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What is the Nature of the Dynamics between Government Spending and Aggregate Output in the Nordic Countries?

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Abstract

The main aim of this paper is to examine the relationship between government consumption and aggregate output in five Nordic countries in two different scenarios: first, in periods when government consumption increases and, second, in periods when government consumption decreases. Therefore, the nonlinear ARDL model is applied to test for the presence of a short-run and long-run asymmetry in output response to government consumption. The key findings are as follows. First, based on the linear model, a positive connection between government consumption and economic activity has been confirmed, both in the short and long term, which is also in line with the predictions of economic theory. Second, based on the nonlinear model, six out of ten short-term coefficients are statistically significant, as are six out of ten long-term coefficients, with statistically significant asymmetry detected in four out of ten cases. Thus, estimated test statistics and graphical analysis suggest the presence of a negatively inclined asymmetry in the relationship between government consumption and the dynamic of aggregate output with stronger output response in periods when government consumption decreases.

Keywords: fiscal policy, Nordic countries, nonlinear ARDL model

Introduction

In the macroeconomic sense, the new millennium has shaken the foundations of economic science and called into question the predictive and explanatory power of economic theories developed on the shoulders of great economic minds and economic experiences of the 20th century. Although at the turn of the millennium macroeconomics may have functioned more and more as a sophisticated science based on rigorous mathematical models and bold assumptions and some even dared to compare them with certain physical models based on known laws of nature, economic developments over the past two decades thoroughly shook mainstream economics. By no means that economic theory and institutions of economic policy were wrong. On the contrary, most of the accumulated knowledge may even fully correspond to these times within given economic circumstances. Macroeconomics has run into difficulties because of prescribing the existing medicine to new

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economic problems, which is problematic due to the basic nature of social and, thus, economic development which has underlying characteristics of a constantly changing living organism that actively responds to stimuli and new information. Even though at first some new discoveries may seem like everlasting laws or assumptions, they can quickly trigger different behavior of those same actors in the economy, based on which some economic laws or assumptions were initially detected at all.

So, we have experienced several economic shocks, to name just the biggest, the global financial crisis with a prolonged debt crisis in the euro area, then, a period of deflationary pressures partly offset by large scale monetary measures, and, finally, the rise of the centennial epidemic and related economic shocks which still require extreme caution by the economic policy to maintain business cycle stability, even though threats of higher inflation persist. It is economic policy, both monetary and fiscal, that has come under severe scrutiny and criticism (Bernanke, 2019). If we focus only on the scientific debate and ignore the institutional malfunctions that are partly embedded in the system (Reichlin, 2020), especially in the euro area, we can recognize that in the last decade some alternative macroeconomic narratives have risen to the surface, for example, the theory of secular stagnation (Summers, 2016), the so-called permanent and persistent state of underutilization to which, until recently, the mainstream economics did not pay even the slightest attention. Although inflationary pressures emerged in 2021, this perception of inflationary pressures required more than a decade of extremely loose monetary policy, historically benevolent fiscal transfer policies, and supply-side shocks in terms of relatively large output constraints accompanied by unexpected structural turbulences (Andre et al., 2021).

Consequently, it is quite understandable to pose questions that address the issues of efficiency of economic policy where especially monetary policy is under severe pressures because of the interest rates near zero lower bound, which certainly reduces the potency of monetary policy in a function of the business cycle stabilizer. From this, it is logical that the focus of research has been shifted to the field of fiscal policy and its instruments where the transmission mechanism is yet to be fully explained (Ahuja & Pandit, 2021). Although in the last decade a macroeconomic framework has been reestablished within which fiscal policy has gained significance relative to the period before the Great Recession (Shambaugh, 2019), a detailed analysis of the effectiveness of fiscal stimuli within different scenarios and circumstances remains unclear. The main emphasis of the current research is, therefore, on the analysis of the short and long-run effects of fiscal policy on economic growth with a special focus on the impact

of structural characteristics of countries and dynamics of the business cycle on the effectiveness of fiscal measures which may help to elucidate fiscal policy transmission mechanism. One of these peculiarities is the presence of nonlinear processes in the relationship between fiscal spending and economic activity.

The main goal of this paper is, therefore, to analyze thoroughly the connection between government spending and aggregate output via the application of linear and nonlinear autoregressive distributed lag (ARDL) models on the new sample of five Nordic economies. According to economic theory, there is a positive relationship expected between government spending and the dynamics of output, thus both variables should be moving in the same direction, which can be tested with the linear model. However, the main interest is to determine whether the output response to either positive or negative dynamics in government spending is equal in its magnitude or, in other words, whether we can expect asymmetric output response in those two different scenarios. A nonlinear ARDL model is used to assess the presence of the aforementioned economic phenomenon.

