

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 the only small open economy 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 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 at stimulating real GDP and increasing employment than pure demand side measures. Measures that increase research and development and those that improve the education level of the labour force are very effective at 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 less important during the “Great Moderation” from the mid-1980s onwards (Lucas 2003), again came to the fore in industrialized countries. Monetary policy reacted quickly by expansionary measures, and fiscal policies followed by letting automatic stabilizers work; in some countries these were supported 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 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 the 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 of utmost importance to clarify the appropriate 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 as to whether demand side (Keynesian) fiscal policies aiming primarily at supporting deficient demand can contribute to stabilizing this economy or whether some element of supply side orientation has to be added to render these policies successful. In the wake of the oil price shocks, the debate between Keynesians and supply siders was a hot topic in the 1980s and (like many macroeconomic policy debates) it has not yet been completely settled. 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 – like most real world shocks – contained both demand and supply elements, but most interpretations agree that demand side elements prevailed. Nevertheless, especially in the European Union, policies proposed by the European Commission (and to some extent prescribed to the member states) contained calls for structural reforms to enhance growth and employment, both in the short and the long term, which implies that fiscal policy should also embed supply side measures. Such prescriptions are regularly issued by the Commission and other institutions until today. In 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 as to whether Slovenia would benefit more from a demand or 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 macroeconomic 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 2024 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 at 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 nearly all industrial countries, irrespective of their initial situation, unemployment rose sharply. Partly due to government failures, namely inadequate action taken by its economic policy makers, Slovenia was hit particularly badly by the crisis. Slovenia was the only country in former Yugoslavia to join the European Union in 2004, at the same time as most countries from Central and Eastern Europe, and it introduced the euro as legal tender as early as 2007. Its economic development was successful in terms of GDP growth and a reduction in 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 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 once a more vigorous economic recovery started in 2014 did it decline 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 for 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 politically motivated management buyouts and privatisations became non-performing. Due to the ensuing high level of public debt and the large share of non-performing loans, both future macroeconomic development and public finances are still vulnerable in Slovenia. According to the IMF (2015b), the still prevailing deleveraging needs of the private and public sectors are weighing 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 to the IMF (2015a), consolidation should be mainly focused on the expenditure side, since expenditures, in particular social expenditures, were the main drivers of the drastic deterioration in 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 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 in the value of public bonds. As soon as these bonds are held by banks, their balance sheets deteriorate, necessitating further state aid, leading to a further deterioration in 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, adherents of different macroeconomic theories still diverge in their interpretation. 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 the 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 of 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, 23 of which are behavioural equations and 52 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 data 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 described. A full list of the equations along with the definitions of the variables 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 macroeconomic 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 taken from the estimate made by the European Commission. It was extracted in spring 2017 from the website of the European Commission on which the results of its economic forecasts are published.⁷ 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. For simulations and forecasts, the trend of the TFP is explained in a behavioural equation. In accordance with the literature on endogenous growth, technical progress is influenced by the proportion 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.

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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 captures 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 older people (65 years and above). The labour demand of companies (actual employment) is modelled via the employment rates of the two age groups, i.e. employment as a share of the relevant age group in the 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 borne 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 the total population. These equations too have been estimated as Tobit models with the restriction of being positive, but below 0.95 and 0.9, 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 by 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 the wage costs of public employees. Similarly to consumer prices,

both the investment and export deflators are influenced by domestic and imported cost elements. The former are approximated by the unit labour costs in the investment deflator equation and the gross wage rate in the export deflator equation, respectively, 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 domestic price developments. Furthermore, the real effective exchange rate is an important determinant of exports and imports. When determining the effective exchange rate for Slovenia, the fact that the country has only been a Euro Area member state since 2007 has to be taken into account. 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 are determined via their relation to nominal GDP, which is exogenous and has to be extrapolated in ex ante simulations, like 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 and 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 rounded off 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 in the period 2017 to 2030. As we are 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 up to 2015, our forecast has to start in 2016. To this end, we have to make assumptions about the future development of all exogenous variables in the model. These can be divided into international variables (world trade, oil price, Euro Area interest rates), Slovenian variables largely beyond the control of the policy makers (population), and Slovenian policy instruments (tax rates, various government spending items).

For the interest rates we assume that the European Central Bank will only start to raise its policy rates in 2018; hence the three-month Euribor is assumed not to become positive until 2018. Afterwards it will gradually rise further to reach 2 percent from 2023 onwards. 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 start rising gradually as early as 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, and 3 percent per year from 2018 onwards are assumed. After a decline of 18.5 percent in 2016 (annual average), it is assumed that the oil price will rise by 26 percent in 2017, by 10.5 percent in 2018, and by 2.0 percent p.a. thereafter.

According to existing projections, Slovenia's working-age population will decline by around 0.75 percent per year until 2022, by 0.5 percent in 2023 and by 0.4 percent per year afterwards. Conversely, as is the case all over Europe, the population aged 65 and over will continue to rise. According to population projections, this growth will decrease more or less steadily from almost 3 percent in 2016 to about 1.6 percent in 2030.

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, with the exception of the value added tax rate, which was raised from 20 to 22 percent in 2016. In the baseline, it is held constant at this level over the entire simulation period. Government consumption, public

vestment in equipment and machinery, public spending on research and development transfer payments to private households, as well as residual government expenditures and revenues are all assumed to increase by 3.5 percent p.a. from 2017 until the end of the simulation period. For 2016, the assumed development of the policy instruments and the other exogenous variables aims at matching actual developments as far as possible, to the extent that the data are already available.

These settings of the exogenous variables lead to the following baseline simulation results until 2030. According to recent estimates and 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. Our model then predicts a decline in the growth rate to a minimum of 1.6 percent in 2023 and 2024. Afterwards, growth picks up again and stabilises at around 2 percent per year. Due to the projected population development and the slightly lower GDP growth, employment is forecast to decline from 2020 onwards, but unemployment will also decrease. The unemployment rate is projected to decline from 8.4 percent in 2016 to 2.8 percent in 2030. After negative and then zero inflation until 2018, the inflation rate is forecast to rise slightly to 1.4 percent in 2024 and 2025, before it declines again to 1.2 percent p.a. in the last three years of our simulation period. Despite the overall favourable real economic development, the ratio between public debt and nominal GDP is projected to rise from 83 percent in 2016 to 123 percent in the final year of the simulation period. This increase is partly attributable to the low inflation, but the main driver of this development is the fact that our model predicts that total government expenditures rise faster than revenues.

Our model predicts a rather pessimistic development of trend total factor productivity. According to the simulation, trend TFP would stagnate on average between 2017 and 2030. As we regard this as too pessimistic, we exogenously raised trend TFP via an add factor such that it increases by 1.6 percent per year on average during the simulation period. Furthermore, with the aim of strengthening potential GDP growth we reduced the NAIRU. According to the recent forecast by the European Commission, the Slovenian NAIRU will decrease from 7.0 percent in 2016 to 6.0 percent in 2025. For our simulations we assumed a more pronounced decrease to 4.0 percent in 2025 and to 0.5 percent in 2030.

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 2030, we focus on developments from 2017 onwards. The policy measures to which we now turn 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 proportion of people with tertiary education in the labour force. We subsume this instrument under the spending measures, although due to a lack of adequate data, our model does not contain a specific instrument which directly relates 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: Proportion 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 relative to the baseline. Hence, from 2018 to 2030, in the first simulation public consumption (GN) is 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 proportion of people with tertiary education is increased by 0.5 percentage points with respect to the baseline. In the simulations focussing on the revenue side, the value added tax rate is reduced by 1 percentage point from 2018 onwards, 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 the GDP expenditure identity directly, 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 this spending category initiates both demand and supply effects as well. 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 proportion 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 one 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 revenue sides 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 are 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).

