have increased since the mid 1990s. This has been due partly to higher tax rates and improving employment and partly to increased yield from company tax. Grants were cut during 1993-98 and in real terms they have somewhat diminished even after that. Municipalities used borrowing to cope at the beginning of the recession, but the level of loans has now returned to the pre-recession level. At present, municipalities finance a substantially larger share of their expenditures from their own revenue sources than in the mid 1980s.

*Figure 19* *Aggregated Municipal Expenditures, Revenues, Grants and Loans (in FIM billions, 1990 prices)*




The effect of municipal size on causality is tested by ranking the municipalities according to population and then dividing them into four equal-sized groups. The first group contains the smallest 109 municipalities, group two the next largest 109 municipalities, and so on up to the fourth group that consists of the 109 largest municipalities.

[166] Year dummies are added in estimations to control for macroeconomic changes that are common to all municipalities.

In addition, economic condition is used to separate the municipalities. The economic situation may severely restrict the freedom of action of a municipality. Again, four groups are formed according to economic condition as follows: i) excellent, ii) good, iii) satisfactory and iv) poor. The grouping is based on four variables, each describing different economic aspect of the municipalities: tax rate, tax base, solidity and operating surplus.[167] A municipality can be considered to be in an excellent economic condition if it has a large tax base and a low tax rate together with high solidity and an operating surplus. The actual ranking of the municipalities is performed so that in the first step, for each of the four variables, the municipalities with best situation are given 6 points and the worst 1 point. Table 1 shows the details of scoring in the case of tax base.[168] The four separate scores points are then summed. As there are separate sums for each year, a time mean is taken over each of the two time periods (1985-92 and 1993-99) to obtain one figure for each municipality. The time mean of points describes the average position of a municipality over that specific time period. After ranking the municipalities according to time means they are then divided into four equal-sized groups.

To obtain a picture of the joint effect of size and economic condition, municipalities are also grouped using population and economic condition together. The four groups that are formed in this way are: i) small and economically weak, ii) small and economically strong, iii) large and economically weak, iv) large and economically strong. Each group contains an equal number of municipalities.

*Table 39. The scoring table for tax base (T)*

| CRITERION | Points given to municipality |
|---|---|
| $T_i >$ (mean + SD)* | 6 |
| (mean + 0,5×SD) $< T_i \leq$ (mean + SD), | 5 |
| mean $< T_i \leq$ (mean + 0,5×SD), | 4 |
| (mean - 0,5×SD) $< T_i \leq$ mean, | 3 |
| (mean - SD) $< T_i \leq$ (mean – 0.5×SD), | 2 |
| $T_i \leq$ (mean – SD). | 1 |

*$T_i$ is the tax base in municipality i, SD is the standard deviation.

All variables are converted into real per capita figures using a consumer price index so that amounts for the period 1985-92 are converted to 1990 prices and for the period 1993-99 to 1995 prices. All variables are transformed into natural

[167] Municipalities have been classified using these variables also by Helin & Poteri (1990).

[168] For instance, if municipality i has a tax base ($T_i$) higher than the arithmetic mean of all municipalities plus the standard deviation, it gets 6 points. If, at the other extreme, a municipality has a tax base smaller than mean minus the standard deviation, it gets one point. The same scoring method is used for the other three variables. For the tax rate the order of points is reversed so that municipalities with the lowest tax rate are awarded the highest points.

logarithms before estimation. Time dummies are added to control for possible trends and macroeconomic factors that are common to all municipalities.

Summary statistics are presented in Table 40. Altogether, there are 12 separate groups that are analysed in the estimations for the two separate time periods.

*Table 40. Summary statistics for the variables used (per capita). Years 1992 and 1999[169]. 1995 FIM.*

| | Expenditures | | Revenues | | Loans | | Grants | |
|---|---|---|---|---|---|---|---|---|
| Year | 1992 | 1999 | 1992 | 1999 | 1992 | 1999 | 1992 | 1999 |
| Population 1 | 21 404 | 21 454 | 8 336 | 14 335 | 5 606 | 3 236 | 10 079 | 6 003 |
| Population 2 | 22 065 | 21 071 | 8 439 | 14 014 | 5 447 | 3 791 | 10 389 | 6 346 |
| Population 3 | 21 889 | 20 355 | 9 003 | 14 396 | 4 644 | 4 391 | 9 381 | 5 567 |
| Population 4 | 23 843 | 20 599 | 11 278 | 16 537 | 4 741 | 4 427 | 7 770 | 3 850 |
| | | | | | | | | |
| Condition 1 | 22 881 | 21 990 | 8 066 | 13 954 | 6 630 | 5 535 | 11 425 | 7 290 |
| Condition 2 | 22 131 | 20 927 | 8 677 | 14 442 | 5 237 | 4 212 | 10 208 | 5 924 |
| Condition 3 | 21 171 | 20 527 | 9 041 | 15 147 | 4 270 | 3 623 | 8 879 | 4 821 |
| Condition 4 | 23 020 | 20 034 | 11 271 | 15 739 | 4 301 | 2 475 | 7 106 | 3 733 |
| | | | | | | | | |
| “Small and poor” | 22 506 | 21 989 | 8 193 | 14 032 | 6 505 | 4 764 | 11 116 | 7 026 |
| “Small and rich” | 22 507 | 20 469 | 8 549 | 14 310 | 5 362 | 2 332 | 10 516 | 5 303 |
| “Large and poor” | 20 473 | 20 850 | 8 760 | 14 550 | 3 957 | 5 158 | 8 675 | 5 891 |
| “Large and rich” | 23 717 | 20 171 | 11 553 | 16 390 | 4 615 | 3 590 | 7 311 | 3 547 |

