Demand Side or Supply Side Stabilization Policies in a Small Euro Area Economy: A Case Study for Slovenia

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Abstract: In this paper we investigate how effective stabilization policies can be in a small open economy which is part of the Euro Area, namely Slovenia. In particular, we investigate fiscal policy effects on aggregate target variables of the Slovenian economy. Slovenia is an interesting case because it is one of the few small open economies from Central and Eastern Europe that was already in the Euro Area before the Great Recession. Simulating the SLOPOL10 model, an econometric model of the Slovenian economy, we analyse the effectiveness of various categories of public spending and of taxes over a time horizon until 2024. Some of these instruments are targeted towards the demand side, while others primarily influence the supply side. Our results show that those public spending measures that entail both demand and supply side effects are more effective in stimulating real GDP and increasing employment than purely demand side measures. Measures that increase research and development and those that improve the education level of the labour force are very effective in stimulating potential and actual GDP. Employment can also be effectively stimulated by cutting the income tax rate and the social security contribution rate, i.e. by reducing the tax wedge on labour income and positively affecting Slovenia's international competitiveness. This shows that fiscal policy measures with a supply side component are much more effective than those that are purely demand side oriented.

Keywords: macroeconomics; stabilization policy; fiscal policy; tax policy; public expenditures; demand management; supply side policies; Slovenia; public debt.

JEL Codes: E62; E17; E37.

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1. Motivation

The Great Recession, the financial and economic crisis of 2007 to 2009, was the most severe economic crisis since the Great Depression of the 1930s. As a consequence, stabilization policy, which was considered to be of less importance during the "Great Moderation" since the mid-1980s (Lucas 2003), again came to the fore in the industrialized countries. Monetary policy reacted quickly by expansionary measures, and fiscal policies followed by letting automatic stabilizers work and in some countries supporting them by discretionary measures such as tax reductions or increases in public expenditures. In the Euro Area, the leading role of monetary policy was even more pronounced than elsewhere as its member states had surrendered this instrument to the European System of Central Banks and the European Central Bank (ECB) in particular. This implies that the only macroeconomic stabilization policy instrument available to Euro Area members was fiscal policy. It is therefore of interest to investigate again the role of fiscal policy in stabilizing an economy faced with a deep and (as it turned out in Europe) prolonged (double-dip) recession. Unfortunately, within academia opinions about the effectiveness of expansionary fiscal policy measures are sharply divided. While some authors (e.g. Taylor 2009) argue against using fiscal policy in a discretionary way, others point towards potentially large multiplier effects of tax reductions or expenditure increases (e.g. Romer and Romer 2010). In view of the architecture of the Euro Area and the fact that most of its members have to be characterized as small open economies, it is therefore of utmost importance to clarify the adequate role of fiscal policy for small open economies in a monetary union, which is constrained by the problem of high and rising sovereign debt.

In this paper, we aim at contributing to this debate by empirically estimating fiscal policy effects for the Euro Area economy of Slovenia. We are particularly interested in the question whether demand side (Keynesian) fiscal policies aiming primarily at supporting deficient demand can contribute to stabilizing this economy or some element of supply side orientation has to be added to render these policies successful. The debate between Keynesians and supply siders was a hot topic in the 1980s in the wake of the oil price shocks and (as many macroeconomic policy debates) has not been completely settled since then. The prevailing opinion (though not a consensus) considers demand side policies to be appropriate when combating an adverse demand side shock but not necessarily when faced with a supply side shock (such as stagflation). The Great Recession – as most real world shocks – contained both demand and supply elements, but most interpretations agree that demand side elements prevail. Nevertheless, especially in the European Union, policies proposed by the European Commission (and to some extent prescribed to the member states) contain calls for structural reforms to enhance growth and employment both in the short and the long term, which implies for fiscal policy to embed also supply side measures. By contrast, many politicians and interest group representatives heavily criticize what they call the "austerity regime" of the Commission and advocate an expansionary fiscal policy stance in spite of already high public debt.

Here we examine the question whether Slovenia would benefit more from a demand or from a supply side orientation of its fiscal policy with the help of an econometric model. The plan of the paper is as follows: Section 2 gives a brief overview of the recent past and the present situation of the Slovenian economy. Section 3 describes the macroeconometric model SLOPOL10 which is used for the empirical analysis. More details of the model are given in the Appendix. Section 4 presents a forecast of the Slovenian macroeconomy for the years 2017 to 2014 obtained with the model, which serves as the baseline solution for the policy simulation. The forecast implies sluggish growth but decreasing unemployment and public debt to GDP ratio in the medium run. In Section 5, we describe the policy simulations and show their main

results. It turns out that expenditure side budgetary measures with a strong supply side content (especially research and development related spending and enhancement of human capital) will be most successful and effective in stabilizing the Slovenian economy, while tax policies exert much smaller and transitory effects. Section 6 concludes.

2. Slovenia in the Euro Area

During the Great Recession, real GDP in Slovenia declined by as much as 7.8 percent in 2009. As in in nearly all industrial countries, irrespective of their initial situation, unemployment rose sharply. Partly due to government failures, i.e. to inadequate actions taken by its economic policy makers, Slovenia was hit particularly sharply by the crisis. Together with most countries from Central and Eastern Europe, Slovenia was the only country in former Yugoslavia to enter the European Union in 2004 and to introduce the euro as legal tender as early as 2007. The economic development of Slovenia was successful in terms of GDP growth and the reduction of unemployment before the Great Recession.

However, the positive macroeconomic development disguised a housing bubble. With the outbreak of the global financial and economic crisis, the real estate bubble burst, and the impact of the recession was especially deep in Slovenia. In 2012 and in 2013 the Slovenian economy contracted again, and even at the end of 2016 seasonally adjusted real GDP was still lower than in the second quarter of 2008, the last pre-crisis quarter in Slovenia. As a result of this double-dip, the unemployment rate rose from its low of 4.3 percent in 2008 to 10 percent in 2013, and only with a more vigorous economic recovery starting in 2014 in declined again.

The double economic crisis resulted in an unprecedented increase in Slovenia's public debt. As the IMF (2015a) notes, the economic crisis culminated in a severe financial crisis in 2013. This required significant public support to six banks, at a fiscal cost of about 10 percent of GDP. As a result, Slovenia's fiscal position deteriorated significantly. The budget deficit rose from near zero in 2007-2008 to almost 14 percent of GDP in 2013, and the debt ratio quadrupled, rising to more than 83 percent in 2015.

Public debt did not only rise as a result of discretionary stabilization policies and the working of automatic stabilizers but was also driven by public capital injections into the banking system. This state aid became necessary as some of the largest banks developed liquidity and solvency problems when loans became non-performing resulting from the bursting of the real estate bubble. Due to the meanwhile high level of public debt and the large share of non-performing loans, the future macroeconomic development as well as public finances are still vulnerable in Slovenia. According to the IMF (2015b), still prevailing deleveraging needs of the private and public sectors weigh on medium-term growth. Therefore, public finances have to be consolidated through structural measures and reforms to put public debt on a sustained downward path. According the IMF (2015a), consolidation should be mainly focused at the expenditure side, since expenditures, in particular social expenditures were the main driver of the drastic deterioration of Slovenia's public finances. Even excluding one-off bank support costs, public spending has increased by more than 5 percentage points of GDP between 2008 and 2014, one of the largest figures in the group of Central and Eastern European countries. Moreover, with an expenditure to GDP ratio now at about 46 percent (excluding bank support costs), Slovenia has switched from being below the OECD average prior to the crisis to now being even well above the OECD average. Social benefits are the largest expenditure category in Slovenia.

As the IMF (2015b) states, restructuring of the banking sector is also important in the context of consolidating public finances. Large injections into the banking sector raise public debt,

leading to a decline of the value of public bonds. As far as these bonds are held by banks, their balance sheets deteriorate, necessitating further state aid, leading to a further deterioration of public finances. This link has to be broken.
Public finances may be insufficiently prepared to deal with the drop in aggregate demand resulting from such a crisis if automatic stabilizers are not well developed or if political authorities are under pressure from unions to continue making excess payments to public employees, pensioners, etc. This raises the question of the adequate reaction of the Slovenian government budget and the effectiveness of alternative measures.
Although there is a large body of evidence regarding the effects of macroeconomic policies in different countries during the Great Recession, its interpretation still diverges among adherents of different macroeconomic theories. In particular, the role of fiscal policy and the specific problems of countries within the Euro Area are subject to ongoing controversies (see, for instance, Coenen et al. 2008, 2012, Cogan et al. 2010). It is well known that fiscal policy effects are smaller ceteris paribus in an open economy than in larger economies that are less open, but the empirical evidence is also mixed for open economies. Slovenia is an interesting case because it is one of the few small open transition economies that was already in the Euro Area before the Great Recession. Especially for small open economies, an internationally coordinated fiscal action might be more effective than isolated policies. Furthermore, an already high level of public debt is likely to undermine positive effects of fiscal stimuli. Hence, a clear commitment to fiscal consolidation after overcoming a crisis is required (see, e.g., Spilimbergo et al. 2009, IMF 2008). Fiscal multipliers do not only depend on the openness of an economy, but may also vary with the position in the business cycle. Auerbach and Gorodnichenko (2013) conclude that in particular spending multipliers tend to be larger in recessions than in expansions. Furthermore, strict fiscal consolidation measures in a recession might contribute to a deepening of the recession (Blanchard and Leigh 2013).
In this paper we analyse the effects of different fiscal policy measures in Slovenia with a focus on the situation after the Great Recession. We use the SLOPOL model, an econometric model of the Slovenian economy constructed by us, to simulate the effects various tax and spending policies on important macroeconomic variables as well as on the public debt level. Moreover, we investigate whether (and if so, how) fiscal policy can reduce the macroeconomic effects of the aftermath of the Great Recession. These simulations update and extend earlier simulations reported in Neck et al. (2013) by focusing on some supply side components of fiscal policies in addition to their demand side effects.

3. The Macroeconometric Model SLOPOL10

For this study we use an updated version of the SLOPOL model. SLOPOL is a medium-sized macroeconometric model of the small open economy of Slovenia. We use the most recent version SLOPOL10, consisting of 75 equations, of which 24 are behavioural equations and 51 are identities. In addition to the 75 endogenous variables the model contains 41 exogenous variables. For the present work we built on earlier versions as described in Neck et al. (2011), updated and re-estimated the equations, and made some amendments to the model.
The behavioural equations were estimated by ordinary least squares (OLS), except for the labour demand and supply equations which were estimated as censored Tobit models. Almost all behavioural equations were specified in error correction form. This requires inspecting the time series properties to ensure that the variables are either stationary or cointegrated. Most of the variables passed these tests; hence it was decided to use the error correction specification. The results of the unit root and cointegration tests are not reported here; see

Weyerstrass and Neck (2007) for the tests as used in a previous version of the model. In an error correction model, the behavioural equations are defined in terms of the growth rates of the relevant endogenous variables; the equations comprise both the short-run dynamics of the endogenous variables and the long-run equilibrium between the endogenous and the explanatory variables.

The behavioural equations were estimated using quarterly data for the period 1995q1 to 2015q4. Data for Slovenia and for Euro Area aggregates as well as the oil price were taken from the Eurostat database, and world trade came from the CPB Netherlands Bureau for Economic Policy Analyses.