Figure 1 Real GDP, spending measures

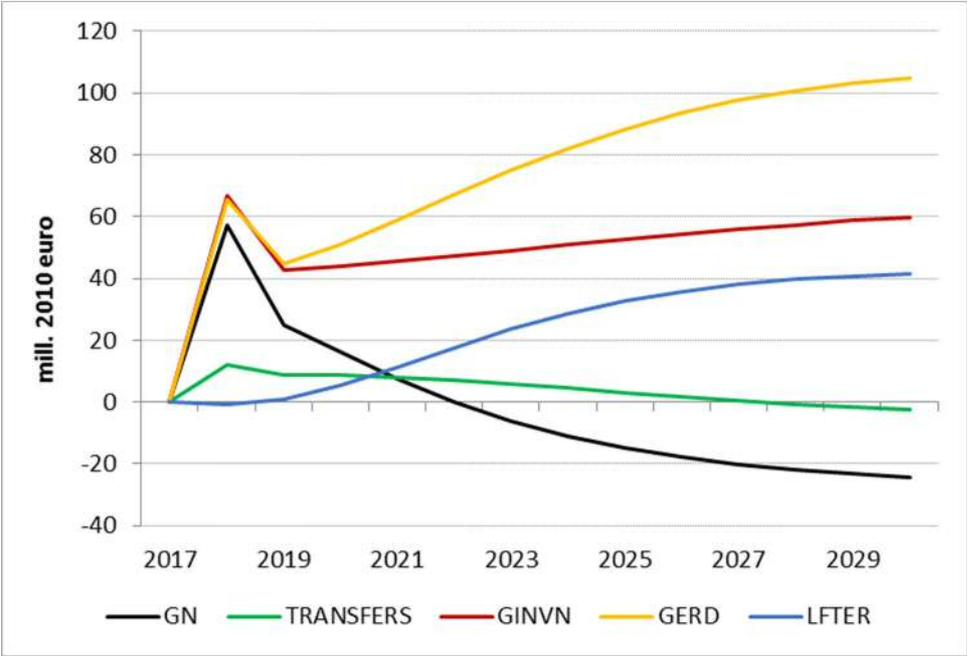


Figure 2 Real GDP, revenue measures

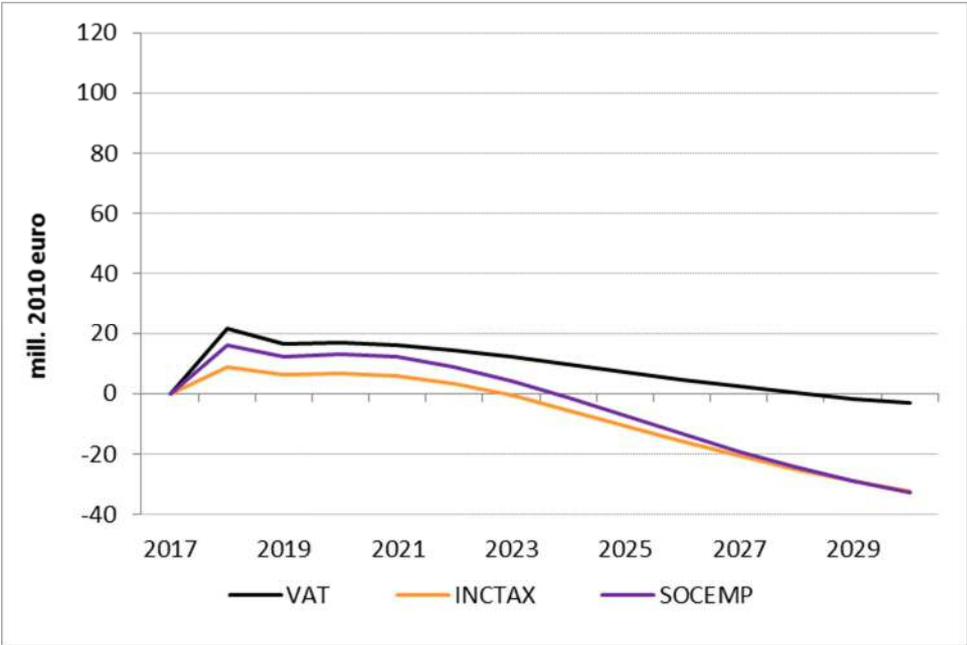


Figure 3 Real GDP growth, spending measures

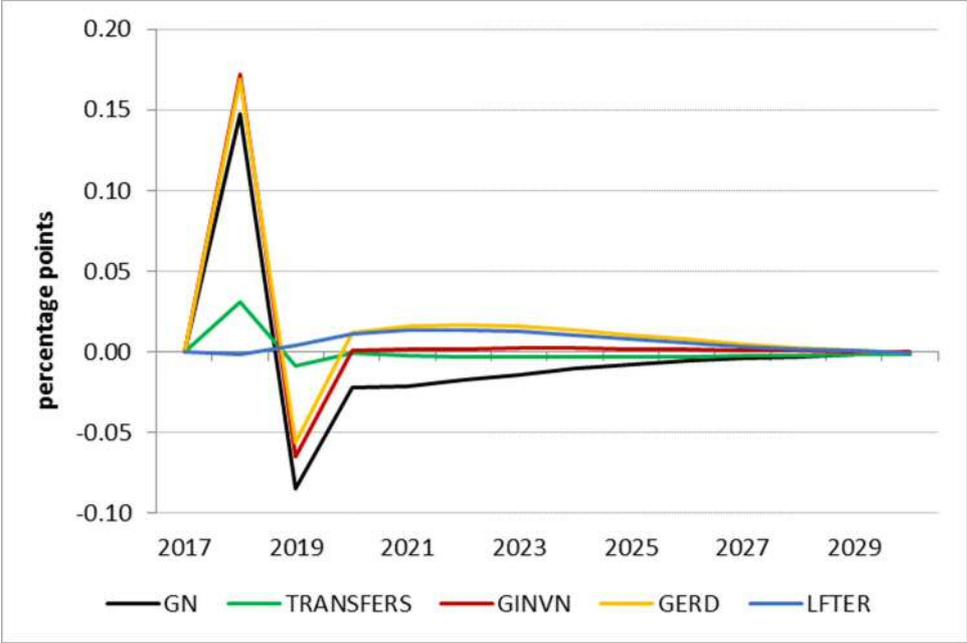


Figure 4 Real GDP growth, revenue measures