From Table 40 we can see that real expenditures have decreased significantly in almost all groups from 1992 to 1999. This has happened especially in “large and rich” municipalities. Only in smallest 109 municipalities and in the “large and poor” group have the expenditures increased.

At the same time there has been a considerable increase in the own source revenues side in all groups. The largest percentage growth appears to have been in the smallest and the poorest municipalities. Loans have been reduced in all groups except for the “large and poor”. Central state grants to municipalities have reduced sharply. The largest percentage cuts have been for the wealthiest and largest municipalities.

[169] The final year of the first period under study is 1992, while 1999 is the final year of the second study period.

All in all there is a significant difference between the years 1992 and 1999. The general picture is that the importance of own source revenues has increased considerably at the same time as grants have been diminishing. Loans have been reduced and expenditures cut. All this seems to indicate that change from the matching grants system to the formula-based system and the cuts in grants have caused the municipalities to change their expenditure behaviour. The explanation may be more complicated than this, however.

## 5.4 Empirical results

To keep the presentation concise, only the estimation results for the largest 109 municipalities are presented in detail. The results for direction of causality between own source revenues and expenditures in all separate subgroups are summarised in Table 49.[170]

Let us start with the detailed description for the estimations concerning the group with the largest 109 municipalities (Population 4). The estimations and tests for the expenditures, own source revenues, grants and loans equations are carried out in the following steps: first, the unrestricted model with no assumption of parameter stability over time is estimated and the overall model validity is tested. After that, the model is re-estimated using the assumption of time invariant parameters. This assumption is tested against the hypothesis of time variant parameters. In the third step using the model selected, the correct lag length is tested starting from the longest lag allowed by the data. Finally, the causation is tested by dropping each right-hand variable at a time.

As the data has been divided into two separate time periods, the respective results of the estimations are also reported consecutively. The results[171] of the expenditures equation for the years 1985-92 are presented in Table 41. Looking at the results, the most general model has a Q value 27.9 with 24 degrees of freedom.[172] The $\chi^2$ value is 33.2, so the most general model is accepted as the starting

[170] The results for parameter stability, lag length and other causality than between revenues and expenditures are presented in the Appendix, Tables A1-A3. More detailed estimation results can be obtained from the author.

[171] All estimations are carried out using White's (1980) covariance matrix estimator to obtain consistent estimates of the standard error.

[172] The degrees of freedom are calculated by subtracting the total number of estimated parameters from the total number of instrumental variables (see Holtz-Eakin et al. (1988) and Holtz-Eakin et al. (1989) for more detailed description). For 1992 there are 6 years available for instrumental variables, which means 6 $\times$ 4 = 24 plus the constant, or 25 instrumental variables altogether. For 1991 the years 1985-1989 are usable, so we get $(5 \times 4) + 1 = 21$ instrumental variables, and so on. The total number of instruments is then 24 + 21 + 17 + 13 = 76. Because there are 13 parameters for each estimated year (4m + 1), the degrees of freedom for Q are 76 - 52 = 24.

point[173]. Next, the model is restricted by assuming time invariant parameters: the $Q_R$ value is now 194.1 with 60 degrees of freedom. The L value is then 166.2 with 36 degrees of freedom.[174] At the 0.10 level of significance, the critical value is 47.2 and therefore the hypothesis of time invariant parameters is rejected.

Next, the results relating to lag length are investigated, conditional on the assumption that parameters vary over time. The first question is whether the data will allow the lag length to be shortened from three to two. When m = 2 is imposed, the value of Q is 66.9. Comparing this to the value of Q in line i), we get L = 39.0 with 16 degrees of freedom.[175] The critical value of the $\chi 2$ -distribution at the 0.10 level is 23.5. Therefore, the restriction that two lags in each variable is enough is rejected and the original three-year lag structure is used in further estimations.

Conditional on m = 3 and time varying parameters, the testing of causality can now begin. To test whether own source revenues cause expenditures, the expenditure equation is simply estimated without revenues. The Q value is now 45.0; the L value is then 17.1 with 12 degrees of freedom,[176] which means that the hypothesis of non-causality is accepted. Hence, own source revenues do not cause expenditures.

Next, the causality from grants to expenditures is tested.[177] The Q value is 30.1, L is 2.2 and the hypothesis of non-causality is accepted. Dropping the loans from the expenditure equation gives a Q value 45.4 and an L value of 17.5, so the hypothesis of non-causation is also accepted.

