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A Model-based Analysis of the Impact of Cohesion Policy Expenditure 2000-06: Simulations with the QUEST III endogenous R&D model

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A Model-based Analysis of the Impact of Cohesion Policy Expenditure 2000-06: Simulations with the QUEST III endogenous R&D model

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Abstract

More than a third of the EU budget is devoted to Cohesion Policy with the objective to foster economic and social cohesion in the European Union. Large-scale fiscal transfers are used to support investment in infrastructure, R&D and human capital. This paper provides a model-based assessment of the potential macro-economic impact of these fiscal transfers using a DSGE model with semi-endogenous growth (Jones, 1995) and endogenous human capital accumulation. The simulations show the potential benefits of Structural Funds with significant output gains in the long run due to sizeable productivity improvements.

JEL Classification System: C53, E62, O30, O41

Keywords: Cohesion Policy, endogenous growth, R&D, dynamic general equilibrium modelling.

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Non-technical Summary

The European Union uses large-scale fiscal transfers through its Cohesion Policy Programmes to foster economic and social cohesion. Cohesion Policy is one of the key pillars of the European Union. The transfers are used to boost investment in infrastructure, R&D and human capital. In the programme period 2000 to 2006, more than €250 billion was spent on regional policy structural instruments for the 15 old Member States, pre-accession aid and structural interventions for the new member states (NMS). This amounted to approximately 37 percent of the EU budget. As these transfers have the potential of directly contributing to productivity growth, they play a crucial role in achieving cohesion, and are an important policy instrument in the EU.

This paper provides a model-based assessment of the impact of structural funds and cohesion funds for the programming period 2000-2006 for all member states that receive large allocations of these funds. The emphasis is on spending under so-called Objective One, defined as promoting the development and structural adjustment of regions whose development is lagging behind, but for some selected countries spending under Objective Two is also included.. The model used in this evaluation is an endogenous growth extension of the QUEST III model, the dynamic stochastic general equilibrium (DSGE) model developed and used by the Directorate-General for Economic and Financial Affairs (ECFIN) of the European Commission.

The model belongs to the class of micro-founded dynamic general equilibrium (DGE) models that are now widely used in economic policy institutions. These models have emerged in recent years as the latest step in the development of macroeconomic modelling and reflect the approach adopted now in most modern research in macro economics. The focus in these models is on the economy as a whole, as an integrated system of economic agents that base their economic decisions over a range of variables by continuously re-optimising, subject to budgetary, technological and institutional constraints. These models are forward looking and intertemporal, i.e. current decisions are affected by expectations about the future.

We use an endogenous growth extension of the model here that incorporates elements from the new endogenous growth theories. Traditional economic theories assumed economic growth was driven by exogenous technical progress, not affected by policies, and population

growth. Endogenous growth theories emphasise how investment in research and development and in human capital can lead to innovations and new technologies, and make technical progress an endogenous variable. Our model applies the Jones (1995) semi-endogenous growth framework to explicitly model the underlying development of R&D. The endogenous modelling of R&D allows us to analyse the impact of R&D promoting policies on growth. Furthermore, the endogeneity of human capital accumulation in the model can capture the effects of policies promoting vocational education and training.

The version of QUEST III used here is a global model which includes each of the EU27 member states and one block representing the rest of the world. The explicit modelling of cross-country linkages through bilateral trade relationships allows us to capture spillovers and interactions between EU member states, both beneficiaries and donor countries, of cohesion expenditure.

Support to R&D includes all spending on research, technological development and innovation (RTDI), including the establishment of networks and partnerships between businesses and/or research institutes. In the model this is captured as reductions in fixed costs and reductions in intangible capital costs for the intermediate sector, the users of the output of the R&D sector. The model employs the Dixit-Stiglitz product-variety framework and the mechanism through which this R&D spending supports growth in the model is as follows. By reducing costs, the cohesion programme spending makes it easier for new start-ups to enter the market and so support the introduction of new products. This is because although both existing firms and newcomers face similar problems when marketing new products, start-ups typically have less access to capital markets and have to overcome administrative hurdles (and costs) to set up a new business. Reducing fixed costs and intangible capital costs promotes entry of new firms and new products in the market. By supporting innovation, high skilled workers are reallocated in the model from the production sector to the R&D sector. Initially, this reallocation reduces final goods production and has a negative impact on growth, but over time the positive output effects dominate as productivity increases, and this also stimulates physical investment. While it takes time for these effects to become apparent, the output gains are significant and, importantly, continue to increase long after spending is discontinued (reflecting the endogenous growth nature of the modelling approach).

Expenditure on *human resources* includes all spending on educational and vocational training as well as more generally defined labour market policies and spending on social inclusion.

This is partly modelled as non-productive government spending and direct transfers to households, but the productivity enhancing effects are captured through their effects on skills. Total human capital in the models depends on the efforts individuals spend on accumulating human capital and an increase in the years of schooling (participation in training) for a respective skill group raises the skill efficiency of that group (see appendix). The effects of this on average skill efficiencies take time to build up, when one takes into account cohort effects, and the gains are only becoming apparent in the medium term, not dissimilar to those of R&D spending, but they are equally significant and highly persistent. The efficiency effects depreciate only slowly, according to the exit rate of working age population in the long run.