The remainder of this study is comprised of the following chapters. Chapter 2 provides some insights into the nature of the relationship between government spending and economic activity through an overview of the relevant empirical literature with a special focus on Nordic countries. In chapter 3, we present the methodological framework used in this paper and, in chapter 4, we briefly describe the dataset that enters our analysis. Results are listed, explained, and interpreted in chapter 5 while chapter 6 concludes.

Empirical Literature Review

In this chapter, we present the key findings of the empirical literature in the field of examining the effectiveness of fiscal policy in ensuring sustainable and stable rates of economic growth. At the same time, we also review the main characteristics that, according to the latest findings, affect the effectiveness of fiscal incentives. Some estimates of fiscal multipliers along with specific characteristics, structural and dynamic, that determine the size of multipliers are also elaborated. Moreover, special attention is dedicated to studies that consider the sample of Nordic countries.

The foundations for the study of the transmission mechanism of fiscal policy and the effectiveness of fiscal stimulus were laid by seminal papers Blanchard and Perotti (1999) and Perotti (2002), which examined the impact of

government spending and taxes on GDP and other macro-economic variables, such as interest rates and price levels. Key findings support conventional wisdom of economic theory and can be summarized as positive estimates of the government spending multiplier and negative estimates of the tax multiplier while the potential for fiscal stimulus to boost economic growth has been diminished in developed countries since the 1980s. On the eve of the Great Recession, Giordano et al. (2007) support the notion of discretionary fiscal policy. Nevertheless, as in Blanchard and Perotti (1999) and Perotti (2002), limited capacity to fight slumps in real GDP was attributed to fiscal policy. More recently, Burriel et al. (2019) stressed the important role of discretionary fiscal policy, House et al. (2020), however, stated that austerity measures have led to greater falls in GDP over the recent decade than would be realized in the counterfactual scenario.

The evolution of economic research showed that estimates of fiscal multipliers as one of the most important metrics for studying the effectiveness of fiscal policy vary both between countries and within phases of the business cycle. Therefore, the focus of the empirical literature was moved on to the study of individual structural and dynamic factors that could explain this variation of the size of fiscal multipliers. The first set of studies examine the role of a business cycle and a common conclusion has emerged that fiscal multipliers tend to increase during recession periods (Auerbach & Gorodnichenko, 2010, 2011, 2014; Batini et al., 2012; Qazizada & Stockhammer, 2015). Nevertheless, some studies, for example, Ramey and Zubairy (2014), despite being in minority, showed that the size of fiscal multipliers does not necessarily differ between phases of the business cycle. In addition to this, Auerbach and Gorodnichenko (2017) showed that in times of severe and prolonged recession accompanied with interest rates near zero lower bound when monetary policy has a reduced capacity to stimulate the economy further, the size of fiscal multipliers increases. The gradual shift of attention to fiscal policy to ensure economic growth was greatly accelerated during the COVID 19 pandemic when the officials of monetary policy institutions urged fiscal policy authorities for a more active role, which was translated into massive fiscal expansion on the country and international level (Gaspar et al., 2021; Schnabel, 2021).

The second set of studies examines the structural characteristics of countries and their role in determining the dynamics between government spending and economic activity. There are some factors, namely lower public indebtedness, higher level of development, lower trade openness, periods of the credit crunch, and financial stress where consensus is gradually emerging in the direction of higher estimated fiscal multipliers (Ilzetzki et

al., 2013; Hory, 2016; Koh, 2017; Borsi, 2018). Nevertheless, certain studies also offer results that contradict the growing majority. Koh (2017), for example, reports that are not necessarily smaller in the case of higher trade and financial openness, fiscal multipliers and that the role of the exchange rate regime by determining the effectiveness of fiscal incentives is not clear.

As far as the analysis of the effectiveness of fiscal policy in the Nordic countries is concerned, there is less empirical evidence available. However, certain studies have addressed the aforementioned problem at least in a somewhat broader form. Ravn and Spange (2014) note that fiscal policy has only a short-run impact on economic activity with the estimated government spending multiplier being larger than the tax multiplier. The output effect of fiscal stimuli is statistically significant only in the short run. Nevertheless, the fiscal multiplier reaches the value of the impact slightly above unity. Then, its values drop to around 0.6 in one year. The quoted authors also demonstrate that exogenous shocks to government spending account for less than 10 % of the movements in output over the business cycle in Denmark. Based on the standard structural VAR methodological framework, Lehmus (2014) estimates fiscal multiplier using Finnish data. He finds spending multipliers larger than 1 in the short run and tax multipliers half of that value. Yet, tax multipliers are more persistent in time. Furthermore, if public investments data are added to the public spending variable, the expenditure multiplier becomes more persistent. Ahonen (2020) estimates with the application of the Bayesian time-varying parameters vector autoregression model on Finish economy covering for 1985-2018 that the government consumption multiplier has fluctuated over time reaching values between 1.2 and 1.85. In addition to this, she finds higher average values of the fiscal multiplier in the period 2000-2018. Nevertheless, the model does not provide any clear explanation for the increase in the cumulative spending multiplier.