To summarise, it is found that during the period with the matching grant system between the years 1985-92, the municipal expenditures can be described by a dynamic process which has three-year lags. The estimated parameters taken as a group vary over time. Past own source revenues have not caused present expenditures. It is also found that neither grants nor loans cause expenditures.

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[173] Holtz-Eakin et al. (1989) stress that inferences about causality will be incorrect if the lag length or parameter constancy is wrongly chosen. To avoid these type II errors, they suggest that a 0.10 level of significance be used in testing the parameter stability and lag length, and a 0.05 level of significance when testing the causality.

[174] There are 36 degrees of freedom because the 12 parameters each for 1989 through to 1991 are constrained to be equal to their 1992 values.

[175] There are 16 degrees of freedom because 1 lag is reduced for each of the four variables compared with the situation in line i) (for four estimated years).

[176] There are 12 degrees of freedom, because one variable with three lags is dropped from four year estimates.

[177] In the causality testing, one variable at a time is dropped from the equation, and the change in the L value is tested against the $\chi^2$ value. Then the variable in question is returned to the equation, and the exclusion of next variable is tested. Therefore, in this testing procedure, the order of exclusion of variables does not matter. This is the procedure suggested by Holtz-Eakin et al. (1988, 1989).

Turning to the results of the revenues equation (Table 42), it is found, first, that the parameters vary over time in the model. Second, lags of three years are needed to describe the dynamic process. Third, none of the three variables used can be dropped from the equation. So, as expenditures cause own source revenues but not vice versa, the conclusion is that for the largest 109 municipalities during the period 1985-1992, there has been a "spend and tax" relationship between expenditure and revenue decision-making.

The results for the loans equation (Table 43) show that parameters are time varying (lines i and ii), three-year lags are needed to describe the dynamic process (line iii), and expenditures, own source revenues and grants cause loans (lines iv-vi).

The results for the grants equation are presented in Table 44. As was mentioned above, nearly all of the grants during the years 1985-92 were matching grants. Therefore, it is self evident that expenditures cause grants. The results are presented for checking reasons, however. It is found, just as in the loans equation, that parameters are time varying, three-year lags are needed to describe the dynamic process, and all of the variables cause grants.

*Table 41. The expenditures equation 1985 – 1992 (T = 8, N =109)*

| | Q | L | $Df_Q$ | $Df_L$ | $\chi^2$ | Accept? |
|---|---|---|---|---|---|---|
| i) Time varying parameters, m = 3 | 27.9 | | 24 | | 33.2 | YES |
| ii) Time invariant parameters, m = 3 | 194.1 | 166.2 | 60 | 36 | 47.2 | NO |
| iii) m = 2, given i) | 66.9 | 39.0 | 40 | 16 | 23.5 | NO |
| vi) drop revenues, given i) | 45.0 | 17.1 | 36 | 12 | 21.0 | YES |
| vii) drop grants, given i) | 30.1 | 2.2 | 36 | 12 | 21.0 | YES |
| viii) drop loans, given i) | 45.4 | 17.5 | 36 | 12 | 21.0 | YES |

*Table 42. The revenues equation 1985 – 1992, (T = 8, N = 109)*

| | Q | L | DfQ | DfL | $\chi$2 | Accept? |
|---|---|---|---|---|---|---|
| i) Time varying parameters, m = 3 | 32.4 | | 24 | | 33.2 | YES |
| ii) Time invariant parameters, m = 3 | 229.8 | 197.4 | 60 | 36 | 47.2 | NO |
| iii) m = 2, given i) | 86.0 | 53.6 | 40 | 16 | 23.5 | NO |
| iv) drop expenditures, given i) | 66.6 | 34.2 | 36 | 12 | 21.0 | NO |
| v) drop grants, given i) | 101.8 | 69.4 | 36 | 12 | 21.0 | NO |
| vi) drop loans, given i) | 81.5 | 49.1 | 36 | 12 | 21.0 | NO |

*Table 43. The loans equation 1985 – 1992, (T = 8, N = 109)*

| | Q | L | DfQ | DfL | $\chi 2$ | Accept? |
|---|---|---|---|---|---|---|
| i) Time varying parameters, m = 3 | 24.6 | | 24 | | 33.2 | YES |
| ii) Time invariant parameters, m = 3 | 245.3 | 220.7 | 60 | 36 | 47.2 | NO |
| iii) m = 2, given i) | 98.6 | 74 | 40 | 16 | 23.5 | NO |
| iv) drop expenditures, given i) | 124 | 99.4 | 36 | 12 | 18.5 | NO |
| v) drop grants, given i) | 103.3 | 78.7 | 36 | 12 | 18.5 | NO |
| vi) drop revenues, given i) | 107.6 | 83 | 36 | 12 | 18.5 | NO |