Infrastructure spending is assumed in the model to have a positive productivity effect and accounts for a large share of the total output enhancing effects in the model simulations. This category includes investment in transport, telecommunications, energy and environmental infrastructure. In the short run the effects of government investment (productive) and government consumption (unproductive) are similar. Both lead to higher aggregate demand but are partly crowded out by lower private consumption and private investment and some of the demand impulse leaks abroad through higher imports. However, in the medium term government investment raises productivity (this in contrast to unproductive government consumption) and the output enhancing effects of infrastructure investment become stronger in the following years.

Spending in the category *Technical assistance, agriculture, industry and services* is partly modelled as reductions in fixed costs (lowering start-up costs and increasing entry of new firms). This category includes a diverse range of interventions, including support to processing and marketing of agricultural and fisheries products, agricultural waste resources management, co-financing of state aids to industries and services, supporting plant and equipment investment, as well as expenditure on technical assistance related to preparation, implementation, monitoring and evaluation. Part of this is modelled as lowering capital costs for tangible capital (increasing investment and capital accumulation). Yet another part of this spending is modelled as unproductive government spending, like e.g technical assistance, monitoring and evaluation costs. The latter only has a growth boosting effect in the short run, i.e. during the years of the programming period when the spending occurs, but the former has a permanent output enhancing effect even after spending has discontinued.

The model simulations of cohesion policy spending show the benefits from cohesion spending build up gradually over time. In the short run there can already be a positive impact from the additional spending as consumption rises in anticipation of higher permanent income but this can be partly offset by lower private investment. The productivity enhancing effects from cohesion expenditure become gradually significant over the following years and lead to higher growth. In the long run the positive supply effects persist even when spending is discontinued, and there are significant endogenous growth effects. Wages grow in the long run in line with productivity and as productivity gains become stronger over time, there are significant increases in incomes. Employment increases in beneficiary countries but falls in donor countries. There is generally upward pressure on inflation as the demand effects dominate in the short run, but in the medium term, as potential output increases, inflationary pressures subside. Imports are boosted by the increase in demand while the increase in spending leads to a sizeable real appreciation in the largest recipient countries and this loss in competitiveness reduces exports. As a result of this, trade balances deteriorate and current account deficits become larger.

A comparison across countries shows GDP effects roughly proportional to the funds received, when the financing of EU contributions is also taken into account. Hence, the largest recipients, Portugal, Greece and Spain, show the largest increases in GDP. Germany, which is a net contributor to cohesion (EU budget) spending, also shows positive output effects. Although labour taxes increase, to finance the increase in EU budget contributions, and hence employment falls, the productivity enhancing effects of the cohesion spending come to dominate after two years. In Italy, the output effects also become positive in later years. Across all recipients countries, Spain and Greece appear to gain most in the medium term, relative to their share of spending. Other EU15 member states which do not receive Cohesion support face negative output effects due to the distortionary effects from higher taxes that are required to pay for EU cohesion policy. While this is partly offset by higher export growth for those countries that have close trading links to the recipient countries, the overall effect on output is in most cases negative.

The analysis shows there are potentially significant long run benefits from EU Cohesion Policy spending in the less developed regions of the EU. These positive benefits become stronger in the medium and long run and are able to deliver a significant improvement in incomes in the regions supported. These interventions are likely to bear fruit only in the

medium term and significant effects from these policies should only be expected some years after implementation. In the short run, the additional spending could give rise to crowding out of productive private investment due to intertemporal consumption-investment decisions. Also, R&D promoting policies could drive up wages of researchers and crowd out high skilled employment in other sectors. In addition, there is little benefit one can expect in the short run from training and other human capital investments. But in the medium term the productivity enhancing effects of infrastructure investment, R&D promoting policies, and human capital investments become gradually stronger and even when the programme is terminated and spending discontinued there are permanent positive output gains.

It is important to point out that the success or failure of EU Cohesion Policy programmes should not exclusively be judged on the basis of its effect on gross domestic product. The objective of Cohesion policy is to foster social and economic cohesion and to achieve real convergence in the Union. GDP is the yardstick most commonly used, and GDP per capita is the measure on which eligibility for Cohesion support is determined, and this is therefore the logical first measure to use in an assessment. But one should be aware that even as an indicator of market activity, gross domestic product is not a measure without flaws. Alternative measures like gross national product, which includes net capital paid to and from abroad, or net national income, which includes profits exported and imported, may be preferred. But more generally, other measures of wellbeing should also be taken into account in a wider assessment of EU Cohesion Policy.

It should also be stressed that the results reported here are based on a macroeconomic analysis and the long run output gains reflect the assumed productive impact of investment in infrastructure, human capital and R&D in the model. Hence, this aggregate macroeconomic modelling approach gives an estimate of the *potential* effect of Cohesion spending as the results depend crucially on the underlying assumption that the money is spent efficiently. This modelling approach should be complemented with an analysis based on micro data from individual projects as only such a project-based analysis could shed light on the question whether these positive impacts shown here are achievable.