Without explicit empirical research, Martorano (2015) just merely addresses the topic of the effectiveness of fiscal policy in Iceland. He compares the paths of economic recovery from the 2008 financial crisis in Iceland and Hungary and finds that the Icelandic government met the objectives of the IMF program by replacement of the previous flat tax system with a progressive tax structure while the Hungarian government, following a different strategy, had to ask for additional help. He also argues that Iceland, when pursuing the goal of inclusive economic recovery, helps to reduce income inequality with social transfers. For Norway, Aursland et al. (2020) find that the zero lower bound on nominal interest rates and downward nominal wage rigidity can account for higher

fiscal multipliers individually during recessions. In joint presence, however, the existence of downward nominal wage rigidity reduces the multiplier at the zero lower bound. They show that the state-dependency is robust to alternative assumptions about the origin of the recession, the nature of the fiscal stimulus, and its financing source.

Hjelm and Stockhammer (2016) use quarterly Swedish data set on fiscal variables, namely government consumption, investments, transfers to households, indirect taxes on consumption goods, and direct taxes on household income, and estimate the effects on GDP and employment for the period 1980-2015. According to their results, the fiscal policy generally has a Keynesian effect although often insignificant with on average larger fiscal multipliers throughout flexible exchange rate regime. In the linear model, government investment generates the strongest multiplicative effect. In the nonlinear model, however, all three fiscal spending variables, namely government consumption, investments, and transfers to households, have a substantial positive impact on employment in recession periods while the employment just barely reacts to shocks in taxes. In addition to this, the results from the nonlinear model are sensitive to fiscal instruments and the definition of recession periods. Hatemi (2014) does not find support for a discretionary fiscal policy in Sweden. This seems to be the case regardless of whether the asymmetric process is taken into account in the estimation of the impulses or not. Hence, he argues that the Ricardian equivalence might hold in the case of Sweden. Consequently, these results can also be interpreted as empirical evidence that the stance of fiscal policy, regardless of whether it is contractionary or expansionary, is not a major factor behind the performance of the Swedish economy.

The autoregressive distributed lag approach (ARDL) which is also used in this paper has been already applied to modeling fiscal policy actions. Among others, Alexiou and Nellis (2017) found that the size of the fiscal multiplier does not differ substantially over the phases of the business cycle and that government consumption has a positive effect on economic growth, regardless of inflation rates. On the other hand, there was a lack of evidence that low-interest rates significantly determine the relationship between government consumption and output. It is important to note that the study takes into account only the Greek economy. Furthermore, Sharma and Mittal (2019) provide some evidence about the presence of an asymmetric connection between fiscal deficit and GDP in the short and long run based on the nonlinear ARDL model for India where, according to their findings, fiscal deficit harms GDP. Asandului et al. (2020) estimate on a sample of twelve post-communist economies and asymmetric ARDL approach that cumulative impact of fiscal

policy generates inflationary output effect for countries in their sample.

As was shown in this chapter, many new papers have recently emerged in the field of studying and analyzing the transmission mechanism of fiscal policy, addressing various aspects of the effectiveness of fiscal stimuli in promoting economic growth. Although consensus is gradually being made, there are still different interpretations of the impact of some individual structural and dynamic factors on the size of fiscal multipliers. As a result, the transmission mechanism of fiscal policy has been only partially explained so far. For that reason, our study focuses on identifying the possible presence of asymmetric processes in the relationship between government spending and economic activity in a special sample of five Nordic countries, all of which record a relatively high share of government spending in GDP.

Methodology

For estimating the relationship between government consumption and economic activity, we initially use the linear autoregressive distributed lag model following Pesaran et al. (2001) and then, the upgraded nonlinear autoregressive distributed lag model introduced by Shin et al. (2014). The aforementioned methodological technique was applied in Senekovič (2021) by assessing the fiscal policy actions of the world's largest developed economies. However, it is also utilized in various research areas of macroeconomics, such as testing for purchasing power parity (see, for example, Arize and Bahmani oskooee (2021)) or analyzing the role of the tourism sector in aggregate output (see, for example, Husein and Kara (2020)).

The relationship between government consumption and economic activity is first estimated via the autoregressive distributed lag model following Pesaran et al. (2001) which is noted as a linear or symmetric ARDL model from here on. The model is presented in equation 1.

$$\Delta \log Y_t = \alpha_0 + \sum_{i=1}^{n_1} \alpha_{1i} \Delta \log Y_{t-i} + \sum_{i=0}^{n_2} \alpha_{2i} \Delta \log G_{t-i} + \alpha_3 \log Y_{t-1} + \alpha_4 \log G_{t-1} + \varepsilon_t \quad (1)$$

Where the coefficients α_{2i} represent short-run effects of government consumption (measured in first differences) on economic activity and the coefficient α_4 represents long-run effect estimated based on the lagged variable of government consumption. Notations are as follows. G stands for government consumption and Y stands for aggregate output.

