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The EU's fiscal targets and their economic impact in Finland

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Abstract

In this paper, we quantify time-varying fiscal multipliers using Finnish economic data and address questions about the design of the fiscal adjustment currently needed to comply with the EU's fiscal targets. We find that the necessary adjustment is likely to be larger than what is proposed in the current fiscal plans. The consolidation measures slow the economic recovery, and their cumulative multiplier effect on economic activity is close to 1 in the period 2016-2019. Despite the large fiscal multipliers, we do not find significant benefits in delaying the fiscal consolidation in terms of the present value of the GDP, at least given the current economic forecasts. Our results suggest that the emphasis of the government's fiscal plans on net revenue measures (defined as gross revenues minus transfers) seems to be well-placed.

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1 Introduction

In this paper, we quantify time-varying fiscal multipliers using Finnish economic data and an augmented version of Auerbach and Gorodnichenko (2012a) model. We then apply the model to address questions about the design of economic consolidation: (1) How much fiscal effort is needed to comply with the EU's fiscal targets and how large is the associated output response? (2) How much does the relative weighting of the consolidation measures between revenue and spending matter for the size of the output response? (3) Is it beneficial in terms of the present value of (real) GDP to delay the fiscal consolidation?

We first use our model to quantify the consolidation measures that are necessary in Finland to adjust the structural budget balance[1] in accordance with the EU's fiscal rules. Based on our model, we find that the needed fiscal adjustment is likely to be larger than that is proposed in the current fiscal plans.[2] According to our results, the consolidation measures slow the economic recovery, and their cumulative multiplier effect on economic activity (the real GDP) is close to 1 in the period 2016-2019. Our results suggest that the current emphasis of the government's fiscal plans on net revenue (gross revenue minus transfers) seems to be well-placed. The analysis implies that subjecting the economy to government spending (government consumption and investment expenditure) consolidation would result in a larger negative effect on economic activity and require substantially larger consolidation.[3]

[1] The budgetary position of the public finances, when the effects of economic cycles and one-off expense and income items are eliminated

[2] Whereas the government's current fiscal plans propose a total of 3.5 billion EUR consolidation measures in 2016-2019, the necessary adjustment in our model is roughly 5.5 billion EUR (3.5-9 billion EUR at the 90 % confidence interval) during the same time period.

[3] In terms of the government spending multipliers, our estimates are in line with Auerbach and Gorodnichenko's (2012a) findings. The multiplier is much larger in recessions than in expansions. In the expansions, the revenue multiplier behaves similarly with the spending multiplier, while the multiplier in recessions suggests that (in the relevant time horizon) the revenue impact can be quite sluggish.

Despite the large fiscal multipliers, we do not find significant benefits in delaying the fiscal consolidation, at least given the 2015 economic forecasts by the Ministry of Finance. Several factors contribute to this finding. First, in the current forecasts, expected GDP growth does not greatly exceed the forecasts for the government interest rates. Thus, the forecasts do not generate incentives to wait. Instead, the increasing debt due to the postponed balancing of the budget deficit may generate the need for larger consolidation in the near future if the fiscal policy is later set to eliminate the increase in public debt caused by the initial delay. Second, based on the results, it seems that the time-variation of the fiscal multipliers is difficult to exploit with a discretionary fiscal policy. Although the spending multiplier is large in recessions, delayed consolidation appears to revoke a worsening of the business cycle that is sufficient to remove the benefits from the delay. Furthermore, the net revenue multiplier seems not to increase greatly in recessions.

We acknowledge that the design of the consolidation involves many uncertainties. First, our measurement of the necessary consolidation is based on the historical, average consolidation measures (structural shocks to the net revenue and the spending series) that we estimate based on our data. This provides some ambiguity in the comparison between the actual and model outcomes. Second, policy makers should be aware that the capacity of the output gap and economic forecasts to filter out cyclical fluctuations and measure cyclical phase effects on the budgetary position is limited, which may result in an under- or overestimate of the budgetary position independent of the economic cycle.[4] Third, our results suggest that consolidation can potentially be far less damaging under more robust economic growth, and thus, the optimal timing and the impact of the consolida-

[4] The discretionary assessment method used as the methodological alternative to the structural balance in the EU framework (the spending rule) may steer the fiscal policy in a more countercyclical direction (Kuusi 2015).

tion ultimately depend on the success of the actions taken to foster growth.[5]

This paper is organized as follows. In section 1, we review the recent literature. In section 2, we discuss the EU's fiscal rules and the methodology. In section 3, we introduce the data and characterize the estimated regime-specific responses of the econometric model. In sections 4 and 5, we analyze the design of the fiscal adjustment programs. In section 6, we conclude the paper.

2 Literature

The fiscal multiplier (typically defined as the change in output resulting from a unit increase in a fiscal variable) is one of the most frequently studied topics in all of macroeconomics. The extensive and growing literature approaches the topic from an empirical and a theoretical viewpoint. Our goal here is not to give a complete review of this literature. Instead, our aim is to give a brief overview of the studies that are most relevant to our approach. More extensive surveys can be found, for example, in Ramey (2011), Virkola (2014), and Batini et al. (2014).

When estimating multipliers, we rely on the econometric methods that are used in the existing literature. We build on Blanchard and Perotti (2002), who use a very similar identification scheme, but they focus on the average multiplier (in a linear structural vector autoregressive (SVAR) model) instead of time-varying multipliers. Using US data, they find government spending has a positive multiplier of around one and taxes have a negative multiplier of a roughly similar size when the multiplier is defined as the peak response of the GDP to the initial impulse in the fiscal variable. Perotti (2005) uses the same modeling strategy but includes additional variables (inflation and interest rates) in the model. He also estimates multipliers for a handful of other developed economies in addition to

[5] Other unresolved issues include credibility of the fiscal policy, social fairness, and the political unrest that the measures can generate.

the US and finds that there seems to be some heterogeneity in fiscal multipliers among countries and across different specifications with US being the country where the government spending multiplier is the largest. Overall, the size of the estimated multipliers in these two related studies then is quite modest.

In this work, we extend Blanchard and Perotti's (2002) approach in several ways. First, we consider regime-specific multipliers similar to Auerbach and Gorodnichenko's (2012a). They use a non-linear smooth transition vector autoregressive (STVAR) model and find that the multiplier is larger in recessions than in economic expansions.[6] This result is in line with the basic Keynesian notion that the multiplier is larger when there are idle resources in the economy. The finding has potentially important policy implications. The variation could, under some conditions, be exploited by using a more counter-cyclical fiscal policy in order to achieve gains in cumulative GDP (see Fletcher and Sandri, 2015). Furthermore, it seems that the effects of fiscal consolidation were underestimated by economic forecasters in the recent economic crisis (see Blanchard and Leigh, 2013).

Second, we follow the recent literature that modifies the Blanchard and Perotti (2002) framework by considering expectations of future fiscal measures. An important issue in fiscal multiplier analysis is the effect of fiscal foresight (see, for example, Beaudry and Portier, 2014; Leeper et al., 2013). With fiscal foresight we mean that economic agents can anticipate future shocks to fiscal variables. If

[6] In addition to the multiplier depending on the economic cycle, the literature has identified other qualities that might affect the size of the multiplier over time or across countries. For example, multipliers are expected to be larger when monetary policy does not endogenously respond to a fiscal policy shock (see Christiano et al., 2011) and multipliers are found to be smaller in developing than in developed countries (Ilzetzki et al., 2013). In addition, countries that have a floating exchange rate are more open to trade or that are under a large debt burden are found to have smaller multipliers (Ilzetzki et al., 2013). The size and persistence of the fiscal shock and how it is financed can also affect the multiplier. However, in our analysis, we are interested only in the variation caused by the economic cycle as we are not interested in comparing multipliers across countries but only in Finland.

this is not taken into account, there is a risk that the results are biased as the researcher and the agents in the economy have different information sets. In fact, this scenario can considerably affect the results (see Leeper et al., 2013).

Auerbach and Gorodnichenko (2012a) find that taking fiscal foresight into account has an effect on the estimated multipliers in recessions and expansions compared to the baseline model, although the size and the direction in which the multipliers change varies with the specification used. In a recent paper, Caggiano et al. (2015) analyze the fiscal multiplier in a similar STVAR framework and take into account fiscal foresight. They use generalized impulse responses instead of impulse responses where the regime is assumed to stay in a full-blown recession or expansion for the entire period as in Auerbach and Gorodnichenko (2012a). Caggiano et al. (2015) find that in their baseline specification the output response to an anticipated government spending shock is not statistically larger in recessions than in expansions. However, there is a meaningful difference in these estimates if one focuses on deep recessions and strong expansions that are defined as points in time when the regime variable is at least two standard deviations from its mean (Caggiano et al., 2015).

For Finland, the literature on fiscal multipliers is scarce. However, there are some empirical estimates of their size. Following Blanchard and Perotti's (2002) methodology and using Finnish data, Lehmus (2014) estimates government spending has a peak multiplier of around 1.3 after five quarters and a tax increase has a (negative) peak multiplier of roughly -0.6 after nine quarters. This would suggest that the spending multiplier in Finland might be somewhat larger than in an average economy. Virkola (2014) studies the effect of the exchange rate regime for fiscal multipliers by comparing the multipliers in two otherwise similar economies, Finland and Sweden. He also finds by using the Blanchard and Perotti (2002) modeling strategy that the government spending multiplier is large whereas for

Sweden the estimated multiplier is close to zero. When Virkola (2014) adds a variable that controls for fiscal foresight, he finds the estimated size of the multiplier is larger than without the variable. To our knowledge, our paper is the first to estimate regime-specific effects of fiscal policy for the Finnish economy as Lehmus (2014) and Virkola (2014) use linear SVAR models.

We acknowledge methods other than the usual SVARs have also been used to empirically estimate fiscal multipliers. One method is local projection introduced by Jorda (2005). This method relies on directly estimating the fiscal multiplier by using linear regressions instead of trying to estimate the true multivariate model of the economy in the form of a VAR. Using local projections, Auerbach and Gorodnichenko (2012b) estimate regime-specific fiscal multipliers for a group of OECD countries and find again that the multipliers are larger in recessions than in expansions. However, Owyang et al. (2013) and Ramey and Zubairy (2014) find using the same framework, that there is no difference in the multipliers in different regimes. This, however, can be explained by the way that the multiplier is calculated as explained in Ramey and Zubairy (2014).

We should also point out that although we report estimated regime-specific multipliers, we focus on the effects of alternative consolidation programs which is something not widely done in the literature. In a somewhat related study, Jorda and Taylor (forthcoming) analyze the regime-specific effects of fiscal consolidation. They find that austerity measures may have a considerable negative effect on growth and that the effect is larger when the economy is in recession (fiscal consolidation of 1% of the GDP results in a GDP loss of 3.5% in five years) than in an expansion (GDP loss of 1.8% under the same consolidation).

3 Methodology

In this section, we introduce the key elements of the simulation model.

3.1 The EU's fiscal rules

We start by introducing the EU's fiscal rules. As the preventive arm of the Stability and Growth Pact (SGP) is currently applied in the Finnish case (the 3 % and 60 % deficit and debt criteria of the excessive deficit procedure criteria are not breached), we focus on the set of rules under EU legislation.

A key concept in the preventive arm is the structural budgetary position (SB). The SB measures the budgetary position of public finances, when the effects of economic cycles and one-off expense and income items are eliminated (Mourre et al., 2013; Havik et al., 2014). In the preventive arm, the SB is used to define the medium-term objective (MTO)[7] for budgetary positions in public finances. In this exercise, we set the MTO in accordance with Finland's current MTO, a structural balance of -0.5 per cent of the GDP, which equals the minimum level required by EU regulations.

Furthermore, the preventive arm uses the structural budgetary position and the increase in spending to assess deviations from the MTO or from the path toward it. If the country has not achieved its MTO, the adjustment toward the required objective must be at least 0.5% of the GDP on an annual basis, in such a manner, however, that the adjustment effort is higher in good times and lower in bad times. At present, the adjustment towards the MTO is defined in accordance with the European Commission's matrix of required annual fiscal adjustments (2015, appendix 2). The MTO is considered to have been achieved if the structural balance deviates from the objective by less than 0.25 per cent of

[7]The Fiscal Compact obliges the member states to set an MTO; as a result, this obligation is included in their national legislation. In the Fiscal Compact, the lower limit of the MTO for countries in the Eurozone was set to a budgetary position of -0.5%, except in the case of countries whose debt is less than 60% and that do not have long-term sustainability risks (in which case the lower limit is -1%). The MTO links the rules to long-term sustainability assessments of the public economies, since the MTO is evaluated every three years as based on a long-term sustainability indicator that estimates the level of debt of the public economy and the aging of the population. For more information on the estimation of the MTO, see the European Commission (2013a).

GDP. When the MTO has been achieved, it must be continuously adhered to.

The assessment of the SGP's preventive arm deviates with respect to the ex post, in-year, and ex ante evaluation. Based on the preventive arm, the assessment of the sufficiency of the measures, particularly over the last year (ex post), is the key issue. In the ex post evaluation, the significant deviation procedure can be applied only if the deviation from the MTO in the previous year was more than 0.25% of the GDP. Furthermore, a significant deviation from the required structural adjustment path must be observed – at least 0.5% of GDP in one year, or 0.25% of GDP in two subsequent years – as compared to the adjustment path. The deviation assessment is performed based on the structural balance and the spending benchmark, while taking account of the cyclical state. According to the spending benchmark, public spending may grow only at the same rate as the potential medium-term GDP used as the reference. Unlike the SB, the spending rule evaluates potential production in the medium-term, cyclical spending items are subtracted from public spending more directly than in assessments based on an output gap or standard cyclic elasticity, and the revenue trend is measured based on the observed decisions on the revenue basis and assessments of their effects (see, e.g., Kuusi, 2015, for details).

In what follows, the adjustment toward the MTO is defined in accordance with the European Commission's (2015) matrix of required annual fiscal adjustments that is available in the Appendix of this paper. We assume that the flexibility guidance is applied (that is, the relevant macroeconomic variables are measures) before the additional consolidation measures are taken.[8]

If the structural balance deviates from the objective, we address the significance of the deviation. We focus on the SB in our simulations; while the mea-

[8] Finland's required fiscal effort for 2016 is currently fixed based on the spring 2015 forecasts of the macroeconomic variables for 2016. The required adjustment is currently 0.5 pps in 2016 and 0.6 pps in 2017.

surement of the spending rule is beyond the scope of this paper. However, we acknowledge the importance of the spending rule in serving as inputs for tuning financial policy. Therefore, in discussions of our results we rely on a recent report by Kuusi (2015) that assesses the challenges in the European Commission's method of calculating the SB based on an output gap, and examine alternative indicators that might be used to steer the fiscal policy.[9]

While we focus on the preventive arm of the SGP that currently applies to Finland, our model also allows us to ask, whether the fiscal adjustment is in compliance with a sufficient pace of debt reduction, as defined by the debt reduction benchmark in the corrective arm of the SGP. If that is not the case, the country may be subjected to the excessive deficit procedure.