The model contains behavioural equations and identities for the goods market, the labour market, the foreign exchange market, the money market and the government sector. Rigidities of wages and prices are taken into account. The model combines Keynesian and neoclassical elements, the former determining the short and medium run solutions in the sense that the model is demand-driven and persistent disequilibria in the goods and labour markets are possible. In the following, the model equations are verbally described. A full list of the equations along with the variable definitions is provided in the appendix.

The supply side incorporates neoclassical features. In accordance with the approach applied by the European Commission for all EU Member States (Havik et al. 2014), potential output is determined by a Cobb-Douglas production function with constant returns to scale. It depends on trend employment, the capital stock and autonomous technical progress. Trend employment is defined as the labour force minus natural unemployment, the latter being defined via the non-accelerating inflation rate of unemployment (NAIRU). In line with the literature on production functions as well as international practice in macroeconometric modelling, the elasticities of labour and capital were set at 0.65 and 0.35 respectively. These elasticities correspond approximately to the shares of wages and profits, respectively, in national income. The NAIRU, which approximates structural unemployment, is estimated by applying the Hodrick-Prescott (HP) filter to the actual unemployment rate. For forecasts and simulations, the structural unemployment rate is then extrapolated with an autoregressive (AR) process. The capital stock enters the determination of potential GDP not with its trend level but with its actual one.

Several steps are required to determine technical progress. First, ex post total factor productivity (TFP) is calculated as the Solow residual, i.e. that part of the change in GDP that is not attributable to the change in the production factors labour and capital, weighted with their respective production elasticities. In a second step, the trend of technical progress is then determined by applying the HP filter, in a procedure similar to the NAIRU. For simulations and forecasts, the trend of the TFP is explained in a behavioural equation. In accordance with the endogenous growth literature, technical progress is influenced by the share of people with tertiary education in the labour force. In addition, trend TFP is influenced by the real investment ratio, i.e. gross fixed capital formation over GDP. As a third factor, lagged real government spending on research and development (R&D) is included in the TFP equation.

On the demand side, consumption of private households is explained by a combination of a Keynesian consumption function and a function in accordance with the permanent income hypothesis and the life cycle hypothesis. Thus, private consumption depends on current disposable income and on the long-term real interest rate, the latter entering the consumption equation with a negative sign. Real gross fixed capital formation is influenced by the change in total domestic demand (in accordance with the accelerator hypothesis) and by the user cost of capital, where the latter is defined as the real interest rate plus the depreciation rate of the capital stock. Changes in inventories are treated as exogenous in the SLOPOL model, as in many macroeconomic models in use around the world.

Real exports of goods and services are a function of the real exchange rate and of foreign demand for Slovenian goods and services. Foreign demand is approximated by the volume of world trade. The real exchange rate shall capture the competitiveness of Slovenian companies on the world market. Real imports of goods and services depend on domestic final demand and on the real exchange rate. A real appreciation of the Slovenian currency (the Slovenian tolar until the end of 2006 and the euro following Slovenia's entry into the Euro Area on 1 January 2007) makes Slovenian goods and services more expensive on the world markets. On the other hand, foreign products become relatively cheaper; hence domestic production is substituted by imports. Thus a real appreciation stimulates imports while exerting a negative effect on exports. Even when Slovenia is part of the Euro Area, its real exchange rate can, of course, still appreciate or depreciate, not only against other currencies but also against other Euro Area countries due to inflation differentials.

On the labour market, both labour demand and supply are divided into the main age group (15 to 64 years) and the older people (65 years and above). Labour demand of companies (actual employment) is modelled via the employment rates of the two age groups, i.e. employment as share of the relevant age group in total population. Both equations were estimated as Tobit models, the employment rates being restricted to lie between 0 and 0.9 (15 to 64 years) and between 0 and 0.5 (65 years and older), respectively. Both employment rates are positively influenced by real GDP and negatively by the real net wage and additionally by the wedge between the gross and the net wage. The idea behind the latter is that increases in the tax wedge are born partly by employers and partly by employees. Rising income tax rates or social security contribution rates raise the production wage to which employers react by reducing their employment demand. Labour supply is modelled via the share of the labour force of the two age groups in total population. Also these equations have been estimated as Tobit models with restrictions of being positive, but below 0.9 and 0.5, respectively. Labour supply depends positively on the real net wage and, as employment, negatively on the wedge between the gross and the net wage.

In the wage-price system, gross wages, the CPI and various deflators are determined. The gross wage rate depends on the price level, labour productivity and the unemployment rate. This equation is based on a bargaining model of the labour market, where the relative bargaining power of the employees (or the trade unions) is negatively affected by unemployment. The consumer price index is linked to the private consumption deflator. The latter depends on domestic and international factors. Domestic cost factors comprise unit labour costs and the capacity utilisation rate. The inclusion of the capacity utilisation rate in the price equation represents a channel for closing an output gap by increasing prices in the case of over-utilisation of capacities and decreasing prices if actual production falls behind potential GDP. Foreign influences on Slovenian consumer prices are approximated by the import deflator. The public consumption deflator is linked to the most important cost factor of the public sector which is public consumption. Public consumption includes purchases of goods and services and wage costs of public employees. Similarly to consumer prices, both the investment and the export deflators are influenced by domestic and imported cost elements. The former are approximated by the unit labour costs, while the latter are captured by the import deflator. Finally, the import deflator is influenced by the oil price in euro as a proxy for international raw material prices, which constitute an important determinant of the price level in a small open economy like Slovenia.

On the money market, the short-term interest rate is linked to its Euro Area counterpart so as to capture Slovenia's Euro Area membership and the resulting gradual adjustment of interest rates in Slovenia towards the Euro Area average. In the same vein, the long-term Euro Area interest rate is included in the equation determining the long-term interest rate in Slovenia. In

addition, the long-term interest rate is linked to the short-term rate, representing the term structure of interest rates. Furthermore, the long-term interest rate is influenced by the debt to GDP ratio, representing a risk premium that rises with the debt ratio. The foreign exchange market is modelled by the real effective exchange rate against a group of 41 countries. Due to Slovenia's membership of the Euro Area, the nominal exchange rate is exogenous for Slovenia. However, the real exchange rate is still endogenous, even for the Euro Area countries, since it also depends on the domestic price development. Furthermore, the real effective exchange rate is an important determinant of exports and imports. When determining the effective exchange rate for Slovenia, it has to be taken into account that the country has been a Euro Area member state only since 2007. As the time series on which the estimations of the behavioural equations are based include the period before Slovenia's Euro Area accession in 2007, the bilateral exchange rate between the Slovenian tolar and the euro is included as one of the explanatory variables in the real effective exchange rate equation. In addition, the exchange rate between the euro and the US dollar is considered. Furthermore, inflation in Slovenia is a regressor. To be theoretically consistent, the inflation differential between Slovenia and the group of countries forming the base for the real effective exchange rate should have been taken. However, this would have involved information about price developments in 41 countries, and for these exogenous variables assumptions had to be made for ex post simulations.

In the government sector of the model, the most important expenditure and revenue items of the Slovenian budget are determined. Social security contributions by employees are calculated by multiplying the average social security contribution rate by the gross wage rate and the number of employees. In the same vein, income tax payments by employees are determined by multiplying the average income tax rate by the gross wage rate and the number of employees. In a behavioural equation, social security payments by companies are linked to social security contributions by employees. Profit tax payments by companies are explained by GDP as an indicator for the economic situation, taking account of the fact that profits and hence profit tax payments display a strongly pro-cyclical behaviour. Value added tax revenues depend on the value added tax rate and on private consumption. Other direct and indirect taxes, respectively, are determined via their relation to nominal GDP which is exogenous and has to be extrapolated in ex ante simulations, as all other exogenous variables. Interest payments on public debt depend on the lagged debt level and on the long-term interest rate. Public consumption, transfer payments to private households as well as the remaining public expenditures and revenues are exogenous. By definition, the budget balance is given by the difference between total government revenues and expenditures. The public debt level is extrapolated using the budget balance equation. The model is closed by a number of identities and definition equations.

Although the SLOPOL model is used for forecasting and policy simulations, it should be noted that the model – like every structural econometric model – may be subject to the famous Lucas critique. Lucas (1976) argued that the relations between macroeconomic aggregates in an econometric model should differ according to the macroeconomic policy regime in place. In this case, the effects of a new policy regime cannot be predicted using an empirical model based on data from previous periods when that policy regime was not in place. As Sargent (1981) argues, the Lucas critique is partly based on the notion that the parameters of an observed decision rule should not be viewed as structural. Instead, structural parameters in Sargent's conception are just "deep parameters" such as preferences and technologies. These parameters would be invariant, even under changing policy regimes. Providing for such "deep parameters" requires a different class of macroeconomic models, namely Computable General Equilibrium (CGE) or Dynamic Stochastic General Equilibrium (DSGE) models.

An approach taking the Lucas critique into account in structural models like SLOPOL emerged in the so-called London School of Economics tradition initiated by Sargan (1964). According to this approach, economic theory guides the determination of the underlying long-run specification, while the dynamic adjustment process is derived from an analysis of the time series properties of the data series. Error correction models involving cointegrated variables combine the long-run equilibrium and the short-run adjustment mechanism.

4. A Medium-Run Projection of the Slovenian Economy

The focus of this paper lies on the analysis of the relative effectiveness of spending and tax policies in Slovenia during the period 2017 to 2024. As we will be interested in comparing the effects of these fiscal policy measures with the trajectory of the Slovenian economy without such discretionary policies, we first have to determine a baseline simulation. Since the model is based on data until 2015, our forecast has to start in 2016. To this end, we have to make assumptions about the future development of all exogenous variables of the model. These can be divided into international variables (world trade, oil price, Euro Area interest rates), Slovenian variables largely beyond the control of policy makers (population), and Slovenian policy instruments (tax rates, various government spending items). For 2016 to 2018, we additionally use an add factor which adjusts real GDP so as to come as close as possible to estimations about real GDP growth in 2016 and forecasts for 2017 and 2018, respectively (IMAD 2016, European Commission 2017).

For the interest rates we assume that the European Central Bank will start to raise its policy rates only in 2018, hence the three months Euribor is assumed to become positive only in 2018. Afterwards it shall gradually rise further to reach 2 percent in 2023. At present, it is expected that US macroeconomic policies will be more expansionary than those in the EU and the Federal Reserve will increase its discount rate earlier than the ECB, implying gradual interest rate increases due to the international interest rate connections. Therefore the Slovenian long-term interest rate is assumed to gradually rise already from 2017 onwards. The exchange rate between the euro and the US dollar is held constant at 1.10 dollar per euro. For world trade, growth rates of 1.1 percent in 2016, 1.8 percent in 2017, 3 percent in 2018 and 4 percent per year from 2020 onwards are assumed. After a decline of 18.5 percent in 2016 (annual average), it is assumed that the oil price rises by 26 percent in 2017, by 10.5 percent in 2018, and by 1.5 percent p.a. thereafter.

According to existing projections, Slovenia's population in the working age will decline by around 0.75 percent per year until 2022 and by 0.5 percent per year afterwards. In contrast, as all over Europe, population aged 65 and over will continue to rise. According to the population projections, this growth slightly decreases from almost 3 percent p.a. during 2016 to 2019 to about 2 percent p.a. in 2023 and 2024.