Shin et al. (2014) upgrade the linear ARDL model by introducing some nonlinearities into it. To detect asymmetries in the relationship between independent and dependent variables Shin et al. (2014) decompose fluctuations in the independent variable, in our case in government consumption, into its positive and negative partial sums, which is represented in equation 2 and equation 3.

$$\log G_t^+ = \sum_{j=0}^t \Delta \log G_j^+ = \sum_{i=1}^t \max(\Delta \log G_{j,0}) \quad (2)$$

$$\log G_t^- = \sum_{j=0}^t \Delta \log G_j^- = \sum_{i=1}^t \min(\Delta \log G_{j,0}) \quad (3)$$

Then Shin et al. (2014) develop a nonlinear model by replacing independent variables, in our case government consumption, with partial sum components defined in equations 1 and 2. The nonlinear (asymmetric) ARDL approach is then defined in equation 4 as follows.

$$\begin{aligned} \Delta \log Y_t = & \beta_0 + \sum_{i=1}^{n_1} \beta_{1i} y_t \Delta \log Y_{t-1} + \sum_{i=0}^{n_2} \beta_{2i} \Delta \log G_{t-i}^+ \\ & + \sum_{i=0}^{n_3} \beta_{3i} \Delta \log G_{t-i}^- + \beta_4 \log Y_{t-1} + \beta_5 \log G_{t-1}^+ + \beta_6 \log G_{t-1}^- + \mu_t \end{aligned} \quad (4)$$

Where coefficients β_{2i} represent the short-run effect of government spending on economic activity in case of positive dynamics of government consumption, and coefficients β_{3i} represent the effect of government spending on economic activity in case of negative dynamics in government consumption. The long-run output effect of government spending for the case of positive and negative dynamics in government spending is represented by the coefficients β_5 and β_6 , respectively.

Data Properties

For the present study, we use a quarterly dataset for five Nordic countries, namely Denmark, Finland, Iceland, Norway, and Sweden. For all five countries, data were retrieved from the International Monetary Fund (2021). In pursuit of estimating the relationship between government consumption and economic activity with focusing on detecting potential asymmetries among those two variables, we use GDP and government final consumption expenditures as it is defined in the expenditure structure of the GDP as proxy variables. Time series for each country cover timespan from 1995Q1 to 2020Q4 which comprises

104 data points per country. For each of the five countries, government consumption and GDP data were obtained in constant national currency units in absolute terms, where-with the exception of Iceland, variables were also seasonally adjusted by the database. Finally, we transform real government consumption and real GDP variables into a logarithmic form.

Compared to other developed countries, the role of the state has been traditionally emphasized in the economies of the Nordic countries. Thus, unlike Anglo-Saxon as well as continental capitalism, Nordic capitalism is even more socially oriented in terms of providing a relatively denser social network that helps members of society overcome obstacles when their existence is threatened. As a result, the Nordic countries recorded a higher share of government expenditure in GDP, which was around or slightly above 25% for all countries in 2020, with Iceland having the highest share of 27.8% and Finland the lowest share of government consumption in GDP with 24.4%. For comparison, we cite the share of government consumption in Germany, which is considered the benchmark of continental Europe, and the European Union average. In the case of the former, the share is 22.4%, and in the case of the latter 22.7%. On the other hand, the average share of government consumption in GDP for OECD countries amounts to 18.8% (World Bank, 2021).

Interpretation of Results

In this chapter, we present the estimates for each country separately, for both the symmetric (linear) and asymmetric (nonlinear) models. In the case of the asymmetric model, the results are also shown in a graphical form where a short-dashed line represents the output response in the case of a positive change in real government spending while a long-dashed line indicates the response of real output in the case of negative change in real government consumption. The solid line represents the perceived asymmetry. The shaded area represents the 90% confidence interval in detecting output response asymmetry between the aforementioned two scenarios. Graphical representations of the results of the nonlinear model are plotted on a 20 quarters horizon. The results are presented in alphabetical order of the included countries.

In the case of Denmark (Table 1), the results of the linear model show a positive statistical link between the dynamics of government consumption and the dynamics of aggregate output with the coefficient being statistically significant in both the short and long term. The magnitude of the output effect of government consumption is stronger in the long

run. In the asymmetric model, in the short run, a positive output response is estimated in periods when government consumption increases and negative output response in periods when government consumption decreases. Conversely, in the long run, in both cases, a positive output response was observed, regardless of the dynamics of government consumption. In the nonlinear model, estimated coefficients are statistically significant only when government consumption decreases. The analysis of the output

response through the prism of detecting asymmetry is of interest where statistically significant both short-term and long-term asymmetries are found (Figure 1). In the short term, we observe a negatively inclined asymmetry, which means that under negative dynamics in government consumption, the output response is stronger in its magnitude. On the other hand, in the long run, however, this output response goes into positive territory.