The debt benchmark is governed by three conditions, and to comply with the benchmark, at least one has to hold (European Commission, 2013). First, the differential of debt compared to the reference value has decreased over the past three years at least at an average rate of 1/20 as a benchmark, which is measured by the excess of the debt ratio reported for the year t over a backward-looking element of a benchmark for debt reduction. Second, the budgetary forecasts indicate that, at unchanged policies, the required reduction in the differential will occur over the three-year period encompassing the two years following the final year for which data are available, which is measured by the excess of the debt ratio forecast for year t+2 over a forward-looking element of a benchmark for debt. Third, the breach of the benchmark can be attributed to the influence of the cycle, to be assessed according to a common methodology to be published by the European Commission. In particular, the European Commission uses a cyclically adjusted debt measure to address the influence of the cycle.

[9] In particular, the results produced by the application of the spending rule – and its counterpart in the corrective part, the bottom-up assessment method - suggest that a financial policy based on them could have been more countercyclical than that based on the output-gap-based SB: more contractionary in expansions, and more expansionary in recessions.

3.2 Estimation of the regime-specific responses of economic activity

We next introduce a model that estimates the output impacts of the fiscal adjustment measures. We build our framework on Auerbach and Gorodnichenko's (2012a) STVAR model that we use to estimate the effects of fiscal policies that can vary over the business cycle. The key equations of the model are the following:

$$X_t = C + F(z_{t-1})\Pi_R X_{t-1} + (1 - F(z_{t-1}))\Pi_E X_{t-1} + \epsilon_t \tag{1}$$

$$\epsilon_t \sim N(0, \pi_t) \tag{2}$$

$$\Omega_t = F(z_{t-1})\Omega_R + (1 - F(z_{t-1}))\Omega_E \tag{3}$$

$$F(z_{t-1}) = \frac{exp(-\gamma z_{t-1})}{(1 + exp(-\gamma z_{t-1}))}, \gamma > 0, z_t \sim N(0,1) \tag{4}$$

The model allows two types for differences in the propagation of structural shocks: 1) contemporaneous via differences in covariance matrices for disturbances Ω_R and Ω_E and 2) dynamic via differences in lag polynomials $\Pi_R(L)$ and $\Pi_E(L)$. In our benchmark estimation, we use four endogenous variables X_t: general government (net) revenue (R_t^{net}) that includes government gross revenue minus transfers, general government spending G_t that includes government consumption and investments, the GDP_t, and the expected change in the structural budget balance one year ahead $E_t = E_t[SB_{t+4}/GDP_{t+4} - SB_t/GDP_t]$ with quarterly indexation. The first three variables are measured in (log) per capita and real terms. The GDP deflator is used as the inflation variable in each case. The role of the expectation variable is to control for fiscal foresight and the consistency of expectations during the consolidation program.[10]

[10] We collect biannual forecasts of fiscal variables and differentials between potential and actual GDP growth rates to approximate changes in the structural balance. In the exercise, we interpolate the variables to quarterly frequency.

Variable z is an index normalized to have unit variance so that γ is scale invariant of the business cycle, with a positive z indicating an expansion. Adopting the convention that $\gamma > 0$, we interpret $\Omega_R(L)$ and $\Pi_R(L)$ as describing the behavior of the system in a (sufficiently) deep recession ($F = 1$) and $\Omega_E(L)$ and $\Pi_E(L)$ as describing the behavior of the system in a (sufficiently) strong expansion ($F = 0$). We date the index z by t − 1 to avoid contemporaneous feedback from policy actions into whether the economy is in a recession or an expansion.

Following Auerbach and Godornichenko (2012a), we set z equal to a seven-quarter moving average of the output growth rate. However, instead of using the centered average over the quarters $[t-3, t+3]$ as in Auerbach and Godornichenko (2012a), we follow Caggiano et al. (2015) in using the moving average of past values. In particular, we consider the moving average over the period $[t-6, t]$ as z_t. The key advantages of using this measure of z is that we can easily consider dynamic feedback from policy changes to the state of the regime (policy shocks can alter the regime).

Following Auerbach and Gorodnichenko (2012a), we use maximum likelihood and Chernozhukov and Hong's (2003) Markov Chain Monte Carlo (MCMC) method of to estimate our non-linear STVAR model represented in Eqs. 1-4. We employed The Metropolis-Hastings algorithm, which means that at each iteration we draw a candidate vector of parameter values and stochastically either rejected or accepted with a probability that is proportional to the value of the associated likelihood function. After multiple iterations, this method yields a chain of possible parameter values, and given the algorithm used, their distribution also provides the probability distribution of the parameter values as the time spent at each candidate vector is proportional to the value of the likelihood function. The only differences in our estimation procedure compared to Auerbach and Gorodnichenko (2012a) is that we use more draws and a longer burn-in period for the MCMC to make sure that we achieve, in all of our estimations, the desired acceptance rate for candidate draws (0.3) when we apply this method.

To identify structural shocks during the simulation, we use the Blanchard and Perotti identification scheme. Our starting point is, similar to Auerbach and Godordnichenko (2012a), the Blanchard and Perotti (2002) paper, which estimated multipliers for government purchases and taxes on quarterly US data with the identifying assumptions that (i) discretionary policy does not respond to output within a quarter, (ii) nondiscretionary policy responses to output are consistent with auxiliary estimates of fiscal output elasticities, (iii) innovations in fiscal variables not predicted within the VAR constitute unexpected fiscal policy innovations, and (iv) fiscal multipliers do not vary over the business cycle. We consider an expectation-augmented, regime-specific extension to the classic identification scheme.[11] To capture the structural shocks, we consider the following system of identifying equations:

$$\epsilon_{g,t} = s_{g,t}, \tag{5}$$

$$\epsilon_{r,t} = a_1 * \epsilon_{y,t} + a_2 * \epsilon_{g,t} + s_{r,t}, \tag{6}$$

$$\epsilon_{y,t} = c_1 * \epsilon_{r,t} + c_2 * \epsilon_{g,t} + s_{y,t}, \tag{7}$$

$$\epsilon_{E,t} = d_1 * \epsilon_{r,t} + d_2 * \epsilon_{g,t} + d_3 * \epsilon_{g,t} + s_{E,t}, \tag{8}$$

The first equation states that shocks in tax revenues and output have no contemporaneous effect on government spending (within a quarter). As argued in Blanchard and Perotti (2002) and Auerbach and Gorodnichenko (2012a), this identifying minimum-delay assumption may be a sensible description of how gov-

[11] Whereas Auerbach and Gorodnichenko (2012a) rely mainly on the Cholesky decomposition in identifying structural shocks, we resort to the Blanchard and Perotti (2002) framework to make comparisons between the impact of revenue and spending measures on economic activity.

ernment spending operates because in the short run the government may be unable to adjust its spending in response to changes in the fiscal and macroeconomic conditions.

The second equation states that unexpected movements in taxes within a quarter, t, can be due to one of three factors: the response to unexpected movements in the GDP, captured by $a_1 * \epsilon_{y,t}$, the response to structural shocks to spending, captured by $a_2 * \epsilon_{g,t}$, and the response to structural shocks to taxes, captured by $s_{r,t}$.

We rely on institutional information about tax, transfer, and spending programs to construct the parameter a_1. The coefficient captures two different effects of activity on net revenues: the automatic effects of economic activity on revenues under existing fiscal policy rules and any discretionary adjustment made to fiscal policy in response to unexpected events during the quarter. The key to our identification procedure is to recognize that the use of quarterly data virtually eliminates the second channel. As Blanchard and Perotti (2002) argue, direct evidence of the conduct of fiscal policy suggests that it takes policy makers and legislatures more than a quarter to learn about a GDP shock, decide what fiscal measures to take in response, pass these measures through the legislature, and actually implement them.

Thus, to construct a_1, we need only to construct the elasticities to the output of government purchases and of taxes minus transfers. To obtain these elasticities, we use information about the features of the spending and tax/transfer systems. [12]To solve, a_2, we use OLS estimation, and two, regime-specific explanatory variables ($F_t * \epsilon_{g,t}$, $(1 - F_t) * \epsilon_{g,t}$) to explain the cyclically-adjusted, reduced form tax

[12]We calibrate the parameter to 1.16 based on the ETLA's earlier estimations based on quarterly data from 1995 onward (See, Virkola, 2014), but we acknowledge that there is some uncertainty in the estimate. The European commission currently uses 1.12, while Virkola (2014) suggests that the estimate is smaller when earlier data are used. Thus, we investigate the robustness of our results to different values of a_1.

residuals, $\tilde{\epsilon}_{r,t} = \epsilon_{r,t} - a_1 * \epsilon_{y,t}$. The estimated coefficients of the two explanatory variables yield the regime-specific a_2's.

The third equation in the system of Eqs. 5 - 8 states that unexpected movements in output can be due to unexpected movements in taxes, $c_1 * \epsilon_{r,t}$, unexpected movements in spending, $c_2 * \epsilon_{g,t}$, or to other unexpected shocks, $s_{y,t}$. We use the regime-weighted, cyclically-adjusted, reduced form tax residuals $(F_t * \tilde{\epsilon}_{r,t}, (1 - F_t) * \tilde{\epsilon}_{r,t})$ as instruments for estimating regime-specific c_1 and c_2 in a regression of $\epsilon_{y,t}$ on the regime-specific spending and tax residuals $(F_t * \epsilon_{g,t}$, $(1 - F_t) * \epsilon_{g,t}$, $F_t * \epsilon_{r,t}$, $(1 - F_t) * \epsilon_{r,t})$.

Finally, the fourth equation states that expectations regarding the structural balance can change as a result of changes in revenue $d_1 * \epsilon_{r,t}$, spending $d_2 * \epsilon_{g,t}$, the output $d_3 * \epsilon_{y,t}$, as well as surprise changes in the expectations $d_4 * \epsilon_{E,t}$. For expectations, the regime-specific d_1, d_2, and d_3 are solved in a standard OLS regression of $\epsilon_{E,t}$ on regime-specific spending, tax, and output residuals.

We use the estimated Eqs. 5–8 to write the structural shocks s as a function of the reduced form shocks ϵ and solve the vector of the structural shocks $(s_{t,g}, s_{t,r}, s_{t,y}, s_{t,E})$ that maintains the economy on the assigned adjustment path.

To characterize the adjustment path, we set two constraints on the fiscal policy. First, the structural balance adjusts according to the adjustment program (x_t^{exo}). Second, the revenue-to-GDP ratio is set exogenously at r_t^{exo} during each period of the program. The latter constraint is required to govern the balance between the revenue and spending consolidation. Furthermore, the economic environment is controlled with additional constraints: The one-year-ahead expectations are assumed to be unbiased, and the economy may be subjected to exogenous, surprise output shocks $(s_{t,y}^{exo})$. Formally, the constraints can be expressed as

$$\frac{SB_t}{GDP_t} - \frac{SB_{t-1}}{GDP_{t-1}} = x_t^{exo}, \tag{9}$$

$$\frac{R_t}{GDP_t} = r_t^{exo}, \tag{10}$$

$$E_t[\frac{SB_{t+4}}{GDP_{t+4}} - \frac{SB_t}{GDP_t}] = \frac{SB_{t+4}}{GDP_{t+4}} - \frac{SB_t}{GDP_t}, \tag{11}$$

$$s_{t,y} = s_{t,y}^{exo}, \tag{12}$$

Furthermore, the SB is determined as the difference between the actual budget position and the cyclical effect in proportion to the GDP net of one-off spending measures.

$$\frac{SB_t}{GDP_t} = \frac{PB_t}{GDP_t} - \frac{i_t^{exo} * D_{t-1}}{GDP_t} - \xi * OG_t + OO_t, \tag{13}$$

where the primary balance PB_t measures the general public balance B_t net of the interest rate expenses. The cyclical correction is the product of the output gap OG_t and the (semi)elasticity between the output gap and the budgetary balance, ξ[13]. In addition, the headline budgetary position is adjusted in proportion to GDP by using the effect of certain one-off revenue and spending items, OO_t. However, in the current fiscal forecasts, these items are anticipated to have zero value, and thus, they are omitted in the following analysis. The interest expenditures are defined for a given initial debt (D_{t-1}), and (within reasonable debt level[14]) the exogenous path of the interest rate of the public debt (i_t^{exo}). Formally, the debt accumulation equation is

[13]We calibrate $\xi = 0.57$ based on Price et al. (2014).

[14]We follow Rawdanowicz (2012) and assume that the interest rate is independent of the level of debt as long as the debt-to-GDP ratio does not exceed 75 % of the GDP.

$$D_t = D_{t-1} - B_t + sfa_t, \tag{14}$$

where the second term is the headline budgetary position B_t, and the last term is the exogenous stock-flow adjustments of the government debt (sfa_t). The debt-to-GDP ratio is defined in nominal terms, and thus, we have to take stand on the level of inflation in the model. In our benchmark specification, we use a simple Phillips curve. Following Rawdanowicz (2012), we assume that each percentage point increase in the output gap contemporaneously lowers inflation by 0.3 percentage points.

We adjust the PB_t in Eq. 13 by changing the public sector net revenue R_t^{net} and the public sector spending G_t (government consumption and investment): $PB_t = R_t^{net} - G_t$.[15] The size of the required fiscal adjustment depends directly on the discretionary measures that are taken to adjust the primary balance in Eq. 13, as well as their propagation to the fiscal variables, economic activity, and expectations. Changes in the output gap partly compensate for the impact of the business cycle in so far that it is captured by the cyclical correction. Finally, the adjustment affects the government interest expenditures and alters the size of the necessary changes in the primary balance to achieve a certain improvement in the SB.

We use forward recursion to solve the structural shocks so that the endogenous variables fulfill Eqs. 9 – 13. To make the solution tractable, we have to make certain assumptions. Namely, we assume that the interest expenditures in quarter t are paid in the following quarter $t+1$, and that the current output gap depends

[15] The (primary) budget balance can be equally written in net or gross terms by changing the position of the transfers. However, our revenue and spending variables omit some items that are included in the actual budget balance. As we focus on the changes in the SB, that is not a major problem as long as the value of these items remains constant during the simulations.

on the regime variable (also defined in the previous quarter) as well as its past value (see the specification of the output gap forecasting model in the following section). In these terms, the solution is linear conditional on the regime-specific impact of the history of the endogenous variables, the interest expenses, and the output gap.