*Table 44. The grants equation 1985 – 1992, (T = 8, N = 109)*

| | Q | L | DfQ | DfL | $\chi 2$ | Accept? |
|---|---|---|---|---|---|---|
| i) Time varying parameters, m = 3 | 29.2 | | 24 | | 33.2 | YES |
| ii) Time invariant parameters, m = 3 | 483.8 | 454.6 | 60 | 36 | 47.2 | NO |
| iii) m = 2, given i) | 107.1 | 77.9 | 40 | 16 | 23.5 | NO |
| iv) drop expenditures, given i) | 88.6 | 59.4 | 36 | 12 | 18.5 | NO |
| v) drop loans, given i) | 81 | 51.8 | 36 | 12 | 18.5 | NO |
| vi) drop revenues, given i) | 105.4 | 76.2 | 36 | 12 | 18.5 | NO |

Next, the results for the latter period (1993-1999) are presented in Table 45. According to the results for the expenditures equation, it is found that the parameters are time varying, three-year lags are needed, and that own source revenues, grants and loans all cause expenditures.

The results for the revenues equation in Table 46 reveal that parameters are time invariant, three year lags are needed and that both grants and loans can be dropped from the model, i. e. these variables do not cause own source revenues. Only expenditures cause own source revenues. As we just found that own source revenues cause expenditures, a two way causation is verified.

Table 47 presents the results for the loans equation. It is found that parameters are time invariant, two year lags are needed, and that only own source revenues cause loans.

The results for the grants equation in Table 48 show that parameters are varying in time, three year lags are needed and that expenditures and grants cause grants.

*Table 45. The expenditures equation 1993 – 1999 (T = 7, N = 109)*

| | Q | L | $Df_Q$ | $Df_L$ | $\chi^2$ | Accept? |
|---|---|---|---|---|---|---|
| i) Time varying parameters, m = 3 | 6.1 | | 12 | | 18.5 | YES |
| ii) Time invariant parameters, m = 3 | 99.9 | 93.9 | 36 | 24 | 33.2 | NO |
| iii) m = 2, given i) | 56.9 | 50.8 | 24 | 12 | 18.5 | NO |
| vi) drop revenues, given i) | 49.8 | 43.7 | 21 | 9 | 16.9 | NO |
| vii) drop grants, given i) | 43.7 | 37.6 | 21 | 9 | 16.9 | NO |
| viii) drop loans, given i) | 33.6 | 27.5 | 21 | 9 | 16.9 | NO |

*Table 46. The revenues equation 1993 – 1999, (T = 7, N = 109)*

| | Q | L | DfQ | DfL | $\chi 2$ | Accept? |
|---|---|---|---|---|---|---|
| i) Time varying parameters, m = 3 | 9.3 | | 12 | | 18.5 | YES |
| ii) Time invariant parameters, m = 3 | 58.1 | 48.8 | 36 | 24 | 33.2 | NO |
| iii) m = 2, given i) | 29.4 | 20.1 | 24 | 12 | 18.5 | NO |
| iv) drop expenditures, given i) | 31.8 | 22.5 | 21 | 9 | 16.9 | NO |
| v) drop grants, given i) | 23.5 | 14.2 | 21 | 9 | 16.9 | YES |
| vi) drop loans, given i) | 18.1 | 8.8 | 21 | 9 | 16.9 | YES |

*Table 47. The loans equation 1993 – 1999, (T = 7, N = 109)*

| | Q | L | DfQ | DfL | $\chi 2$ | Accept? |
|---|---|---|---|---|---|---|
| i) Time varying parameters, m = 3 | 8.5 | | 12 | | 18.5 | YES |
| ii) Time invariant parameters, m = 3 | 24.3 | 15.8 | 36 | 24 | 33.2 | YES |
| iii) m = 2, given ii) | 27.2 | 2.9 | 40 | 4 | 7.8 | YES |
| iv) m = 1, given iii) | 37.2 | 10.0 | 44 | 4 | 7.8 | NO |
| vi) drop expenditures, given iii) | 30.8 | 3.6 | 42 | 2 | 6 | YES |
| vii) drop grants, given iii) | 28.2 | 1.0 | 42 | 2 | 6 | YES |
| viii) drop revenues, given iii) | 37.8 | 10.6 | 42 | 2 | 6 | NO |

*Table 48. The grants equation 1993 – 1999, (T = 7, N = 109)*

| | Q | L | DfQ | DfL | $\chi 2$ | Accept? |
|---|---|---|---|---|---|---|
| i) Time varying parameters, m = 3 | 4.6 | | 12 | | 18.5 | YES |
| ii) Time invariant parameters, m = 3 | 34.5 | 29.9 | 36 | 24 | 33.2 | YES |
| iii) m = 2, given ii) | 45.5 | 11 | 40 | 4 | 7.8 | NO |
| iv) drop expenditures, given ii) | 44.7 | 10.2 | 39 | 3 | 7.8 | NO |
| v) drop loans, given ii) | 44.5 | 10 | 39 | 3 | 7.8 | NO |
| vi) drop revenues, given ii) | 35.9 | 1.4 | 39 | 3 | 7.8 | YES |

To summarise the estimation results for the largest municipalities, the finding that the largest municipalities have moved from “spend and tax” causality to

"simultaneous" causality suggests that these municipalities have altered their behaviour considerably following the change in the grant system. If it can be stated that the "simultaneous" causality is a more cautious and cost-aware way to operate than a "spend and tax" policy, then it can also be said that the largest municipalities clearly have become more careful when deciding about spending.