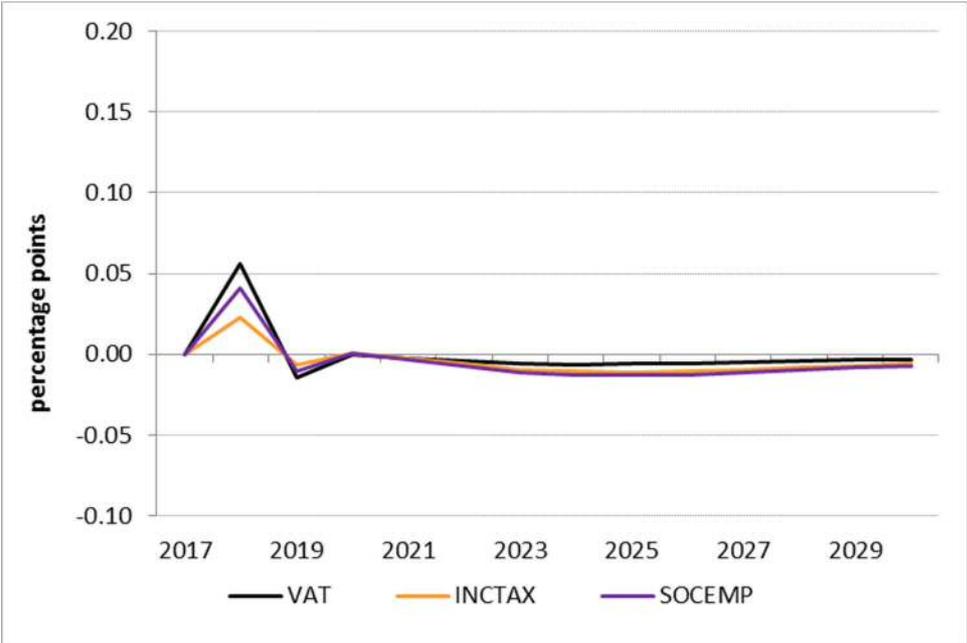


Figure 5 Potential GDP, spending measures

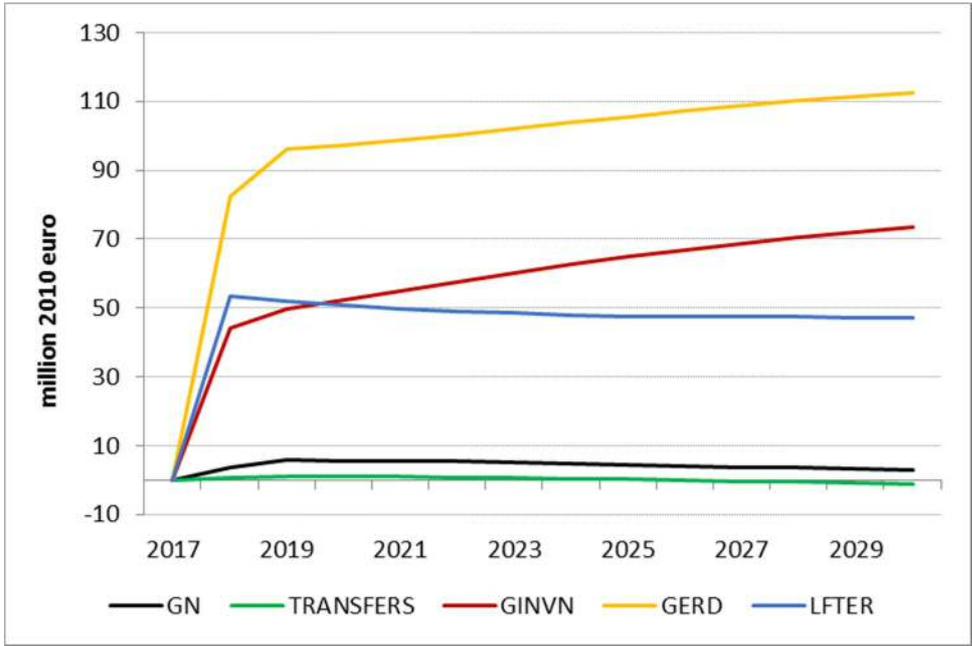


Figure 6 Potential GDP, revenue measures

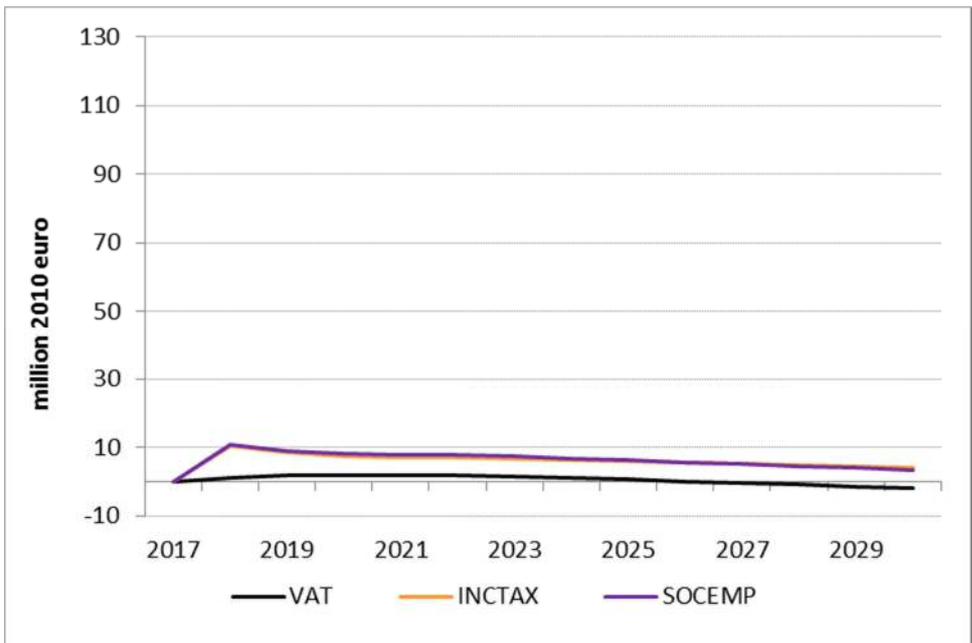


Figure 7 CPI level, spending measures

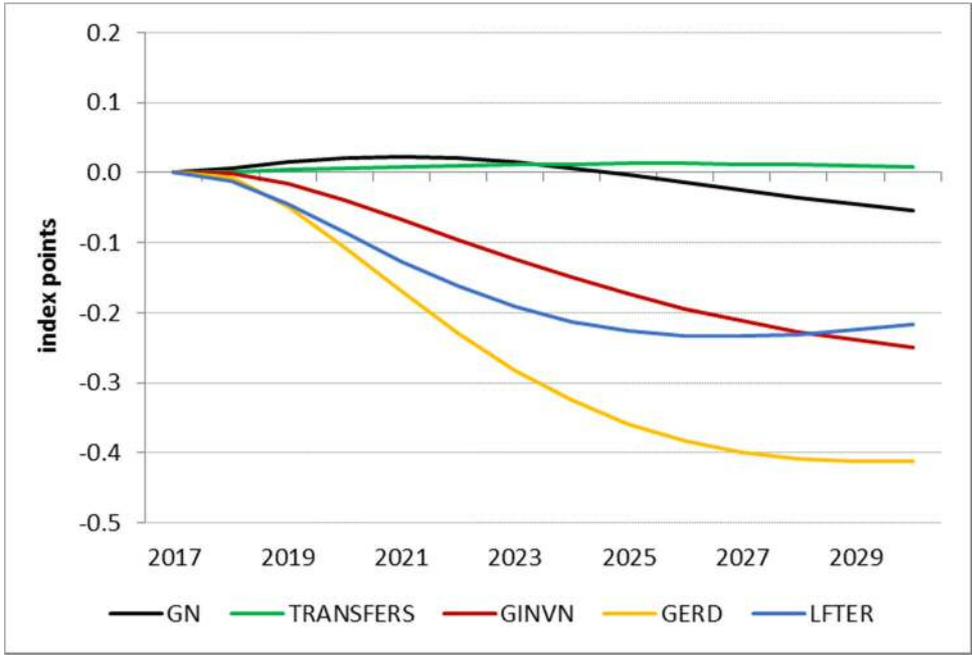


Figure 8 PI level, revenue measures