Table 1. Denmark results

Linear (symmetric) ARDL model				
	Coefficient	Estimates	t-statistic	Prob. level
Constant	α_0	0.216	1.26	0.210
Short-run	α_2	0.597	3.77	0.000
Long-run	α_4	0.807	4.23	0.000
Nonlinear (asymmetric) ARDL model				
	Coefficient	Estimates	t-statistic	Prob. level
Constant	β_0	1.495	3.08	0.003
Short-run positive	β_2	0.016	0.50	0.621
Short-run negative	β_3	-0.204	-2.63	0.010
Long-run positive	β_5	0.135	0.31	0.582
Long-run negative	β_6	1.764	4.39	0.039
Asymmetry testing				
	F-statistic		Prob. level	
Short-run asymmetry	6.838		0.010	
Long-run asymmetry	9.680		0.003	

Figure 1. Asymmetry testing for Denmark

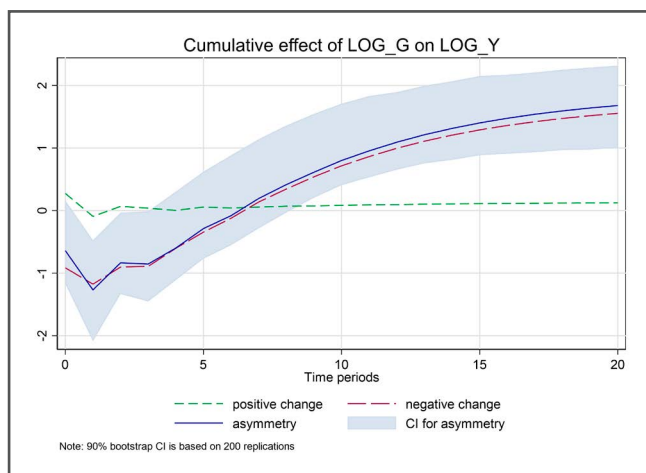


Figure 2. Asymmetry testing for Finland

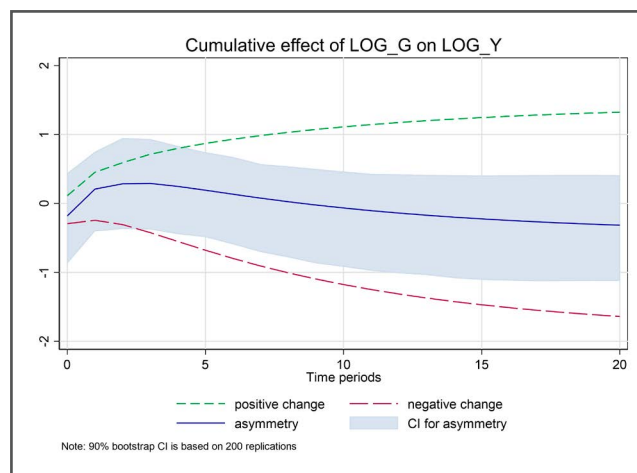


Table 2. Finland - results

Linear (symmetric) ARDL model				
	Coefficient	Estimates	t-statistic	Prob. level
Constant	α_0	0.026	0.13	0.896
Short-run	α_2	0.096	1.76	0.082
Long-run	α_4	1.123	4.30	0.000
Nonlinear (asymmetric) ARDL model				
	Coefficient	Estimates	t-statistic	Prob. level
Constant	β_0	0.776	1.73	0.087
Short-run positive	β_2	0.106	0.97	0.334
Short-run negative	β_3	-0.138	0.86	0.392
Long-run positive	β_5	1.431	3.14	0.080
Long-run negative	β_6	-1.871	1.682	0.198
Asymmetry testing				
	F-statistic		Prob. level	
Short-run asymmetry	0.561		0.456	
Long-run asymmetry	0.418		0.520	

Table 2 presents the results for Finland where a positive relationship between government consumption and economic activity is estimated within a linear model, which is in line with assumptions of economic theory. Both coefficients, short-term and long-term, are statistically significant, with the long-term effect on the output being stronger. In the nonlinear model, the estimated coefficients – except for the output response in periods of positive dynamics in government consumption – do not meet the criteria for achieving statistical standards for significance. Nevertheless, in line with economic theory predictions, a positive output response is recorded when government consumption increases and a negative output response when government consumption decreases. In terms of magnitude, a stronger long-term effect of government consumption on output is again perceived, in both scenarios, in the case of negative and positive dynamics of government consumption. From Figure 2, one can observe a relatively symmetrical response of output. Thus, it is not surprising that even through test statistics, we reject the assumption of the presence of an asymmetric response of output to changes in government consumption. Nevertheless, only based on graphical analysis and beyond statistical standards, we can only speculate that for Finland the output response is slightly stronger under positive dynamics in government spending in the short term, while in the long run, the output response is slightly more intense in the case of negative dynamics in government spending.