The summary results for all 12 groups[178] concerning the causal relationships between spending and taxation can be found in Table 49. Starting from the subgroups defined using population size, the main findings are that during the matching grants system, the largest 109 municipalities have had a "spend and tax" type of causality, whereas the 109 smallest municipalities applied "tax and spend". For the two middle groups there has been a "simultaneous" relationship. No change can be found for the smallest municipalities. The results can be interpreted as indicating that the largest municipalities have become more careful in their spending decisions. There also seems to be a marked difference between small and large municipalities: the small municipalities have been careful irrespective of the grant system, whereas the behaviour of the largest municipalities changes radically as the grant system is changed.

The results for the groups defined according to economic condition show that under the matching grants system (1985-92) there has been no difference between the four groups: all have had a simultaneous decision-making system. The results for the second period (1993-99), however, do show some variation between the groups. The economically strongest municipalities seem now to behave so that there is no causal connection between own source revenues and spending. The weakest municipalities have a "tax and spend" causality, whereas the two middle groups have a "simultaneous" relation. According to the results, there has been a major change for the economically weakest municipalities. This can be either because the municipalities have consciously altered their behaviour or because the world has changed so that the changes in own source revenues have become a more dominant factor. All in all, the mixed results for the groups defined according to economic condition suggest possible problems with this criterion. Using four separate indicators may lead to a situation where the groups are internally too heterogeneous for the tests. Nevertheless, some of the results obtained using also the economic criteria can be interpreted intuitively, although it must be noted that the population groups seem to behave somewhat better in this respect.

Finally, no variation could be found between the cross-subgroups (size and economic condition together, see the last four lines in Table 49) during the first period: all groups are found to have a "simultaneous" relation. During the latter period, "tax and spend" now applies for the smallest municipalities (both poor and rich). Similarly, for both groups of large municipalities the "simultaneous"

[178] Separate groups were listed and summarised in Table 40.

relation applies. The size of the municipality therefore appears to be the dominant factor rather than the economic condition (as defined here).

On the whole, these results supplement those obtained from the previous analysis. When all municipalities were analysed together (Moisio, 2000), a "spend and tax" type of causality was found for the first period and "simultaneous" causality for the latter period. In this study, population size subgroups were examined separately and only the largest 109 municipalities followed the same pattern. In both studies the general finding, namely that there has been a shift towards higher cost awareness, receives support.

*Table 49. Summary of the causality tests for the subgroups (the hypothesis accepted is marked with X)*

| | Period 1985 –1992 | | | Period 1992 –1999 | | |
|---|---|---|---|---|---|---|
| | Hypothesis: | | | | | |
| | "Spend & Tax" | "Simultaneous relation" | "Tax & Spend" | "Spend & Tax" | "Simultaneous relation" | "Tax & Spend" |
| Population 4 (largest) | X | | | | X | |
| Population 3 | | X | | | X | |
| Population 2 | | X | | | (X)[179] | |
| Population 1 (smallest) | | | X | | | (X)[180] |
| EC 4 (strongest) | | X | | No causal connection found | | |
| EC 3 | | X | | | X | |
| EC 2 | | X | | | X | |
| EC 1 (weakest) | | X | | | | X |
| "Small and poor" | | X | | | | X |
| "Small and rich" | | X | | | | X |
| "Large and poor" | | X | | | X | |
| "Large and rich" | | X | | | X | |
| | → | | | → | | |
| | Increasing caution | | | Increasing caution | | |

Some remarks on the grants and loans in the analysed system can also be made.[181] The results suggest that grants are caused by all three other variables in

[179] The expenditures equation was significant only at the 5 % level. Therefore, the suggestion of Holtz-Eakin et al. (1988) to use the 10 % level to avoid type II errors is not fulfilled. This may be because more years would be needed, or simply because the model itself is inappropriate. The tests, in any case, show the same results as those for the previous period.

[180] The expenditures equation was significant only at the 0.1 % level. This model is then estimated with serious problems.

[181] A more detailed summary of all the estimations is provided in the Appendix, in Tables A.1 – A.3.

most of the analysed subgroups during the matching grants period. This is no surprise, as grants were by definition tightly tied with the expenditures and the own source revenues at that time. During the latter period, the picture is more blurred, however. As most of the grants now are formula-based, it is natural that the connection with expenditures is no longer as clear. According to the results, expenditures cause grants only for the economically weakest municipalities. There do not seem to be systematic differences among the population subgroups. On the other hand, when the municipalities are divided according to both the economic condition and population, the findings suggest that the small and large municipalities do differ from each other so that the own source revenues cause grants in the small municipalities but not in the larger municipalities.

