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THE INTERTEMPORAL SPENDING BEHAVIOR OF LOCAL GOVERNMENTS: A COMPARATIVE ANALYSIS OF THE SCANDINAVIAN COUNTRIES*

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Abstract

The paper investigates the intertemporal spending behavior of Scandinavian local governments with particular attention to liquidity constraints imposed by balanced-budget-rules and other regulations. The main finding is that Danish local governments are more able to smooth current expenditures than their Norwegian and Swedish counterparts. Whereas the permanent-income hypothesis cannot be rejected for Denmark, it is in most cases rejected for Norway and Sweden. The Swedish system of market-based control and the Norwegian system of administrative control seem to produce similar results in terms of consumption smoothing.

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1. Introduction

Most empirical analyses of local government spending behavior have traditionally been carried out within the context of a static median voter model, but during the last decade intertemporal models based on rational forward-looking behavior have been taken to the data in an increasing number of studies. The seminal papers in this tradition are Holtz-Eakin and Rosen (1989, 1991, 1993). Using U.S. panel data they find that the development of local government labor demand, construction spending and capital spending is consistent with rational forward-looking behavior, i.e. current expenditures are determined by permanent rather than current resources.

In Holtz-Eakin *et al.* (1994) the conclusion is contrary. They estimate the so-called ‘*I* - model’, developed by Campbell and Mankiw (1990), using aggregate time series data for the U.S., and find (p. 173) “that essentially 100% of the growth rate of state and local spending on nondurable items is determined by the decision maker’s contemporaneous level of resources.” Dahlberg and Lindström (1998) apply the same approach in a study of Swedish local governments. Their estimates indicate that (p. 269) “spending decisions on nondurable goods and services are to a very high degree (90% or more) associated with permanent resources.” They also argue that some of the difference between the Swedish and U.S. results reflects different types of data (panel data vs. aggregate time series data).¹ The study by Borge and Tovmo (2000) indicates that the intertemporal spending behavior of Norwegian local governments is somewhere between their American and Swedish counterparts.

The different results for different countries and different types of data have motivated this comparative study where we apply the ‘*I* -model’ to analyze the intertemporal spending behavior of Scandinavian local governments.² The analysis is based on panel data for each individual country and covers the period 1985-1994. The Scandinavian countries are well suited for a comparative analysis of intertemporal spending behavior since they are similar in many respects, but differ with respect to central government regulations of budgeting and

¹ Empirical analyses of private consumption show the same pattern: Whereas rational forward-looking behavior is clearly rejected in aggregate time series studies, the results are less clear when microeconomic data is applied (Jappelli *et al.* 1998, p. 251).

² A comparative analysis of private consumption along the same lines can be found in Campbell and Mankiw (1991).

borrowing that affects the municipalities' intertemporal budget constraint.³ Thus, we have an experimental situation that provides us with an opportunity to disentangle the effects of different institutional settings on intertemporal spending behavior. During the period under study, Sweden had *de facto* no requirement of budget balance and local governments were free to borrow without approval by the state. At the other extreme, local government borrowing is very restricted in Denmark. Borrowing is limited to finance investments of 'market-based' activities financed by user-charges. Norway is somewhere between the neighboring countries: There is a balanced-budget rule that requires a non-negative net operating surplus. Borrowing is extensively used to finance investments, but must be approved by the state.

The main finding of the empirical analysis is that Danish local governments behave more forward-looking than their Norwegian and Swedish counterparts do. Whereas the permanent-income hypothesis cannot be rejected for Denmark, it is in most cases rejected for Norway and Sweden. It is particularly local governments with medium or low revenue that behave more forward-looking in Denmark than in Norway and Sweden.

The rest of the paper is organized as follows. The theoretical and institutional background is presented in Section 2 and 3 respectively. Section 4 discusses data and estimation methods, while estimation results are reported in Section 5. Finally, Section 6 summarizes the main findings of the paper.

2. Theoretical background

The permanent-income hypothesis is the benchmark model of intertemporal consumption behavior by private households. The model assumes rational forward-looking behavior, and implies that a household's current consumption depends on expected future income and interest rates. Testable empirical implications of the permanent-income hypothesis were developed in a seminal paper by Hall (1978). Under certain assumptions the permanent-income hypothesis can be expressed as follows

³ We use the terms local government and municipality interchangeably.

$$E_{t-1}(\Delta \ln C_t) = m + \frac{1}{s} E_{t-1}(r_t) \quad (1)$$

where C is consumption expenditures, r the real interest rate, $1/s$ the intertemporal elasticity of substitution and m a constant. E_t denotes expectations conditional on information available at the beginning of period t .