1. Introduction

Cohesion Policy is one of the key pillars of the European Union. Greater economic and social cohesion among the EU member states and its regions was formalised as objective in the Single European Act (1986) and has since then become one of the most important and most debated EU policies. An increasing share of the European budget is allocated to this goal and the Structural and Cohesion Funds are now the second-largest item in the budget, receiving around one-third of the total EU budget.

Cohesion Policy provides the basis for substantial cross-country transfers of resources from richer to poorer countries in the EU. The resources are targeted on public and private investment in physical and human capital, and designed to increase economic and social cohesion among member states, enhancing a faster catch-up process of the less developed member states in terms of income per capita. With the adoption of the 'Lisbon Strategy' by the European Council in Lisbon in March 2000 - with its focus on growth, employment and innovation - this became more and more the leitmotiv of many EU policies and this was the momentum for a paradigm shift in Cohesion Policy. And with the enlargement of the EU in 2004 came increased disparities in income, as the average GDP per capita in these new member states was under half the EU average and almost all their territories were eligible for the highest possible level of support from the Structural and Cohesion Funds.

Cohesion policy programmes consist of four Structural Funds (the European Regional Development Fund (ERDF), the European Social Fund (ESF), the European Agricultural Guidance and Guarantee Fund (EAGGF), and the Financial Instrument for Fisheries Guidance (FIFG)) as well as the Cohesion Fund (CF). In the programming period 2000-2006 the total amount available for the Structural and Cohesion Funds was €13 billion for EU-15, and €1.7 billion for the 10 new Member States between 2004 and 2006. The objectives of Cohesion Policy are defined as promoting the development and structural adjustment of regions whose development is lagging behind (Objective 1), supporting the economic and social conversion of areas facing structural difficulties (Objective 2), and supporting the adaptation and modernisation of policies and systems of education, training and employment (Objective 3). In this study we look at the impact of structural funds and the cohesion fund in all member states that receive large allocations of these funds, mainly under Objective 1, but for some countries, notably Germany and Italy, Objective 2 is also included.

This paper provides a model-based assessment of the potential impact of cohesion expenditure in the programming period 2000-2006, using a multi-country version of the QUEST III model, the model of DG Economic and Financial Affairs of the European Commission (see Ratto, Roeger and in 't Veld (2009)). The model belongs to the class of New-Keynesian micro-founded dynamic general equilibrium (DGE) models that are now widely used in economic policy institutions¹. The version of QUEST III used here is a large

¹ These models include full microeconomic foundations, i.e. model equations are equilibrium conditions that are explicitly derived under assumptions of optimising behaviour and include fully consistent stock-flow dynamics. In contrast to the earlier generation of Real Business Cycle models in which markets continuously cleared, they include nominal and real rigidities in the New-Keynesian fashion, as well as financial frictions in the form of financial constraints, that give a role to aggregate demand in output determination. As a consequence, they are better able to match some basic regularities found in time series data and also give scope for active policy intervention. Other examples of DSGE models at policy institutions are the GIMF model at the IMF (Kumhof

scale version which includes each of the EU27 member states, and one region representing the rest of the world. The explicit modelling of cross-country linkages through bilateral trade relationships allows us to capture spillovers and interactions between EU member states, both beneficiaries as well as paying member states, of cohesion expenditure.

The version of the QUEST model we use in this study is an extension of QUEST III with human capital accumulation and endogenous technological change. The model has been used extensively for the analysis of structural reforms in the EU (the Lisbon Strategy for Growth and Jobs) and is described in Roeger, Varga and in 't Veld (2008). It is particularly suitable for an evaluation of the type of structural policies that form the core of Cohesion Policy interventions. The model incorporates productive infrastructure investment that captures the productivity-enhancing effects of public capital. It also employs the product variety framework proposed by Dixit and Stiglitz (1977) and applies the Jones (1995) semi-endogenous growth framework to explicitly model the underlying development of R&D. The endogenous modelling of R&D allows us to analyse the impact of R&D promoting policies on growth. Furthermore, the endogeneity of human capital accumulation in the model can capture the effects of policies promoting vocational education and training.

The paper is organized as follows. The first section briefly reviews previous economic evaluations of Cohesion policy. The next section gives an overview of the Structural and Cohesion Funds in the period 2000-6 and the size of the fiscal transfers involved. Section 4 describes the model, and focuses on those features of the model which enable us to carry out the impact assessment of the fiscal transfers. The model results for recipient countries are presented in detail in the following section. As the model results depend crucially on assumptions related to the productive impact of additional public capital a sensitivity analysis is included in the following section. The last section concludes.

and Laxton, 2007), the NAWM at the ECB (Christoffel, Coenen and Warne, 2008) and the SIGMA model at the Fed (Erceg, Guerrieri and Gust, 2006).