Turning to the fiscal policy instruments, it is assumed that the tax and social security contribution rates will not be changed from their 2015 values. The exception is the value added tax rate which in 2016 was raised from 20 to 22 percent. In the baseline, it is held constant at this level over the entire simulation period. Government consumption and investment are assumed to be increased by 3 percent p.a. from 2017 to 2019, and by 4 percent p.a. afterwards. Public spending on research and development is increased by 5 percent per year from 2017 until 2024. Transfer payments to private households are assumed to decline by 0.2 percent in 2017, to stagnate in 2018, and to increase by 0.2 percent in 2019, by 0.4 percent in 2020, by 0.7 percent in 2021, by 1.1 percent in 2022, and by 4 percent in 2023 and 2024. Residual government expenditures and revenues are increased by 3 percent p.a. and 4 percent p.a., respectively, over the entire simulation period. For 2016, the assumed

development of the policy instruments and the other exogenous variables aims at matching as far as possible the actual development as far as the data are already available.
These settings of the exogenous variables lead to the following baseline simulation results until 2024. According to recent forecasts (IMAD 2016, European Commission 2017), real GDP in Slovenia increased by about 2.5 percent in 2016, and growth will reach around 3 percent in 2017 and in 2018. As described above, we adjusted the endogenous model results so as to come as close as possible to these projections. Our model afterwards predicts a decline in the growth rate to just 0.75 percent in 2023 and in 2024. Due to the projected population development and the lower GDP growth, employment is forecast to decline from 2019 onwards, but unemployment is also decreasing. The unemployment rate is projected to decline from above 7 percent in 2016 to 4.5 percent in 2024, with a slight increase in the final year of our simulation period. After almost zero inflation in 2016, the inflation rate is forecast to rise steadily and even overshoot the 2 percent target of the ECB from 2021 onwards. Due to the overall favourable real economic development and the pick-up in inflation, the ratio between public debt and nominal GDP is projected to decline from 83 percent in 2017 to 70 percent in the last two years of the simulation period.

5. Policy Simulations

In this section we analyse the effectiveness of fiscal policies in Slovenia. For this purpose, we are interested in deviations of important macroeconomic aggregates like real GDP, the price level and inflation, employment and unemployment as well as the debt ratio from the baseline simulation described in the previous section. To this end, we perform eight simulations and analyse differences to the baseline. Although we run the model over the period 2016 to 2024, we focus on the development from 2017 onwards. The policy measures to which we turn now are implemented from 2018 onwards.
We distinguish between four spending instruments and three tax rates, In addition, we analyse the effects of an increase in the share of people with tertiary education in the labour force. We subsume this instrument under the spending measures, although due to lack of adequate data our model does not contain a specific instrument which is directly related to the education level, such as the number of teachers at high schools or the amount of public spending on universities.
For the simulations we consider the following instruments:

(i) GN: Government consumption, nominal
(ii) TRANSFERS: Transfers, nominal
(iii) GINVN: Public investment, nominal
(iv) GERD: Government expenditures on R&D, nominal
(v) LFTER: Share of people with tertiary education in the labour force
(vi) VAT: Value added tax rate
(vii) INCTAX: Personal income tax rate
(viii) SOCEMP: Employees' social security contribution rate

For each instrument, we run one separate simulation, i.e. in each simulation only one instrument is altered, whereas for all other instruments the baseline path is taken.
We assume that from 2018 onwards the public spending items are increased by 100 million euro per year with relative to the baseline. Hence, from 2018 until 2024 in the first simulation public consumption (GN) is by 100 million euro higher than in the baseline. In the second simulation this change is applied to transfers to private households (TRANSFERSN). In the third and fourth simulation, respectively, GINVN and GERD are raised by 25 million euro per quarter or 100 million euro per year over their baseline values. The share of people with tertiary

education is gradually increased from the first quarter of 2018 onwards, such that in 2018 on average this share is by 0.4 percentage points higher than in the baseline, and from 2019 on the share is by 1 percentage point higher compared to the baseline. In the simulations focussing on the revenue side, the value added tax rate is reduced by 1 percentage point from 2018 on, while in the remaining two simulations the income tax rate and the employees' social security contribution rate, respectively, are reduced by 0.5 percentage points relative to the baseline.

The fiscal policy instruments operate via diverse channels. By definition, public consumption and transfers initially trigger pure demand effects, either directly or via private consumption. Public investment also enters directly the GDP expenditure identity, but in addition it enters the capital stock and hence potential output. Furthermore, the investment ratio, i.e. real investment divided by real GDP, influences TFP and thereby also potential GDP. Public R&D spending also influences total factor productivity and is also part of investment, hence also this spending category initiates both demand and supply effects. The difference between the impacts of GINV and GERD is that the former affects the TFP only indirectly via the investment ratio, while the latter has also a direct effect on total factor productivity. In accordance with endogenous growth theory, the share of people with tertiary education in the labour force (LFTER) influences TFP and hence potential output. In contrast to all other instruments considered here, LFTER is not an instrument per se, but it can be viewed as an intermediate goal that can be reached by different policies such as higher spending on education or improving the efficiency of the educational system.

Ceteris paribus, a higher VAT rate raises indirect taxes which in turn reduces disposable income that is a determinant of private consumption. Changes in the income tax rate influence the tax wedge, i.e. the difference between the gross and the net wage. A higher tax wedge has negative effects on both labour demand and labour supply, which is another supply side policy effect. Increases in the income tax rate in addition reduce disposable income. Finally, the social security contribution rate influences the tax wedge and disposable income in the same way as the income tax rate. In addition, changes in employees' social security contributions also influence employers' contributions.

The following figures show the resulting absolute deviations from the baseline of important macroeconomic aggregates which are generally regarded as policy targets (real GDP level and growth, CPI level and inflation, employment, unemployment rate, debt to GDP ratio) in the various policy simulations. In order to keep the figures legible, the scenarios targeting the expenditure and the revenue side of the budget are shown in separate figures.

The names of the scenarios as indicated in the legends of the figures correspond to the policy instruments as mentioned above. The deviations from the baseline as measured in million euro at previous year's prices, reference year 2010 (real GDP), persons (employment), percentage points (GDP growth rate, inflation rate, unemployment rate, debt to GDP ratio), and index points (CPI level), respectively.