In the symmetric model for Iceland, we estimate a positive relationship between government consumption and economic activity. On the other hand, however, the statistical significance of both coefficients, short-term and long-term, is on the verge of admissibility (Table 3). Nevertheless, the long-term effect, which is otherwise more intense in magnitude, can still be characterized as statistically significant. Conversely, in the asymmetric model, all estimated coefficients are statistically significant, and the signs of the coefficients are also in line with the expectations of economic theory. In contrast to the results for Denmark and Finland, in the case of Iceland, a stronger short- and long-term output response is observed under the scenario where government consumption increases. Test statistics confirm the presence of an asymmetric long-term effect of government consumption on output, namely, asymmetry is slightly inclined in favor of a positive scenario. In addition to this, Figure 3 shows a slightly stronger short-run response of output in the case of negative dynamics of government consumption. This short-run asymmetry, however, is not supported by statistical criteria.

The results for Norway are mixed and a bit contradictory compared to results for other Nordic countries. Even though the linear model provides positive short-run and long-run estimates which are also statistically significant, which confirms an established positive relationship between dynamic activity in government consumption and

Table 3. Iceland - results

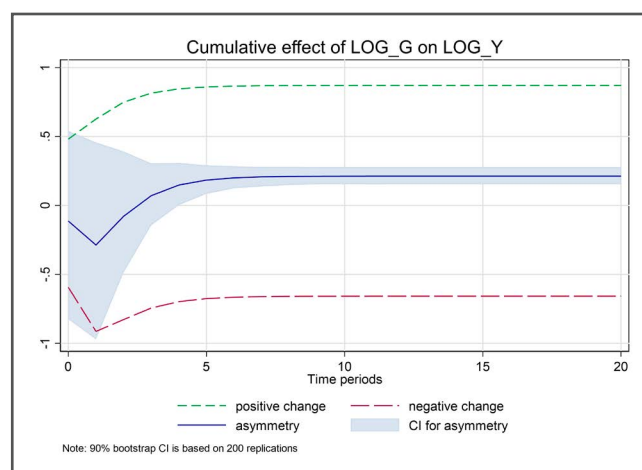
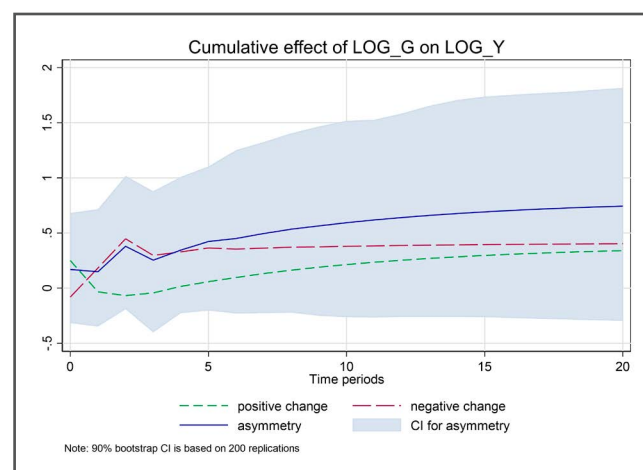
Linear (symmetric) ARDL model				
	Coefficient	Estimates	t-statistic	Prob. level
Constant	α_0	0.760	2.75	0.007
Short-run	α_2	0.163	1.64	0.105
Long-run	α_4	2.461	1.72	0.089
Nonlinear (asymmetric) ARDL model				
	Coefficient	Estimates	t-statistic	Prob. level
Constant	β_0	5.582	4.20	0.000
Short-run positive	β_2	0.390	3.60	0.001
Short-run negative	β_3	-0.295	3.03	0.003
Long-run positive	β_5	0.871	83.0	0.000
Long-run negative	β_6	-0.658	26.6	0.000
Asymmetry testing				
	F-statistic		Prob. level	
Short-run asymmetry	0.694		0.407	
Long-run asymmetry	30.38		0.000	

Table 4. Norway – results

Linear (symmetric) ARDL model				
	Coefficient	Estimates	t-statistic	Prob. level
Constant	α_0	0.688	2.92	0.004
Short-run	α_2	0.319	3.18	0.002
Long-run	α_4	0.633	5.68	0.000
Nonlinear (asymmetric) ARDL model				
	Coefficient	Estimates	t-statistic	Prob. level
Constant	β_0	2.171	2.30	0.024
Short-run positive	β_2	-0.068	-0.41	0.686
Short-run negative	β_3	0.085	2.39	0.004
Long-run positive	β_5	0.390	2.32	0.132
Long-run negative	β_6	0.413	0.18	0.673
Asymmetry testing				
	F-statistic		Prob. level	
Short-run asymmetry	0.018		0.891	
Long-run asymmetry	1.209		0.275	

economic activity, the results from the nonlinear model do not corroborate these findings (Table 4). A mere look at Figure 4 reveals the unusual response of output to the initial dynamics in government consumption. Thus, in the case of an increase in government consumption, output

initially reacts positively. After the first quarter, however, it slips into the negative zone and then continues in the positive zone after the fifth quarter. At the same time, neither the short-term nor the long-term coefficient is statistically significantly different from zero. In the scenario