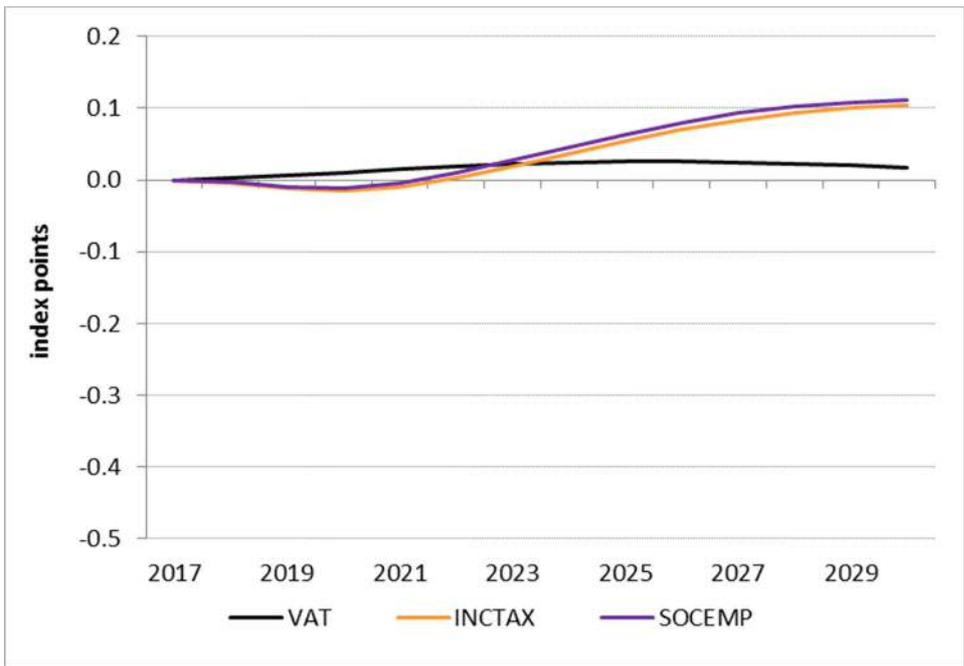


Figure 9 Inflation rate, spending measures

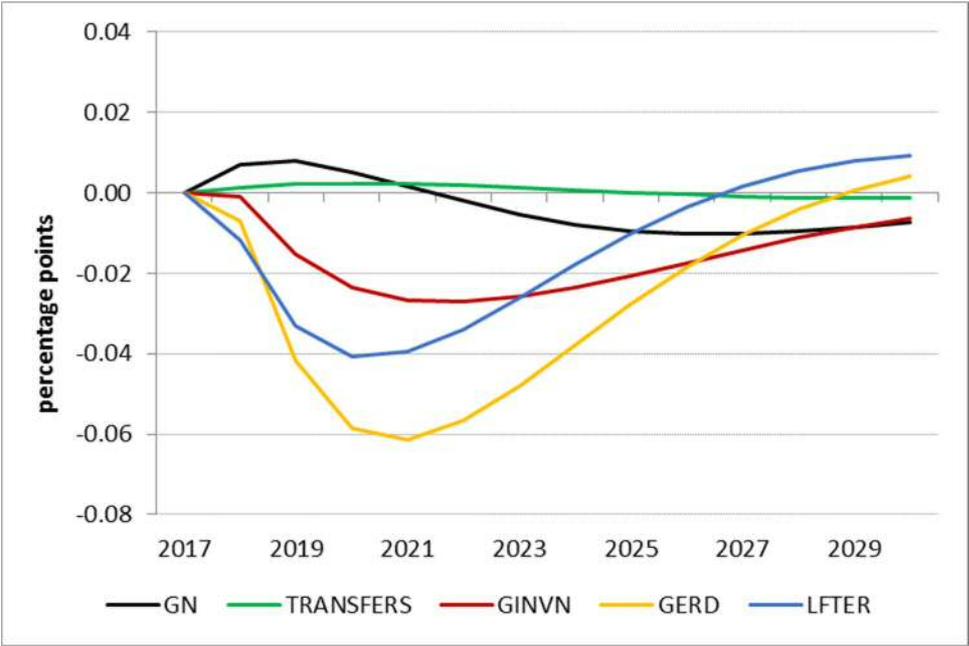


Figure 10 Inflation rate, revenue measures

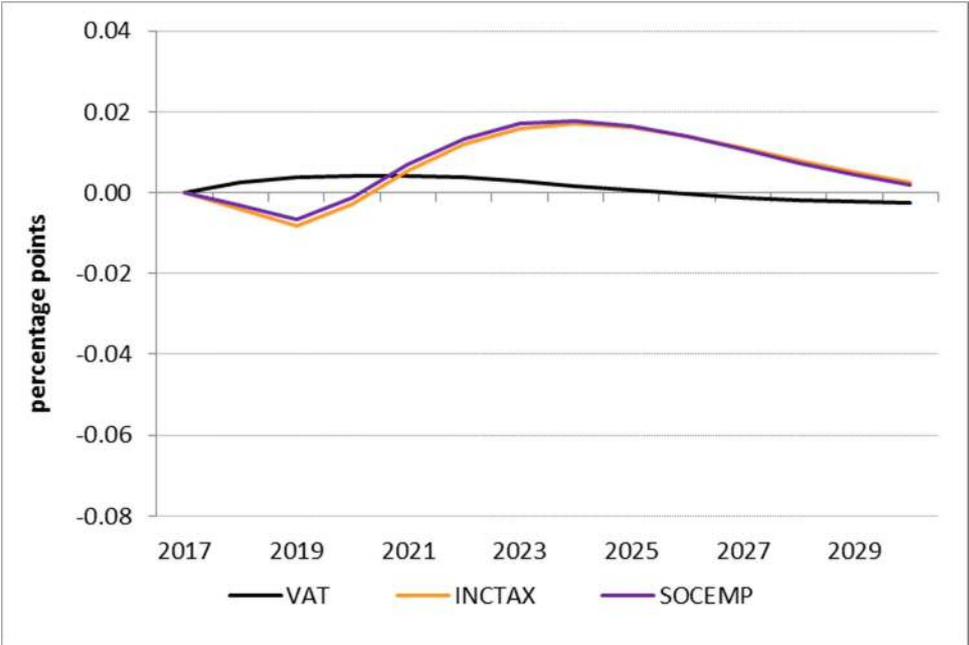


Figure 11 Employment, spending measures

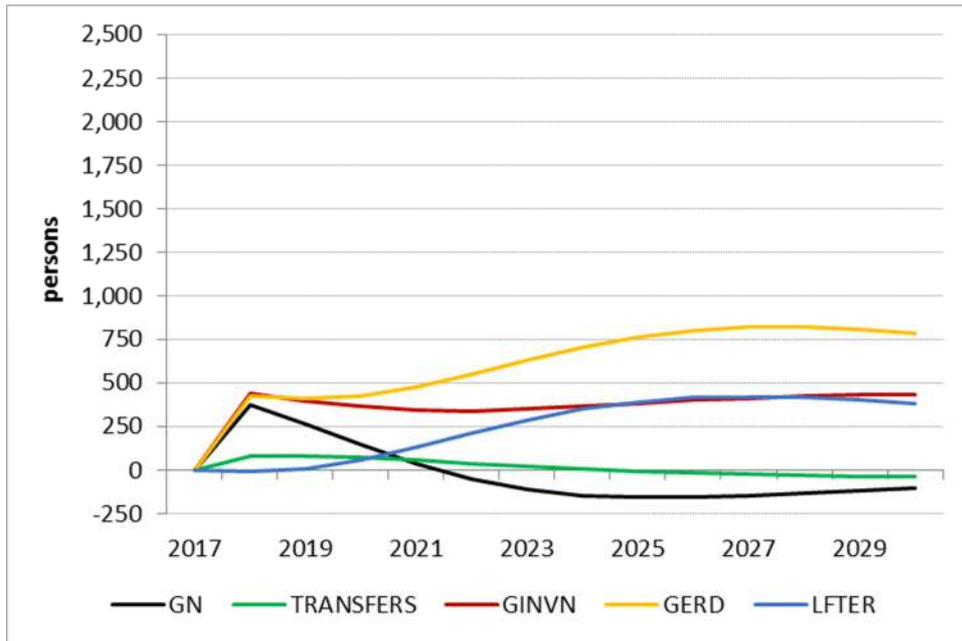