Equation (1) states that planned consumption growth is determined by the (expected) real interest rate and time preferences. The consumption growth rate is higher the higher the real interest rate and the higher the intertemporal elasticity of substitution is. If the real interest rate is constant, the consumption path will have a constant growth rate. The level of consumption is determined by the level of expected future income.

The testable implication of equation (1) is that no information available at the beginning of period $t-1$ should have any predictive power for consumption growth from $t-1$ to t . This is the approach used in the original paper by Hall and the first applications to local governments' spending behavior (Holtz-Eakin and Rosen 1989, 1991, 1993). A disadvantage by this approach is that the results may be difficult to interpret since the permanent-income hypothesis is not tested against a specific alternative. Campbell and Mankiw (1990) proposed to test the permanent-income hypothesis against a simple alternative. The alternative is that for a fraction I of consumers, current consumption is linked to current income (R) in the sense that $\Delta \ln C_t = \Delta \ln R_t$. Consumption of the rest of the consumers follows the permanent-income hypothesis as described by equation (1). The so-called ' I -model' is then given by:

$$E_{t-1}(\Delta \ln C_t) = (1-I)m + I E_{t-1}(\Delta R_t) + (1-I) \frac{1}{s} E_{t-1}(r_t) \quad (2)$$

The key parameter in equation (2), and the parameter to be estimated in the empirical analysis, is I . If I equals zero, expected fluctuations in income will not show up in the consumption path. Consistent with the permanent-income hypothesis, consumers are perfectly able to smooth spending over time. On the other hand, if I is strictly positive, the consumption path is affected by expected fluctuations in income, and the permanent-income hypothesis is rejected. An advantage with the ' I -model' is that it does not only facilitate a test of the permanent-income hypothesis. If the permanent-income hypothesis is rejected, it also

provides information about how ‘serious’ the rejection is: the higher the value of I , the more weight is put on expected fluctuations in income and the more ‘serious’ is the rejection.

The ‘ I -model’ does not specify why agents depart from rational forward-looking behavior. A positive and significant I is evidence of ‘excess sensitivity’, but we do not know whether agents are liquidity constrained (unable to borrow against future income) or just myopic. Much of the recent empirical literature has investigated whether households are liquidity constrained or not. Runkle (1991), Shea (1995) and Zeldes (1989) split the households according to wealth. The idea is that if liquidity constraints are important, the permanent-income hypothesis should be rejected for low-wealth households, but not for high-wealth households. The results are mixed. The findings of Zeldes are consistent with liquidity constraints, whereas Runkle cannot reject the permanent-income hypothesis for neither high nor low-wealth households. Shea rejects the permanent-income hypothesis for both types of households, and the results are inconsistent with liquidity constraints.

It is important to notify that local governments may face liquidity constraints for two reasons. First, they may meet credit market constraints in the same way as private consumers. Second, they may be liquidity constrained because of balanced-budget-rules (BBRs) imposed by higher-level government. The proceeding section provides details about local governments’ intertemporal budget constraint in the three Scandinavian countries.

3. Institutional background

Compared to most other industrialized countries, the Scandinavian countries have a remarkably large local public sector. Local and county governments are providers of welfare services like kindergartens, primary and secondary education, health care (including hospitals) and care for the elderly. Roughly 2/3 of all public services are provided through the local public sector.⁴ Local income tax and central government grants are the main sources of revenue in all three countries, and local tax discretion is more limited in Norway than in Denmark and Sweden. Since the Scandinavian local public sectors have much in common with respect to tasks and financing, but meet different central government regulations, we have an experimental situation that makes it possible for us to identify the effects of

differences in BBRs and other regulations on the municipalities' intertemporal spending behavior.

Norway

The Norwegian BBR is guided by what we can call the 'wealth preservation' principle, i.e. local governments are not allowed to let their net wealth deteriorate over time. Until 1993, the practical implementation of the principle was that current revenue had to be sufficient to cover current expenditures, interests and regular installment on debt (a proxy for the depreciation of the real capital stock), i.e. a non-negative net operating surplus. Loans, funds and revenue from sale of property could be used for investment purposes only. The more flexible BBR from 1993 implies that local governments can balance their budgets by use of so-called 'rainy-day' funds.⁵

The BBR is imposed *ex ante*, i.e. local governments must submit a balanced budget prior to the fiscal year. If a net operating deficit occurs, it can be carried over, but has to be 'repaid' within 4 years.⁶ Debt financing must be approved by the county governor,⁷ and this has been the effective constraint on local government borrowing. If borrowing is approved, local governments can easily find credit institutions willing to lend them money. Since local governments cannot go bankrupt and are expected to be bailed out by the national government in case of a severe financial crisis, loans to local governments are considered to have very low risk.