2. Economic evaluations of Cohesion Policy

The question is to what extent do the large scale fiscal transfers under Cohesion policy programmes contribute to an increase in production capacities in the recipient countries. Some experts have expressed doubts about the effective and productive absorption of these transfers and challenged the belief that these transfers are likely to achieve economic convergence. The transfers under Cohesion policy show strong similarities to official development assistance given to low-income countries and the economic arguments are similar. There is a long and inconclusive literature on aid and economic growth and considerable debate about the specification and the mechanisms by which aid would affect growth. One of the difficulties is that aid is often given in response to slower growth in the recipient country, which makes interpreting how aid flows then affect growth extremely difficult, and the problems of reverse causality are not easy to address. The effect of the transfer on the terms of trade is also critical. Boone (1996) found that aid often financed consumption rather than investment and that the growth benefits of aid were therefore limited. Burnside and Dollar (2000) addressed some of the scepticism implied by Boone and concluded that aid only works in a good policy environment, and this gave a new impulse to this literature (for a review of this literature see Hansen and Tarp (2000) and Easterly (2003)). Although there is no clear consensus on the effectiveness of development assistance, there is general scepticism on inflated claims on the growth dividend of aid². Notwithstanding this, there seems to be a growing consensus in favour of the argument that aid boosts growth by increasing total savings.

Herve and Holzmann (1998) provide a detailed analysis of potential absorption problems related to the large-scale fiscal transfers under EU Cohesion Policy. They discuss several reasons why the actual increase in (physical and human) capital could be considerably smaller than what would be expected under an optimal use of transfers. Factors that could lead to such a sub-optimal use of fiscal transfers are:

- (1) Waste of transfers. Due to lack of adequate administrative environment, transfers may be used for investment projects with zero or negative economic return.
- (2) Administrative costs to ensure the best possible use of transfers. Extra resources needed for programming and monitoring that cannot be used for increasing the productive capacity of the economy. This should at least seek to avoid waste of transfers, and aim to avoid sub-optimal use.
- (3) Rent-seeking activities. Transfers provide an incentive to economic agents in public and private sector to invest resources in directly unproductive activities to catch a rent in the form of a share of the transfers. Competition for resources absorbs resources that can no longer be used productively.
- (4) Diversion of funds to consumption. Positive income shocks affect consumption-investment decision of private and public sectors. Because of consumption-smoothing behaviour, the increase in future consumption possibilities will lead to a higher consumption on impact, to the detriment of investment.³

² As Easterly (2003) puts it, "In virtually no other field of economics do economists and policymakers promise such large welfare benefits for modest policy interventions as "we" do in aid and growth. The macroeconomic evidence does not support these claims." (ibid., p.40).

³ In addition to these factors, the authors list other "absorption problems" that could lead to a *sub-optimal* investive use of transfers; timing related problems (due to considerable time lags before returns to investment materialise, opportunity costs are high and private investment decisions may be delayed), information disadvantage of the disbursing authority (leading to support of sub-optimal investment projects), public choice

Hervé and Holzmann (1998) argue that for the EU cohesion policy programmes absorption problems are of empirical relevance and that their scope may be very high. They conclude that in some cases, transfers "may be unquestionably detrimental to economic growth and real convergence" (ibid, p.14) with as most likely cause rent seeking, protectionism and market rigidities. They also argue that absorption problems are likely to increase with the amount of transfers.

Empirical assessments

Ex-post evaluation studies of EU Cohesion Policy in the past have also generally given only mixed support for large transfers. The large income gap between the poorer EU regions and the EU average is essentially a reflection of lower productivity and capital stock. Structural EU funds encourage investment and should thus support convergence. But while there has been strong catching-up of some assisted regions in terms of per capita incomes, it is not clear to what extent this can be attributed to Structural Funds interventions and there are many other assisted regions that have remained relatively poor. Growth regressions augmented with Structural Fund variables show generally no significant impact from these transfers. Boldrin and Canova (2001) investigate the role of European regional policies in promoting convergence in output per capita during the period 1980-1996. They conclude that there is no evidence that structural and cohesion funds regions behave differently from others or display any form of systematic catching-up with the rest of regional income distribution.

Other studies show similarly mixed evidence on convergence. Cappelen *et al.* (2003) find evidence from an empirical growth model that EU regional policy has become more effective in its aim to generate growth and contribute to greater equality in productivity and income in Europe. However, their estimates suggest that growth in poorer regions is greatly hampered by an unfavourable industrial structure (dominated by agriculture) and lack of R&D. This supports the view that fiscal transfers should be accompanied by policies that facilitate structural change and increase R&D capabilities in poorer regions. Ederveen *et al.* (2002) and Ederveen, Groot and Nahuis (2006) explore the effectiveness of EU Structural Funds by means of a panel data analysis for 13 countries in the EU and find that Structural Funds are – on average - ineffective. However, using a wide range of conditioning variables like openness, institutional quality, corruption and indicators of good governance, they show that for countries with the 'right' institutions, Structural Funds are effective.