Figure 12 Employment, revenue measures

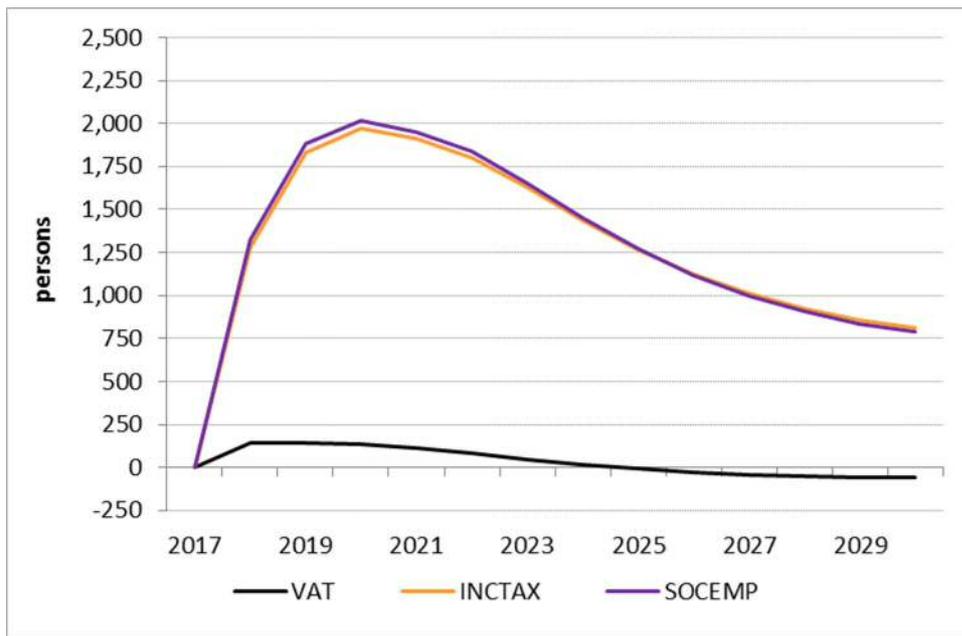


Figure 13 Unemployment rate, spending measures

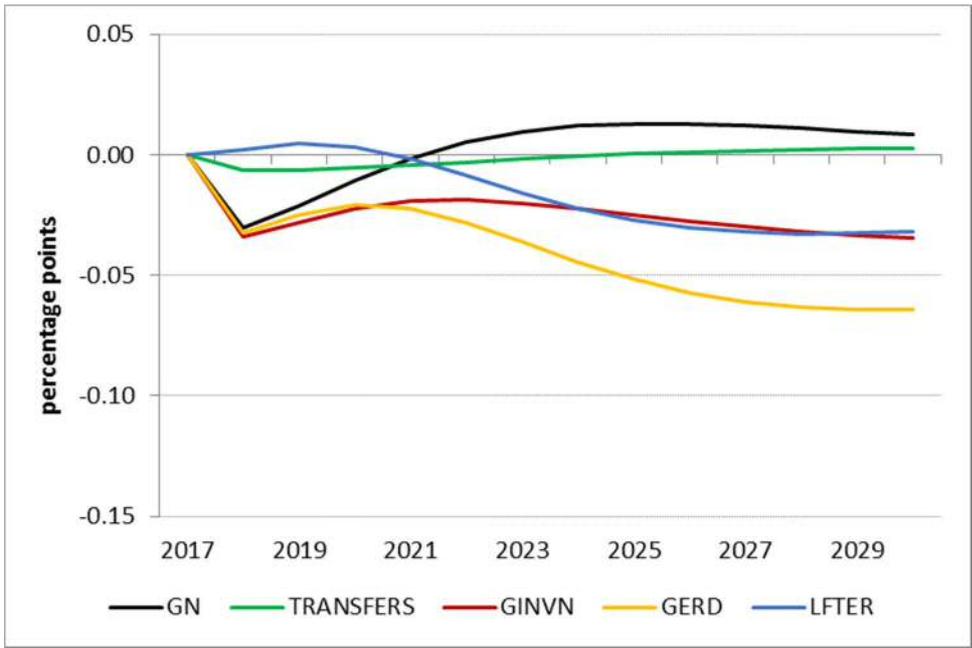


Figure 14 Unemployment rate, revenue measures

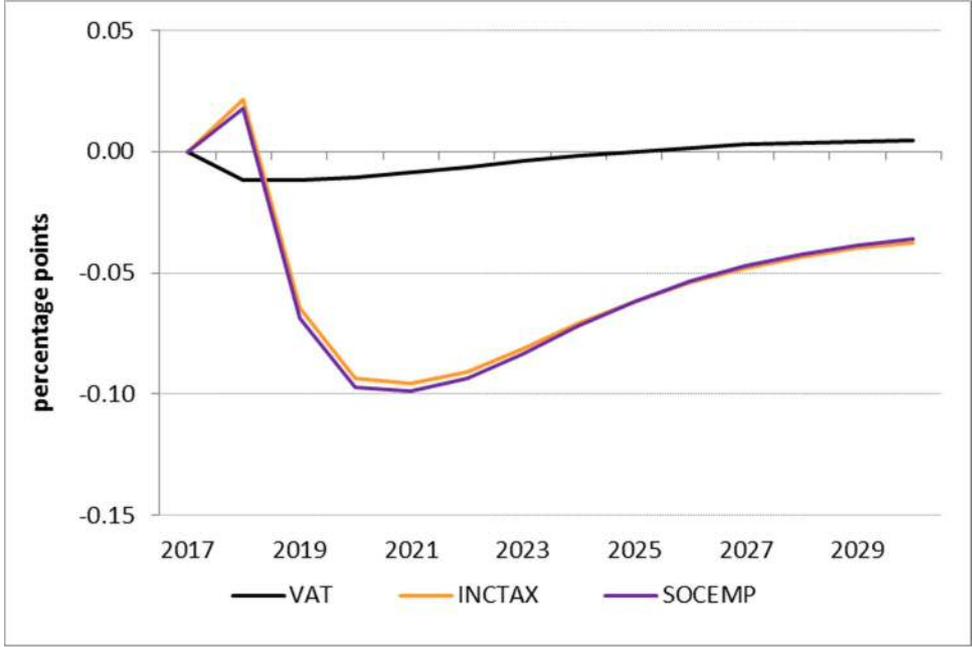


Figure 15 Net exports in relation to GDP, spending measures