Finally, our estimates of the impulse responses to policy shocks contain a fair amount of uncertainty. This uncertainty is represented by the confidence intervals we construct for each simulation we conduct. As in Auerbach and Gorodnichenko (2012a), we construct confidence intervals by drawing a set of parameter values from the MCMC chain to calculate the lagged response of the variables. To calculate the contemporaneous response, we draw a set of residuals from the covariance matrix of residuals. We measure the variance of this covariance matrix is calculated by using the duplication matrix (see Auerbach and Gorodnichenko (2012a) and Hamilton (1994) for more details). The 90% confidence intervals we use in this article are constructed by using 1000 draws from the MCMC chain and the covariance matrix of residuals. We use the Blanchard and Perotti identification scheme for each draw of residuals, and thus, our confidence intervals takes into account the uncertainty involved in the estimation of the structural shocks in Eqs. 5–8.

4 Model characteristics

4.1 Data

The STVAR model is estimated with Finnish data from 1975Q2 to 2015Q2. We include government spending (G_t), tax revenues net of transfers (R_t^{net}), GDP (Y_t), and a expectations variable (E_t) in the model as our variables of choice. Except for the expectations variable, which is the expected change in the structural balance over the next year, this is the typical set-up of variables for a structural VAR model studying fiscal multipliers. We follow the usual definitions for the fiscal variables. G_t is defined as the sum of general government consumption and investment, and R_t^{net} is general government tax revenue net of transfers to households and subsidies to the private sector. Tax revenue is defined here as the sum of direct taxes on business, direct taxes on households, social security contributions, and indirect taxes. All series G_t, R_t^{net}, and Y_t are quarterly, real valued (we use the GDP deflator for all variables) seasonally adjusted (using the TRAMO-SEATS method) and divided by population so that the variables are per capita.

To control for the expectations during the program, we construct a proxy for the expected changes in the SB. The use of the expectation variable serves two purposes. First, the adjustment program affects the medium-term expectations of the economic agents regarding the fiscal policy that may greatly affect their economic behavior. The expectation variable control these changes in the expectations. Second, Blanchard and Perotti's (2002) classic identification scheme unrealistically assumes that there is no fiscal foresight in addition to the VAR model's forecasts. One way to tackle this problem is to directly use fiscal forecasts as controls in the model.

To construct the variable, we use the Research Institute of the Finnish Economy's (ETLA's) biannual, one-year-ahead forecasts of government spending, revenues, as well as GDP growth. We interpolate the variables to quarterly frequency, and use levels of the variables to construct forecasts of the budget balance.[16] We have also collected forecasts of the potential GDP growth that we compare to the actual GDP growth and calculate changes in the output gap as their difference.[17]

[16]We acknowledge that the interpolation only partially controls for the (quarterly) changes in the fiscal forecasts, and thus provides only a partial solution to the fiscal foresight problem.

[17]The potential output growth estimates for 2002 onward are based on reference values provided by the Commission to the individual member states. Potential output growth estimates for 1989–2001 are based on the estimates made by the OECD at the end of the same year on average

We then correct changes in the budget balance using the output gap estimates and the output gap semi-elasticity of the budget balance (0.57).

To obtain data for the first three variables, we use Virkola's (2014) dataset for the years 1975-2011. These data are from the Statistics Finland quarterly national accounts except for the data on direct taxes on business, which comes from the Bank of Finland quarterly estimates (Virkola, 2014). For the rest of our sample period, we update these series by using quarterly data on government finances from Eurostat for the fiscal variables and quarterly national accounts data from Statistics Finland for the GDP, GDP deflator, and population. The series for G_t and R_t^{net} in Virkola (2014) and those constructed using Eurostat are found to closely follow each other in the overlapping period 1999–2011. Thus, we are comfortable with using the period-by-period changes in these series after 2011 to update our original time series.

In Fig. 1, we plot the used data (black line), as well as our estimates of the trend growth (red, dotted line) that are accounted for by the vector of constants C in our dynamic model.[18] To give an overview of the trends, we begin from the initial values of the data and solve the contributions of C without additional shocks. However, we allow the regime to follow our regime variable during the simulation. Fig. 2 reports the estimated, reduced form shock processes (ϵ).

4.2 Regime-specific responses of economic activity

We report the regime variable (7 quarters moving average of real GDP growth) in Fig. 3. We consider different values of the γ parameter. In our benchmark simulations, we use $\gamma = 2$, which is relatively close to the parameterization $\gamma =$

growth for the following two years and the preceding five years. For the 1980s, we estimated potential output growth based on the average five-year growth forecast made by the ETLA in the same year. The series is interpolated to quarterly frequency.

[18] In our benchmark model, the lag length of the VAR is 3, while we set $\gamma = 2$ (see the following subsection).

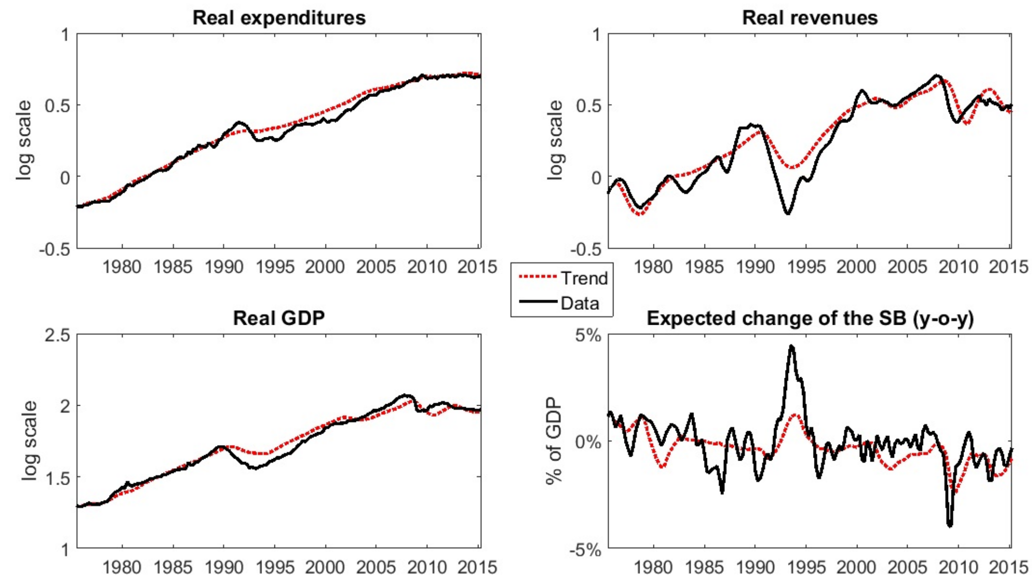

Figure 1: Data and trends.

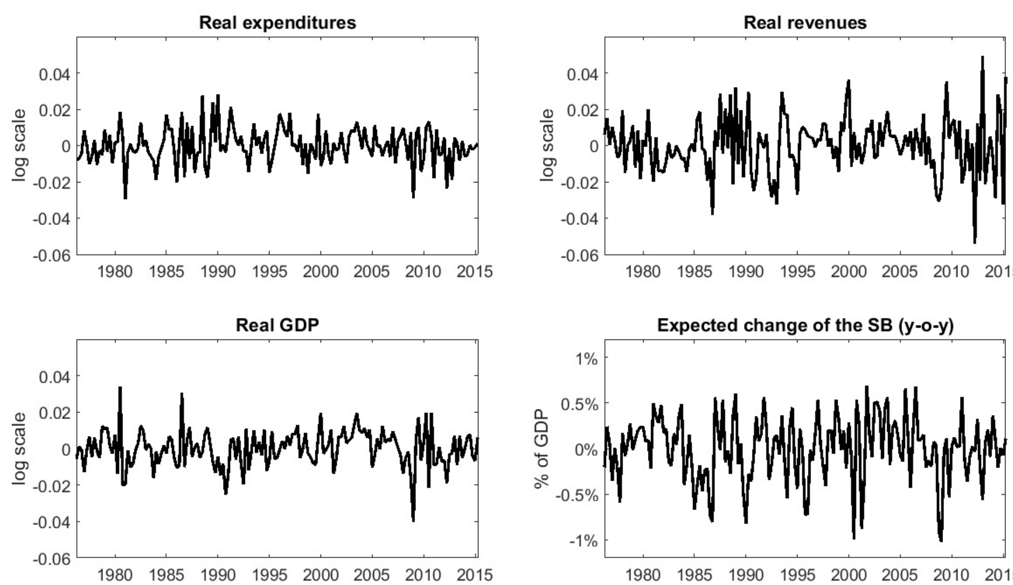

Figure 2: Shocks.

1.5 in Auerbach and Gorodnichenko (2012a). The smaller the γ, the deeper (expansionary) the economic downturn (upturn) that is qualified as an extreme recession (expansion). To analyze the robustness of our results, we also consider $\gamma = 3$.[19]

In both cases, we find that the Finnish economy reached the recession state ($F = 1$) in two periods during years 1975–2015. The first period was the Finnish Great Depression of the 1990s, while the second time was at the onset of the global financial crisis. Furthermore, we report periods close to the recession regime during the oil crisis and in recent years. In addition, there have been several expansionary periods, when the regime has been close to 0.

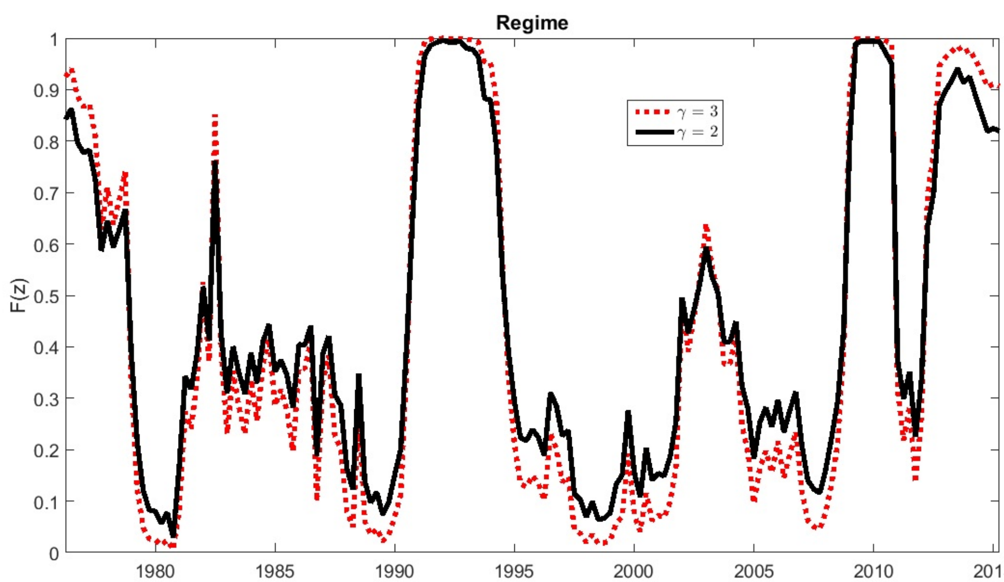

Figure 3: Regime variable, seven quarters moving average of real GDP growth, $\gamma = 2$ and $\gamma = 3$.

A concern that the choice of the regime variable raises is that the GDP growth alone may not provide a sufficient measure of the business cycle. For example,

[19]We find that the choice of γ does not greatly affect our results.

in a small open economy a GDP contraction may generate different amounts of economic slackness – and thus the size of the fiscal multipliers may vary – depending on whether the shock that caused the contraction hits the external sector or the home market.

To address this issue, we compare our regime variable to the European Commission's production function-based output gap estimates.[20] Fig. 14 shows that there is a clear connection between the regime variable ($\gamma = 2$), and the output gap, as shown by the fitted line. We argue that our results are best understood as reflecting this historical, average relationship. We acknowledge that the differences have been large occasionally; however, currently the two indicators seem to provide a consistent view of the business cycle. In particular, when we use the regime variable and the relationship plotted in Fig. 14 to forecast the output gap in 2015, we obtain an output gap estimate -3.3% of GDP, while in the spring 2015 general government fiscal plan for 2016-2019 the actual, corresponding output gap estimate is -2.8% of GDP.

As a part of the exercise, we forecast the European Commission's output gap estimates. We find that the regime variable and the lagged output gap predict well the current value of the output gap as shown in Fig. 15 in the Appendix. Fig. 15 reports the predicted values of the following autoregressive model: $OG_t = 0.91 * OG_{t-1} + 0.38 * Z_t$). The estimated coefficients are highly significantly different from 0 with standard errors, .016 and .048, respectively.

In Table 1, we report our estimates of the regime-specific coefficients that are defined in Eqs. 5–8. We find that the estimates are reasonable and the uncertainty related to their estimation is moderate. We find that unexpected movement in government spending has, on average, increased government revenue ($a_2 > 0$), while the effect is smaller in recessions. Surprise increases in government revenue

[20] The European Commission's estimates use more detailed information such as the capacity utilization rate, and the new-Keynesian wage Phillips curve, to measure the slack in the economy.

	Expansion regime (F=0)			Recession regime (F=1)		
	median	05th perc.	95th perc.	median	05th perc.	95th perc.
a_1	1.16	-	-	1.16	-	-
a_2	0.52	0.49	0.54	0.29	0.25	0.34
c_1	-0.61	-0.57	-0.64	-0.29	-0.26	-0.35
c_2	0.25	0.21	0.31	0.82	0.72	0.91
d_1	0.05	0.04	0.06	-0.04	-0.03	-0.04
d_2	-0.11	-0.09	-0.12	0.00	-0.02	0.03
d_3	-0.05	-0.03	-0.06	0.18	0.15	0.20

Table 1: Estimates of the coefficients in Eqs. 5-8.

lower the GDP ($c_1 < 0$), but less in recessions. On the other hand, increases in government spending increase GDP ($c_2 < 0$), but much less in expansions. Finally, a surprise increase in revenue generate expectations of an increase in the SB ($d_1 > 0$) in expansions, while the effect is marginally negative in recessions. An increase in spending has a negative effect on the expected SB in expansions ($d_2 > 0$), while the effect is small and insignificant in recessions. Unexpected GDP shocks have a marginally negative effect on the expected SB in expansions ($d_3 < 0$), while the effect is positive in recessions.