From 2001 borrowing and budget control have become more targeted. Only local governments that do not submit a balanced budget or plan to repay a past deficit over more than two years are subject to such control. A bit more than 10% of the local governments are subject to borrowing and budget control in 2001.

Sweden

It has been prescribed by Swedish law that the municipalities are to balance their budgets. Balanced budgets have however only been an *ex ante* claim and, until the late 1990s, there

⁴ Söderström (1998) discusses Scandinavian fiscal federalism in a comparative perspective.

⁵ Borge and Tovmo (2000) analyzes whether the more flexible BBR has led to more forward-looking behavior. There is some evidence of more forward-looking behavior in local governments with 'good' economic conditions.

⁶ The surpluses in the following 4 years must in aggregate be at least as large as the deficit.

has, *de facto*, been no requirement of budget balance. The municipalities have had large opportunities to bypass the prescription of budget balance, not the least since they have been free to borrow without any approval by the state. There were no ‘punishments’ involved for a municipality running a deficit.

The local public sector was hit by the recession in the first half of the 1990s, and the combined effect of lower grants, a falling tax base and a temporarily tax stop⁸ was a serious challenge. Many local governments found it difficult to adjust their expenditures in tandem with the fall in revenues, and some had to finance their current expenditures by borrowing. The national government was concerned by this development, and has dealt with the question of introducing a BBR and/or borrowing constraints during the last half of the 1990s. The process ended with the introduction of a BBR from 2000. The BBR implies that current revenue must be sufficient to cover current expenditures, interests, and calculated depreciation of the real capital stock. If a deficit occurs, it may be carried over, but has to be repaid within 2 years. Borrowing approval was considered not to be necessary since the new BBR prevents loan financing of current expenditures.

It is interesting to notice that the Norwegian and Swedish systems have converged during the last ten years. The Norwegian system of administrative control has introduced more market based control of borrowing, whereas the Swedish system of market-based control has built in more administrative control in terms of a BBR that will be enforced by the national government.

Denmark

The regulation of local government borrowing is more severe in Denmark than in Norway and Sweden. The main rule is that borrowing can only be used to finance investments of ‘market-based’ activities that to a large extent are financed by user charges. These activities do first and foremost include utilities like electricity, gas, heating and water supply, but also some housing and industrial buildings. Investments for other services must be financed by current revenues.

⁷ The county governor is the central government’s representative in the county.

⁸ In the years 1991-1993 Swedish local governments were not allowed to increase their tax rates.

Implications for intertemporal flexibility

The question addressed in this paper is to what extent local governments are able to smooth current expenditures in response to expected and temporary reductions in current revenues. To be specific, the revenue reduction could be in terms of lower grants or a lower tax base, and smoothing can mainly be obtained in three ways, i.e. by:

- Adjusting the financing of investments
- Reducing the level of investments
- Increasing the local tax rate

Table 1 ranks the three countries according to how efficient their local governments may use these three instruments to smooth current expenditures. Norwegian and Swedish local governments can smooth current expenditures by adjusting the financing of investments. If they expect a temporary reduction in current revenues, they can avoid a reduction in current expenditures simply by reducing the fraction of investments financed by a net operating surplus in the same year and increasing the fraction of investments financed by borrowing.⁹

In the Norwegian case, this strategy obeys the BBR as long as the local government under consideration still has a non-negative net operating surplus. However, the local government cannot freely adjust their borrowing. Loan financing must be approved by the county governor,¹⁰ who typically will emphasize to what extent the local government can handle increased debt servicing costs. The possibilities to smooth spending will differ between different types of local governments, and local governments with ‘good’ economic conditions in terms of high revenues, low debt and a low fraction of investments financed by borrowing are least likely to be liquidity constrained.

Swedish local governments do not need any approval by the state to increase the fraction of investments financed by borrowing, but in this respect market control is likely to have the same impact as administrative control. That is, local governments with ‘good’ economic conditions are least likely to meet effective credit market constraints.

⁹ Alternatively they could increase the fraction of investments financed by funds or sale of property.

¹⁰ We refer to the situation before 2001.

We find it difficult to rank Norway and Sweden in terms of the possibilities to adjust the financing of investments in response to an expected temporary reduction in current revenues. But this strategy is certainly more difficult to carry out in Denmark where loan financing is much more restricted.

Table 1: Ranking of the three countries

	Norway	Sweden	Denmark
Adjusting the financing of investments	1	1	3
Adjusting the level of investments	2	2	1
Adjusting the local tax rate	3	1	1

On the other hand, adjusting the level of investments may be a more efficient instrument for Danish local governments. A reduction in the level of investments (for purposes where borrowing is not allowed) facilitates an increase in current expenditures by the same amount. If Norwegian and Swedish local governments reduce their investments, the county governor (Norway) and the credit market (Sweden) may require that they also reduce their borrowing. If this is the case, a reduction in investments will only facilitate an increase in current expenditures that is less than the reduction in investments.