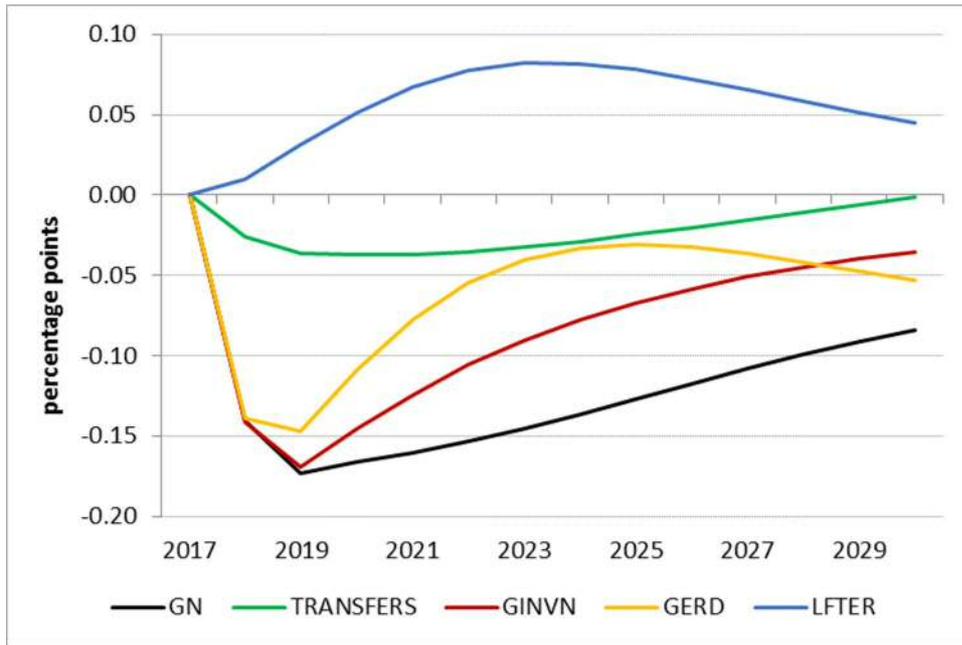


Figure 16 Net exports in relation to GDP, revenue measures

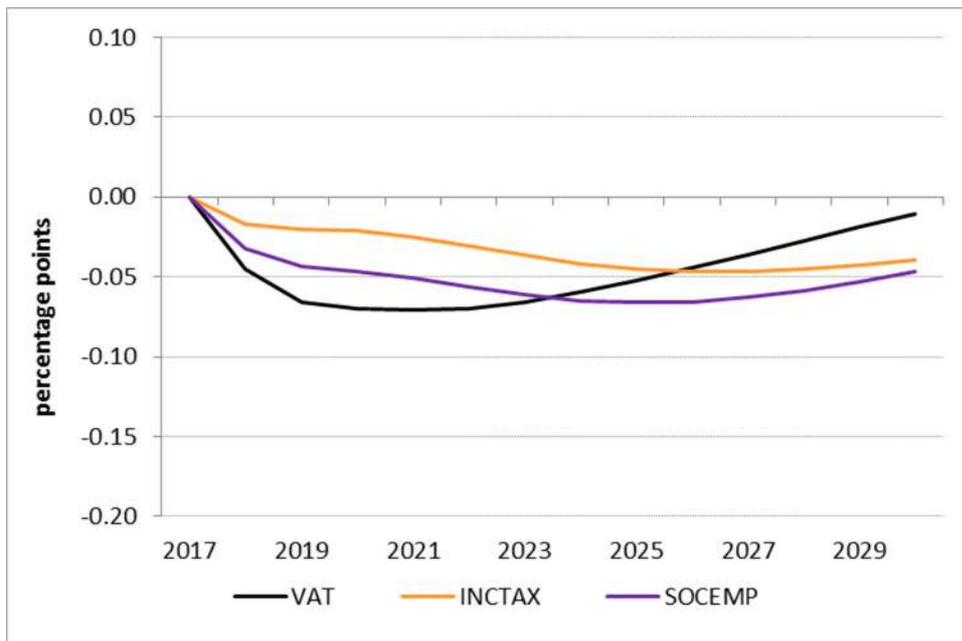


Figure 17 Debt to GDP ratio, spending measures

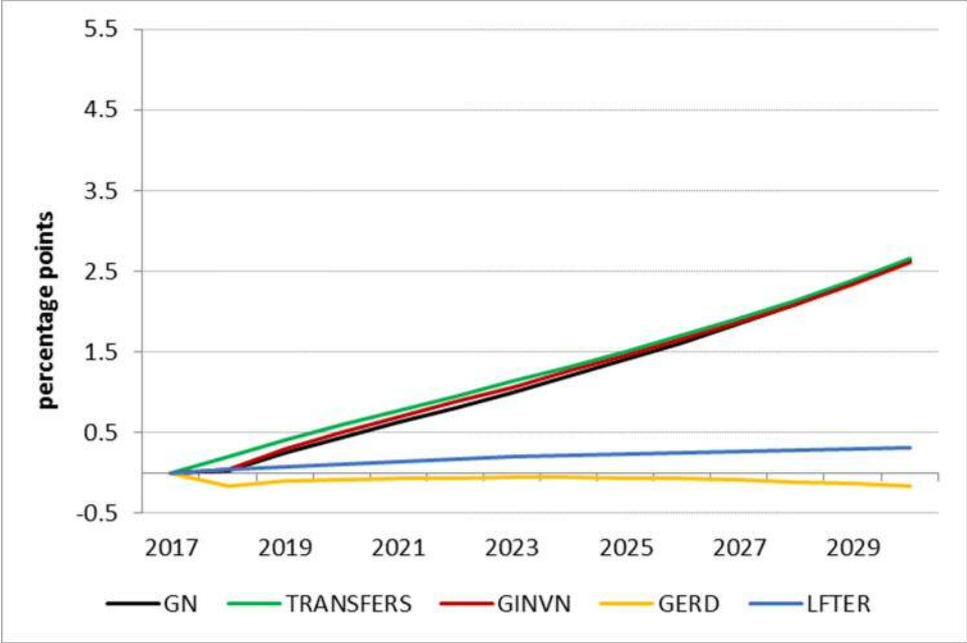
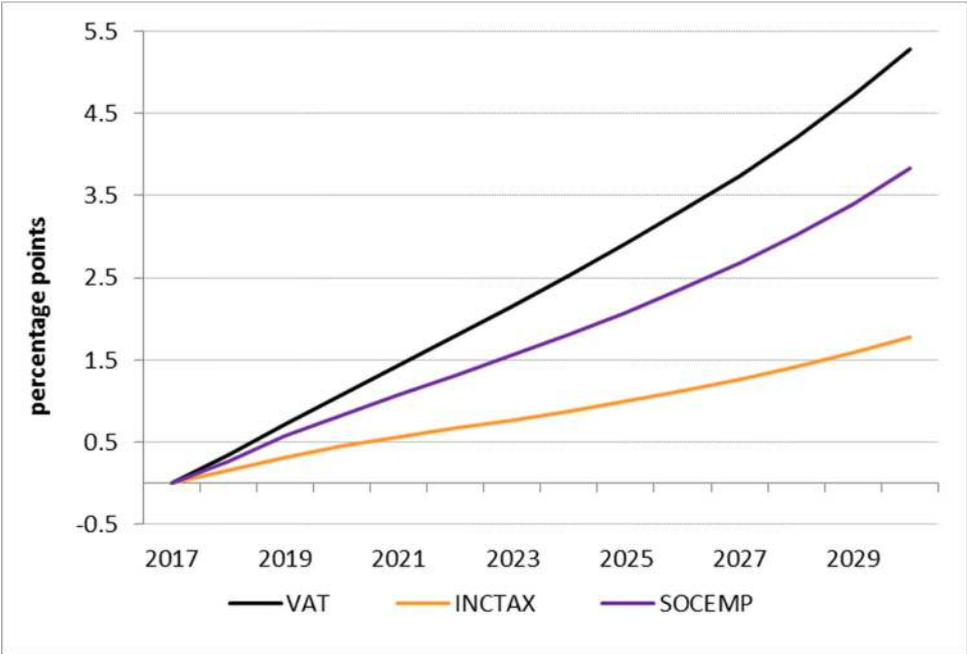