Next, we further illustrate the model's behavior by reporting the expansion (F = 0) and recession (F = 1) impulse response of the output to an unanticipated government spending increase and net tax increase shock in Fig. 4. The shock is normalized to have the sum of government spending increase or revenue increase over 20 quarters equal to one % of GDP.[21] This measure has been advocated by Woodford (2011) and others since the size of the multiplier depends on the persistence of fiscal shocks.[22] Even in the largest Finnish downturns and expansions,

[21]We report the corresponding, unscaled shock processes of the fiscal variables and the GDP in Figs. 16 and 17 in the Appendix. Following Auerbach and Gorodnichenko (2012a) we solve the impulse responses of the model without the influence of the time trends. Furthermore, we set the initial values of the endogenous variables to 0.

[22]Figs. 16 and 17 suggest that the corresponding maximum impact factors of the initial spending increase and net revenue increase shocks are roughly 2.5 and -1 in recessions, and -1

the extreme regime has lasted no more than few years, and therefore, the focus on the analysis of the regime-specific multipliers should be on the initial responses. After the initial impact, the impulse becomes a mixture of the two regimes that can be analyzed using dynamic impulse responses.[23]

In terms of the spending multipliers, our estimates are in line with Auerbach and Gorodnichenko's (2012a) findings. The multiplier is much larger in recessions than in expansions. In the recessions, our (expectations augmented) multiplier can rise well above 2. On the other hand, in expansions the multiplier can be negative. Overall, we find that the regime-specific spending multipliers are the same size magnitude as the estimates for the US economy.

As we take a stand on the revenue-spending mix of the consolidation, we also calculate the regime-specific revenue multipliers. Although the estimation has caveats, we find that our results are similar to what Auerbach and Gorodnichenko (2012a) report in the Appendix of their paper.[24] In the expansions, the revenue multiplier behaves similarly with the spending multiplier, while the multiplier in recessions suggests that (in the relevant time horizon) the revenue impact can be quite sluggish.

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and -1.5 in expansions.

[23] Here, the estimates are mainly shown to allow a meaningful comparison with Auerbach and Gorodnichenko (2012a). In the main simulations, we instead use dynamic impulse responses that include dynamic responses to changes in the regime variable.

[24] Auerbach and Gorodnichenko (2012a) are less confident of the SVAR framework as a tool for measuring the effects of tax policy, because many of the unexpected changes in revenues may arise as a result of a change in the relationship between tax revenues and aggregate activity rather than policy change, and the elasticity of revenue is likely to vary over the cycle, thereby introducing a bias of unknown magnitude and direction to the regime-specific estimates.

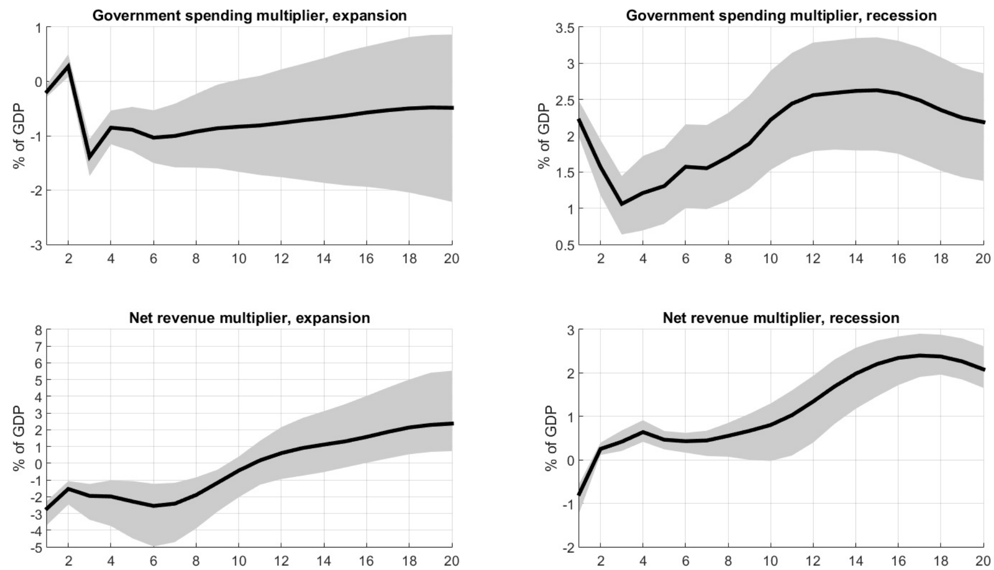

Figure 4: Figure plots the expansion (F = 0) and recession (F = 1) impulse response of the output to an unanticipated government spending increase shock and a net revenue increase shock that is normalized to have the sum of government spending increase or revenue increase over 20 quarters equal to one. The shaded region is the 90% confidence interval.

5 The EU's minimum adjustment and the assessment of the current fiscal plans

5.1 Strategy

The present model, similar to other small-scale models, cannot be used alone to address the medium-term dynamics of the Finnish economy or the fiscal position of the public sector. The current fiscal plans build on a mixture of views regarding, for example, the economic impact of the global economic crisis, development of Finnish global competitiveness, and the cost of aging. Our model remains agnostic over the validity of these views.

We next use the model to analyze how much the existing fiscal forecasts would *change* as a result of the fiscal adjustments. We take the following steps to achieve a meaningful counter-factual:

1. A no-policy-change scenario is built based on the actual fiscal forecasts.
2. The model is then calibrated to yield a benchmark path that shares similarities with the actual, no-policy-change scenario.
3. A counter-factual path is solved using the model in which the economy is subjected to a fiscal adjustment.
4. Differences between the model's counter-factual path and the benchmark path are collected, and they are used to augment the actual fiscal forecasts' no-policy-change scenario.
5. The augmented no-policy-change forecast is used to make inferences about the economic outcomes of the adjustment, and, for example, their compliance with the EU's fiscal targets.

As the actual no-policy change scenario, we use the spring 2015 general government fiscal plan for 2016–2019. As the spring 2015 fiscal plan does not include forecasts of the impact of the new government's fiscal plans, and the underlying economic environment has changed little between Spring 2015 and Autumn 2015, we consider it to be a reasonable choice of the no-policy change benchmark for the assessment of the new government's fiscal plans.

We use the spring 2015 real GDP growth, output gap, inflation, and budget balance forecasts for the years 2016–2019. Furthermore, we extend the real GDP growth forecast for 2020-2025 with current long-term growth forecasts from the Ministry of Finance, while for the other variables we assume that in the no-policy-change scenario the variables stabilize to their 2019 values. We also assume that the fiscal measures taken in 2015 permanently improve the structural budget balance by 0.2 percentage points compared to the spring forecast. For the stock-flow adjustments and government effective interest rates we use autumn 2015 forecasts for 2016–2019, and assume that the variables remain at their 2019 level in 2020–2025. We report the relevant forecasts as a part of our results in the next subsection.

We then calibrate the model to yield a benchmark path that is similar to the actual, no-policy-change scenario. We consider the current regime to be the key defining feature of the model economy. Thus, we calibrate the regime to match the actual observed regime (see Fig. 3), close to 0.9. The real GDP growth stabilizes in the simulation so that the regime remains neutral after a modest recovery after two years (eight quarters).[25] Figure 5 shows the benchmark simulation. We allow the SB to deteriorate for another 0.7 percentage points as in the no-policy-change fiscal forecast. In addition, during the simulation, we allow a moderate increase in the government real (net) revenue, so that under the assumed path of the SB, the real government spending does not have a trend in the no-policy-change simulation.

5.2 Results

In this subsection, we subject the benchmark simulation to fiscal adjustments. As references, we use the planned measures in the *autumn* 2015 general government fiscal plan for 2016–2019. In Table 2, we have collected information on the measures from the report's sections 8.2 and 8.3 and reorganized it according to our division of the data fot the net revenue and expenditure (spending) measures.[26]

We begin by measuring the minimum fiscal adjustment. In the *spring* 2015

[25] Following Auerbach and Gorodnichenko (2012a), we simulate impulse responses without considering trends (C).

[26] In practice, we include the government's (net) transfer measures ('siirtomenojen väheneminen') in the net revenue. We do not currently consider the effects of the planned one-off measures.

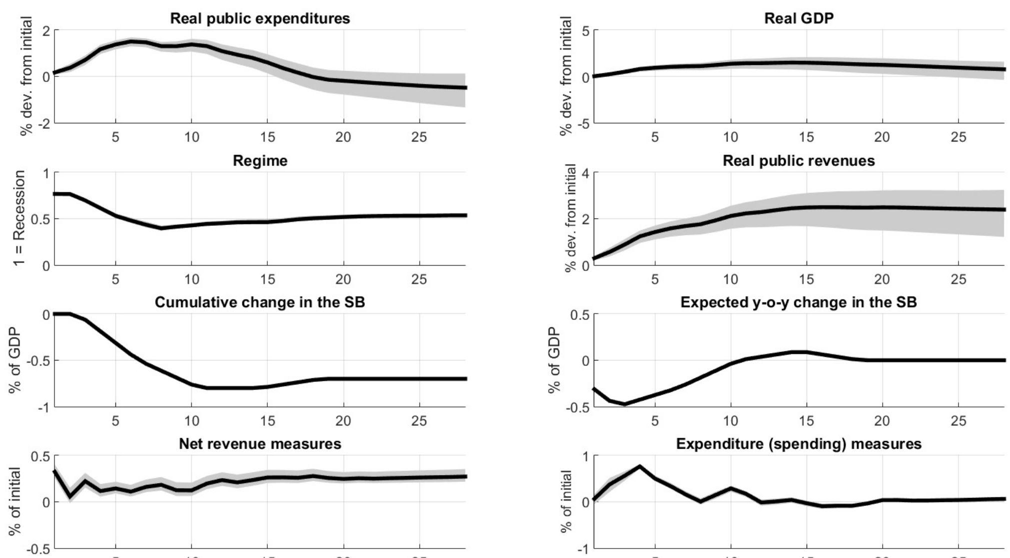

Figure 5: Benchmark scenario, quarterly observations of key variables.

general government fiscal plan the gap between the current SB in 2015 and the MTO is 1.3 percentage points of the GDP. Therefore, after the measures that are assumed to be taken in 2015 (0.2 pps), the remaining fiscal adjustment is 1.1 pps. Based on the flexibility guidance, we assume that during the fiscal adjustment the economy is taken to the MTO in two years, the adjustment being 0.5 pps in 2016, while the rest of the adjustment (0.6 pps) is made in 2017.[27] The adjustment takes the SB exactly to the MTO by the end of 2017. We also find that the pace is sufficient to comply with the debt reduction benchmark (especially the forward-looking debt reduction benchmark) in 2019.

Finally, in the simulation, we calibrate the share of the expenditure (spending) side measures to roughly meet their share in Table 2, 1/4. We calibrate the share by adjusting the exogenous net-revenue-to-GDP ratio during the simulation.

The results are shown in Figs. 6 and 7. First, the figures show the no-policy-

[27]We assume that the adjustment is divided evenly in each quarter within the years.

	Net revenue measures	Expenditure measures
2016	1.3	-0.3
2017	0.5	-0.2
2018	0.2	-0.1
2019	0.5	-0.3
Total	2.5	-0.9

Table 2: The government's planned consolidation measures. On the revenue side, we report the planned, permanent effect of the net revenue measures on the increase of net revenue in billions of EUR in each year. On the expenditure (spending) side, we similarly report the effect of the measures on the decrease in public spending.

change scenario based on the actual fiscal forecasts (black, dashed line). Second, we collect differences between the generated adjustment path and the model's no-policy-change path, and we use them to augment the actual fiscal forecasts' no-policy-change scenario (red line).[28]

Let us discuss the key features of the simulation.

1. The fiscal multiplier of the adjustment in 2016–2019 is large, cumulatively around 1 in 2019 in terms of the real GDP.

2. The amount of adjustment necessary to reach and maintain the MTO is roughly 5.5 billion EUR by 2019.

[28] In our benchmark model, we follow Auerbach and Gorodnichenko (2012a) and calibrate the lag length of the model to 3. Although we have tested the optimal lag length, the results are not definite. We report in the Appendix (Figs. 18 and 19) the results for the minimum adjustment, when the lag length is instead set to 2. We find that the required consolidation is roughly 1 billion EUR smaller, but the solution seems to suffer from unrealistic oscillations. We also find that the use of lag lengths higher than 3 yields unstable estimates. Furthermore, in the benchmark model, we use $\gamma = 2$. In Figs. 18 and 19, we quantify the minimum adjustment, when $\gamma = 3$, instead. The results suggest that the choice of γ has only a small effect on our results. In addition, we find that using γ's higher than 3 would not divide our data meaningfully into recessions and expansions. Finally, Figs 20 and 21 suggest that our results are robust to different assumptions of a_1 ($a_1 = 1.16$ vs. $a_1 = 1.06$).

3. The business cycle worsens and the output gap becomes larger as a result of the consolidation. The change partly covers the improvement in the structural balance.

4. The estimates contain a fair amount of uncertainty. For example, 90% confidence interval for the necessary adjustment is 3.5 to 9 billion EUR.

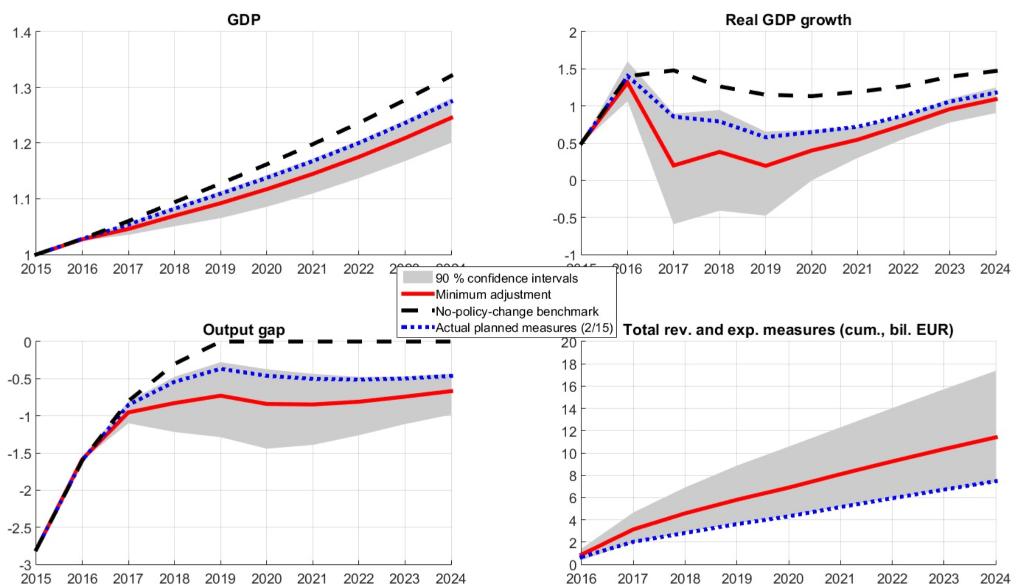

Figure 6: The counterfactual adjustment paths. Annual economic outcomes and the total size of the required adjustment. The reported confidence intervals are for the minimum adjustment, while the reported point estimates are the median paths.