Figure 1 Real GDP, spending measures

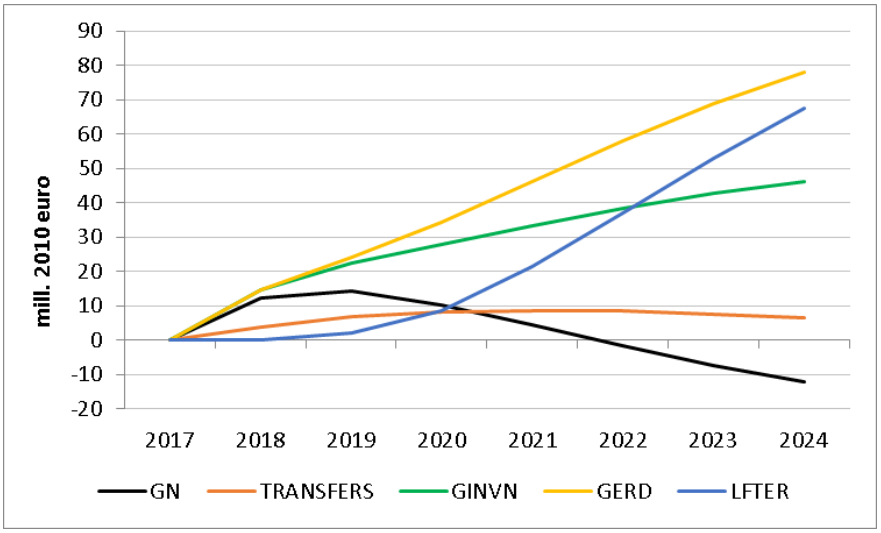


Figure 2 Real GDP, revenue measures

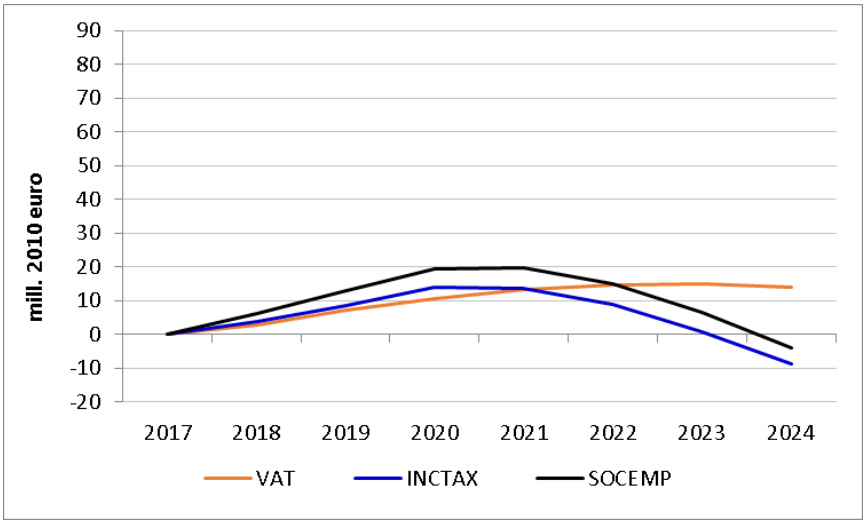


Figure 3 Real GDP growth, spending measures

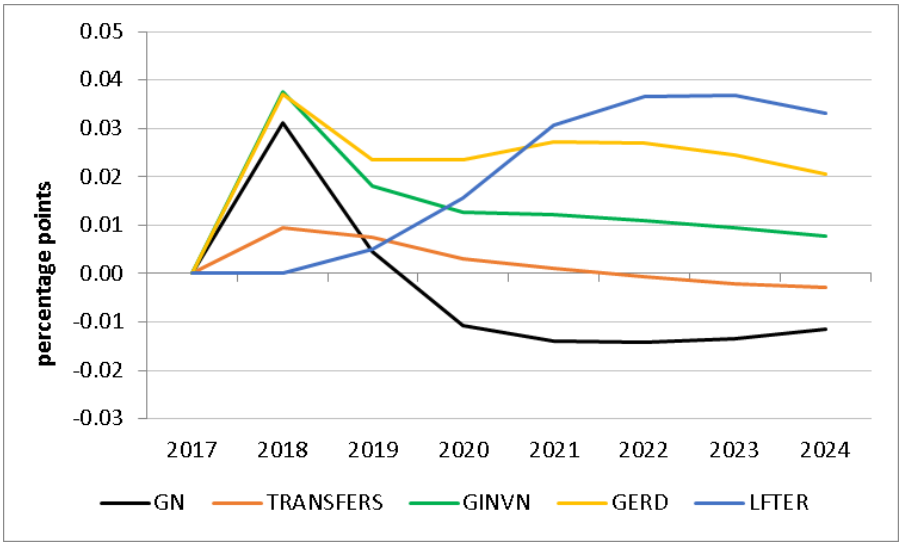


Figure 4 Real GDP growth, revenue measures

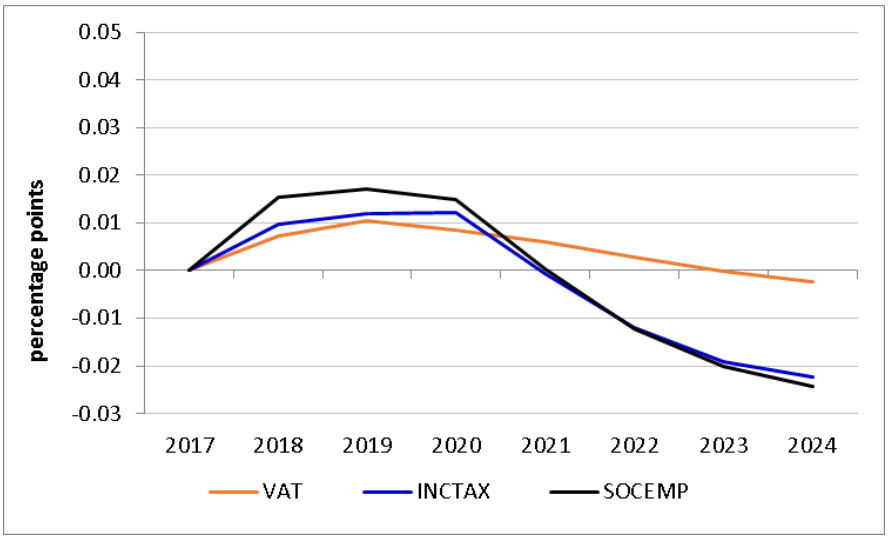


Figure 5 CPI level, spending measures

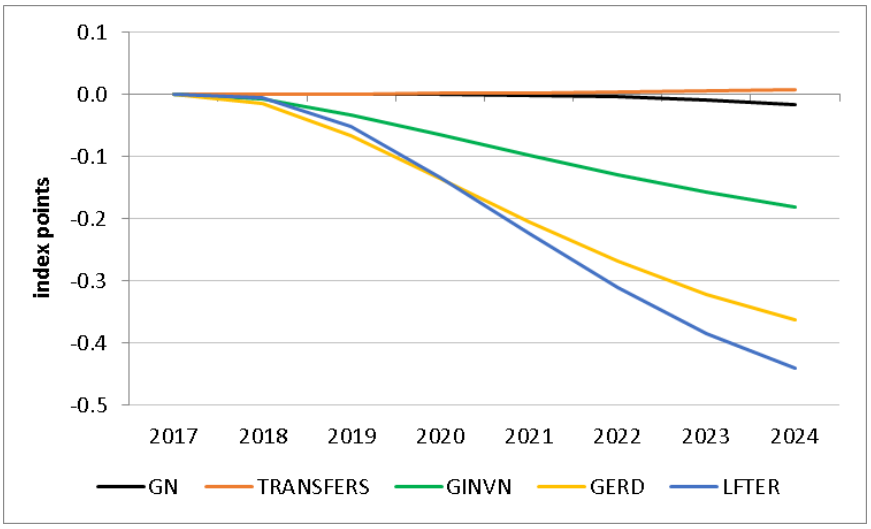


Figure 6 CPI level, revenue measures

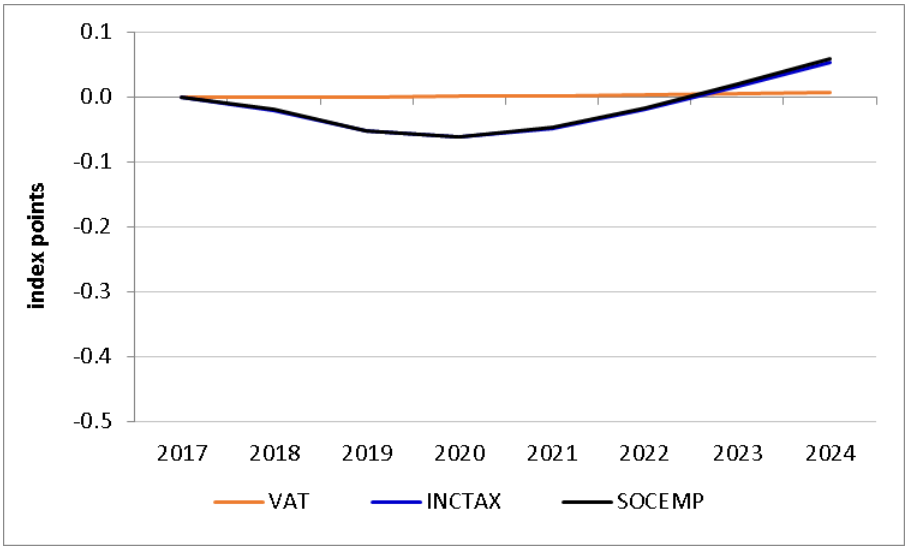


Figure 7 Inflation rate, spending measures

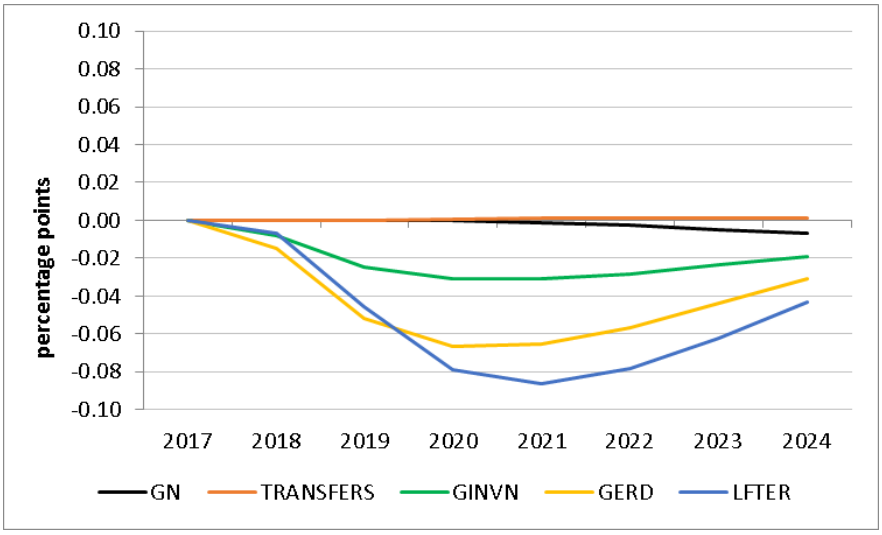


Figure 8 Inflation rate, revenue measures

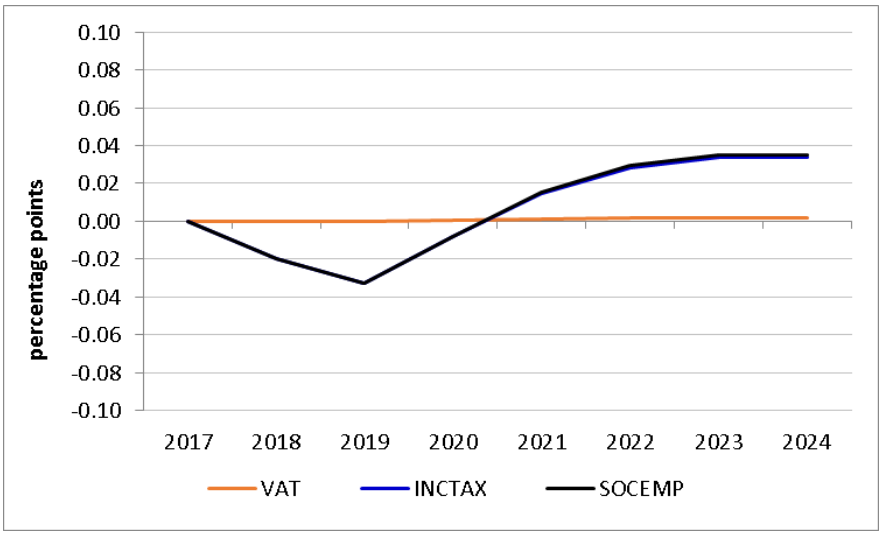


Figure 9 Employment, spending measures

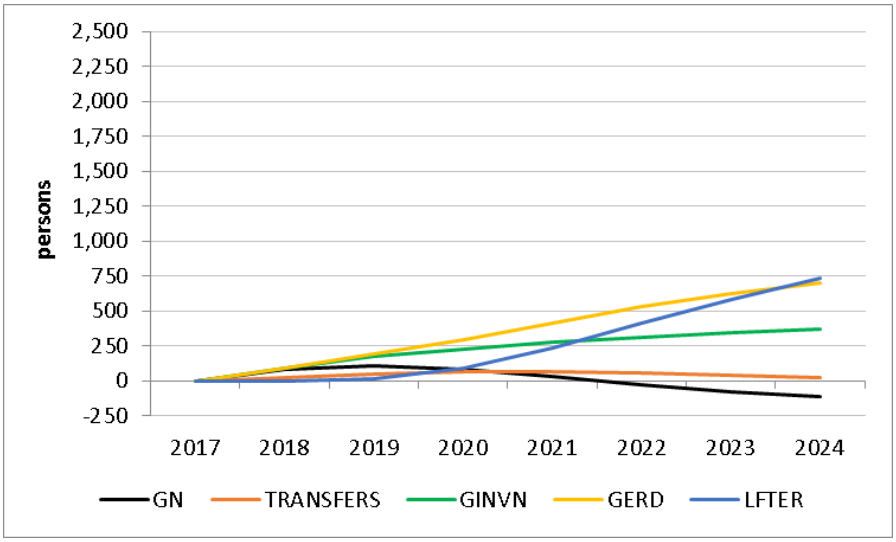


Figure 10 Employment, revenue measures

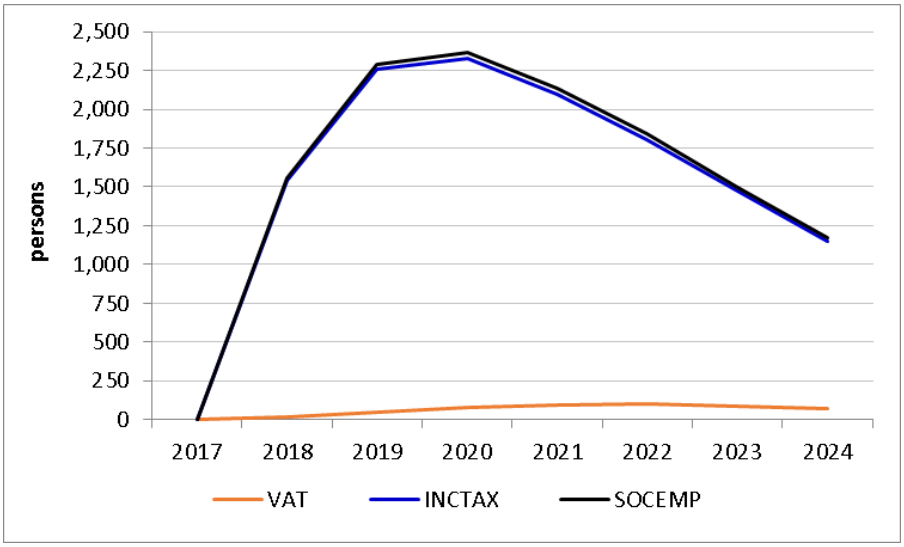


Figure 11 Unemployment rate, spending measures

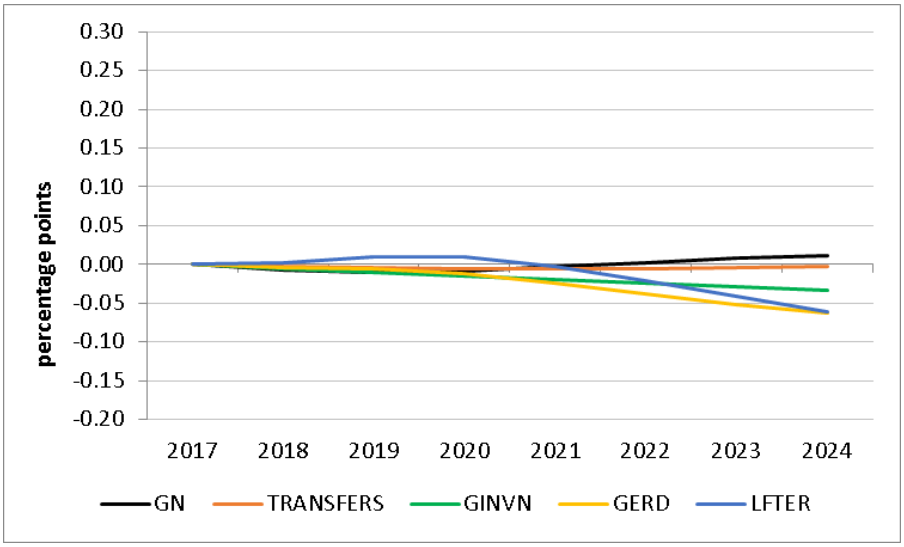


Figure 12 Unemployment rate, revenue measures

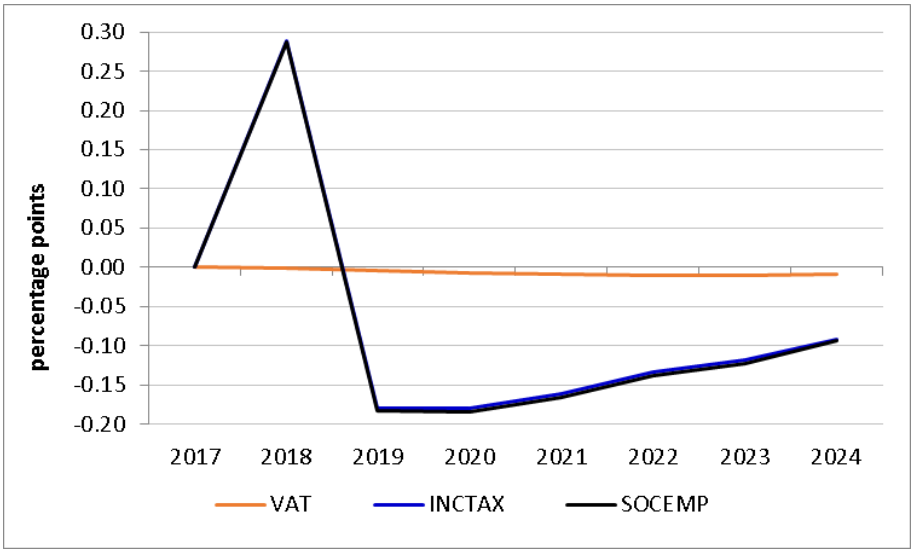


Figure 13 Debt to GDP ratio, spending measures

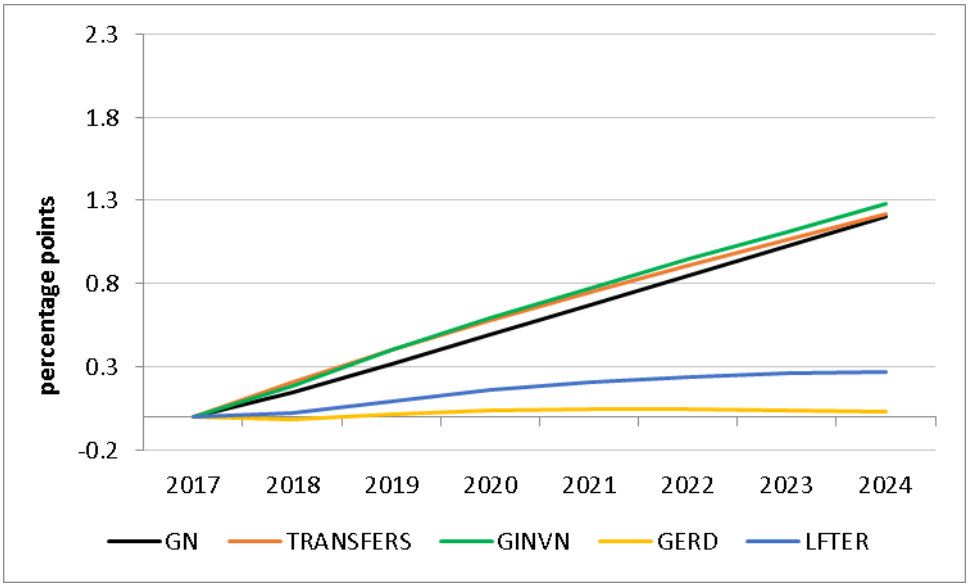
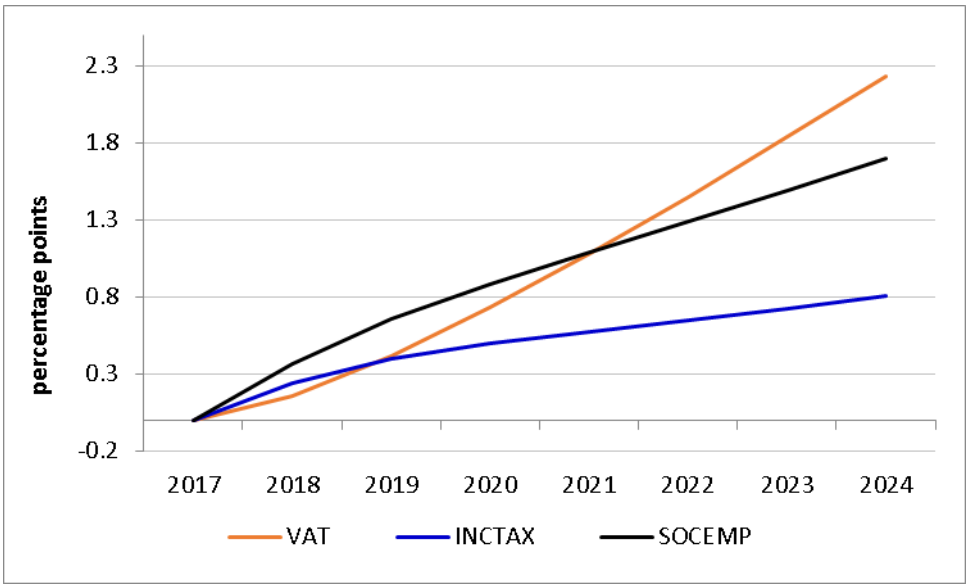


Figure 14 Debt to GDP ratio, revenue measures



As we assumed the change in each of the policy instruments (increases in spending, decreases in taxes) to be approximately of equal size in terms of 2018 euros, we can compare the effectiveness of each of them over time. Figures 1 and 2 show that there are clearly three instruments, all form the expenditure side, which lead to permanent and increasing additional real GDP; namely government spending on R&D (GERD), measures to improve human capital (LEFTER), and government investment (GINV). As Figure 3 shows, these measures generate higher growth over the entire simulation period (and beyond). On the other hand, government consumption (GN), transfers (TRANSFERS) and the three tax measures result in smaller and relatively short-lived increases in output, with crowding-out effects of public consumption after four years, of income taxes (INCTAX) after five years, and of social security contributions (SOCEMP) after six years. The instruments with long-run effects are those which contain a strong supply side element and increase total factor productivity and hence potential output in addition to aggregate demand. These effects are strongest for the R&D related and the tertiary

education related expenditures, which is in agreement with growth theory predicting permanent growth effects primarily from technical progress to which these two instruments are strongly related. Public investment increases the capital stock and therefore also potential output, but these increases are decreasing over time due to the diminishing marginal productivity of capital. This implies that if policy makers want to curb sluggish growth of real GDP, they have to implement measures with strong supply side (productivity) effects affecting research and development and human capital.