In a recent study, Checherita, Nickel and Rother (2009) look at the impact of net fiscal transfers to households and EU structural funds for per-capita output convergence across a large sample of European regions during the period 1995-2005. They find that while net fiscal transfers contribute to reducing disparities in income available to households at the regional level - and thus achieve their intended distributional goal - they also impede output growth, i.e. there is a negative impact of net transfers on growth in receiving regions and small contributors, and a negative impact, as well, of net taxes on growth in paying regions (the big contributors). The authors suggest this may point to an "immiserising convergence" with

considerations (leading to intentional support of suboptimal projects). Finally, changes in relative prices could lead to Dutch disease type phenomena (rising factor demand non-tradable sector leading to decline in tradable sector), immiserising growth phenomena (industrial restructuring in favour of protected subsectors, with harmful consequences for long run growth) and worsening of negative effects of market failures (polarisation effects of transfers due to increasing returns to scale and labour market distortions).

output growth rates in receiving poor regions declining by less than in paying rich regions in reaction to the tax-transfer scheme. EU structural and cohesion funds spent during 1994-1999 are found to have had a slight positive impact on economic growth, mainly through the human development component, but the results do not seem to be robust when country dummies are included. Note that the fact that fiscal transfers contribute to reducing regional disparities in disposable income, but not in reducing disparities in output per capita indicates that there could be a trade-off between distributional policies and policies targeted to growth and economic convergence.

Model based assessments

Project-based assessments of Cohesion programmes could through conventional cost-benefit analysis calculate the economic or social rate of return of individual projects. However, this does not take into consideration externalities and spillover effects of individual projects onto the rest of the economy. That is why macro-economic models have frequently been used to assess the economy-wide feedbacks and interactions of the fiscal transfers at the aggregate level and the structural changes in productive potential of the economy as a whole. An example of a study using single country models to evaluate cohesion spending is Pereira and Gaspar (1999). They find in a two-sector endogenous growth model calibrated to Portugal, that EU funds inflows of around 3½ percent of GDP during the period 1989–93 increased growth by about ½ percentage point a year (both in the short and long run). They also conclude that the impact on growth was maximized when EU funds were spent on infrastructure rather than on private physical or human capital accumulation.

Many country assessments of Structural Funds have relied on HERMIN models of the beneficiary countries (e.g. Bradley, Herce and Modesto (1995), Bradley, Morgenroth and Untiedt (2003)). These model were specifically designed to carry out an analysis of the impact of cohesion policy expenditure on the beneficiary countries. The HERMIN models generate large positive short run impacts of cohesion policy through hybrid output equations (Bradley and Fitzgerald (1988)) where cohesion policy expenditure is directly added to domestic absorption, while gradually building-up long run output effects are modelled through terms added to these hybrid output equations that capture output externalities associated with infrastructure and human capital. World demand is exogenous in these single country models and private sector demand is not based on intertemporal optimising behaviour but modelled in a traditional Keynesian fashion (e.g. consumption as a fixed share of disposable income). With interest rates and exchange rates exogenous the output effect in HERMIN models is directly determined by the given increase in absorption and the assumed long run output and productivity parameters.

More recently, the European Commission (European Commission, 2007) used three models for an ex-ante assessment of potential effects of Cohesion expenditure over the programming years 2007-13: HERMIN models of individual member states (Bradley, Untiedt and Mitze, 2007), the QUEST II model, the global macroeconomic model of DG Economic and Financial Affairs of the European Commission and the predecessor of the current QUEST III model (in 't Veld, 2007), and the EcoMod model of ULB/Ecomod partners, a dynamic-recursive CGE model (Bayar, 2007). All three models showed positive output effects from cohesion expenditure, but the demand effects were in the short run smaller in the micro-founded QUEST II model than in the HERMIN model. The long run output effects were

similar in the QUEST and HERMIN, but larger in EcoMod, while the employment effects in QUEST were smallest as in this model productivity gains are passed on into higher wages⁴.

There have also been earlier applications of New-Keynesian dynamic general equilibrium models to cohesion policy. In Varga and in 't Veld (2009), we apply the version of the QUEST III model that we use in this paper to an evaluation of the effects of cohesion spending in the new member states over the period 2007-2013. Allard *et al.* (2008) use the GIMF model, the dynamic general equilibrium model of the IMF for an assessment of cohesion spending on new member states. They pay particular attention to the ongoing convergence process of the NMS and compare the impact of EU transfers to households to public infrastructure investment, finding a stronger impact of the latter on long term growth. QUEST and GIMF are similar in that both are micro-founded global open-economy models and similar mechanisms are at play in these models. Utility maximising households smooth their consumption and this leads to a lower impact of transfers in the short run, while public investment boosts productivity and generates higher growth in the medium run. The main difference is that in the version of the QUEST III model used here the supply side effects are modelled in greater detail with human capital accumulation and endogenous technological change.

⁴ Larger long run positive employment effects in HERMIN are driven by the technical assumptions that the output elasticity of public infrastructure investment exceeds the productivity elasticity.

3. The European Union's Cohesion Policy programme 2000-2006

In the period 2000 to 2006, more than €250 billion was spent in total on regional policy structural instruments for the 15 Member States, pre-accession aid and structural interventions for the new member states (NMS). This amounted to approximately 37 percent of the EU budget.