We then construct an alternative consolidation path that aims at capturing the fiscal impact of the proposed measures (Table 2). Accordingly, the amount of spending measures is calibrated roughly at 1 billion EUR, while the rest of the consolidation originates from the net revenue. The total amount of consolidation measures is calibrated at 3.4 billion EUR. Furthermore, the simulation is calibrated to roughly match the timing of the measures.

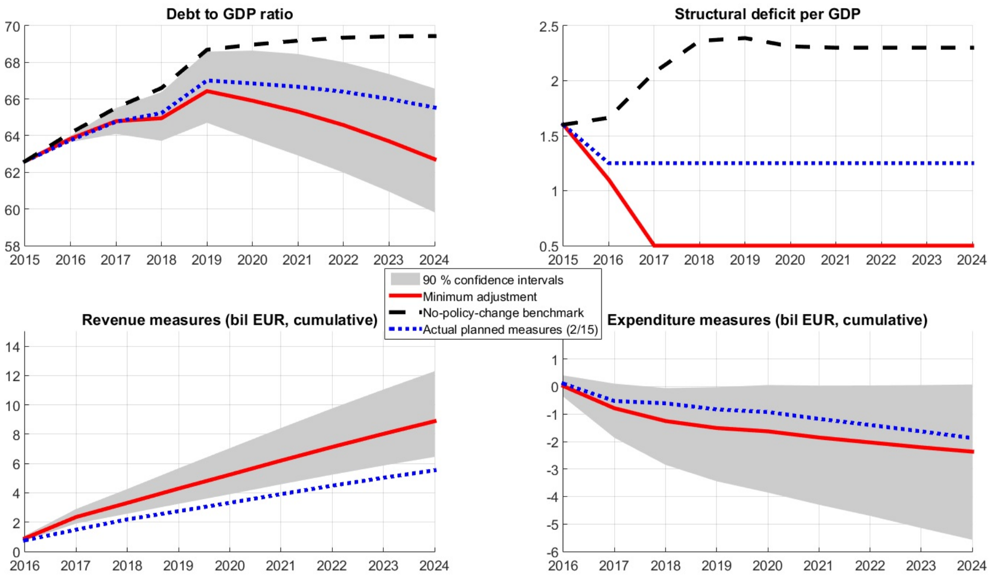

Figure 7: The counterfactual adjustment paths. Annual fiscal outcomes. The reported confidence intervals are for the minimum adjustment, while the reported point estimates are the median paths.

The results are reported in Figs. 6 and 7 (blue, dotted line). They suggest that after 2017 the current plans fall short of the MTO target by roughly 0.8 pps in terms of the improvement in the SB. Furthermore, if the median outcome would actualize, the deviation could be considered significant (in the ex post evaluation).[29] The significant deviation procedure could be applied as the deviation from the MTO remains for many years more than 0.25% of the GDP, and an

[29]Our measurement is based on the historical, average consolidation measures (structural shocks to the net revenue and the spending series) that we estimate based on our data. This provides some ambiguity in the comparison between the actual and model outcomes. First, the output responses may be different within more detailed income and expenditure categories. We discuss these differences in the next section. Second, the reported measures in Table 2 are permanent while our measures are conditioned on the expected improvement of the structural balance only one year ahead. This may lead into an upward bias in the difference between our measures and the actual measures. However, we find that historically the model's shocks have been persistent especially in the recessionary regime (see Fig. 16), and, furthermore, our simulations indicate that the simulated adjustment is featured with the continuity of the consolidation measures in the medium-term.

actual (ex post) significant deviation is identified – at least 0.5% of GDP in one year, or 0.25% of GDP in two subsequent years – as compared to the path toward the MTO.

We are aware that the capacity of the output gap and economic forecasts to filter out cyclical fluctuations and measure cyclical phase effects on the budgetary position is limited, which may result in an under- or overestimate of the budgetary position independent of the economic cycle. In particular, a fiscal policy steered by the output gap-based structural balance may turn out to be pro-cyclical. A recent report by Kuusi (2015) examines how the SB would have steered fiscal policy in the recent Finnish history, and shows that there are statistical problems related to the calculation of structural unemployment and, more generally, the limited capacity of the method to predict cyclical changes in real time.

Judging from Kuusi's (2015) analysis, the discretionary assessment method used as the structural balance's methodological alternative in the EU framework may steer fiscal policy in a more counter-cyclical direction.[30] For example, a financial policy based on the expenditure benchmark in the preventive part of the SGP would have been stringent before the crisis of the 1990s, which might have contributed to mitigating the crisis and allowed for a greater fiscal impulse contingency during the crisis. Furthermore, based on the discretionary assessment (the bottom-up assessment of effective actions in the corrective part of the SGP), the financial policy pursued since 1992 would have been sufficiently stringent, whereas a policy based on the structural balance would have created further pressure for tightening. These lessons should be borne in mind when fiscal policy is conducted in the current crisis.

[30] In this paper, we do not attempt to calculate the expenditure rule, but we recommend that its guidance is applied when the measures are implemented in practice.

6 Analyzing the design of the adjustment

6.1 How much does the relative weight between revenue and expenditure measures matter?

In this subsection, we use dynamic impulse responses (in which the regime shifts) to study how much the relative weight between revenue and expenditure measures matters for the required size of the adjustment and the economic outcomes. The regime-specific fiscal multipliers (especially the lower revenue multiplier in a recession) suggest that a focus on the revenue may be beneficial in terms of minimizing the size of the consolidation and its effects on economic activity.[31]

To further elaborate the matter, we next compare two adjustment programs that reach the MTO according to the minimum adjustment program (the SB adjusts 0.5 pps in 2016 and 0.6 pps in 2017). The first program is our benchmark program in which most of the adjustment comes from the revenue. We then compare the program to an alternative program in which the consolidation is mostly achieved on the spending side. In each case, the no-policy-change simulation remains the same as in the benchmark simulation.

The results are shown in Figs. 8 and 9. We find that the fiscal multiplier of the expenditure side adjustment is larger, and thus, the GDP remains over 1 % lower in the year 2019 when compared to the program in which most of the adjustment comes from the revenue. The amount of adjustment necessary to reach the MTO in the year 2019 is substantially higher, and amounts to roughly 9 billion EUR (3.6 billion EUR more than in the benchmark). Meanwhile, the output gap becomes substantially larger as compared to the benchmark consolidation. The debt-to-GDP ratio is roughly 1 pp higher in 2019 when compared to the benchmark.

Overall, given the need for the substantially larger consolidation measures and

[31] However, our metrics do not capture the total social cost and distributional effects of the adjustment.

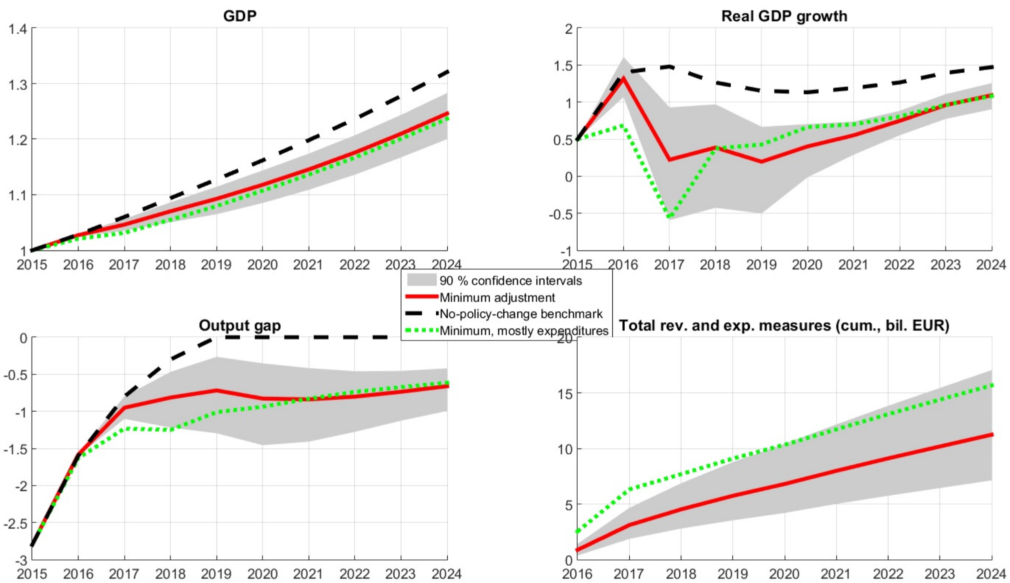

Figure 8: Adjustments from the revenue and expenditure sides, comparison. Economic outcomes and the total size of adjustment. The reported confidence intervals are for the benchmark adjustment.

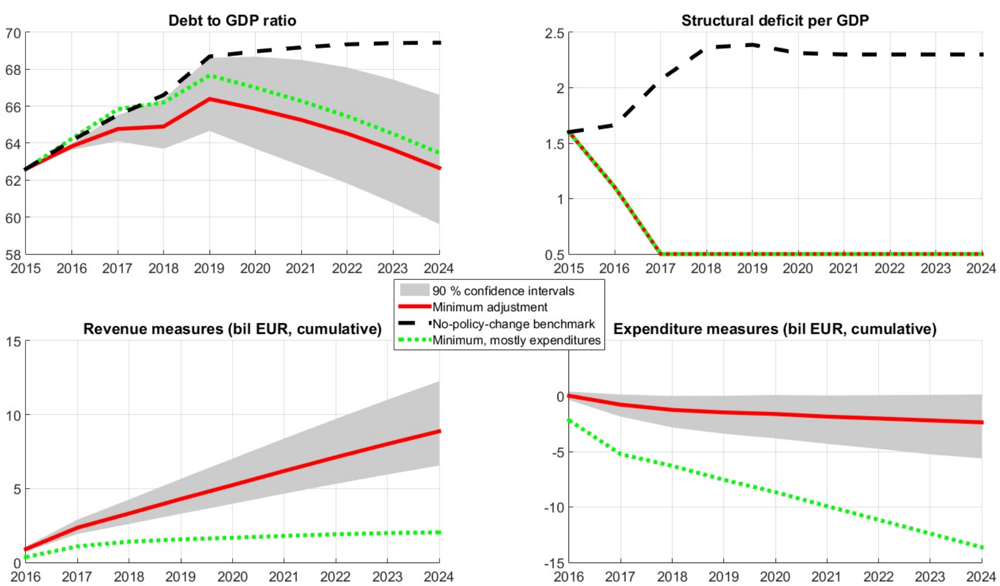

Figure 9: Adjustments from the revenue and expenditure sides, comparison. Fiscal variables. The reported confidence intervals are for the benchmark adjustment.

the weaker economic performance in the simulation the current emphasis of the adjustment on the net revenue side seems well-placed.[32]

We acknowledge that the net revenue and spending classifications are very general, and thus, we cannot provide precise guidance for selection of the best consolidation measures. However, our set-up allows us to provide more details on the economic impacts of different expenditure and revenue categories. Namely, in Fig. 10 we estimate the regime-specific fiscal multipliers for the government consumption expenditures (spending minus investments), and the gross revenues (gross revenues without the omission of transfers).[33] We report the expansion and recession impulse response of the output to an unanticipated government spending increase shock and tax cut shock that are normalized to have the sum of government spending over 20 quarters equal to 1 % of the GDP.

We find that there is no significant differences in the cyclical behavior of the multipliers between the government consumption and spending multiplier. Thus, we cannot find substantial differences between the output responses of government investment and consumption shocks, although our result can be partly explained by the small percentage of investment in government spending. Furthermore, we

[32] Indeed, a typical finding in the literature is that spending multipliers are larger than revenue multipliers. This has often been explained with basic Keynesian theory, which argues that tax cuts are less potent than spending increases in stimulating the economy since households may save a significant portion of the additional after-tax income (Batini et al., 2014). However, the recent literature acknowledges that the SVAR methodology, which uses elasticities of revenue to filter out automatic stabilizers, may fail to capture exogenous policy changes correctly, for example, because changes in revenues are not only due to output developments and discretionary policy, but also to asset and commodity price movements. That may lead to underestimate the revenue multipliers. Using the so-called narrative approach, some papers have instead seek to identify exogenous fiscal shocks directly, and generally find larger revenue multipliers. Recently, Mertens and Ravn (2014) suggest that the main reason for the different tax multiplier estimates is the discrepancy in the output elasticity of tax revenues. Based on their results, we have also tested significantly higher output elasticities of revenues, but we still find similar, small revenue multipliers in recessions. However, due to the increase in the elasticity, revenue multiplier in an expansion becomes larger. Providing further evidence in the Finnish case is still work in progress.

[33] In practice, we estimate a similar STVAR model as before, but we replace either spending with government consumption, or net revenue with gross revenue. In case of gross revenue we calibrate $a_1 = 1.27$ based on Lehmus (2014).

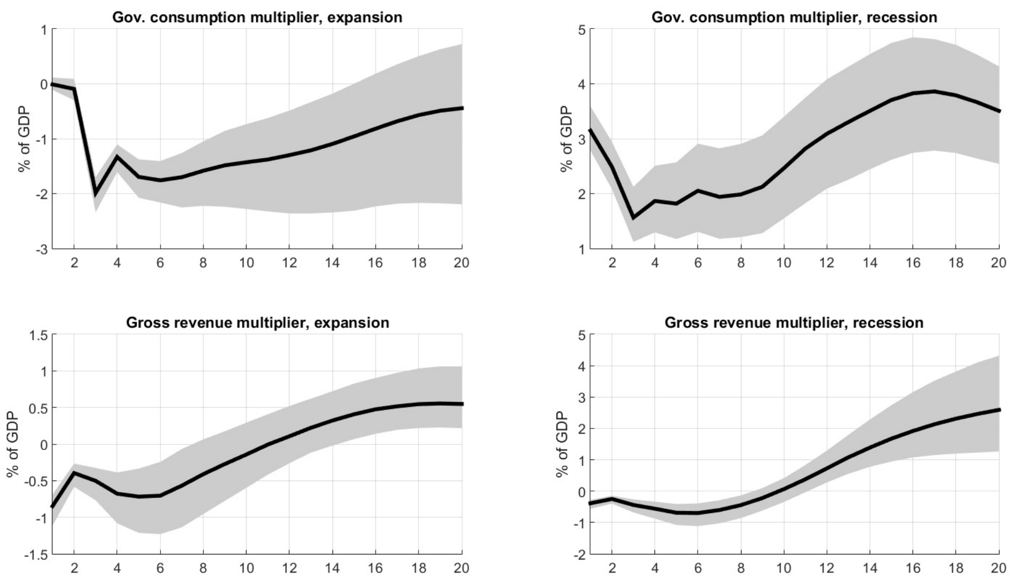

Figure 10: The figure plots expansion (F = 0) and recession (F = 1) impulse response of output to unanticipated government consumption increase shock and gross tax increase shock that are normalized to have the sum of government spending increase or tax increase over 20 quarters equal to 1% of the GDP. The shaded region is the 90% confidence interval.

find that the gross revenue multiplier seems to be more sensitive to changes in the business cycle than the net revenue multiplier. In particular, after transfers are excluded, the gross revenues multiplier in a recession is significantly negative up to 2 years' horizon, while the impact of the gross revenue shocks on economic activity is still smaller than the impact of a government spending shock. The result suggests that the mildly positive impulse response of a net revenue increase in recessions that our benchmark results and Auerbach and Gorodnichenko's (2012a) results have could be explained by the inclusion of government transfers in the net revenue measure.[34] However, more research on this topic is required before more definite conclusions can be drawn.