Figures 5 to 8 show that the effects on prices are relatively small; in the case of increases in transfers and decreases of the VAT rate, they are virtually nil. The other instruments, although applied in an expansionary way, lead to a lower price level and (temporarily) lower inflation. This is somewhat unexpected at first glance but can be explained by the relative size of supply side versus demand side effects: Potential output increases more than real GDP which implies that the supply side effect dominates the demand effect. For the investment variables (GINV, GERD and LEFTER), this effect is more pronounced due to their impact on public capital. But it holds also for the instruments affecting public or private consumption because the elasticity of imports with respect to GDP is well above one according to the estimated import equation, which dampens the GDP effect (but not the potential output effect) of expansionary fiscal policies. In the case of reductions in direct taxes, we have an additional effect of reducing the tax wedge resulting in lower demand for wage increases which in turn reduces cost related price increases.

In contrast to the goods market effects, effects in the labour market are stronger from tax reductions than from spending increases, as can be seen from Figures 9 to 12. On the expenditure side, transfers have only very minor and transitory effects on employment, and public consumption effects even turn into negative after three years. Again, supply related effects are stronger and, in particular, last longer and increase over time, especially those of R&D and tertiary education enhancing measures. Nevertheless, all of these effects are relatively small in terms of additional employment and reduced unemployment. On the other hand, direct tax reductions generate three times as many additional jobs than even the most effective expenditure measure, although this effect decreases after three years. This means that in order to increase employment and decrease unemployment, policy makers will have to reduce the tax wedge of income tax and social security contributions (the payroll related costs). The peak in the unemployment rate in the first year (Figure 12) is due to the fact that labour supply reacts more quickly to the reduction of the tax rates than labour demand, leading to a transitory increase in unemployment.

Finally, Figures 13 and 14 show the effects on public debt as related to GDP. Recall that the immediate effect of each measure on the public budget and hence the first round effect (in 2018) on the public deficit is assumed to be approximately the same for each measure. Over time, however, the costs in terms of a higher debt to GDP ratio develop in a different way. Here the clear winner are expenditures related to R&D, with human capital stimulation coming second. The loser is the VAT rate reduction; given its low effectiveness with respect to output and especially employment, this instrument seems to be rather unattractive. Instead, if containing public debt within limits prescribed by the EU Stability and Growth Pact is required, an increase in the VAT rate to finance income tax reductions and supply side related expenditure increases may be a reasonable policy mix.