It can also be noted that grants cause expenditures during the matching grants period for the three smallest population groups only (Population 1 – Population 3). Similarly, grants cause expenditures only for the three weakest groups (EC1-EC3) during the same period. The mixed grouping strengthens this finding: the group "large and rich" is the only one in which the grants do not cause expenditures. During the formula-based period, the grants cause expenditures in all population groups. The economically strongest municipalities are still the only ones where the grants do not cause expenditures. The conclusion then is that the grants mostly cause expenditures in the small and economically weak municipalities, irrespective of the grant system.

Finally, the results for the loans equations during the matching grants period show that loans are caused by expenditures, own source revenues and grants irrespective of the subgroup. During the latter, formula-based grant period, the results are again more mixed. It seems that the loans in the smallest (Population 1 and Population 2) municipalities are not caused by any of the variables used in the model. The loan decisions in these municipalities appear then to be determined by factors other than expenditures, own source revenues or grants.

## 5.5 Summary and conclusions

In this paper, the dynamic interrelationship of Finnish municipal expenditures and own source revenues has been investigated. Panel data from 436 municipalities covering the years 1985-1999 was used. To define the effect of major reform of the grants system in 1993 on causality between own source revenues and expenditures, the data was divided into two separate time periods: the last eight years (1985-1992) of the matching grants system and the first seven years (1993-1999) of the formula-based grant system.

In addition, the data was divided into subgroups according to population size and economic condition in order to reveal the possible effect of these characteristics on causality. Altogether, 12 equal-sized subgroups were created over the two

time periods. The empirical analysis utilised the econometric technique developed by Holtz-Eakin et al. (1988) allowing for time varying parameters and municipality-specific effects.

The main findings are, first, that there is a marked difference between small and large municipalities in their economic behaviour. This inference is based on the finding that during the matching grants period the "tax and spend" hypothesis applies for the smallest municipalities and "spend and tax" for the largest 109 municipalities. During the formula-based grants period, "tax and spend" continues to apply for the smallest municipalities but the largest 109 municipalities now have a "simultaneous" relation between spending and own source revenues. Over the years, the difference between small and large municipalities may have diminished, but it has not completely disappeared. This result is also in line with Oulasvirta's (1996, p. 133-137) finding that small rural municipalities in South-Western Finland (where most of the small municipalities are located) have traditionally been very reluctant to increase public expenditures even in times of most generous state grant system.

Second, there appears to be a shift towards higher level of cost-awareness among the municipalities. This inference is based on the finding that the largest municipalities that used to have a "spend and tax" causality now have a "simultaneous" causality between expenditures and own source revenues. Hence, more careful decision-making has emerged. As for the smallest municipalities, these seem to have been careful irrespective of the grant system, because their decision-making was found to be "tax and spend" during both periods. The increased level of carefulness may have occurred because of the increased importance of own source revenues in municipal finance. Also cuts on formula based grants may have affected so that municipalities have become more alert. As smaller municipalities are not able to bear much financial risks, their budget behaviour has been more careful than that of the large municipalities.

Third, it seems that economic condition gives a poor description of the variation in municipal budgetary decision-making, especially during the matching grants period. All municipalities seem to have had a "simultaneous" causality between own source revenues and expenditures. Under the formula-based grant system there is more variation between the groups. The weakest municipalities have now moved to "tax and spend" causality, and for the strongest municipalities "no connection" causality is found. Altogether, the apparent poor performance of the economic condition index could mean either that the index is badly constructed, or that economic condition is actually an inferior variable when explaining the differences in causality between own source revenues and expenditures.

Fourth, grants seem mostly to cause expenditures in the small and economically weak municipalities, irrespective of the grant system. This means that the flypaper effect is verified in the sense that past grant innovations cause present expen-

ditures. Loans are caused by expenditures and own source revenues during both periods.

In conclusion, the reaction to specific central state measures may differ considerably between separate groups of municipalities. Although difficult, the differences should be taken into account before making important changes or restrictions that affect to municipalities' budgetary variables.

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## APPENDIX

Tables A.1 – A.3 contain the main information from the estimations and tests for each subgroup. Table A.1 presents the results for subgroups Population 1 – Population 4. Estimated equations for each subgroup are displayed so that the Expenditures equation in the first line is. Each table is divided into two sections so that in the columns 2 – 7 are the results for the matching grants period, and in the columns 8 – 13 are results for the formula-based grants period. Column two (and eight) indicates whether the parameters were found to vary. In the third (and ninth) column(s) is shown the minimum lags needed to describe the dynamic process. In the following columns are the results for the causality tests. Table A.2 presents the results for the economic condition subgroups presented in the same way as in Table A.1 In table A.3 are the results for the crossgroups.