6.2 How would delaying fiscal consolidation affect the present value of GDP?

In the recent literature, scholars have argued that under large fiscal multipliers in depressions the fiscal consolidation should be delayed in order to maximize the economic activity over the business cycle. DeLong and Summers (2012) posit that fiscal multipliers and hysteresis effects are currently substantial in most advanced economies. Consequently, temporary fiscal stimulus will boost output not only in the short run but also in the long run due to lessened hysteresis effects.

However, the conclusion that delaying fiscal consolidation is optimal relies on several assumptions, as the recent study by Fletcher and Sandri (2015) shows.

First, DeLong and Summers' (2012) model shows that, under their preferred parameters, the positive effects of fiscal stimulus on GDP more than offset the

[34] In comparison, in a typical macroeconomic model investment has the highest short-term multiplier, followed by government wages and government purchases, while untargeted transfers to households are associated with the lowest output impact among expenditure side fiscal instruments, especially in the EU. On the revenue side, the ranking of tax instruments reflects their perceived distortionary effects. Corporate income taxes and personal income taxes have the most negative effects on GDP. Consumption taxes have a smaller effect. (Batini et al., 2014)

negative effect on the GDP from the higher distortionary taxes when taxes are used to stabilize the debt-to-GDP ratio at a higher level following the stimulus. However, this assumption could be problematic if higher debt ratios have costs other than the distortions associated with the extra taxes required to pay the (growth-adjusted) interest. For example, higher debt may increase borrowing costs, raise the risk of a sovereign crisis, or reduce the fiscal space to adopt future stimulus. Because of these costs, the scenario of a stimulus that permanently raises the debt-to-GDP ratio may not be fully comparable to a baseline scenario with a lower debt-to-GDP ratio.

Following Fletcher and Sandri (2015), we examine the case in which an initial stimulus is followed by fiscal consolidation in order to return the debt-to-GDP ratio to its baseline path. By incorporating the consolidation phase that is required to return the debt-to-GDP ratio to its baseline path, we acknowledge that the positive effects of the initial stimulus through the fiscal multiplier and hysteresis effects operate in reverse during the subsequent consolidation.

Second, Fletcher and Sandri (2015) show that if the multiplier is constant over time and there is no hysteresis, then delaying consolidation has no effect on the present value of the (real) GDP, even if the multiplier is substantial. This is because, with a constant multiplier, the GDP gains from the initial stimulus are exactly offset by the losses from the subsequent consolidation. Under these conditions, the absolute size of the multiplier is thus irrelevant to assessing the merit of the stimulus in terms of boosting the present value of GDP. [35]

Thus, Fletcher and Sandri (2015) suggest that the decision about delaying

[35] As Fletcher and Sandri (2015) mention, in DeLong and Summers' model, the economy implicitly reverts to its pre-stimulus cyclical state when the temporary stimulus is removed. This reversion could be interpreted as an implicit assumption that either (i) the multiplier is the same during the expansion phase when the stimulus is applied and the contraction phase when the stimulus is withdrawn or (ii) the multiplier is lower during the contraction phase, but the output gap closes at least partially on its own, although DeLong and Summers are not explicit about the assumptions in this regard.

fiscal consolidation should not be shaped mainly by views on the average size of the fiscal multiplier, but by the degree to which multipliers vary over the cycle and the degree to which this time-variation can be exploited by discretionary fiscal policy. Explicit assumptions are needed regarding how multipliers vary over time and how persistent the output gap is.

The novelty of this paper is that we use our estimated model (instead of the calibrated model in Fletcher and Sandri, 2015) to ask whether the current conditions in Finland are such that delaying consolidation is likely to increase the present value of the GDP. In this exercise, we have explicitly estimated the degree to which multipliers vary over time and the speed at which the output gap closes.

In this subsection, we use our model to compare two adjustment programs that converge to the same debt level by 2024. The first program is the minimum adjustment program that takes the economy to the MTO by the end of 2017. We then compare the program to an alternative program that reaches the same debt level in 2024, but the adjustment of the structural balance is slower. We assume that in the alternative program the SB adjusts linearly until the end of 2020, and then stays at the level that is sufficient to reach convergence of the debt levels in the two programs by 2024. Furthermore, in the alternative program, we calibrate the revenue-to-gdp ratio so that the revenue-expenditure mixes are roughly similar in the two programs. In each case, the no-policy-change simulation remains the same as in the benchmark simulation.

We collect the present values of (real) GDP in both cases and compare them in Table 3 when different (annual) discount factors are used.[36] The column '5 years' reports the impact of the delay on the present value compared to the minimum adjustment. The total effect is summarized in terms of GDP growth in one year. We report the results in Figures 11 and 12

[36] The present value is defined as the discounted sum of the real GDP in 2015-2024.

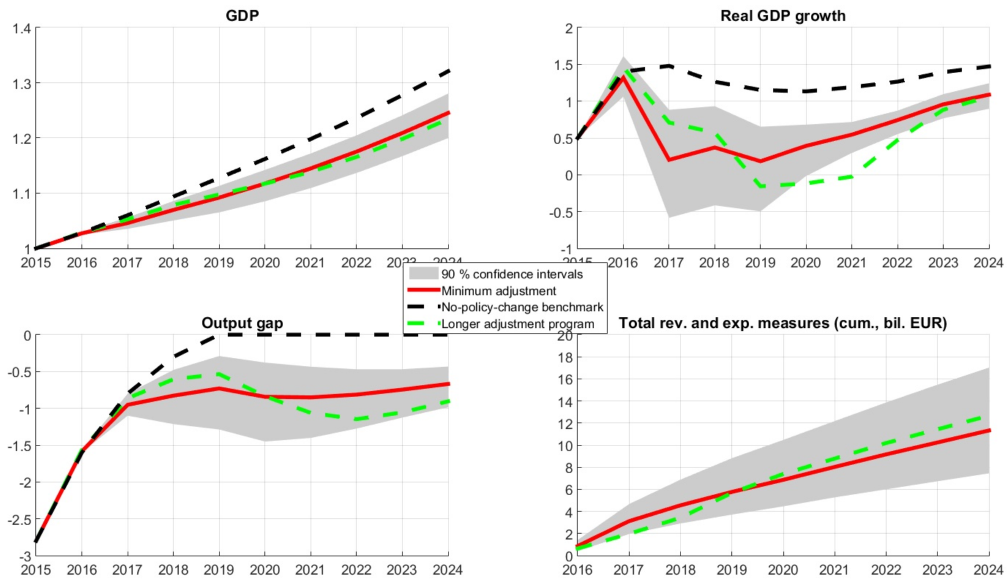

Figure 11: Adjustment in two years vs. adjustment in five years, comparison. Economic outcomes and the total size of adjustment. The reported confidence intervals are for the two-year adjustment.

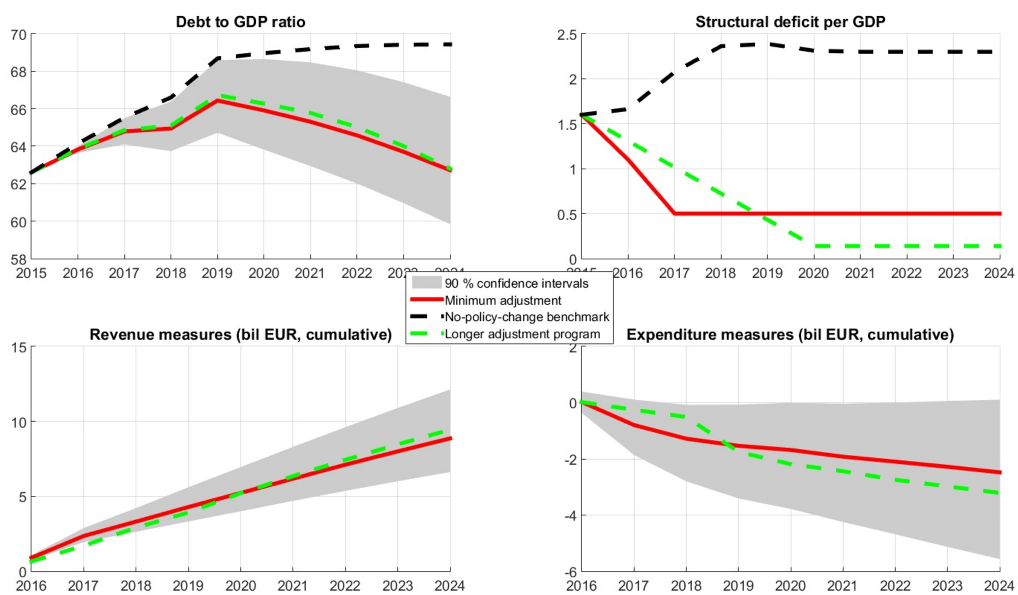

Figure 12: Adjustment in two years vs. adjustment in five years, comparison. Fiscal variables. The reported confidence intervals are for the two-year adjustment.

The discount factor	5 years	5 years + init. expansion
1 %	-0.98 %	-0.20 %
2 %	-0.85 %	-0.03 %
4 %	-0.59 %	0.29 %
6 %	-0.35 %	0.61 %

Table 3: Comparison of the present values of (real) GDP in different adjustments when different (annual) discount factors are used. The column ”5 years” reports the impact of delay on the present value as compared to the minimum adjustment. The column ”5 years + init. expansion” reports the impact of delay on the present value as compared to the minimum adjustment, when the delay is accompanied with an additional expenditure side expansion at the beginning of the program. The total effect is summarized in terms of GDP growth in one year.

Based on the analysis, we find that despite the high regime-specific multipliers the impact of the delay on the present value of the GDP in 2016–2024 is small and even negative. Similarly to Fletcher and Sandri (2015), we consider the 2% discount factor the most relevant.

Several factors could contribute to the result. First, in the current economic forecasts, expected GDP growth does not greatly exceed the forecasts for the government interest rates that would generate strong incentives to postpone the measures necessary to balance the general government budget. In the forecasts, the long-term potential of the economy is depressed by the structural shock that Finnish industries have faced in recent years. Moreover, achieving a robust recovery towards the potential seems to be undermined by the low external cost competitiveness of the Finnish products in the medium-term. Instead, the increasing debt due to the postponed balancing of the budget deficit may generate the need for larger consolidation in the near future if the fiscal policy is later set to eliminate the increase in public debt caused by the initial delay.

Second, based on the results, it seems that time-variation of the fiscal multipliers are difficult to exploit with a discretionary fiscal policy. Although the expenditure multiplier is large in recessions, the delayed consolidation appears to revoke a worsening of the business cycle that is sufficient to remove the benefits from the delay. Figure 11 shows that the delayed consolidation causes a rather strong negative impact on economic growth after 2019.

One explanation for the result is, as Fletcher and Sandri (2015) show, that the effects of delaying consolidation can be quite different if the multipliers vary with the growth rate of the GDP, or if they depend on a more slow-moving variable, such as the output gap. During the delayed consolidation phase, fiscal tightening can reduce growth fast, and because multipliers vary negatively with the growth in the GDP, this lower growth raises the fiscal multiplier, which further depresses growth. The result is a downward spiral of lower growth and higher multipliers. [37]

Furthermore, it seems that net revenue multiplier does not rise as strongly as the expenditure multiplier. This may partly explain why the timing of revenue-based fiscal adjustments may not be as sensitive, as in the case of an expenditure-based adjustment. Thus, we further elaborate the relationship between the timing and the revenue-expenditure balance by simulating an alternative, delayed adjustment. During the alternative adjustment, the SB improves similarly to the first delayed program, but in the first years of the adjustment, there is an additional, temporary increase in the spending that is financed with further net revenue measures. The column "5 years + init. expansion" in Table 3 reports the impact of delay on the present value of the GDP as compared to the minimum adjustment when different discount factors are used. The total effect is again summarized in terms of GDP growth in one year. We leave further details of the program to be

[37] Whether multipliers actually depend on the output gap, growth, or some other variables, remains an open question. Auberbach and Gorodnichenko (2012b) provide some empirical evidence in favor of fiscal multipliers varying more closely with growth than the output gap. In the current framework we found out that the use of a slow-moving variable such as the output gap easily makes the solution algorithm unstable, and the results thus become unreliable.

found in the Appendix (Figs. 22 and 23).

We find that the alternative, delayed program is better in terms of increasing the present value of the GDP, but the difference is not large. In particular, the increase is sufficient to equalize the present values of the minimum adjustment and the five-year adjustment under reasonable values of the discount factor.

Finally, even if our simulations do not show large benefits from a delay when the current forecasts are used, stronger-than-expected changes in the business cycle can markedly alter the economic outcomes of the consolidation in our model. We illustrate this by subjecting the no-policy-change benchmark and the simulation with minimum fiscal consolidation to surprise GDP shocks (3% per annum) that lead the economy to strong expansion ($F \approx 0.2$) in the years 2017–2020. We analyze the differences between the simulations (that are due to the fiscal consolidation that is made in the expansion) and find that the consolidation has only a small effect on economic growth in 2016–2018, while the consolidation measures have a moderate impact on the GDP in 2019. We report the findings in the Appendix in Figs. 24 and 25.

Thus, we acknowledge that the benefits of the delay would become larger if positive surprise shocks to economic activity occur in the near future. Especially, our example as well as the variation in the regime-specific fiscal multipliers suggest that a policy that uses temporary expansions in strong downturns and withdraws them in strong upturns could easily increase the present value of the GDP. However, as, by definition, negative surprise shocks with reverse consequences are as likely to occur in the current situation, we believe that the focus on the median behavior of the economy is well-placed.[38]

[38] In addition, we do not consider various other risks to delaying consolidation such as risks of higher sovereign yields arising from temporarily higher debt and the political-economy risks that the stimulus may not be reversed once the economy recovers.