The third smoothing strategy is to maintain local revenues by increasing the local tax rates in cases where grant reductions or a lower local tax base is expected. This strategy is particularly effective if the inhabitants are not liquidity constrained. The responsibility of adjusting saving and borrowing to varying economic conditions can be shifted over to the inhabitants, and smoothing of local public consumption does not have any costs in terms of less smoothing of private consumption.¹¹ If the inhabitants are liquidity constrained, there will be a trade off between smoothing of local public consumption and smoothing of private consumption. This strategy may be more effectively used in Denmark and Sweden where local governments have more tax discretion than in Norway.

Although adjusting the local tax rates may be an important smoothing strategy, it is irrelevant in relation to the ‘*I* -model’ where spending is conditioned on revenue. The estimate of *I* provides information about the degree of consumption smoothing after revenue changes are controlled for. Consequently, only the first two smoothing strategies (adjusting the financing

¹¹ However, unstable tax rates may have costs in terms of higher tax distortions (Barro 1979).

and level of investment) are relevant in terms of explaining differences in I across the three countries.

Three testable implications can be derived from the above discussion. First, if adjusting the financing of investments is the most important smoothing strategy, we expect to find a lower I in Norway and Sweden than in Denmark. On the other hand, if adjusting the level of investments is most important, I will be lowest in Denmark. Finally, in Norway and Sweden we expect local governments with 'good' economic conditions to have a lower I than local governments with 'poorer' economic conditions. This relationship is expected to be weaker in Denmark since adjusting the financing of investments is a less important smoothing strategy.

4. Data and empirical specification

The empirical analysis is based on balanced panel data sets of Danish, Norwegian and Swedish local governments over the years 1985-1994. The number of cross section units is 275 for Denmark, 274 for Sweden and 411 for Norway. In the cases of Norway and Sweden, we exclude local governments that are consolidated during the period under study and/or handle activities that normally are a county responsibility. In addition, there were a few municipalities with unreasonably high or unreasonably low growth in spending or revenue (in at least one year). We interpreted this as measurement errors, and excluded those municipalities from the samples.

Since the theoretical model discussed in Section 2 focuses on non-durable spending, the preferred spending measure would be local government spending on non-durable goods and services. Data on non-durable spending is not available, and instead we must rely on current expenditures that include wages and purchases of goods and services for non-investment purposes. A potential problem with this approach is that the spending measure may include some spending on durables. The revenue measure includes local taxes, grants from the central government, user charges and interest. Spending and revenue are measured in real per capita terms. In the case of Sweden and Denmark, the consumer price index is used as deflator, while the national account's price index for local government consumption is used in the case of Norway. However, the estimation results are unaffected by the choice of deflator since time

dummies are included in all equations estimated. Data are provided by the Danish Ministry of Finance, Statistics Norway, and Statistics Sweden.

The development of local government spending and revenue is displayed in Table 2. There are several breaks in the series. In the case of Denmark, the sharp decline in spending and revenue in 1991 reflects new accounting standards. In Norway, the high spending and revenue growth in 1988 reflects that the municipalities became responsible for some health care institutions that earlier were a county responsibility. Moreover, the figures underestimate the actual spending and revenue growth in 1991 due to new accounting standards. For Sweden there are three breaks in the series. The first one, between 1985 and 1986, is caused by the introduction of new accounting standards. The second one, between 1991 and 1992, is due to the elderly reform in 1992, in which the municipalities overtook some responsibilities from the counties. The last one, between 1992 and 1993, is due to a grant reform, which in addition to turning matching grants into general grants decreased the total amount of grants given to the municipalities. In the empirical analysis, the breaks are controlled for by allowing separate I 's for these years.

Table 2: Real spending and revenue growth (%), 1984-1994
Unweighted averages

	Denmark		Norway		Sweden	
	Revenue	Spending	Revenue	Spending	Revenue	Spending
1984	1.9	0.7	3.7	3.8	-0.5	0.0
1985	-0.6	3.9	7.8	4.6	-0.2	1.4
1986	1.3	0.6	1.0	2.1	5.3	4.3
1987	-0.7	1.6	0.9	3.4	2.0	2.5
1988	3.4	1.0	13.0	10.6	-4.6	-0.8
1989	3.4	3.4	4.6	3.4	3.7	3.1
1990	1.5	1.5	3.0	3.6	1.0	1.1
1991	-39.4	-41.9	2.0	1.1	1.6	2.2
1992	-3.7	-3.8	3.8	5.1	17.6	13.6
1993	2.5	5.3	1.8	2.1	-14.2	-11.1
1994	4.7	2.2	3.6	2.1	-0.0	-0.4