Figure 18 Debt to GDP ratio, revenue measures



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 from 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 and 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 fall over time due to the diminishing marginal productivity of capital. This implies that if policy makers want to curb sluggish growth in 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 in 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. However, 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 in Figures 9 to 12. On the expenditure side, transfers have only very minor and transitory effects on employment, and public consumption effects even turn negative after three years. Again, supply related effects are stronger and, in particular, last longer and increase over time, especially those of measures enhancing R&D and tertiary education. 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 as 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 (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 in 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 is expenditure related to R&D, with human capital stimulation coming second. The loser is the reduction in VAT; given its low effectiveness with respect to output and especially employment, this instrument seems to be rather unattractive. Instead, if containing public debt within the 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 also declining 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 over the next few years as well. Recent macroeconomic and fiscal performance and the forecast raise the question as to how the economy could be stimulated without, at the same time, increasing the debt level further (or even 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 spending on R&D and tertiary education, are more effective at stimulating real GDP than pure demand side measures. Measures that improve the education level of the labour force are very effective at 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 only has negligible effects on the debt to GDP ratio, while all the 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 only has very little scope for influencing macroeconomic developments 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 bring about 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

$$AGWR = AGWN / CPI \cdot 100$$

$$BALANCE = TGRN - TGEN$$

$$BALANCEGDP = BALANCE / GDPN \cdot 100$$

$$CAGDP = CAN / GDPN \cdot 100$$

$$CAN = EXR \cdot EXPDEF / 100 - IMPR \cdot IMPDEF / 100$$

$$CAPR = (1 - DEPR / 100) \cdot CAPR-1 + INVR$$

$$CN = CR \cdot CDEF / 100$$

$$DEBT = DEBT-1 - BALANCE + BANKCAP + DEBTADJ$$

$$DEBTGDP = DEBT / (GDPN + GDPN-1 + GDPN-2 + GDPN-3) \cdot 100$$

$$DEMAND = INVR + CR + GR + EXR$$

$$EMP = EMP1564 + EMP65PLUS$$

$$GAP = (GDPR - YPOT) / YPOT \cdot 100$$

$$GDPDEF = GDPN / GDPR \cdot 100$$

$$GDPN = CN + GN + (INVR + INVENTR) \cdot INVDEF / 100 + CAN$$

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

$$GERDR = GERD / INVDEF \cdot 100$$

$$GINVR = GINVN / INVDEF \cdot 100$$

$$GN = GNFIN + GN_REST$$

$$GOV10YR = GOV10Y - INFL$$

$$GR = GN / GDEF \cdot 100$$

$$GRGDPR = GDPR / GDPR-4 \cdot 100 - 100$$

$$GRYPOT = (YPOT / YPOT-4 - 1) \cdot 100$$

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

$$INCOMER = INCOME / CPI \cdot 100$$

$$INCTAX = INCTAXPERS + INCTAXCORP$$

$$INCTAXPERS = INCTAXRATE \cdot (AGWN \cdot EMP / 1000) / 1000$$

$$INFL = (CPI / CPI-4 - 1) \cdot 100$$

$$INVN = INVR \cdot INVDEF / 100$$

$$INVR = PRINVR + GINVR + GERDR$$

$$LF = LF1564 + LF65PLUS$$

$$\text{LOG}(YPOT) = 0.65 \cdot \text{LOG}(\text{TRENDEMP}) + (1 - 0.65) \cdot \text{LOG}(CAPR) + \text{LOG}(\text{TRENDTFP})$$

$$\text{NETWAGEN} = \text{AGWN} - \text{WEDGE}$$

$$\text{NETWAGER} = \text{NETWAGEN} / \text{CPI} \cdot 100$$

OILEUR = OIL / EURUSD

PRIMBALANCE = BALANCE + INTEREST

PRIMBALANCEGDP = PRIMBALANCE / GDPN · 100

PROD = GDPR / EMP · 100

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

SOCTOTAL = SOCCOMP + SOCEMP

TAXDIRREST = TAXDIRRATE · GDPN / 100

TAXINDIRREST = TAXINDIRRATE · GDPN / 100

TGEN = GNFIN + GINVN + TRANSFERSN + INTEREST + EXPREST

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

TRENDEMP = LF · (1 - NAIRU_EU / 100)

UCC = GOV10YR + DEPR

ULC = AGWN / PROD

UN = LF - EMP

UN1564 = LF1564 - EMP1564

UR = UN / LF · 100

UR1564 = UN1564 / LF1564 · 100

UTIL = GDPR / YPOT · 100

WEDGE = AGWN · (INCTAXRATE + SOCEMPRATE)

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			

Private consumption

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

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.321936	0.290450	1.108405	0.2715
LOG(INCOMER/INCOMER(-4))	0.285259	0.052040	5.481512	0.0000
LOG(CR(-4))	-0.121486	0.016484	-7.369967	0.0000
LOG(INCOMER(-4))	0.081661	0.034563	2.362665	0.0209
GOV10YR	-0.006417	0.001266	-5.068519	0.0000
D2013*@SEAS(1)	-0.062606	0.017726	-3.531924	0.0007
R-squared	0.638662	Mean dependent var		0.017708
Adjusted R-squared	0.612852	S.D. dependent var		0.027772
S.E. of regression	0.017280	Akaike info criterion		-5.202834
Sum squared resid	0.020903	Schwarz criterion		-5.018829
Log likelihood	203.7077	Hannan-Quinn criter.		-5.129296
F-statistic	24.74484	Durbin-Watson stat		1.411753
Prob(F-statistic)	0.000000			

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	0.549852	0.133474	4.119548	0.0001
LOG(EXR(-1)/EXR(-5))	0.277227	0.053973	5.136417	0.0000
LOG(WTRADE/WTRADE(-4))	0.815406	0.059154	13.78450	0.0000
LOG(EXR(-4))	-0.287643	0.058846	-4.888083	0.0000
LOG(WTRADE(-4))	0.411336	0.082413	4.991134	0.0000
LOG(REER(-4)/REER(-8))	-0.321950	0.094641	-3.401803	0.0011
D2007	0.033620	0.011872	2.831993	0.0061
D2012+D2013	-0.026177	0.009320	-2.808663	0.0065
R-squared	0.925243	Mean dependent var		0.060795
Adjusted R-squared	0.917547	S.D. dependent var		0.074717
S.E. of regression	0.021455	Akaike info criterion		-4.746438
Sum squared resid	0.031301	Schwarz criterion		-4.501098
Log likelihood	188.3646	Hannan-Quinn criter.		-4.648388
F-statistic	120.2305	Durbin-Watson stat		1.551703
Prob(F-statistic)	0.000000			