7 Conclusions

In this paper, we quantify time-varying fiscal multipliers using Finnish economic data and an augmented version of the Auerbach and Gorodnichenko (2012a) model. We then apply the model to address open questions that concern the design of economic consolidation.

We find that the fiscal adjustment in Finland that is needed to comply with the EU's fiscal framework is currently quite large compared to the current fiscal plans. Whereas the country's current fiscal plans propose a total of 3.5 billion EUR consolidation measures in 2016–2019, the necessary adjustment in our model is roughly 5.5 billion EUR (3.5–9 billion EUR at the 90% confidence interval) during the same time period. Our results suggest that the consolidation measures are likely to slow the economic recovery and increase the output gap.[39] The cumulative multiplier effect of the consolidation measures on the economic activity is substantial (close to 1) in the period 2016-2019. Our results suggest that the emphasis of the consolidation on net revenue measures seems to be well-placed in terms of minimizing the multiplier effect.

Despite the large fiscal multipliers, we do not find significant benefits of delaying the fiscal consolidation under the current economic forecasts by the Ministry of Finance. In the forecasts, the long-term potential of the economy is depressed by the structural shock that Finnish industries have faced in recent years. Moreover, achieving a robust recovery toward the potential seems to be undermined by the low external cost competitiveness of Finnish products in the medium-term. Under these circumstances expected GDP growth does not greatly exceed the forecast of government interest rates, and therefore, the current economic situation does not generate strong incentives to wait. Furthermore, it seems that time-variation

[39] However, the increase in the output gap will partly offset the required, structural consolidation effort in the medium-term.

in the fiscal multipliers is difficult to exploit with a discretionary fiscal policy. Although the expenditure multiplier is large in recessions, the delayed consolidation in current conditions appears to revoke a worsening of the business cycle that is sufficient to remove the benefits from the delay.

Several aspects should be borne in mind when our results are interpreted. First, while it seems that postponing the adjustment is not a good policy under current economic forecasts, our results nevertheless suggest that the economic outcomes of fiscal consolidation can potentially be far less damaging under more robust economic growth. Thus, we want to emphasize how important it is to achieve economic growth in times of fiscal consolidation. The optimal timing and the impact of the consolidation ultimately hinge on the actions that are taken to foster economic growth.

Second, policy makers should also be aware that the capacity of the output gap and economic forecasts to filter out cyclical fluctuations and measure cyclical phase effects on the budgetary position is limited, which may result in an under- or overestimate of the budgetary position independent of the economic cycle. In particular, fiscal policy that is steered by the output gap-based structural balance may turn out to be pro-cyclical, as, for example Kuusi (2015) shows. Judging from the analysis by Kuusi (2015), the discretionary assessment method used as the structural balance's methodological alternative in the EU framework (the expenditure rule) may steer fiscal policy in a more counter-cyclical direction. Thus, its guidance should be taken into account when fiscal adjustments are designed.

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Appendix

Figure 13 shows the matrix of minimum fiscal adjustment based on the flexibility guidance in the European Commission (2015).

		Required annual fiscal adjustment*	
	Condition	Debt below 60% and no sustainability risk	Debt above 60% or sustainability risk
Exceptionally bad times	Real growth <0 or output gap <-4	No adjustment needed	
Very bad times	-4 ≤ output gap <-3	0	0.25
Bad times	-3 ≤ output gap < -1.5	0 if growth below potential, 0.25 if growth above potential	0.25 if growth below potential, 0.5 if growth above potential
Normal times	-1.5 ≤ output gap < 1.5	0.5	> 0.5
Good times	output gap ≥ 1.5%	> 0.5 if growth below potential, ≥ 0.75 if growth above potential	≥ 0.75 if growth below potential, ≥ 1 if growth above potential

* all figures are in percentage points of GDP

Figure 13: Flexibility guidance.

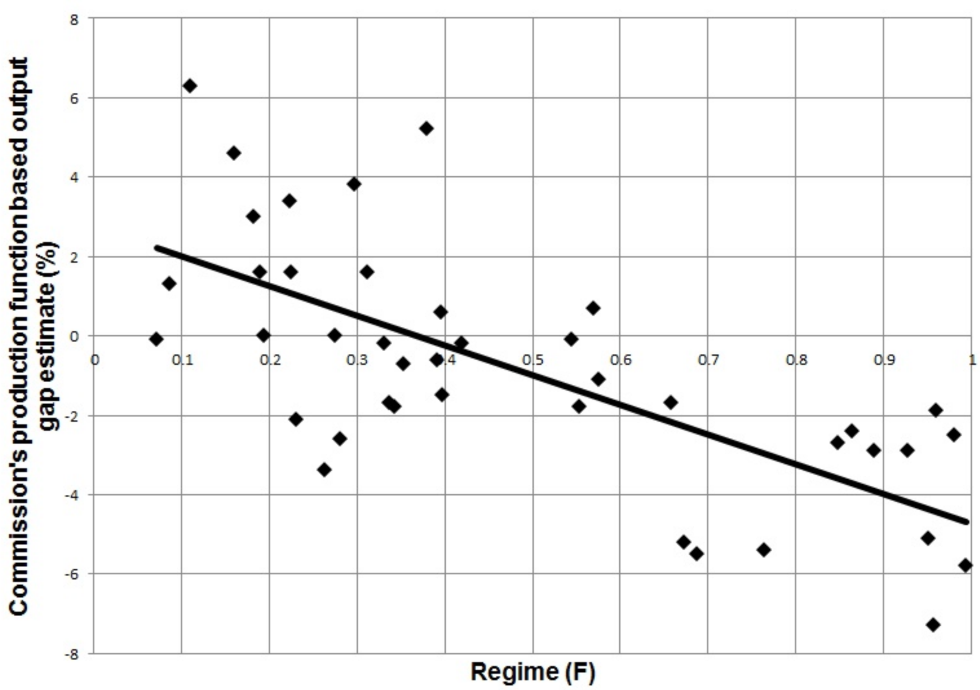

Figure 14: European commission's output gap estimates and the regime (F, $\gamma = 2$).

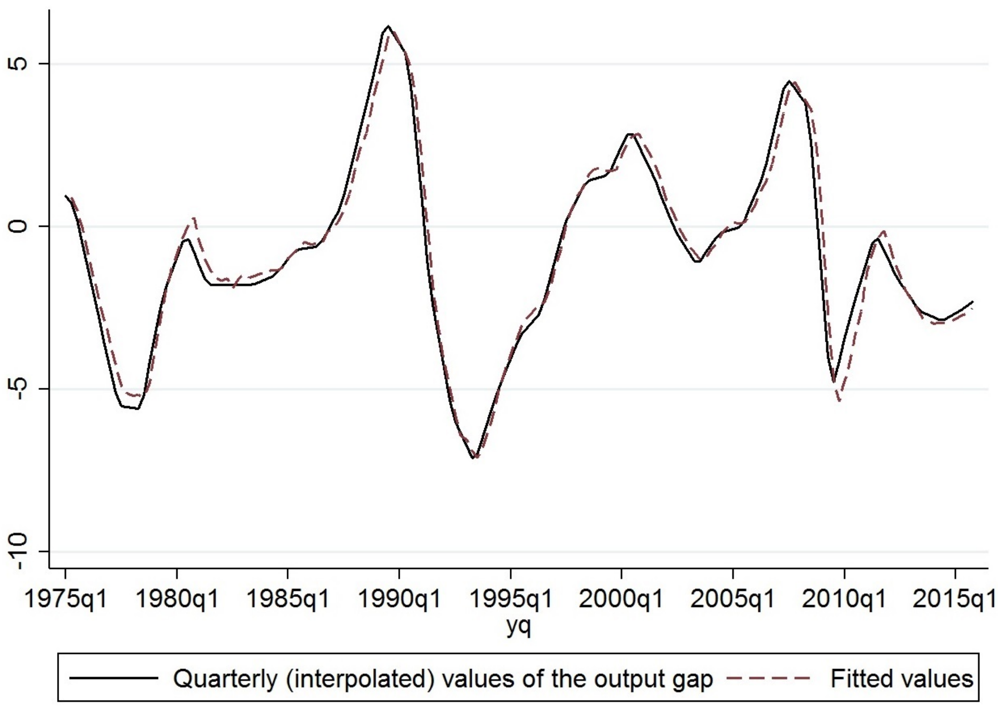

Figure 15: The European Commission's output gap estimates and fitted values of the forecasting model.

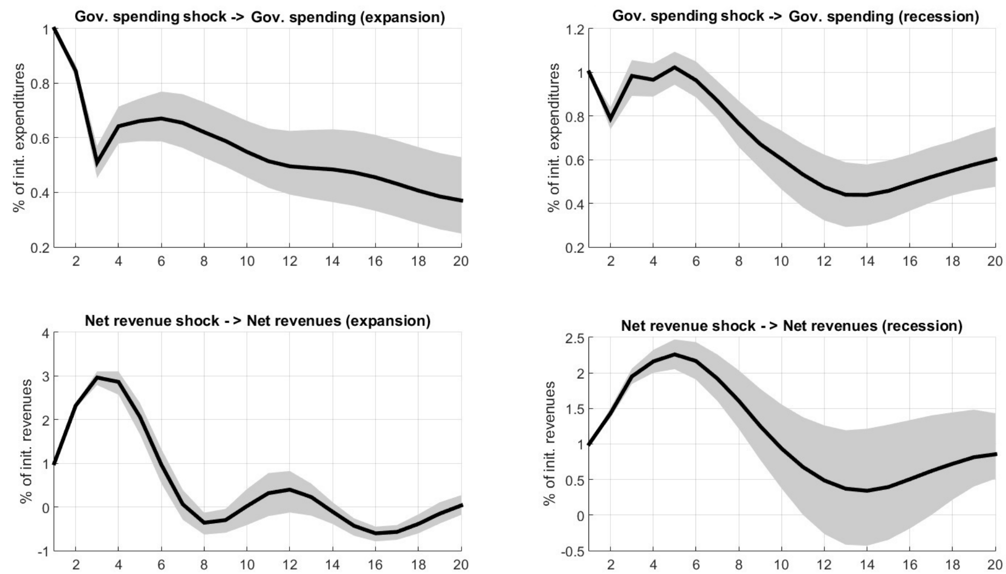

Figure 16: Impulse responses of the shocked fiscal variables that correspond to Fig. 4.

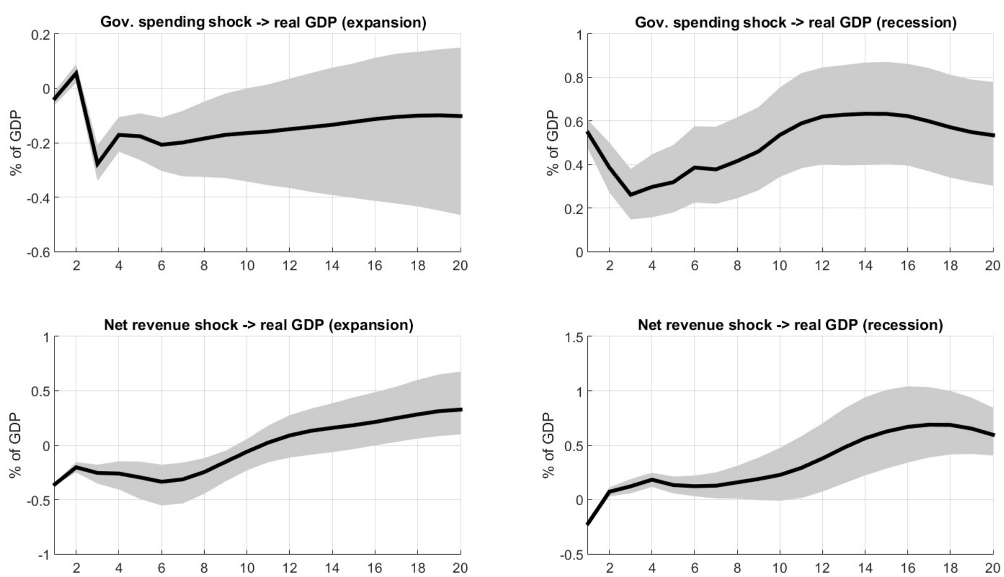

Figure 17: Impulse responses of the GDP that correspond to Fig. 4.

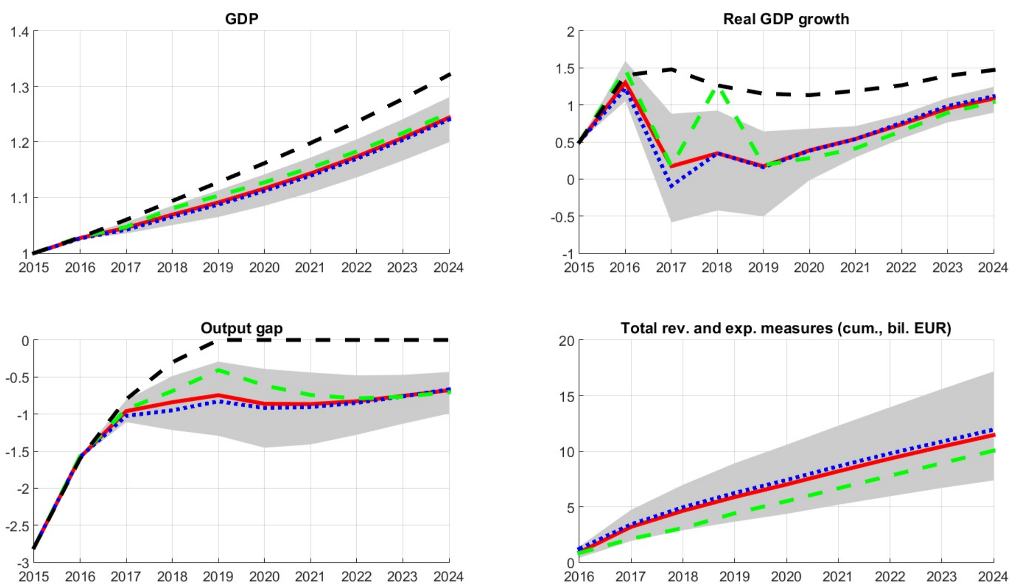

Figure 18: The minimum adjustment with different assumptions of lags and γ. Red line: benchmark (lag 3, $\gamma = 2$). Green, dashed line: lag 2, $\gamma = 2$. Blue, dotted line: lag 3, $\gamma = 3$.