The starting point for the empirical analysis is the empirical counterpart of equation (2):

$$\Delta \ln G_{it} = \mathbf{a}_t + I \Delta \ln R_{it} + I_x D_x \Delta \ln R_{it} + f_i + \mathbf{e}_{it} \quad (3)$$

where G_{it} and R_{it} are, respectively, spending and revenues in local government i in year t . We estimate separate models for each country. The time specific constant \mathbf{a}_t captures the real interest rate and other macroeconomic variables that are common to all local governments in the same country. Break years are captured by the third term on the right hand side, where D_x is a dummy variable that equals one if year x is a break year. f_i is a municipality specific constant term that captures any differences in time preferences across the local governments.¹²

By first differencing equation (3) to remove the municipality specific term, we arrive at the following equation:

$$\Delta^2 \ln G_{it} = \Delta \mathbf{a}_t + \mathbf{I} \Delta^2 \ln R_{it} + \mathbf{I}_x \Delta(D_x \Delta \ln R_{it}) + \Delta \mathbf{e}_{it} \quad (4)$$

The error term (\mathbf{e}_{it}) can be interpreted as the revision of future resources between period $t-1$ and period t . The revision of future resources will most likely be linked to the growth of current resources ($\Delta \ln R_{it}$). Since this correlation carries over to $\Delta \mathbf{e}_{it}$ and $\Delta^2 \ln R_{it}$, the method of ordinary least squares (OLS) may be biased. To account for the endogeneity problem, we need to use some instrumental variable method. We rely on the generalized method of moments (GMM) as developed by Arellano and Bond (1991). This method implies that lagged values of spending and revenue, dated $t-2$ and back, are valid instruments if the error term \mathbf{e}_{it} is serially uncorrelated. Our empirical strategy is to start out by using the maximum number of instruments, and then check whether the results are robust to the choice of instrument set.¹³

The GMM estimator provides one-step and two-step estimates. The estimates from the second step are efficient in the presence of heteroskedasticity, but, as shown by Arellano and Bond (1991), the estimated standard errors tend to be downward biased in finite samples. For this reason we have chosen to report the estimates from the first step, where the estimated standard errors have been corrected for heteroskedasticity. This is the same way of reporting the results as in Bond *et al.* (1999).¹⁴ When it comes to the Sargan test for the joint hypothesis of valid

¹² When the models were estimated without municipality specific constant terms in equation (3), they failed to pass the specification tests. The results are available upon request.

¹³ For the first set of estimations (presented in Table 3), we will, for comparative reasons, use both the OLS and the GMM estimator.

¹⁴ For those interested, the estimates from the second step are presented in the Appendix.

instruments and correct model specification, we rely on the second-step version since the first-step version is not robust to heteroskedasticity.¹⁵

5. Estimation results

The first set of estimation results are presented in Table 3, in which equations like (4) are estimated by both OLS and GMM. The table reports the estimate of I along with the break year interactions (I_x). When OLS is applied, the permanent-income hypothesis is rejected for all three countries. Despite this fact, a substantial share of local government spending, varying from 61% in Sweden to 87% in Denmark is determined by intertemporal optimization.

The GMM estimates indicate that a substantially higher share of local government spending is associated with intertemporal optimization, and the permanent-income hypothesis can no longer be rejected for any of the three countries. Lower estimates with GMM indicate that the error term is positively correlated with changes in current income. This is consistent with the findings of Dahlberg and Lindström (1998) and Borge and Tovmo (2000), and implies that the decision-makers anticipate that some part of the growth in current resources is permanent.

The choice of instruments was based on the assumption that autocorrelation is absent in the error term e_{it} . If this assumption is fulfilled, the error term in the estimated equation (Δe_{it}) is autocorrelated of first order. The tests reported in Table 3 support the assumption guiding the choice of instruments since first order autocorrelation is present, whereas no signs of second order autocorrelation can be found. On the other hand, none of the equations passes the Sargan test for the joint hypothesis of correct model specification and valid instruments.

The rejection of correct model specification and valid instruments may be due to heterogeneous spending behavior. As discussed in Section 3, the extent to which local governments are liquidity constrained may depend on their economic conditions. In the following we split each country's sample according to per capita revenue. For each country the local governments are divided into three groups with 'high', 'medium' and 'low' revenue.

¹⁵ More precisely, the test statistic does not follow the standard χ^2 distribution if the errors are heteroskedastic.