6. Conclusions

Slovenia was hit particularly hard by the Great Recession with real GDP declining by almost 8 percent in 2009, and experiencing a decline in GDP also in 2012 and 2013. As a result, the unemployment rate more than doubled from 4.3 percent to 10 percent, and the debt to GDP ratio rose from 21.5 percent in 2007 to more than 83 percent in 2015. A forecast with SLOPOL10, a medium-sized macroeconometric model for Slovenia, predicts sluggish economic growth also over the next few years. The recent macroeconomic and fiscal performance and the forecast raise the question how the economy could be stimulated without at the same time increasing the debt level further (or even with reducing it). We use SLOPOL10 to simulate different expansionary fiscal policy measures on the revenue and expenditure side. Our results show that those public spending measures that entail both demand and supply side effects, i.e. public investment and especially R&D and tertiary education related spending, are more effective in stimulating real GDP than pure demand side measures. Measures that improve the education level of the labour force are very effective in stimulating potential GDP. Employment can be most effectively stimulated by cutting the income tax rate and the social security contribution rate, i.e. by reducing the tax wedge on labour income and positively affecting Slovenia's international competitiveness. Higher spending on research and development has only negligible effects on the debt to GDP ratio, while all other fiscal policy measures that we considered lead to higher public debt. Due to the high elasticity of imports with respect to demand, pure demand side effects on real variables are small, showing that a small open economy like Slovenia has only very little scope for influencing the macroeconomic development with demand management by fiscal policies.

Of course, it would be premature to infer strong conclusions for the current macroeconomic situation of the Slovenian economy based on just one model specification, but our results clearly support the theory and empirical evidence that policy measures strengthening potential GDP entail the best results in terms of stimulating economic growth and employment without putting too much additional strain on public finances. Supply side related fiscal policy measures outmatch those relying on demand effects only.

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Appendix: the SLOPOL10 model

Identities

OILEUR = OIL / EURUSD

GR = GN / GDEF * 100

CN = CR * CDEF / 100

AGWR = AGWN / CPI * 100

CAN = EXR * EXPDEF / 100 - IMPR * IMPDEF / 100

CAGDP = CAN / GDPN * 100

GRGDPR = GDPR / GDPR(-4) * 100 - 100

GRYPOT = (YPOT / YPOT(-4) - 1) * 100

ULC = AGWN / PROD

EMP = EMP1564 + EMP65PLUS

LF = LF1564 + LF65PLUS

UN1564 = LF1564 - EMP1564

UN = LF - EMP

UR1564 = UN1564 / LF1564 * 100

UR = UN / LF * 100

DEMAND = GDPR + IMPR

INCOME = GDPN + TRANSFERSN - SOCTOTAL - INCTAX - VAT - TAXDIRREST - TAXINDIRREST

INCOMER = INCOME / CPI * 100

INFL = (CPI / CPI(-4) - 1) * 100

UCC = GOV10YR + DEPR

GOV10YR = GOV10Y - INFL

INCTAXPERS = INCTAXRATE * (AGWN * EMP / 1000) / 1000

SOCEMP = SOCEMPRATE * (AGWN * EMP / 1000) / 1000

WEDGE = AGWN * (INCTAXRATE + SOCEMPRATE)

NETWAGEN = AGWN - WEDGE

NETWAGER = NETWAGEN / CPI * 100

SOCTOTAL = SOCCOMP + SOCEMP

INCTAX = INCTAXPERS + INCTAXCORP

CAPR = (1 - DEPR / 100) * CAPR(-1) + INVR

GDPR = CR + GR + INVR + INVENTR + EXR - IMPR + ADD_GDPR

GDPN = CN + GN + (INVR + INVENTR) * INVDEF / 100 + CAN + ADD_GDPR * GDPDEF / 100

GDPDEF = GDPN / GDPR * 100

TRENDEMP = LF * (1 - NAIRU / 100)

LOG(YPOT) = 0.65 * LOG(TRENDEMP) + (1 - 0.65) * LOG(CAPR) + LOG(TRENDTFP)

UTIL = GDPR / YPOT * 100

TAXDIRREST = TAXDIRRATE * GDPN / 100

TAXINDIRREST = TAXINDIRRATE * GDPN / 100

TGRN = VAT + SOCTOTAL + INCTAX + TAXDIRREST + TAXINDIRREST + REVREST

TGEN = GNFIN + GINVN + TRANSFERSN + INTEREST + EXPREST

BALANCE = TGRN - TGEN

BALANCEGDP = BALANCE / GDPN * 100

PRIMBALANCE = BALANCE + INTEREST

PRIMBALANCEGDP = PRIMBALANCE / GDPN * 100

DEBT = DEBT(-1) - BALANCE + BANKCAP + DEBTADJ

DEBTGDP = DEBT / (GDPN + GDPN(-1) + GDPN(-2) + GDPN(-3)) * 100

GINVR = GINVN / INVDEF * 100

GERDR = GERD / INVDEF * 100

INVR = PRINVR + GINVR + GERDR

INVN = INVR * INVDEF / 100

PROD = GDPR / EMP * 100

GN = GNFIN + GN_REST

Behavioural equations

Trend TFP

Dependent Variable: LOG(TRENDTFP)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-4.588302	0.031557	-145.3956	0.0000
LOG(GERDR(-1))	0.009127	0.002939	3.105505	0.0027
LOG(LFTERSHARE)	0.384806	0.013462	28.58483	0.0000
LOG(INVR/GDPR)	0.309750	0.020609	15.03015	0.0000

R-squared	0.926232	Mean dependent var	-3.822358
Adjusted R-squared	0.923320	S.D. dependent var	0.073865
S.E. of regression	0.020454	Akaike info criterion	-4.892575
Sum squared resid	0.031796	Schwarz criterion	-4.773474
Log likelihood	199.7030	Hannan-Quinn criter.	-4.844824
F-statistic	318.0849	Durbin-Watson stat	0.578590
Prob(F-statistic)	0.000000		

NAIRU

Dependent Variable: D(NAIRU)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.036300	0.014034	2.586675	0.0119
AR(1)	0.964684	0.028008	34.44357	0.0000
AR(2)	1.009875	0.042613	23.69864	0.0000
AR(3)	-1.002987	0.027982	-35.84430	0.0000
MA(1)	3.060629	0.107168	28.55926	0.0000
MA(2)	3.788772	0.276980	13.67885	0.0000
MA(3)	2.251278	0.276366	8.146018	0.0000
MA(4)	0.530152	0.105529	5.023732	0.0000

R-squared	0.999989	Mean dependent var	0.030382
Adjusted R-squared	0.999988	S.D. dependent var	0.094764
S.E. of regression	0.000325	Akaike info criterion	-13.12728
Sum squared resid	7.06E-06	Schwarz criterion	-12.88008
Log likelihood	500.2731	Hannan-Quinn criter.	-13.02858
F-statistic	900867.2	Durbin-Watson stat	1.704990
Prob(F-statistic)	0.000000		

Inverted AR Roots	.99-.12i	.99+.12i	-1.01	
	Estimated AR process is nonstationary			
Inverted MA Roots	-.70+.54i	-.70-.54i	-.72	-.94

Private consumption

Dependent Variable: LOG(CR/CR(-4))

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(CR(-1)/CR(-5))	0.430528	0.097671	4.407959	0.0000
LOG(INCOMER/INCOMER(-4))	0.271107	0.049305	5.498538	0.0000
LOG(CR(-4))	-0.076054	0.019353	-3.929895	0.0002
LOG(INCOMER(-4))	0.073271	0.018465	3.968091	0.0002
GOV10YR	-0.002808	0.001490	-1.884146	0.0636

R-squared	0.662603	Mean dependent var	0.017708
Adjusted R-squared	0.643595	S.D. dependent var	0.027772
S.E. of regression	0.016580	Akaike info criterion	-5.297704
Sum squared resid	0.019518	Schwarz criterion	-5.144367
Log likelihood	206.3128	Hannan-Quinn criter.	-5.236423
Durbin-Watson stat	2.201356		

Private gross fixed capital formation

Dependent Variable: LOG(PRINVR/PRINVR(-4))

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.041800	0.007577	-5.516902	0.0000
LOG(PRINVR(-1)/PRINVR(-5))	0.262850	0.068164	3.856155	0.0003
LOG(DEMAND/DEMAND(-4))	1.408577	0.174098	8.090725	0.0000
UCC(-1)-UCC(-5)	-0.010667	0.003353	-3.181333	0.0022
D2010*@SEAS(3)	-0.178049	0.049675	-3.584248	0.0006
D2014*@SEAS(4)	-0.116928	0.047511	-2.461089	0.0165

R-squared	0.837635	Mean dependent var	0.000894
Adjusted R-squared	0.825146	S.D. dependent var	0.112285
S.E. of regression	0.046952	Akaike info criterion	-3.198642
Sum squared resid	0.143295	Schwarz criterion	-3.007429
Log likelihood	119.5518	Hannan-Quinn criter.	-3.122602
F-statistic	67.06673	Durbin-Watson stat	1.904892
Prob(F-statistic)	0.000000		

Exports

Dependent Variable: LOG(EXR/EXR(-4))

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.431178	0.142987	3.015505	0.0036
LOG(EXR(-1)/EXR(-5))	0.369134	0.054150	6.816821	0.0000
LOG(WTRADE/WTRADE(-4))	0.757490	0.063198	11.98600	0.0000
LOG(REER(-4)/REER(-8))	-0.268571	0.101798	-2.638276	0.0103
LOG(EXR(-4))	-0.219205	0.062089	-3.530516	0.0007
LOG(WTRADE(-4))	0.310340	0.086111	3.603954	0.0006

R-squared	0.906577	Mean dependent var	0.060795
Adjusted R-squared	0.899904	S.D. dependent var	0.074717
S.E. of regression	0.023639	Akaike info criterion	-4.576173
Sum squared resid	0.039116	Schwarz criterion	-4.392168
Log likelihood	179.8946	Hannan-Quinn criter.	-4.502636
F-statistic	135.8558	Durbin-Watson stat	1.310206
Prob(F-statistic)	0.000000		

Imports

Dependent Variable: LOG(IMPR/IMPR(-4))

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-4.111959	0.542205	-7.583773	0.0000
LOG(DEMAND/DEMAND(-4))	1.879755	0.049056	38.31848	0.0000
LOG(REER(-2)/REER(-6))	0.403328	0.140640	2.867801	0.0055
LOG(REER(-3)/REER(-7))	-0.452867	0.143641	-3.152768	0.0024
LOG(IMPR(-4))	-0.382446	0.063753	-5.998824	0.0000
LOG(DEMAND(-4))	0.575074	0.099611	5.773224	0.0000
LOG(REER(-4))	0.411427	0.119773	3.435057	0.0010
D1998*@SEAS(1)	0.075797	0.018344	4.131916	0.0001
D2005*@SEAS(2)	-0.078065	0.016886	-4.623123	0.0000
D2008*@SEAS(2)	-0.047996	0.017214	-2.788272	0.0069
D2013*@SEAS(1)	0.046034	0.017093	2.693129	0.0090

R-squared	0.966170	Mean dependent var	0.051021
Adjusted R-squared	0.961045	S.D. dependent var	0.083519
S.E. of regression	0.016484	Akaike info criterion	-5.241260
Sum squared resid	0.017934	Schwarz criterion	-4.906431
Log likelihood	212.7885	Hannan-Quinn criter.	-5.107331
F-statistic	188.4953	Durbin-Watson stat	2.053014
Prob(F-statistic)	0.000000		

Employment 15 to 64

Dependent Variable: EMP1564/POP1564
Method: ML - Censored Normal (TOBIT) (Quadratic hill climbing)
Left censoring (value) series: 0
Right censoring (value) series: 0.9