Figure 3. Asymmetry testing for Iceland

Figure 4. Asymmetry testing for Norway


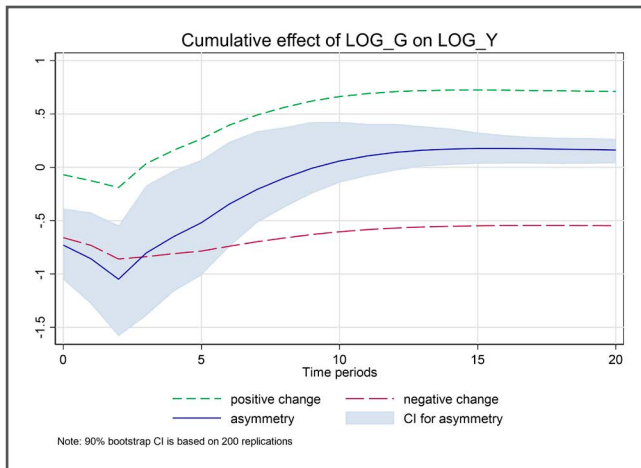
of negative dynamics of government consumption, the output response is even more unusual. Thus, at first, the reaction of the output is slightly negative. Already in the first quarter, however, it turns into a positive area and persists in it over the entire forecast horizon. In terms of magnitude, the response of output is even stronger in the case of negative dynamics of government consumption, as shown by both the estimated coefficients in Table 4 and the dynamic of output response in Figure 4.

In the case of Sweden (Table 5), based on a linear model, we estimate a positive relationship between the dynamics of government consumption and the movement of GDP,

which is also statistically significant both in the short and long term. On the other hand, the nonlinear model produces statistically significant estimates of the coefficients that also follow economic theory in signs. Only long-term asymmetry is identified through statistical standards. However, the detection of statistically significant short-term asymmetry slightly misses the limit value. Figure 5 depicts negatively inclined short-term asymmetry and positively inclined long-term asymmetry. In addition to this, based on graphical analysis, we find that the long-term asymmetry in the output response is milder compared to the short-term period.

Table 5. Sweden – results

Linear (symmetric) ARDL model				
	Coefficient	Estimates	t-statistic	Prob. level
Constant	α_0	0.383	1.85	0.068
Short-run	α_2	1.968	13.2	0.000
Long-run	α_4	0.805	5.58	0.000
Nonlinear (asymmetric) ARDL model				
	Coefficient	Estimates	t-statistic	Prob. level
Constant	β_0	1.759	3.22	0.002
Short-run positive	β_2	0.123	2.77	0.007
Short-run negative	β_3	-0.059	1.71	0.090
Long-run positive	β_5	0.734	47.9	0.000
Long-run negative	β_6	-0.352	5.17	0.026
Asymmetry testing				
	F-statistic		Prob. level	
Short-run asymmetry	2.011		0.160	
Long-run asymmetry	10.47		0.002	

Figure 5. Asymmetry testing for Sweden

Bottom line, the results in the case of empirical analysis of the relationship between government consumption and economic activity in the Nordic sample and by applying a linear model show the existence of a positive relationship between government consumption and output dynamics in both short and long term. A statistically significant positive short-term relationship was found in four out of five cases while a statistically significant positive long-term relationship was estimated for all countries included in our sample.

On the other hand, the results of the nonlinear model are somewhat less unambiguous. First, six coefficients out of ten are assessed as statistically significant in the short-term analysis of the output effect of government consumption. Second, six coefficients out of ten are estimated as statistically significant in the analysis of the long-term impact of government consumption on economic activity. Third, signs of estimated coefficients are in line with economic theory, except for Norway where estimates suggest a different interpretation, and Denmark in the scenario of negative dynamics of government consumption and assessment of long-term impact. And finally, statistically significant asymmetry is detected in four out of ten cases considering both short- and long-run asymmetry for five sample countries. Nevertheless, the results regarding the perception of the asymmetry in the output response to the initial change in government consumption need further clarification.

The graphical analysis alone reveals a slightly more complete picture with an asymmetric short-term output response observed in three out of five cases. If we exclude results for Norway, for which estimates are relatively atypical, and Finland, for which we found rather symmetric output response, in the case of Denmark, Sweden, and conditionally Iceland, however, we can safely speak of detected negatively inclined short-run asymmetry. As

regards the graphical analysis of the long-term effect of government consumption on economic activity, asymmetry can be detected when Norway is excluded due to atypical results and Finland due to a relatively symmetrical output response. This is especially evident in the case of Sweden and Iceland, which is also confirmed by test statistics while in the case of Denmark there is a statistically significant long-run asymmetry. However, the interpretation of the Danish output response is a bit contrary to conventional economic wisdom.