Objectives

The Structural Fund regulations for 2000-06 provided, in particular, for three priority objectives⁵:

- Objective 1 : to promote the development and structural adjustment of regions whose development is lagging behind;
- Objective 2 : to support the economic and social conversion of areas experiencing structural difficulties;
- Objective 3: to support the adaptation and modernisation of education, training and employment policies and systems in regions not eligible under Objective 1.

Objective 1 of the Structural Funds is the main priority of the European Union's cohesion policy. In accordance with the treaty, the Union works to "promote harmonious development" and aims particularly to "narrow the gap between the development levels of the various regions". This is why more than 2/3 of the appropriations of the Structural Funds (more than EUR 135 billion) was allocated to helping areas lagging behind in their development ("Objective 1") where the gross domestic product (GDP) per capita is below 75% of the Community average.

All these regions had a number of economic signals/indicators "in the red":

- low level of investment;
- a higher than average unemployment rate;
- lack of services for businesses and individuals;
- poor basic infrastructure.

Some seventy regions, home to 27% of the European population, were covered in the period 2000-06⁶. The Structural Funds aimed to support the takeoff of economic activities in these regions by providing them with the basic infrastructure they lack, whilst adapting and raising the level of trained human resources and encouraging investments in businesses.

Objective 2 of the Structural Funds aimed to revitalise all areas facing structural difficulties, whether industrial, rural, urban or dependent on fisheries. Though situated in regions whose development level was close to the Community average, such areas were faced with different types of socio-economic difficulties that were often the source of high unemployment. These included:

⁵ In addition there are two Community Initiatives URBAN and INTERREG. More information can be found on the Regional Policy website of the European Commission (http://ec.europa.eu/regional_policy/index_en.htm)

⁶ European Commission (2005), Table 1.

- the evolution of industrial or service sectors;
- a decline in traditional activities in rural areas;
- a crisis situation in urban areas;
- difficulties affecting fisheries activity.

The reform of the Structural Funds under Agenda 2000 concentrated structural assistance on the most pressing development problems. The new Objective 3 of the Structural Funds for 2000-06 brought together the former Objectives 3 (combating long-term unemployment, integration of young people into working life, integration of those threatened with exclusion from the labour market) and Objective 4 (adapting the workforce to changes in production). It became the reference framework for all the measures taken under the new Title on employment inserted in the EC Treaty by the Treaty of Amsterdam and under the European employment strategy . Objective 3 covered all activities relating to the development of human resources, with as goal to modernise education and training policy and systems and promote employment. All regions not covered by Objective 1 were eligible under Objective 3. Training and employment measures in Objective 1 regions were already included in programmes receiving assistance from the European Social Fund (ESF) to that end.

Structural and Cohesion Funds

Cohesion policy spending is provided under different funds.

The four Structural Funds are :

- the European Regional Development Fund (ERDF),
- European Social Fund (ESF),
- European Agricultural Guidance and Guarantee Fund (EAGGF),
- the Financial Instrument for Fisheries Guidance (FIFG))

In addition there is :

- The Cohesion Fund (CF)

All combined 71.6 % of the total Structural and Cohesion Funds falls under the so-called Objective 1.

In the model simulation in this paper, we consider the impact of Structural funds and the Cohesion fund in all Member states that receive large allocations of these funds (see Table 1). Portugal, Spain, Greece, Ireland as well as Italy and Germany received funds over this programme period. The new member states already received pre-accession assistance from 2001 onwards, and cohesion spending in these countries increased after accession in 2004. The expenditure is mainly through Objective 1 programmes, but includes for the Czech Republic (Prague), Spain, Italy and Germany also Objective 2. Note that this is the first time Objective 2 spending is included in model-based evaluations, and for Germany and Italy the amounts are not negligible (9.2 and 7.0 bn. euros respectively)⁷. Total spending of Cohesion policy programmes in this period amounted to €186 billion. (€166 billion from SF, €20 billion from CF).

⁷ INTERREG is not included.

Table 1. Cohesion Policy Payments 2000-6 programming period

	Structural Funds					Cohesion Fund (CF)	Total Cohesion Policy
	European Regional Development Fund (ERDF)	European Social Fund (ESF)	European Agricultural Guidance and Guarantee Fund (EAGGF)	Financial Instrument for Fisheries Guidance (FIFG)	Total Structural Funds		
Czech Rep.	0.98	0.40	0.17	0.00	1.55	0.81	2.37
Cyprus	0.03	0.02	0.00	0.00	0.05	0.03	0.08
Estonia	0.23	0.07	0.06	0.01	0.37	0.29	0.66
Hungary	1.23	0.45	0.31	0.00	2.00	0.82	2.82
Lithuania	0.58	0.19	0.12	0.01	0.90	0.59	1.49
Latvia	0.38	0.13	0.09	0.02	0.63	0.51	1.14
Malta	0.05	0.01	0.00	0.00	0.06	0.02	0.08
Poland	4.95	2.01	1.19	0.17	8.31	3.05	11.37
Slovenia	0.14	0.08	0.02	0.00	0.24	0.16	0.40
Slovakia	0.60	0.32	0.18	0.00	1.11	0.54	1.65
Germany	15.47	11.73	3.65	0.14	31.00	0.00	31.00
Italy	17.39	7.80	3.22	0.34	28.76	0.00	28.76
Ireland	1.93	1.04	0.20	0.06	3.23	0.53	3.76
Portugal	13.01	4.88	2.24	0.21	20.33	2.17	22.50
Greece	14.36	4.77	2.69	0.19	22.00	1.79	23.80
Spain	26.27	11.72	5.68	1.78	45.44	8.86	54.30
Total	97.60	45.63	19.83	2.95	166.00	20.18	186.18