The split is based on average values during the period under study. Our sample split approach is similar to the approaches of Runkle (1991), Shea (1995) and Zeldes (1989) in studies of private consumption.¹⁶

Table 3: Estimation results for pooled samples, 1985-1994
OLS and GMM estimates with standard errors in parentheses

	Denmark		Norway		Sweden	
	OLS	GMM	OLS	GMM	OLS	GMM
I	0.129** (0.021)	-0.039 (0.027)	0.341** (0.029)	-0.060 (0.084)	0.386** (0.036)	-0.032 (0.061)
I_{86}					-0.028 (0.098)	0.130 (0.120)
λ_{88}			0.512** (0.044)	0.584** (0.111)		
λ_{91}	0.789** (0.033)	1.010** (0.052)	0.361** (0.078)	0.482** (0.115)		
I_{92}					0.218 (0.166)	0.309 (0.223)
I_{93}					0.334** (0.119)	0.258 (0.371)
Estimation method	OLS	GMM	OLS	GMM	OLS	GMM
R^2	0.97		0.50		0.54	
Sargan test-value/d.f.		162/106		218/107		173/106
Sargan p-value		0.000		0.000		0.000
m_1	-11.28	-11.21	-11.57	-9.49	-10.56	-10.66
m_2	0.14	0.07	0.02	0.11	1.23	2.12

Note: Time dummies are included in all equations. The Sargan test is a joint test of valid instruments and correct model specification. The figures reported are respectively the test value and the degrees of freedom in the χ^2 distribution. m_1 and m_2 are tests for first and second order autocorrelation, and follows a standard normal distribution. Lagged values of revenues and expenditures are used as instruments in the GMM regressions. * and ** denote significance at the 5% and 1% level respectively (one-tailed tests).

The estimation results for the split samples are displayed in Table 4. For Sweden lagged values of revenues and expenditures dated $t-2$ to $t-8$ ($t-7$ for the high-revenue group) are used as instrument, whereas lagged values dated $t-2$ and back (i.e., the full set of instruments) are used for Denmark and Norway.¹⁷ The specification tests perform better for the split samples. The joint hypothesis of correct model specification and valid instruments cannot be rejected in

¹⁶ Jappeli *et al.* (1998) develop a more advanced approach where the probability of being constrained is estimated in a first stage regression.

¹⁷ For Sweden, it was not possible to invert the weighting matrix when the full set of instruments was used.

any equation, and, except for the low-revenue groups in Denmark and Sweden, there are no sign of second order autocorrelation at the 5% level of significance.

Table 4: Estimation results for samples split by revenue, 1985-1994
GMM estimates with standard errors in parentheses

	<u>Denmark</u>			<u>Norway</u>			<u>Sweden</u>		
	High	Medium	Low	High	Medium	Low	High	Medium	Low
<i>I</i>	0.018 (0.039)	0.028 (0.038)	0.022 (0.046)	0.060 (0.102)	0.124* (0.073)	0.298** (0.079)	0.104 (0.084)	0.183* (0.092)	0.141* (0.085)
Sargan p-value	0.980	0.903	0.334	0.204	0.250	0.173	0.676	0.772	0.709
m_1	-6.23	-6.87	-6.79	-6.00	-8.06	-7.85	-5.87	-6.56	-6.31
m_2	0.99	-0.78	2.01	0.96	-0.31	-0.33	0.32	0.32	2.16

Note: See the notes to Table 3. For Denmark and Norway lagged values of revenues and expenditures dated t-2 and back are used as instruments, and in the case of Sweden lagged values dated t-2 to t-8 (t-7 for the high-revenue group). Separate *I* 's for the break years are estimated, but not reported.

A first observation is that the estimates in Table 4 confirm the main finding from Table 3. That is, Danish local governments behave more forward-looking than their Norwegian and Swedish counterparts do. In the Danish case, the permanent-income hypothesis is not rejected for any of the three groups, whereas the same hypothesis is rejected for two out of three groups in Norway and Sweden. Moreover, in the cases of Norway and Sweden there is evidence that *I* is linked to economic conditions. The permanent-income hypothesis cannot be rejected for the high-revenue groups, but is clearly rejected for the medium and low-revenue groups. However, the point estimates are not significantly different in terms of non-overlapping confidence intervals.

It is of interest to interpret the results in terms of the smoothing strategies discussed in section 3. The fact that Danish local governments come out with the highest degree of consumption smoothing indicates that adjusting the level of investment is a more important smoothing strategy than adjusting the financing. However, the latter strategy seems to be of some importance since *I* is linked to economic conditions in Norway and Sweden. It is an interesting result that the Swedish system of market-based control and the Norwegian system of administrative control produce similar results in terms of consumption smoothing.

The GMM estimates may vary with the choice of instruments, and in Table 5 we perform a sensitivity analysis using different sets of instruments. The first row uses lagged values of

revenues dated $t-2$ to $t-5$, the second row uses lagged values of revenues dated $t-2$ and back, etc. The finding that Danish local governments behave more forward-looking than their Norwegian and Swedish counterparts seems very robust. For all instrument sets reported the Danish estimates of I are lower than the estimates for the corresponding Norwegian and Swedish groups. However, the permanent-income hypothesis must be rejected in three out of six cases for the Danish low-revenue group.