| Table A.1. | Period 1985-1992 | | | | | | Period 1992-1999 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Group** | **Varying parame-ters?** | **Lag length** | **Drop Expendi-tures?** | **Drop Reve-nues?** | **Drop Grants?** | **Drop Loans?** | **Varying parame-ters?** | **Lag length** | **Drop Expendi-tures?** | **Drop Reve nues?** | **Drop Grants?** | **Drop Loans?** |
| **Population 1** | | | | | | | | | | | | |
| Expenditures | Yes | 3 | - | No | No | No | Yes | 3 | - | No | No | No |
| Revenues | Yes | 2 | Yes | - | Yes | Yes | No | 3 | Yes | - | Yes | No |
| Grants | Yes | 3 | No | No | - | No | Yes | 3 | No | No | - | No |
| Loans | Yes | 3 | No | No | No | - | No | 1 | Yes | Yes | Yes | - |
| **Population 2** | | | | | | | | | | | | |
| Expenditures | Yes | 3 | - | No | No | No | Yes | 3 | - | No | No | No |
| Revenues | Yes | 3 | No | - | No | No | Yes | 3 | No | - | No | No |
| Grants | Yes | 3 | No | No | - | No | Yes | 3 | Yes | Yes | - | No |
| Loans | Yes | 3 | No | No | No | - | No | 1 | Yes | Yes | Yes | - |
| **Population 3** | | | | | | | | | | | | |
| Expenditures | Yes | 2 | - | No | No | No | Yes | 3 | - | No | No | No |
| Revenues | Yes | 3 | No | - | No | No | No | 3 | No | - | Yes | Yes |
| Grants | Yes | 3 | Yes | No | - | Yes | Yes | 3 | No | No | - | No |
| Loans | Yes | 3 | No | No | No | - | No | 3 | Yes | Yes | No | - |
| **Population 4** | | | | | | | | | | | | |
| Expenditures | Yes | 3 | - | Yes | Yes | Yes | Yes | 3 | - | No | No | No |
| Revenues | Yes | 3 | No | - | No | No | Yes | 3 | No | - | Yes | Yes |
| Grants | Yes | 3 | No | No | - | No | No | 3 | No | Yes | - | No |
| Loans | Yes | 3 | No | No | No | - | No | 2 | Yes | No | Yes | - |

| Table A.2 | Period 1985-1992 | | | | | | Period 1993-1999 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Group** | **Varying parameters?** | **Lag length** | **Drop Expenditures?** | **Drop Revenues?** | **Drop Grants?** | **Drop Loans?** | **Varying parameters?** | **Lag length** | **Drop Expenditures?** | **Drop Revenues?** | **Drop Grants?** | **Drop Loans?** |
| **Condition 1** | | | | | | | | | | | | |
| Expenditures | Yes | 3 | - | No | No | No | Yes | 3 | - | No | No | No |
| Revenues | Yes | 3 | No | - | No | No | No | 2 | Yes | - | Yes | No |
| Grants | Yes | 3 | No | No | - | No | Yes | 3 | No | No | - | No |
| Loans | Yes | 3 | No | No | No | - | Yes | 2 | Yes | No | No | - |
| **Condition 2** | | | | | | | | | | | | |
| Expenditures | Yes | 3 | - | No | No | No | Yes | 3 | - | No | No | No |
| Revenues | Yes | 3 | No | - | Yes | Yes | Yes | 3 | No | - | No | No |
| Grants | Yes | 3 | No | No | - | No | Yes | 3 | Yes | No | - | No |
| Loans | Yes | 3 | No | No | No | - | No | 2 | No | Yes | No | - |
| **Condition 3** | | | | | | | | | | | | |
| Expenditures | Yes | 2 | - | No | No | No | Yes | 3 | - | No | No | No |
| Revenues | Yes | 3 | No | - | No | No | No | 2 | No | - | No | Yes |
| Grants | Yes | 3 | No | No | - | No | Yes | 3 | Yes | No | - | No |
| Loans | Yes | 3 | No | No | No | - | No | 2 | No | No | Yes | - |
| **Condition 4** | | | | | | | | | | | | |
| Expenditures | Yes | 3 | - | No | No | No | Yes | 3 | - | Yes | Yes | No |
| Revenues | Yes | 3 | No | - | No | No | No | 3 | Yes | - | No | No |
| Grants | Yes | 3 | No | No | - | No | Yes | 3 | Yes | No | - | Yes |
| Loans | Yes | 3 | No | No | No | - | Yes | 3 | Yes | Yes | No | - |