Note: Total payments Structural and Cohesion Funds over period 2000-2009, in bln. euros and as % of GDP.

Due to delays in member states submitting programmes and delays in decision taking, actual cohesion policy payments were spread over a longer period than the official programming period 2000-6, and continue for two to three more years. Table 2 gives the yearly payment profiles in millions of euros and as percentage of GDP for each of the member states⁸.

Fields of intervention

The fields of interventions of Structural Funds are divided into three main categories (and the following sub-categories in brackets): 1) Infrastructure investment (transport, environmental, telecommunication, urban rehabilitation, social infrastructure and health); 2) Investment in human resources (education, labour market programmes, social inclusion, entrepreneurship, actions for women) and 3) Investment in productive environment (business support, tourism, RTDI). Interventions under Cohesion Funds are all in infrastructure investment.

In total, 41 per cent of the investment was spent on infrastructure, of which just under half was allocated to transport and about a third to environment, 33.8 per cent was allocated to creating a productive environment for enterprises and 24.5 per cent to human resources (see Table 3). For a more detailed breakdown of all interventions under cohesion policy programmes, see annex A (Table A1).

⁸ The final 5% payment (of Structural Funds) has been allocated to 2008, which corresponds for most Member States close to actual imbursements.

Table 2. Yearly payment profile 2000-2009**2.a Yearly profile in millions of euros**

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Total
Czech Rep.	0	10	27	53	229	205	506	610	694	31	2365
Cyprus	0	0	0	0	5	9	15	22	30	1	81
Estonia	0	8	10	16	61	100	159	162	146	0	663
Hungary	0	27	41	46	239	401	745	852	423	44	2820
Latvia	0	10	18	23	88	167	175	386	263	10	1140
Lithuania	0	12	30	28	109	186	226	388	483	27	1490
Malta	0	0	0	0	6	5	16	33	21	0	82
Poland	0	46	157	173	1064	995	2127	3367	3147	292	11369
Slovakia	0	4	24	31	153	201	298	431	507	0	1649
Slovenia	0	2	11	9	32	59	97	78	106	8	403
Germany	1018	3053	3347	3385	4032	4304	4226	3998	3513	126	31002
Greece	0	2238	1446	1408	2547	2431	3434	4678	5453	164	23798
Ireland	208	458	614	552	537	431	407	245	300	11	3763
Italy	1512	609	1570	3473	3842	4129	4373	4355	4346	546	28755
Portugal	1340	1657	2802	3107	3195	2678	2373	2122	2935	291	22500
Spain	303	5327	7929	8215	8100	7625	5506	5460	5439	398	54303

2.b Yearly profile as % of GDP

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Czech Rep.	0.00	0.01	0.03	0.07	0.26	0.20	0.45	0.48	0.47	0.02
Cyprus	0.00	0.00	0.00	0.00	0.04	0.06	0.10	0.14	0.17	0.00
Estonia	0.00	0.11	0.13	0.18	0.64	0.91	1.22	1.06	0.92	0.00
Hungary	0.00	0.05	0.06	0.06	0.29	0.45	0.83	0.84	0.40	0.05
Latvia	0.00	0.11	0.18	0.23	0.79	1.28	1.09	1.83	1.14	0.05
Lithuania	0.00	0.09	0.20	0.17	0.60	0.89	0.94	1.37	1.49	0.09
Malta	0.00	0.00	0.00	0.00	0.14	0.11	0.32	0.61	0.36	0.00
Poland	0.00	0.02	0.08	0.09	0.52	0.41	0.78	1.08	0.87	0.10
Slovakia	0.00	0.02	0.09	0.10	0.45	0.52	0.67	0.79	0.78	0.00
Slovenia	0.00	0.01	0.04	0.03	0.12	0.21	0.31	0.23	0.29	0.02
Germany	0.05	0.14	0.16	0.16	0.18	0.19	0.18	0.17	0.14	0.01
Greece	0.00	1.53	0.92	0.82	1.37	1.23	1.61	2.05	2.24	0.07
Ireland	0.20	0.39	0.47	0.40	0.36	0.27	0.23	0.13	0.16	0.01
Italy	0.13	0.05	0.12	0.26	0.28	0.29	0.29	0.28	0.28	0.04
Portugal	1.10	1.28	2.07	2.24	2.22	1.80	1.53	1.30	1.77	0.18
Spain	0.05	0.78	1.09	1.05	0.96	0.84	0.56	0.52	0.50	0.04