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.617752	0.205016	-3.013194	0.0026
EMP1564(-4)/POP1564(-4)	0.473440	0.083637	5.660659	0.0000
LOG(GDPR)	0.200109	0.028037	7.137335	0.0000
LOG(NETWAGER)	-0.044223	0.022892	-1.931810	0.0534
LOG(WEDGE)	-0.071028	0.012054	-5.892452	0.0000
Error Distribution				
SCALE:C(6)	0.009669	0.000829	11.66307	0.0000

Mean dependent var	0.649321	S.D. dependent var	0.020398
S.E. of regression	0.010127	Akaike info criterion	-6.263221
Sum squared resid	0.006358	Schwarz criterion	-6.067382
Log likelihood	218.9495	Hannan-Quinn criter.	-6.185624
Avg. log likelihood	3.219846		

Left censored obs	0	Right censored obs	0
Uncensored obs	68	Total obs	68

Employment 65+

Dependent Variable: EMP65PLUS/POP65PLUS
Method: ML - Censored Normal (TOBIT) (Quadratic hill climbing)
Left censoring (value) series: 0
Right censoring (value) series: 0.5

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.088596	0.129398	-0.684680	0.4935
EMP65PLUS(-1)/POP65PLUS(-1)	0.601889	0.095973	6.271412	0.0000
LOG(GDPR)	0.057105	0.029604	1.928939	0.0537
LOG(NETWAGEN+WEDGE)	-0.048881	0.020062	-2.436480	0.0148
Error Distribution				
SCALE:C(5)	0.010093	0.000847	11.91675	0.0000

Mean dependent var	0.071263	S.D. dependent var	0.015864
S.E. of regression	0.010469	Akaike info criterion	-6.213057
Sum squared resid	0.007233	Schwarz criterion	-6.053713
Log likelihood	225.5635	Hannan-Quinn criter.	-6.149691
Avg. log likelihood	3.176951		
Left censored obs	0	Right censored obs	0
Uncensored obs	71	Total obs	71

Labour supply 15 to 64

Dependent Variable: LF1564/POP1564
Method: ML - Censored Normal (TOBIT) (Quadratic hill climbing)
Left censoring (value) series: 0
Right censoring (value) series: 0.9

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.705334	0.002051	343.9367	0.0000
LOG(NETWAGER/NETWAGER(-4))	0.161188	0.047925	3.363354	0.0008
LOG(WEDGE/WEDGE(-4))	-0.109962	0.031908	-3.446197	0.0006
D2008*@SEAS(2)+D2008*@SEAS(3)	0.043382	0.009935	4.366464	0.0000
Error Distribution				
SCALE:C(5)	0.012786	0.001065	12.00036	0.0000

Mean dependent var	0.698854	S.D. dependent var	0.017798
S.E. of regression	0.013255	Akaike info criterion	-5.741991
Sum squared resid	0.011771	Schwarz criterion	-5.583889
Log likelihood	211.7117	Hannan-Quinn criter.	-5.679050
Avg. log likelihood	2.940440		
Left censored obs	0	Right censored obs	0
Uncensored obs	72	Total obs	72

Labour supply 65+

Dependent Variable: LF65PLUS/POP65PLUS
Method: ML - Censored Normal (TOBIT) (Quadratic hill climbing)
Left censoring (value) series: 0
Right censoring (value) series: 0.5

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.328811	0.049998	6.576439	0.0000
LF65PLUS(-4)/POP65PLUS(-4)	0.151573	0.101923	1.487128	0.1370
LOG(NETWAGER/NETWAGER(-4))	0.193717	0.035015	5.532452	0.0000
LOG(WEDGE)	-0.038563	0.006569	-5.870063	0.0000
Error Distribution				
SCALE:C(5)	0.010654	0.000914	11.66235	0.0000

Mean dependent var	0.070307	S.D. dependent var	0.015414
S.E. of regression	0.011069	Akaike info criterion	-6.098684
Sum squared resid	0.007719	Schwarz criterion	-5.935485
Log likelihood	212.3553	Hannan-Quinn criter.	-6.034020
Avg. log likelihood	3.122872		
Left censored obs	0	Right censored obs	0
Uncensored obs	68	Total obs	68

Average gross wage

Dependent Variable: LOG(AGWN/AGWN(-4))

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.238652	0.094790	2.517697	0.0141
LOG(AGWN(-1)/AGWN(-5))	0.599927	0.081908	7.324412	0.0000
LOG(CPI/CPI(-4))	0.133776	0.060170	2.223294	0.0295
LOG(PROD/PROD(-4))	0.114755	0.046267	2.480250	0.0156
UR	-0.003440	0.001374	-2.503514	0.0147
LOG(AGWN(-4)/CPI(-4))	-0.055291	0.025411	-2.175832	0.0330
D2012*@SEAS(2)	-0.030158	0.012554	-2.402247	0.0190

R-squared	0.842383	Mean dependent var	0.036745
Adjusted R-squared	0.828677	S.D. dependent var	0.029175
S.E. of regression	0.012076	Akaike info criterion	-5.907617
Sum squared resid	0.010062	Schwarz criterion	-5.692944
Log likelihood	231.4894	Hannan-Quinn criter.	-5.821823
F-statistic	61.46166	Durbin-Watson stat	1.669198
Prob(F-statistic)	0.000000		

CPI

Dependent Variable: LOG(CPI/CPI(-4))

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.000764	0.001468	-0.520422	0.6044
LOG(CPI(-1)/CPI(-5))	0.860254	0.052413	16.41307	0.0000
LOG(CDEF/CDEF(-4))	0.119368	0.050859	2.347029	0.0218
LOG(CPI(-4))-LOG(CDEF(-4))	-0.024320	0.010818	-2.247985	0.0277
D2008*@SEAS(4)	-0.024477	0.007146	-3.425420	0.0010

R-squared	0.945553	Mean dependent var	0.040547
Adjusted R-squared	0.942442	S.D. dependent var	0.028874
S.E. of regression	0.006927	Akaike info criterion	-7.042376
Sum squared resid	0.003359	Schwarz criterion	-6.887877
Log likelihood	269.0891	Hannan-Quinn criter.	-6.980686
F-statistic	303.9159	Durbin-Watson stat	1.496781
Prob(F-statistic)	0.000000		

Private consumption deflator

Dependent Variable: LOG(CDEF/CDEF(-4))

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.682771	0.235175	-2.903247	0.0050
LOG(AGWN/AGWN(-4))	0.268729	0.080909	3.321372	0.0014
LOG(IMPDEF(-5)/IMPDEF(-9))	0.090470	0.052562	1.721196	0.0898
LOG(CDEF(-4))	-0.306737	0.078477	-3.908646	0.0002
LOG(AGWN(-4))	0.118148	0.033301	3.547862	0.0007
LOG(UTIL(-1))	0.141968	0.051056	2.780623	0.0070
LOG(IMPDEF(-4))	0.100499	0.048712	2.063128	0.0429

R-squared	0.590179	Mean dependent var	0.018995
Adjusted R-squared	0.554018	S.D. dependent var	0.018193
S.E. of regression	0.012150	Akaike info criterion	-5.894314
Sum squared resid	0.010038	Schwarz criterion	-5.678015
Log likelihood	228.0368	Hannan-Quinn criter.	-5.807948
F-statistic	16.32099	Durbin-Watson stat	0.966717
Prob(F-statistic)	0.000000		

Public consumption deflator

Dependent Variable: LOG(GDEF/GDEF(-4))

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.119450	0.064518	1.851414	0.0681
LOG(GDEF(-1)/GDEF(-5))	0.544327	0.086890	6.264521	0.0000
LOG(GNFIN/GNFIN(-4))	0.090745	0.039735	2.283731	0.0253
LOG(GDEF(-4))	-0.086096	0.028307	-3.041525	0.0033
LOG(GNFIN(-4))	0.038165	0.012460	3.062869	0.0031

R-squared	0.696987	Mean dependent var	0.024844
Adjusted R-squared	0.680608	S.D. dependent var	0.022545
S.E. of regression	0.012741	Akaike info criterion	-5.826710
Sum squared resid	0.012014	Schwarz criterion	-5.676744
Log likelihood	235.1550	Hannan-Quinn criter.	-5.766629
F-statistic	42.55355	Durbin-Watson stat	1.829223
Prob(F-statistic)	0.000000		

Investment deflator

Dependent Variable: LOG(INVDEF/INVDEF(-4))

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.010428	0.001982	5.262049	0.0000
LOG(ULC/ULC(-4))	0.216076	0.052718	4.098676	0.0001
LOG(IMPDEF/IMPDEF(-4))	0.141856	0.054528	2.601534	0.0112
D1997*@SEAS(1)	0.042883	0.016151	2.655108	0.0097
D1998*@SEAS(4)	0.046206	0.016184	2.855100	0.0056
D2000*@SEAS(4)	-0.052778	0.016700	-3.160315	0.0023

R-squared	0.384047	Mean dependent var	0.014950
Adjusted R-squared	0.342428	S.D. dependent var	0.019678
S.E. of regression	0.015957	Akaike info criterion	-5.365841
Sum squared resid	0.018842	Schwarz criterion	-5.187189
Log likelihood	220.6336	Hannan-Quinn criter.	-5.294214
F-statistic	9.227795	Durbin-Watson stat	0.684171
Prob(F-statistic)	0.000001		

Export deflator

Dependent Variable: LOG(EXPDEF/EXPDEF(-4))

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.004907	0.001410	3.479967	0.0008
LOG(IMPDEF/IMPDEF(-4))	0.469760	0.037704	12.45914	0.0000
LOG(ULC/ULC(-4))	0.058161	0.037311	1.558786	0.1231

R-squared	0.673333	Mean dependent var	0.010613
Adjusted R-squared	0.664848	S.D. dependent var	0.019789
S.E. of regression	0.011456	Akaike info criterion	-6.063778
Sum squared resid	0.010106	Schwarz criterion	-5.974452
Log likelihood	245.5511	Hannan-Quinn criter.	-6.027964
F-statistic	79.35703	Durbin-Watson stat	1.071171
Prob(F-statistic)	0.000000		

Import deflator

Dependent Variable: LOG(IMPDEF/IMPDEF(-4))

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.688217	0.259156	6.514300	0.0000
LOG(OILEUR/OILEUR(-4))	0.064189	0.007226	8.883464	0.0000
LOG(IMPDEF(-4))	-0.427363	0.064020	-6.675438	0.0000
LOG(OILEUR(-4))	0.070433	0.009315	7.561347	0.0000
D2009	-0.040262	0.010191	-3.950683	0.0002
D2010	0.028375	0.009917	2.861353	0.0055

R-squared	0.717715	Mean dependent var	0.010685
Adjusted R-squared	0.698642	S.D. dependent var	0.034196
S.E. of regression	0.018772	Akaike info criterion	-5.040838
Sum squared resid	0.026077	Schwarz criterion	-4.862186
Log likelihood	207.6335	Hannan-Quinn criter.	-4.969211
F-statistic	37.62936	Durbin-Watson stat	0.822993
Prob(F-statistic)	0.000000		

Short-term interest rate

Dependent Variable: SITBOR3M-SITBOR3M(-4)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.072921	0.065686	1.110144	0.2705
SITBOR3M(-1)-SITBOR3M(-5)	0.583728	0.054556	10.69963	0.0000
EUR3M-EUR3M(-4)	0.510182	0.070166	7.271125	0.0000
SITBOR3M(-4)-EUR3M(-4)	-0.453068	0.070845	-6.395199	0.0000