| Table A.3 | Period 1985-1992 | | | | | | Period 1992-1999 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Group** | **Varying parameters?** | **Lag length** | **Drop Expenditures?** | **Drop Revenues?** | **Drop Grants?** | **Drop Loans?** | **Varying parameters?** | **Lag length** | **Drop Expenditures?** | **Drop Revenues?** | **Drop Grants?** | **Drop Loans?** |
| **"Small and poor"** | | | | | | | | | | | | |
| Expenditures | Yes | 3 | - | No | No | No | Yes | 3 | - | No | No | Yes |
| Revenues | Yes | 2 | No | - | No | No | Yes | 3 | Yes | - | Yes | Yes |
| Grants | Yes | 3 | No | No | - | No | Yes | 3 | No | No | - | No |
| Loans | Yes | 3 | No | No | No | - | No | 2 | No | Yes | Yes | - |
| **"Small and rich"** | | | | | | | | | | | | |
| Expenditures | Yes | 3 | - | No | No | No | Yes | 3 | - | No | No | No |
| Revenues | Yes | 3 | No | - | No | No | Yes | 2 | Yes | - | No | No |
| Grants | Yes | 3 | No | No | - | No | Yes | 3 | No | No | - | No |
| Loans | Yes | 3 | No | No | No | - | No | 3 | Yes | Yes | Yes | - |
| **"Large and poor"** | | | | | | | | | | | | |
| Expenditures | Yes | 3 | - | No | No | No | Yes | 3 | - | No | Yes | Yes |
| Revenues | Yes | 3 | No | - | No | No | Yes | 1 | No | - | Yes | No |
| Grants | Yes | 3 | No | No | - | No | Yes | 3 | No | Yes | - | No |
| Loans | Yes | 3 | No | No | No | - | No | 3 | Yes | Yes | No | - |
| **"Large and rich"** | | | | | | | | | | | | |
| Expenditures | Yes | 3 | - | No | No | No | Yes | 3 | - | No | No | No |
| Revenues | Yes | 3 | No | - | No | No | Yes | 3 | No | - | Yes | Yes |
| Grants | Yes | 3 | No | No | - | No | Yes | 3 | No | Yes | - | No |
| Loans | Yes | 3 | No | No | No | - | Yes | 2 | No | Yes | No | - |

# 6. Concluding comments

This thesis studied the determinants of expenditure variation of the Finnish municipalities. Also, the intertemporal relationships between main budget variables were under examination. The introduction presented the theoretical and empirical framework of the thesis.

The second chapter of the thesis presented traditional expenditure determination models for expenditures under matching grants period (1985 – 1992). The results, however, were far from traditional because the price elasticity was found to be positive for education and culture expenditures as well as the total operating expenditures. This unconventional result means that the municipalities have diminished their expenditures (in real terms) even though the price of the public goods has fallen. However, at the same time there seem to have been a normal negative relationship between social welfare and health-care expenditures and price. This suggests that there has been a shift of resources from educational to social welfare and health expenditures. The result shows how the closed-ended matching grant is ineffective at a point where the municipalities already produce at grant maximising level or above it.

The second theme of chapter 2 was to test the possible existence of the famous flypaper effect. The effect can be tested because the formula-based grants to municipalities are de facto general grants with no earmarking. The results showed that the per capita grants have four to five times larger effect on expenditures than per capita private taxable incomes. This level of flypaper effect has been found also in other studies. The results prove that grants still have an effect on municipalities' expenditures even though there has been discussion that grants have lost their effect on municipalities. According to results, a FIM 100 increase in grants increase the education and culture expenditures by FIM 40, the social welfare and health-care expenditures by FIM 4 and total operating expenditures by FIM 24. The differences between the grant effects suggest that the grants are perceived differently in different sectors. As shown in the appendix of the second chapter, the education and culture grants are more closely tied with certain criteria such as the number of schools and the average size of the schools. These things can be affected by municipalities themselves. In contrast, none of the criteria in social welfare and health-care grant formulas can be affected by the municipalities themselves. The differences between the two main sector grant determination is something that certainly needs more consideration in the future.

The results of the third chapter show that municipalities have been able to save taxpayer's money by altering their service structure into more non-institutional based services. This result holds even when the effect of increasing Social Insurance Institution expenditures is taken into account. In other words, even though the development has meant that municipalities have been able to pass on some of

their costs to customers and the Social Insurance Institution, some real savings have also been made. This is a welcome result especially when one takes into account that the ageing of the population is a rapidly increasing problem for public sector in Finland. The study is also able to measure the money effects for both municipal sector and the Social Insurance Institution. More better quality data is urgently needed to enable deeper study of the issue, however.

The intertemporal relationships between municipal own source revenues, expenditures, grants and loans were analysed in the following two sections. The fourth chapter analysed all municipalities together and compared the matching and formula-based grant periods. The fifth chapter also compared the two grant regimes but went further by dividing the municipalities into several subgroups. This was done in order to find out if population size or economic condition of the municipalities would have an effect on the results. The results showed that there are important intertemporal relationships between municipal spending and own source revenues. Therefore, the municipalities smooth their own source revenue and spending decisions over time. This means that temporary measures from the State's side will be ineffective. In addition, the reaction to specific central State measures may differ considerably between separate groups of municipalities. As the reaction of small and large municipalities differs, these differences should be taken into account before implementing important changes or restrictions that affect municipalities' own source revenues or expenditures.

In conclusion, the thesis has provided several new aspects of the Finnish municipalities' economic behaviour. Much of these results can be compared to similar studies in other countries, but also some differences have been found. Of course, there are still a great number of interesting issues left to analyse in the Finnish municipal economics. Especially, the intertemporal analysis of the municipal expenditure determination should be continued. Also issues on optimal municipal size, tax competition and benefits from amalgamation will be interesting to analyse in future.

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