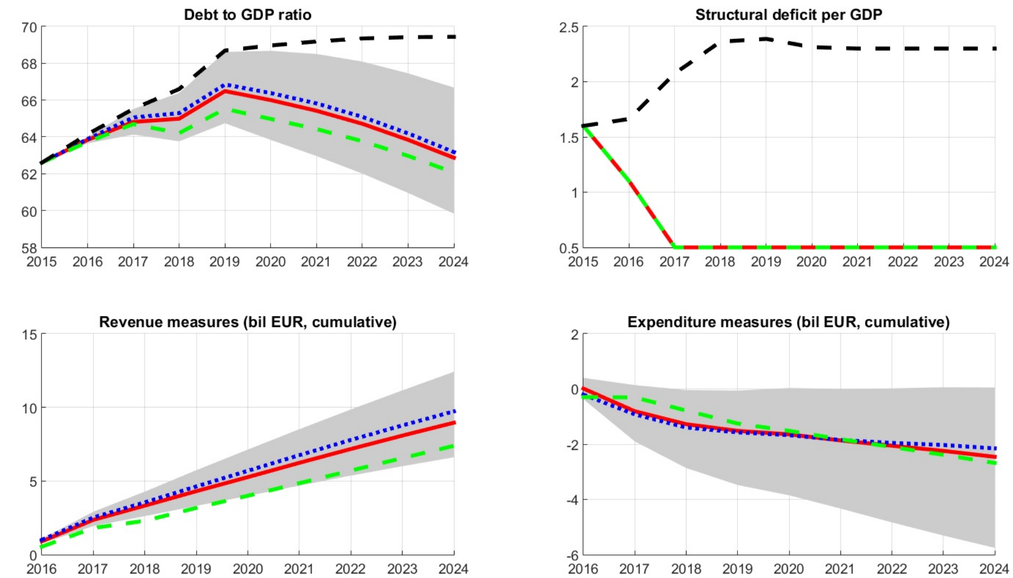

Figure 19: The minimum adjustment with different assumptions of lags and γ. Red line: benchmark (lag 3, $\gamma = 2$). Green, dashed line: lag 2, $\gamma = 2$. Blue, dotted line: lag 3, $\gamma = 3$.

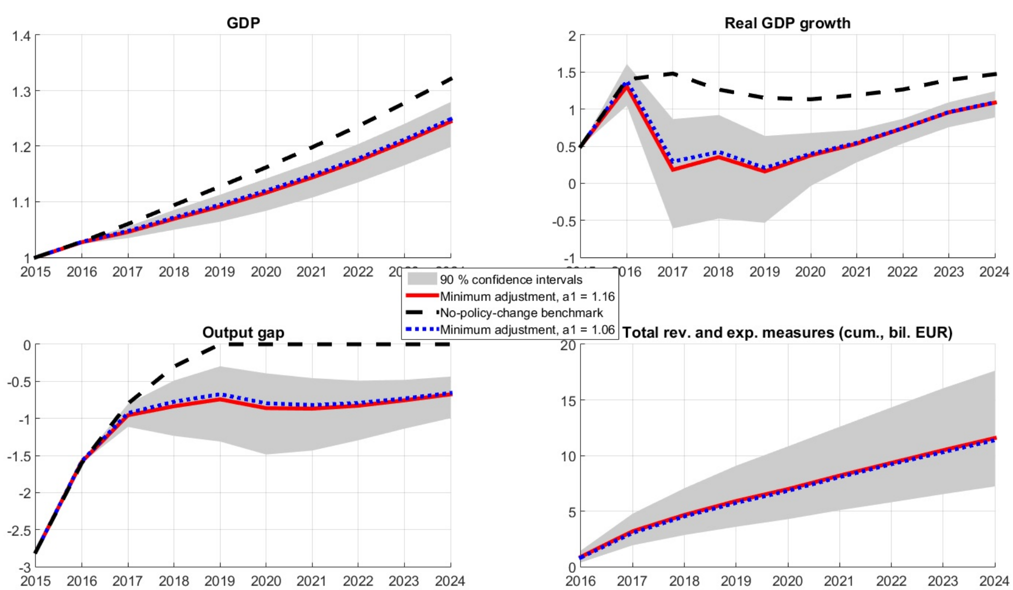

Figure 20: The minimum adjustment with different a_1 assumptions. Red line: benchmark ($a_1 = 1.16$). Blue, dotted line: $a_1 = 1.06$.

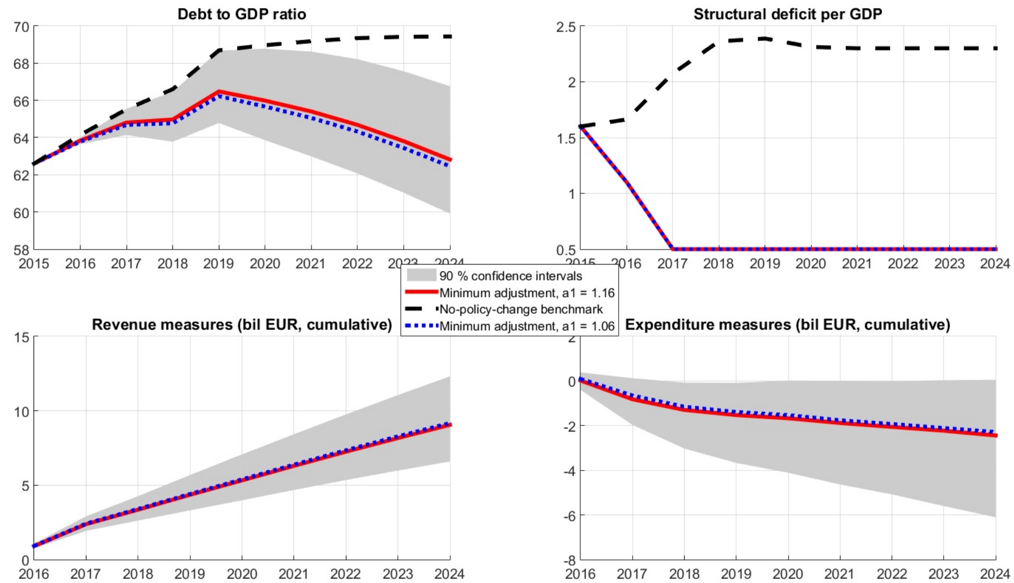

Figure 21: The minimum adjustment with different a_1 assumptions. Red line: benchmark ($a_1 = 1.16$). Blue, dotted line: $a_1 = 1.06$.

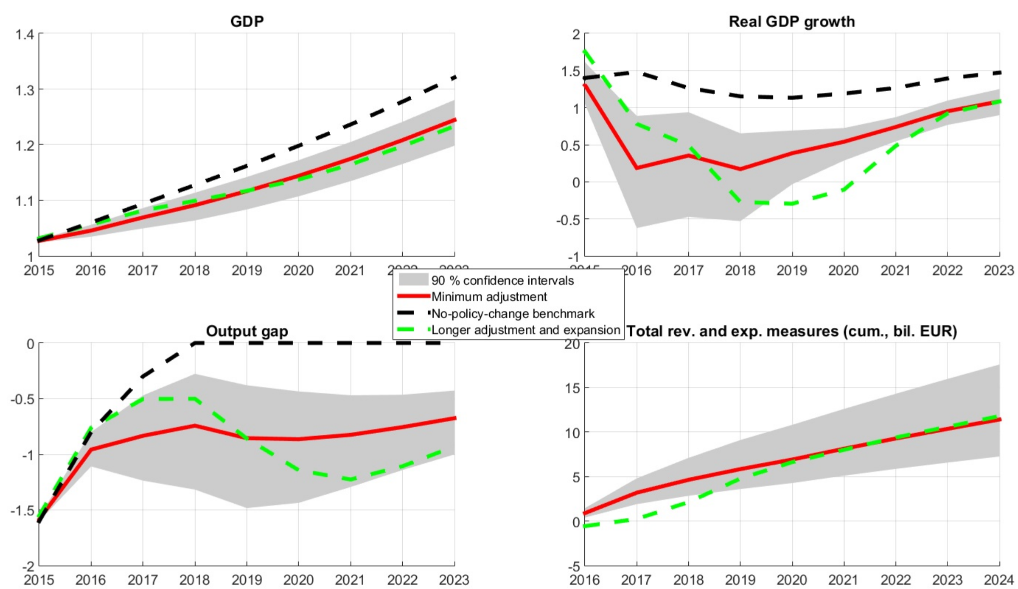

Figure 22: Adjustment in two years vs. adjustment in five years with an initial government spending expansion. Economic outcomes and the total size of adjustment. The reported confidence intervals are for the 2-year adjustment.

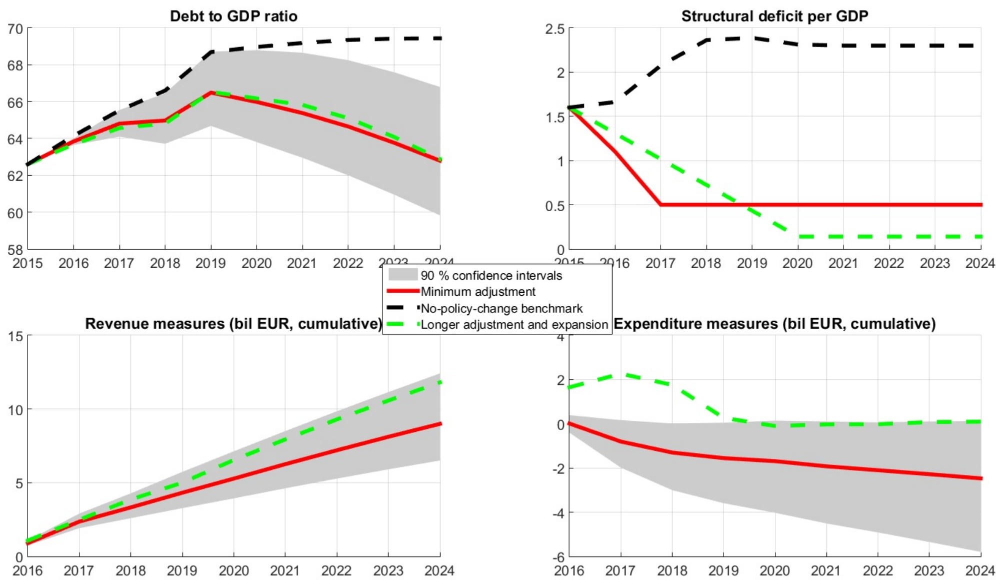

Figure 23: Adjustment in two years vs. adjustment in five years with an initial government spending expansion. Fiscal variables. The reported confidence intervals are for the 2-year adjustment.

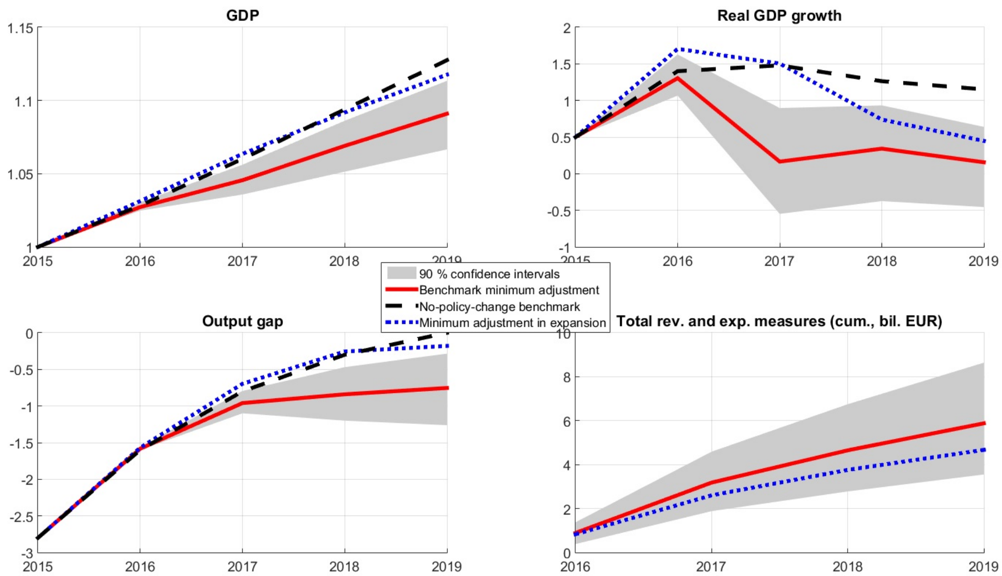

Figure 24: Minimum adjustment in an expansionary regime. Economic outcomes and the total size of adjustment. The reported confidence intervals are for the 2-year adjustment.

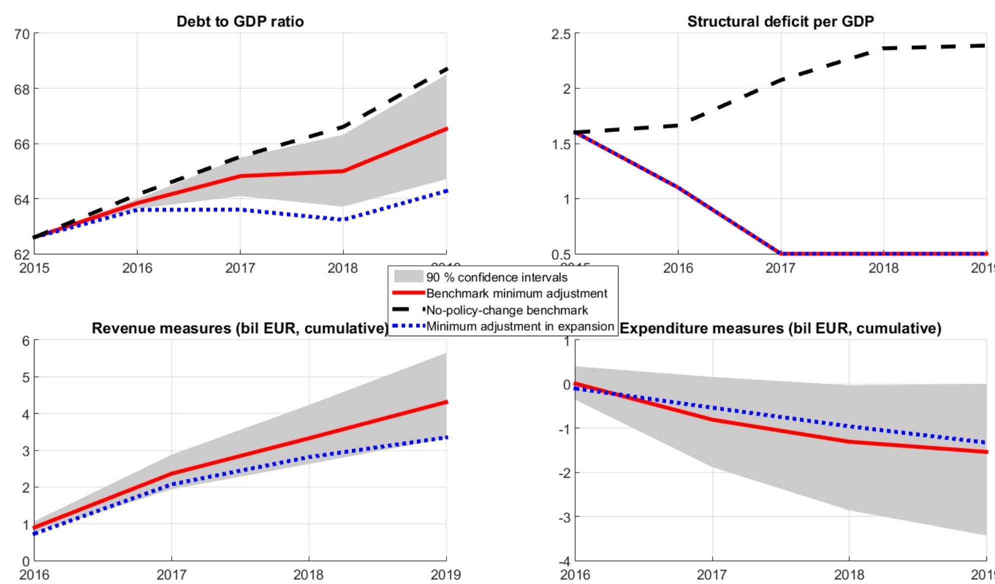

Figure 25: Minimum adjustment in an expansionary regime. Fiscal variables. The reported confidence intervals are for the 2-year adjustment.