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ON LOCAL GOVERNMENT SPENDING AND TAXATION BEHAVIOUR - effect of population size and economic condition

Abstract: This paper examines the Granger causality between total expenditures and own source revenues for 8 subgroups of Finnish municipalities. Two panel data sets that cover the years 1985-1992 and 1993-1999 are used in order to compare the effect of change from a system of matching grants to formula-based grants. 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 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.

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.[i]

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.[ii] 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.[iii] 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.

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,[iv] 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 intertemporal 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 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 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 revenues to expenditures. Dahlberg and Johansson (1998), using annual data for 265 Swedish municipalities over the time period 1974–87 found that expenditures cause 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 revenues.[v] Moisio and Kangasharju (1997) concluded that evidence from annual (1985-92) data for 460 Finnish municipalities supports a bi-directional causality between 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.[vi] 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 revenues to expenditures, whereas during the formula based grants system (1993 -) there was a simultaneous relation between 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 defined by economic condition[vii], 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.[viii] 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 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 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 paper is organised as follows. In section 2 the econometric method is described, in section 3 the data used in the estimations is described and in section 4 the results of the empirical investigations are presented. Section 5 gives the conclusions and a summary of the results.

2. Econometrics

The estimation method for dynamic panel data used in this paper was developed by Holtz-Eakin, Newey and Rosen (1988).[ix] 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:

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

i = 1, …, N and t = m+1, …, T,

where α and δ 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.[x] 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[xi]:

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

i = 1, …, N and t = (m+2), …, T.

To ensure the identification of the parameters in equation (2) there must be a sufficient number of instrumental variables, which can be defined by using the orthogonality conditions:

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

The orthogonality conditions in (3) can be used to identify the parameters of (2) since the disturbance term v_{it} (= $u_{it} - u_{it-1}$) will be uncorrelated with y_{it-s} and x_{it-s} for s ≥ 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, 2(t-2) ≥ 2m, or t ≥ 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 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, i.e. by noting that the difference in the constrained and unconstrained sum of squared residuals has a χ^2 distribution.

As for the question of parameter stability, in equation (2) 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 2) 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[xii] 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:

(4) $L = Q_R - Q.$

Q and Q_R are both χ^2 distributed when N grows. L is also χ^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.[xiii] The remaining municipality specific effects are still controlled for in the usual way.

3. Data

The data was obtained from Statistics Finland and covers 436 municipalities over the period 1985-99.[xiv] 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 feesxv), 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.xvi 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.[xvii]

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.[xviii] 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 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 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.[xix] 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 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.

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.

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.[xx] 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. 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.

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 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 1. Altogether, there are 8 separate groups that are analysed in the estimations for the two separate time periods.

Table 1 Summary statistics for the variables used (per capita). Years 1992 and 1999[xxi]. *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

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 revenues and expenditures in all separate subgroups are summarised in Table 10.

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, 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[xxii] of the expenditures equation for the years 1985-92 are presented in Table 2. Looking at the results, the most general model has a Q value 27.9 with 24 degrees of freedom.[xxiii] The χ^2 value is 33.2, so the most general model is accepted as the starting point[xxiv]. 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.[xxv] 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.[xxvi] 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 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,[xxvii] which means that the hypothesis of non-causality is accepted. Hence, revenues do not cause expenditures.

Next, the causality from grants to expenditures is tested.[xxviii] 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 revenues have not caused present expenditures. It is also found that neither grants nor loans cause expenditures.

Turning to the results of the revenues equation (Table 3), 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 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 4) show that parameters are time varying (lines i and ii), three-year lags are needed to describe the dynamic process (line iii), and expenditures, revenues and grants cause loans (lines iv-vi).

The results for the grants equation are presented in Table 5. 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 2 The expenditures equation 1985 – 1992 (T = 8, N =109)

	Q	L	Df_Q	Df_L	χ^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 3 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 4 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 5 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 6. According to the results for the expenditures equation, it is found that the parameters are time varying, three-year lags are needed, and that revenues, grants and loans all cause expenditures.

The results for the revenues equation in Table 7 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 revenues. Only expenditures cause revenues. As we just found that revenues cause expenditures, a two way causation is verified.

Table 8 presents the results for the loans equation. It is found that parameters are time invariant, two year lags are needed, and that only revenues cause loans.

The results for the grants equation in Table 9 show that parameters are varying in time, three year lags are needed and that expenditures and grants cause grants.

Table 6 The expenditures equation 1993 – 1999 (T = 7, N = 109)

	Q	L	Df_Q	Df_L	χ^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 7 The revenues equation 1993 – 1999, (T = 7, N = 109)

	Q	L	DfQ	DfL	χ2	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 8 The loans equation 1993 – 1999, (T = 7, N = 109)

	Q	L	DfQ	DfL	χ2	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 9 The grants equation 1993 – 1999, (T = 7, N = 109)

	Q	L	DfQ	DfL	χ2	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 8 groups[xxix] concerning the causal relationships between spending and taxation can be found in Table 10. 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 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 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.

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 10 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)[xxx]	
Population 1 (smallest)			X			(X)[xxxi]
EC 4 (strongest)		X		No causal connection found		
EC 3		X			X	
EC 2		X			X	
EC 1 (weakest)		X				X
	→ Increasing caution			→ Increasing caution		

Some remarks on the grants and loans in the analysed system can also be made. 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. 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, revenues and grants irrespective of the subgroup. During the latter, formula-based grant period, the results are 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, revenues or grants.

5. Summary and conclusions

In this paper, the dynamic interrelationship of Finnish municipal expenditures and 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 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, 8 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 revenues. Over the years, the difference between small and large municipalities may have diminished, but it has not completely disappeared.

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 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 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 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 expenditures. Loans are caused by expenditures and 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.

Notes

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[i] 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.

[ii] See for, example, Holtz-Eakin, Rosen and Tilly (1994) describing the US situation, and Dahlberg and Lindström (1998) for the Swedish system.

[iii] 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.

[iv] See, for instance, Moisio (2000) or Dahlberg and Johansson (1998) for a summary of the relevant literature.

[v] 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)).

[vi] 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.

[vii] This is defined more closely below.

[viii] 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.

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ix 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).
x 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).
xi 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).
xii As Holtz-Eakin et al. (1988) point out, it is imperative to use the same covariance matrix when estimating the restricted and unrestricted models.
xiii See also Dahlberg & Lindström (1998).
xiv All municipalities existing in 1999, excluding those located in the autonomous Åland islands.
xv The 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 revenues available. The estimated and actual revenues may differ considerably.
xvi See, for example, Filimon, Romer and Rosenthal (1982), Wyckoff (1991) and Hines and Thaler (1995).
xvii 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".
xviii 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.
xix Year dummies are added in estimations to control for macroeconomic changes that are common to all municipalities.
xx Municipalities have been classified using these variables also by Helin & Poteri (1990).
xxi The final year of the first period under study is 1992, while 1999 is the final year of the second study period.
xxii All estimations are carried out using White's (1980) covariance matrix estimator to obtain consistent estimates of the standard error.
xxiii 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.
xxiv 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.
xxv 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.
xxvi 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).
xxvii There are 12 degrees of freedom, because one variable with three lags is dropped from four year estimates.
xxviii 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 χ^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).
xxix Listed in Table 1
xxx 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.
xxxi The expenditures equation was significant only at the 0.1% level. This model is then estimated with serious problems.

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