Table 5: Sensitivity analysis, varying the instrument set
GMM estimates of I with standard errors in parentheses

Instr.	Denmark			Norway			Sweden		
	High	Medium	Low	High	Medium	Low	High	Medium	Low
R(2,5)	0.007 (0.050)	0.047 (0.051)	0.063 (0.069)	0.173 (0.119)	0.144 (0.108)	0.197* (0.117)	0.277** (0.092)	0.329** (0.112)	0.776** (0.204)
R(2,max)	0.012 (0.044)	0.075 (0.050)	0.131* (0.059)	0.165 (0.107)	0.225** (0.093)	0.310** (0.090)	0.345** (0.087)	0.326** (0.103)	0.853** (0.151)
G(2,5)	0.067 (0.085)	0.016 (0.118)	0.161* (0.087)	0.954** (0.198)	0.362** (0.145)	0.635** (0.118)	0.961** (0.199)	0.734** (0.177)	0.381** (0.088)
G(2,max)	0.123** (0.062)	0.014 (0.093)	0.152* (0.083)	0.670** (0.157)	0.382** (0.115)	0.624** (0.092)	0.974** (0.198)	0.711** (0.136)	0.352** (0.078)
R(2,5)	-0.017 (0.043)	-0.006 (0.043)	0.028 (0.046)	0.040 (0.118)	-0.013 (0.093)	0.194* (0.101)	0.060 (0.082)	0.153 (0.103)	0.122 (0.095)
G(2,5)									
R(2,max)	0.018 (0.039)	0.028 (0.038)	0.022 (0.046)	0.060 (0.102)	0.124* (0.073)	0.298** (0.079)	0.104 (0.084)	0.183* (0.092)	0.141* (0.085)
G(2,max)									

Note: See the notes to Tables 3 and 4. In the case of Sweden lagged values dated $t-2$ to $t-8$ ($t-7$ for the high-revenue group) are used as instruments in the last row.

The relationship between I and economic conditions in Norway and Sweden is less robust. When lags of expenditures are the only instruments, there is no evidence of more forward-looking behavior in local governments with ‘good’ economic conditions. The tendency is rather in the opposite direction.

6. Concluding remarks

Local governments that try to smooth spending over time may face liquidity constraints for two reasons: Credit market constraints and balanced budget rules (BBRs) imposed by higher-level government. The purpose of this paper was to analyze how different regulatory regimes in the three Scandinavian countries affect local governments' ability to smooth spending over time.

Scandinavian local governments are similar in many respects, but there is substantial variation in central government regulations of budgeting and borrowing that affects the intertemporal budget constraint. During the period under study (1985-1994), Sweden had *de facto* no requirement of budget balance and local governments were free to borrow without approval by the state. At the other extreme, local government borrowing is very restricted in Denmark. Borrowing is limited to finance investments of 'market-based' activities financed by user-charges. Norway is somewhere between the neighboring countries: There is a BBR that requires a non-negative net operating surplus. Borrowing is extensively used to finance investments, but must be approved by the state.

The empirical analysis was carried out within the context of the so-called '*I* -model' developed by Campbell and Mankiw (1990). The main finding is that Danish local governments behave more forward-looking than their Norwegian and Swedish counterparts do. Whereas the permanent-income hypothesis is seldom rejected for Denmark, it is mostly rejected in the cases of Norway and Sweden. Consequently, adjusting the level of investments seems to be a more important smoothing strategy than adjusting the financing. Moreover, there is some evidence that Norwegian and Swedish local governments with 'good' economic conditions behave more forward-looking than those with 'poorer' economic conditions. This result, however, is less robust to the choice of instruments.

Our interpretation of the results implies that the high degree of consumption smoothing in Danish local governments may come at the expense of unstable and possibly myopic investment activity. In comparison, the investment activity of Norwegian and Swedish local governments may be closer to rational forward-looking behavior. The simultaneous response of current expenditures, investments and deficits is a topic for future research.