Imports

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

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-5.038052	1.559191	-3.231196	0.0019
LOG(DEMAND(-1)/DEMAND(-5))	1.315281	0.134936	9.747473	0.0000
LOG(IMPR(-4))	-0.480082	0.180981	-2.652671	0.0099
LOG(DEMAND(-4))	0.649493	0.283086	2.294327	0.0249
LOG(REER(-4))	0.642609	0.336451	1.909966	0.0604
LOG(REER(-2)/REER(-6))	0.801468	0.398514	2.011144	0.0483
LOG(REER(-3)/REER(-7))	-0.831232	0.410548	-2.024690	0.0468
D1998*@SEAS(1)	0.090691	0.052148	1.739119	0.0865
D2009*@SEAS(1)	-0.200624	0.048804	-4.110804	0.0001
R-squared	0.717730	Mean dependent var		0.051021
Adjusted R-squared	0.684522	S.D. dependent var		0.083519
S.E. of regression	0.046911	Akaike info criterion		-3.171681
Sum squared resid	0.149641	Schwarz criterion		-2.897730
Log likelihood	131.1097	Hannan-Quinn criter.		-3.062103
F-statistic	21.61303	Durbin-Watson stat		2.088774
Prob(F-statistic)	0.000000			

Employment 15 to 64

Dependent Variable: EMP1564/POP1564

Method: ML - Censored Normal (TOBIT) (Quadratic hill climbing)

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)

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)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.216732	0.047094	4.602100	0.0000
LF1564(-4)/POP1564(-4)	0.694325	0.067324	10.31312	0.0000
LOG(NETWAGER/NETWAGER(-4))	0.145252	0.030076	4.829452	0.0000
Error Distribution				
SCALE:C(4)	0.009160	0.000785	11.66204	0.0000
Mean dependent var	0.699839	S.D. dependent var	0.017790	
S.E. of regression	0.009442	Akaike info criterion	-6.430363	
Sum squared resid	0.005705	Schwarz criterion	-6.299804	
Log likelihood	222.6323	Hannan-Quinn criter.	-6.378631	
Avg. log likelihood	3.274005			
Left censored obs	0	Right censored obs	0	
Uncensored obs	68	Total obs	68	

Labour supply 65+

Dependent Variable: LF65PLUS/POP65PLUS

Method: ML - Censored Normal (TOBIT) (Quadratic hill climbing)

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.170715	0.141368	-1.207595	0.2272
LF65PLUS(-1)/POP65PLUS(-1)	0.380958	0.099130	3.843020	0.0001
LOG(NETWAGER)	0.036490	0.016485	2.213463	0.0269
LOG(WEDGE)	-0.010935	0.004933	-2.216665	0.0266
D2012+D2013	-0.011630	0.004135	-2.812858	0.0049
D2015	-0.018406	0.005203	-3.537480	0.0004
Error Distribution				
SCALE:C(7)	0.008918	0.000748	11.91856	0.0000
Mean dependent var	0.071263	S.D. dependent var	0.015864	
S.E. of regression	0.009394	Akaike info criterion	-6.404195	
Sum squared resid	0.005647	Schwarz criterion	-6.181114	
Log likelihood	234.3489	Hannan-Quinn criter.	-6.315483	
Avg. log likelihood	3.300689			
Left censored obs	0	Right censored obs	0	
Uncensored obs	71	Total obs	71	

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	-0.635911	0.226970	-2.801746	0.0066
LOG(AGWN/AGWN(-4))	0.270101	0.090202	2.994393	0.0039
LOG(IMPDEF(-6)/IMPDEF(-10))	0.129630	0.051156	2.534036	0.0136
LOG(CDEF(-4))	-0.268560	0.073825	-3.637782	0.0005
LOG(AGWN(-4))	0.101022	0.031085	3.249838	0.0018
LOG(UTIL(-1))	0.133540	0.050550	2.641737	0.0103
LOG(IMPDEF(-4))	0.091529	0.049356	1.854469	0.0681
R-squared	0.606476	Mean dependent var		0.018704
Adjusted R-squared	0.571235	S.D. dependent var		0.018140
S.E. of regression	0.011878	Akaike info criterion		-5.938393
Sum squared resid	0.009453	Schwarz criterion		-5.720441
Log likelihood	226.7205	Hannan-Quinn criter.		-5.851449
F-statistic	17.20944	Durbin-Watson stat		1.077614
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	0.691182	0.128747	5.368551	0.0000
LOG(IMPDEF/IMPDEF(-4))	0.477104	0.035258	13.53162	0.0000
LOG(EXPDEF(-4))	-0.636126	0.095037	-6.693435	0.0000
LOG(IMPDEF(-4))	0.403268	0.058925	6.843747	0.0000
LOG(AGWN(-4))	0.046780	0.014052	3.329078	0.0014
R-squared	0.796734	Mean dependent var		0.010613
Adjusted R-squared	0.785893	S.D. dependent var		0.019789
S.E. of regression	0.009157	Akaike info criterion		-6.488204
Sum squared resid	0.006288	Schwarz criterion		-6.339328
Log likelihood	264.5282	Hannan-Quinn criter.		-6.428516
F-statistic	73.49374	Durbin-Watson stat		1.352147
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	-5.491826	0.758742	-7.238066	0.0000
LOG(CN)	1.054549	0.054288	19.42491	0.0000
LOG(VATAXRATE)	1.054032	0.247007	4.267224	0.0001
D2000*@SEAS(1)	-0.336750	0.126663	-2.658629	0.0095
D2001*@SEAS(1)	-0.630827	0.126638	-4.981327	0.0000
D2002*@SEAS(1)	-0.926044	0.126201	-7.337844	0.0000
R-squared	0.890676	Mean dependent var		6.330549
Adjusted R-squared	0.883668	S.D. dependent var		0.366042
S.E. of regression	0.124848	Akaike info criterion		-1.254698
Sum squared resid	1.215779	Schwarz criterion		-1.081068
Log likelihood	58.69730	Hannan-Quinn criter.		-1.184900
F-statistic	127.0950	Durbin-Watson stat		1.827781
Prob(F-statistic)	0.000000			

Interest payments on public debt

Dependent Variable: LOG(INTEREST)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.966945	1.038332	-1.894332	0.0620
LOG(INTEREST(-4))	0.832199	0.048435	17.18193	0.0000
LOG(DEBT(-4)*GOV10Y)	0.242440	0.101939	2.378300	0.0199
@SEAS(1)	0.286858	0.093382	3.071885	0.0030
D2010*@SEAS(2)+D2010*@SEAS(3)	1.454346	0.243343	5.976520	0.0000
R-squared	0.866928	Mean dependent var		3.872337
Adjusted R-squared	0.859831	S.D. dependent var		0.890683
S.E. of regression	0.333464	Akaike info criterion		0.701901
Sum squared resid	8.339891	Schwarz criterion		0.850777
Log likelihood	-23.07602	Hannan-Quinn criter.		0.761590
F-statistic	122.1512	Durbin-Watson stat		2.067527
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
GAP	Output gap in percent of potential GDP
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
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)	
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
D2004	Dummy, 1 in 2004, 0 else
D2005	Dummy, 1 in 2005, 0 else
D2007	Dummy, 1 in 2007, 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
NAIRU_EU	Non-accelerating inflation rate of unemployment, published by European Commission
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