R-squared	0.864515	Mean dependent var	-0.378228
Adjusted R-squared	0.859096	S.D. dependent var	1.466575
S.E. of regression	0.550512	Akaike info criterion	1.693370
Sum squared resid	22.72976	Schwarz criterion	1.813342
Log likelihood	-62.88811	Hannan-Quinn criter.	1.741434
F-statistic	159.5222	Durbin-Watson stat	1.015785
Prob(F-statistic)	0.000000		

Long-term interest rate

Dependent Variable: GOV10Y-GOV10Y(-4)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.116529	0.149341	-0.780286	0.4385
SITBOR3M-SITBOR3M(-4)	0.218874	0.086778	2.522239	0.0145
EUR10Y-EUR10Y(-4)	2.021775	0.188727	10.71268	0.0000
LOG(DEBTGDP/DEBTGDP(-4))	1.694831	0.994270	1.704599	0.0937
D2004	-1.856888	0.502719	-3.693687	0.0005
D2012	1.992136	0.494429	4.029161	0.0002
D2013	1.624226	0.526663	3.083994	0.0031

R-squared	0.710417	Mean dependent var	-0.339688
Adjusted R-squared	0.679935	S.D. dependent var	1.663648
S.E. of regression	0.941197	Akaike info criterion	2.819591
Sum squared resid	50.49361	Schwarz criterion	3.055719
Log likelihood	-83.22690	Hannan-Quinn criter.	2.912613
F-statistic	23.30579	Durbin-Watson stat	0.959335
Prob(F-statistic)	0.000000		

Real effective exchange rate

Dependent Variable: LOG(REER/REER(-4))

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.007941	0.002847	-2.789133	0.0067
LOG(EURUSD/EURUSD(-4))	0.084268	0.018713	4.503065	0.0000
LOG(SITEUR/SITEUR(-4))	0.280321	0.059270	4.729566	0.0000
LOG(GDPDEF/GDPDEF(-4))	0.678165	0.102389	6.623438	0.0000
D1998	0.037226	0.008369	4.447943	0.0000
D1999	0.031405	0.007957	3.946994	0.0002

R-squared	0.720490	Mean dependent var	0.000931
Adjusted R-squared	0.701605	S.D. dependent var	0.027927
S.E. of regression	0.015255	Akaike info criterion	-5.455741
Sum squared resid	0.017222	Schwarz criterion	-5.277089
Log likelihood	224.2296	Hannan-Quinn criter.	-5.384114
F-statistic	38.14987	Durbin-Watson stat	0.649186
Prob(F-statistic)	0.000000		

Employers' social security contributions

Dependent Variable: LOG(SOCCOMP/SOCCOMP(-4))

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.418600	0.057416	-7.290584	0.0000
LOG(SOCEMP/SOCEMP(-4))	0.941308	0.065102	14.45902	0.0000
LOG(SOCCOMP(-4))	-0.646844	0.036565	-17.69022	0.0000
LOG(SOCEMP(-4))	0.682561	0.034697	19.67186	0.0000

R-squared	0.892690	Mean dependent var	0.048899
Adjusted R-squared	0.888454	S.D. dependent var	0.068278
S.E. of regression	0.022804	Akaike info criterion	-4.675068
Sum squared resid	0.039521	Schwarz criterion	-4.555967
Log likelihood	191.0027	Hannan-Quinn criter.	-4.627317
F-statistic	210.7419	Durbin-Watson stat	1.730615
Prob(F-statistic)	0.000000		

Corporate income tax payments

Dependent Variable: INCTAXCORP-INCTAXCORP(-4)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1717.275	454.4591	-3.778722	0.0003
LOG(GDPR/GDPR(-4))	1168.325	197.4044	5.918436	0.0000
INCTAXCORP(-4)	-0.341519	0.083760	-4.077339	0.0001
LOG(GDPR(-4))	193.6532	51.21755	3.780993	0.0003

R-squared	0.443021	Mean dependent var	6.759521
Adjusted R-squared	0.421035	S.D. dependent var	71.62710
S.E. of regression	54.50090	Akaike info criterion	10.88302
Sum squared resid	225746.5	Schwarz criterion	11.00212
Log likelihood	-431.3207	Hannan-Quinn criter.	10.93077
F-statistic	20.15009	Durbin-Watson stat	2.050461
Prob(F-statistic)	0.000000		

Value added tax revenues

Dependent Variable: LOG(VAT)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.380091	0.844108	-1.634970	0.1064
LOG(VAT(-4))	0.647637	0.088544	7.314255	0.0000
LOG(CN)	0.278804	0.111508	2.500307	0.0147
LOG(VATAXRATE)	0.453101	0.231456	1.957613	0.0541
D2001*@SEAS(1)	-0.465332	0.103437	-4.498690	0.0000
D2002*@SEAS(1)	-0.482485	0.117635	-4.101544	0.0001
D2003*@SEAS(1)	0.627134	0.127452	4.920558	0.0000

R-squared	0.922410	Mean dependent var	6.363740
Adjusted R-squared	0.916033	S.D. dependent var	0.340504
S.E. of regression	0.098668	Akaike info criterion	-1.710676
Sum squared resid	0.710685	Schwarz criterion	-1.502248
Log likelihood	75.42703	Hannan-Quinn criter.	-1.627111
F-statistic	144.6409	Durbin-Watson stat	1.567797
Prob(F-statistic)	0.000000		

Interest payments on public debt

Dependent Variable: LOG(INTEREST)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.469603	1.081060	-1.359409	0.1780
LOG(INTEREST(-4))	0.887871	0.047343	18.75384	0.0000
LOG(DEBT(-4)*GOV10Y)	0.183066	0.105499	1.735245	0.0868
D2010*@SEAS(2)+D2010*@SEAS(3)	1.438585	0.256437	5.609893	0.0000

R-squared	0.850185	Mean dependent var	3.872337
Adjusted R-squared	0.844271	S.D. dependent var	0.890683
S.E. of regression	0.351486	Akaike info criterion	0.795412
Sum squared resid	9.389214	Schwarz criterion	0.914513
Log likelihood	-27.81648	Hannan-Quinn criter.	0.843163
F-statistic	143.7641	Durbin-Watson stat	2.003406
Prob(F-statistic)	0.000000		

List of variables

Endogenous	
AGWN	Average gross wage, euro per employee
AGWR	Average gross wage real
BALANCE	Budget balance
BALANCEGDP	Budget balance in relation to GDP
CAGDP	Current account balance in percent of GDP
CAN	Current account balance
CAPR	Real capital stock
CDEF	Private consumption deflator
CN	Private consumption, nominal
CPI	Consumer price index
CR	Private consumption, real
DEBT	Public debt stock
DEBTGDP	Debt level in relation to GDP
DEMAND	Final demand, real
EMP	Total number of employees
EMP1564	Employment, 15 to 64 years
EMP65PLUS	Employment 65 years or older
EXPDEF	Export deflator
EXR	Exports of goods and services, real
GDEF	Public consumption deflator
GDPDEF	GDP deflator
GDPN	Nominal GDP
GDPR	Real GDP
GERDR	Real government R&D expenditures
GINVR	Real government investment
GN	Public consumption, national accounts, nominal
GOV10Y	10 year government bond yield
GOV10YR	Real government bond yield
GR	Public consumption, real
GRGDPR	Real GDP growth rate
GRYPOT	Growth rate of potential GDP
IMPDEF	Import deflator
IMPR	Imports of goods and services, real
INCOME	Disposable income of private households, nominal
INCOMER	Disposable income of private households, real
INCTAX	Total income tax revenues
INCTAXCORP	Corporate income tax revenues
INCTAXPERS	Personal income tax revenues
INFL	Inflation rate
INTEREST	Interest payments on public debt
INVDEF	Investment deflator
INVN	Gross fixed capital formation, nominal
INVR	Gross fixed capital formation, real
LF	Total labour force

LF1564	Labour force, 15 to 64 years
LF65PLUS	Labour force 65 years or older
NAIRU	Non-accelerating inflation rate of unemployment
NETWAGEN	Net wage, nominal
NETWAGER	Average net wage real
OILEUR	Oil price in euro
PRIMBALANCE	Primary budget balance
PRIMBALANCEGDP	Primary budget balance in relation to GDP
PRINVR	Real private investment
PROD	Labour productivity
REER	Real effective exchange rate
SITBOR3M	3 month interest rate before 2007, from 2007 onwards EURIBOR
SOCCOMP	Social security contributions by employers
SOCEMP	Social security contributions by employees
SOCTOTAL	Total social security contributions
TAXDIRECT	Other direct taxes
TAXINDIRECT	Other indirect taxes
TGEN	Total government expenditures
TGRN	Total government revenues
TRENDEMP	Trend of employment
TRENDTFP	Trend of total factor productivity
UCC	User cost of capital
ULC	Unit labour cost
UN	Total number of unemployed persons
UN1564	Unemployment, 15 to 64 years
UR	Unemployment rate
UR1564	Unemployment rate 15 to 64 years
UTIL	Capacity utilisation rate
VAT	VAT revenues
WEDGE	Tax wedge on gross wages
YPOT	Potential output
Exogenous (including policy instruments)	
ADD_GDPR	Add factor for real GDP
BANKCAP	Capital injections into the banking sector, mill. euro
D1997	Dummy, 1 in 1997, 0 else
D1998	Dummy, 1 in 1998, 0 else
D1999	Dummy, 1 in 1999, 0 else
D2000	Dummy, 1 in 2000, 0 else
D2001	Dummy, 1 in 2001, 0 else
D2002	Dummy, 1 in 2002, 0 else
D2003	Dummy, 1 in 20003,0 else
D2004	Dummy, 1 in 2004, 0 else
D2005	Dummy, 1 in 2005, 0 else
D2008	Dummy, 1 in 2008, 0 else
D2009	Dummy, 1 in 2009, 0 else

D2010	Dummy, 1 in 2010, 0 else
D2012	Dummy, 1 in 2012, 0 else
D2013	Dummy, 1 in 2013, 0 else
D2014	Dummy, 1 in 2014, 0 else
DEBTADJ	Change in debt level, not due to budget balance or bank capitalisation
DEPR	Capital stock depreciation rate
EUR10Y	10 year government bond yield, euro area average
EUR3M	3 months EURIBOR
EURUSD	Exchange rate, US dollar per euro
EXPREST	Remaining government expenditures
GERD	Public expenditures - Research & Development
GINVN	Public investment, nominal
GN_REST	Public consumption, diff. between national account and fiscal stat.
GNFIN	Public consumption according to fiscal statistics, nominal
INCTAXRATE	Average personal income tax rate
INVENTR	Real changes in inventories
LFTERSHARE	Active working population, tertiary educated, % of total
OIL	Oil price, USD per barrel Brent
POP1564	Population, 15 to 64 years
POP65PLUS	Population 65 years or older
REVREST	Remaining government revenues
SITEUR	Exchange rate, euro per Slovenian tolar
SOCEMPRATE	Average social security contribution rate
TAXDIRRATE	Other direct taxes in relation to nominal GDP
TAXINDIRRATE	Other indirect taxes in relation to nominal GDP
TRANSFERSN	Transfers to individuals and households
VATAXRATE	VAT rate
WTRADE	World trade, CPB