References

- Arellano; M. and S. Bond (1991): Some tests of specification for panel data: Monte Carlo evidence and application to employment equations, *Review of Economic Studies*, 58, 277-297.
- Barro, R. (1979): A positive theory of fiscal deficits and government debt, *Review of Economic Studies*, 57, 403-414.
- Bond, S., D. Harhoff and J. van Reenen (1999): Investment, R&D and financial constraints in Britain and Germany, Working Paper 99/5, Institute for Fiscal Studies.
- Borge, L.-E. and P. Tovmo (2000): Balanced-budget-rules and the permanent-income hypothesis: An analysis of Norwegian local governments, Mimeo, Department of Economics, Norwegian University of Science and Technology.
- Campbell, J.Y. and N.G. Mankiw (1990): Permanent-income, current income and consumption, *Journal of Business and Economic Statistics*, 8, 265-279.
- Campbell, J.Y. and N.G. Mankiw (1991): The response of consumption to income: A cross-country investigation, *European Economic Review*, 35, 723-767.
- Dahlberg, M. and T. Lindström (1998): Are local governments governed by forward looking decision makers? An investigation of spending patterns in Swedish municipalities, *Journal of Urban Economics*, 44, 254-271.
- Hall, R.E. (1978): Stochastic implications of the life cycle – permanent income hypothesis: Theory and evidence, *Journal of Political Economy* 86, 971-987.
- Holtz-Eakin, D. and H.S. Rosen (1989): The ‘rationality’ of municipal capital spending: Evidence from New Jersey, *Regional Science and Urban Economics*, 19, 517-536.
- Holtz-Eakin, D. and H.S. Rosen (1991): Municipal labor demand in the presence of uncertainty: An econometric approach, *Journal of Labor Economics*, 9, 276-293.
- Holtz-Eakin, D. and H.S. Rosen (1993): Municipal construction spending: An empirical examination, *Economics and Politics*, 5, 61-84.
- Holtz-Eakin, D., H.S. Rosen and S. Tilly (1994): Intertemporal analysis of state and local government spending: Theory and tests, *Journal of Urban Economics*, 35, 159-174.
- Jappelli, T, J.-S. Pischke and N.S. Souleles (1998): Testing for liquidity constraints in Euler equations with complementary data sources, *Review of Economics and Statistics*, 80, 251-262.
- Runkle, D.E. (1991): Liquidity constraints and the permanent-income hypothesis, *Journal of Monetary Economics*, 27, 73-98.

- Shea, J. (1995): Union contracts and the life-cycle/permanent-income hypothesis, *American Economic Review*, 85, 186-200.
- Söderström, L. (1998): Fiscal federalism: The Nordic way, in J. Rattsø (ed.) *Fiscal federalism and state-local finance: The Scandinavian Perspective*, Edward Elgar, Cheltenham.
- Zeldes, S.P. (1989): Consumption and liquidity constraints: An empirical investigation, *Journal of Political Economy*, 97, 305-346.

Appendix

Table A1: Second step GMM estimates for pooled samples, 1985-1994
Standard errors in parentheses

	Denmark	Norway	Sweden
I	-0.048** (0.017)	-0.012 (0.044)	-0.044 (0.036)
I_{86}			0.119 (0.074)
λ_{88}		0.534** (0.065)	
λ_{91}	0.987** (0.031)	0.448** (0.065)	
I_{92}			0.385** (0.113)
I_{93}			0.537** (0.191)

Note: See the notes to Table 3.

Table A2: Second step GMM estimates of I for the samples split by revenue, 1985-1994
Standard errors in parentheses

Instr.	Denmark			Norway			Sweden		
	High	Medium	Low	High	Medium	Low	High	Medium	Low
R(2,5)	-0.005 (0.024)	0.094** (0.033)	0.069 (0.043)	0.168* (0.089)	0.186* (0.081)	0.179* (0.089)	0.250** (0.066)	0.372** (0.054)	0.334** (0.058)
R(2,max)	0.009 (0.015)	0.091** (0.024)	0.150** (0.025)	0.166** (0.058)	0.240** (0.067)	0.252** (0.060)	0.302** (0.055)	0.322** (0.035)	0.337** (0.038)
G(2,5)	0.072 (0.045)	0.087 (0.081)	0.125** (0.049)	1.015** (0.138)	0.338** (0.104)	0.762** (0.091)	0.933** (0.135)	0.884** (0.089)	0.915** (0.136)
G(2,max)	0.147** (0.024)	0.035 (0.050)	0.137** (0.034)	0.755** (0.087)	0.311** (0.064)	0.663** (0.060)	0.865** (0.075)	0.733** (0.052)	0.825** (0.057)
R(2,5)	-0.023 (0.008)	-0.007 (0.017)	0.023 (0.020)	0.048 (0.051)	-0.004 (0.053)	0.199** (0.058)	0.112** (0.028)	0.144** (0.029)	0.130** (0.027)
G(2,5)									
R(2,max)	-0.005 (0.011)	0.026 (0.020)	0.026* (0.015)	0.088** (0.026)	0.121** (0.021)	0.292** (0.024)	0.105** (0.028)	0.163** (0.026)	0.151** (0.026)
G(2,max)									

Note: See the notes to Tables 3, 4 and 5.