Our results are partially comparable with the results of studies that estimate the size of fiscal multipliers depending on the business cycle phase, with most of these studies finding higher multipliers during recession periods. Assuming that the negative dynamics in government consumption coincides with recessionary periods, in the cases of Sweden, Denmark, and partly Iceland where negatively inclined short-run asymmetry is detected, our results are in line with, for example, Auerbach and Gorodnichenko (2010, 2011, 2014), Batini et al. (2014), and Koh (2017) who all assessed larger fiscal multipliers in times of recession. It is also interesting that our results which are indeed estimated based on a more recent data sample show a negatively inclined short-term asymmetry in the Swedish case which is not consistent with Hatemi's (2014) estimates.

Although the results for the sample of the five Nordic countries do not offer a completely clear interpretation, we can, nevertheless, at least partially support the assumption that the dynamics in government consumption have a stronger effect on output during periods of declining government consumption. As a result, the application of austerity measures during recessionary periods works counterproductive, because spending cuts deepen fiscal deficit instead of improving the country's fiscal position.

Conclusion

Explaining the transmission mechanism of fiscal policy in stabilizing the business cycle has gained importance over the last decade. Several issues have arisen addressing differences in the effectiveness of fiscal stimuli in boosting economic growth. According to the recent empirical literature, the heterogeneity in the impact of fiscal stimuli could be explained mainly due to structural differences among individual economies, e.g. trade or capital openness, the level of public or private indebtedness, but also due to cyclical and, thus, non-linear processes in business cycle dynamics. The change in the research focus and the shift to the fiscal field coincides with the development of the economic reality after the Great Recession, which is marked by the relatively exhausted

potential of the monetary authorities and lower average rates of economic growth.

In this paper, we focus on testing the presence of nonlinear or asymmetric processes in the relationship between government consumption and economic activity. Using a nonlinear ARDL model based on the quarterly sample of the five Nordic countries, we check for the presence of short-term and long-term asymmetry in the response of output to the initial positive or negative dynamics in government spending.

The main findings of our research are the following. Based on the linear model, a positive link between government consumption and economic activity has been confirmed, both in the short and long term, which is in line with the predictions of economic theory. Based on the nonlinear model, six out of ten short-term coefficients are statistically significant as are six out of ten long-term coefficients, with results for Norway not offering the possibility of a clear economic interpretation. Thus, based on estimated test statistics and graphical analysis, we can conclude on the presence of short-term or long-term asymmetry in three of the remaining four countries, as in the

Finnish case the output response in both scenarios turned out to be relatively symmetric. Nevertheless, the results suggest the presence of a negatively inclined asymmetry in the relationship between government consumption and economic activity with stronger output response in periods when government consumption decreases. The results, therefore, support the notion that the reduction of fiscal spending in recessionary periods induces a stronger output response and, consequently, further decline of economic activity, which in turn leads to additional fall of aggregate tax revenue and further deterioration of fiscal balance.

Future research should be focused on expanding the sample countries, especially in terms of differentiation of the countries according to their structural and dynamic characteristics, which can, in fact, contribute to a better understanding of the capabilities of fiscal policy to effectively counteract business cycle deviations. Additional research effort should also be directed to expand the basic model with additional variables, which would allow even more detailed analysis and understanding of the specifics of the fiscal policy transmission mechanism.

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Kakšna je narava dinamike med državno potrošnjo in agregatnim outputom v nordijskih državah?

Izvelek

Glavni namen tega članka je analiza razmerja med državno potrošnjo in agregatnim outputom v petih nordijskih državah v primeru dveh različnih scenarijev: prvič, v obdobjih, ko se državna potrošnja povečuje, in drugič, v obdobjih, ko se državna potrošnja zmanjšuje. Za testiranje prisotnosti kratkoročne in dolgoročne asimetrije pri odzivu outputa na državno potrošnja uporabimo nelinearni ARDL model. Ključne ugotovitve so naslednje. Prvič, na podlagi linearne modela je bila potrjena pozitivna povezava med državno potrošnjo in ekonomsko aktivnostjo tako na kratek kot na dolgi rok, kar je tudi v skladu z napovedmi ekonomske teorije. Drugič, na podlagi nelinearnega modela je šest od desetih kratkoročnih koeficientov ocenjenih za statistično značilne, prav tako šest od desetih dolgoročnih koeficientov, pri čemer je statistično značilna asimetrija odkrita v štirih od desetih primerov. Ocenjena testna statistika skupaj z grafično analizo tako kaže na prisotnost negativno nagnjene asimetrije v razmerju med državno potrošnjo in dinamiko agregatnega outputa z močnejšim odzivom outputa v obdobjih, ko se državna potrošnja zmanjšuje.

Ključne besede: fiskalna politika, nordijske države, nelinearni ARDL model