Note: Total Structural and Cohesion Funds as % of GDP

Source: European Commission (DG REGIO and own calculations)

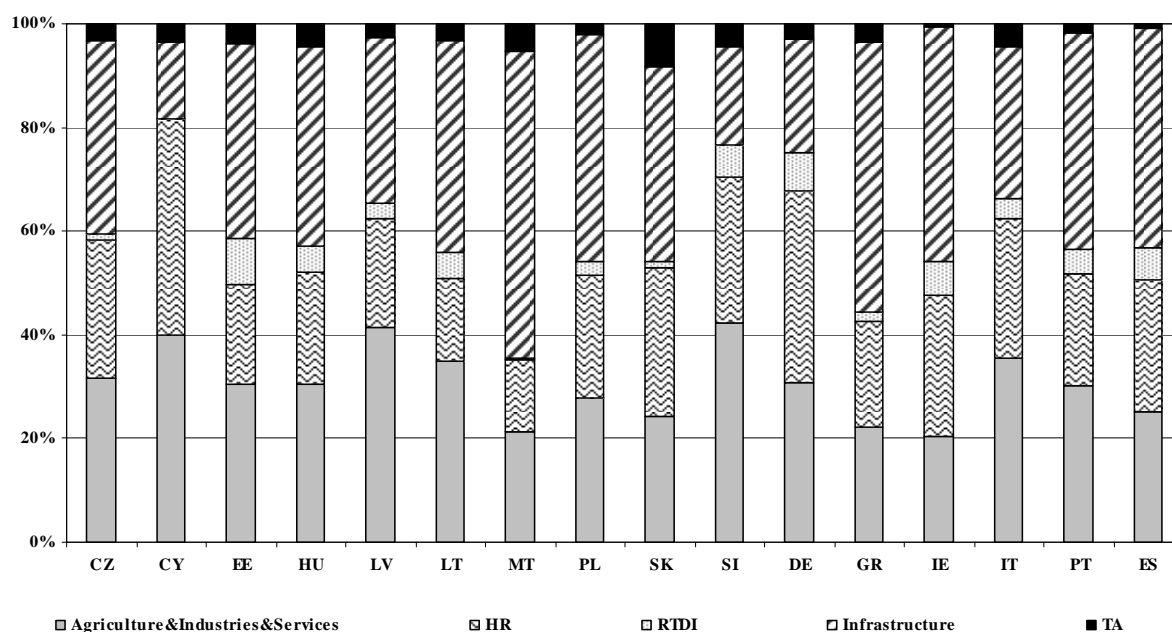
Table 3. Fields of interventions Structural Funds (% of total spending 2000-2009)

	Agriculture, Industries & Services	Human resources	Research and Development	Infrastructure	Technical assistance
Czech Republic	31.7	26.5	1.3	37.1	3.3
Cyprus	40.0	41.7	0.0	14.7	3.5
Estonia	30.4	19.4	8.9	37.3	4.0
Hungary	30.5	21.7	4.9	38.5	4.5
Latvia	41.4	21.0	3.1	31.7	2.8
Lithuania	35.0	15.8	5.2	40.8	3.2
Malta	21.4	13.8	0.3	59.3	5.2
Poland	27.9	23.4	2.7	44.0	2.0
Slovakia	24.3	28.8	0.9	37.7	8.3
Slovenia	42.5	27.9	6.2	19.0	4.4
Germany	30.7	37.1	7.2	22.0	3.0
Greece	22.3	20.4	1.8	52.0	3.6
Ireland	20.3	27.5	6.5	45.1	0.6
Italy	35.5	27.1	3.6	29.5	4.4
Portugal	30.2	21.7	4.5	41.9	1.7
Spain	25.1	25.5	6.2	42.4	0.8

Note: Total Structural Funds only

Source: European Commission (DG REGIO)

Figure 3.1. Fields of interventions (% of total spending 2000-2009)



Source: European Commission (DG REGIO)

4. Model description

The model used in this exercise is an extension of the QUEST III model with semi-endogenous growth. The structure of the model is described in Roeger, Varga and in 't Veld (2008). The model economy is populated by households, final and intermediate goods producing firms, a research industry, a monetary and a fiscal authority. In the final goods sector firms produce differentiated goods which are imperfect substitutes for goods produced abroad. Final good producers use a composite of domestic and imported intermediate goods and three types of labour - (low-, medium- and high-skilled). Households buy the patents of designs produced by the R&D sector and license them to the intermediate goods producing firms. The intermediate sector is composed of monopolistically competitive firms which produce intermediate products from rented capital input using the designs licensed from the household sector. The production of new designs takes place in research labs, employing high skilled labour and making use of the existing stock of domestic and foreign ideas. Technological change is modelled as increasing product variety in the tradition of Dixit and Stiglitz (1977).

Below we describe in some more detail the modelling of households, firms, human capital and the government budget constraint, which constitute the key elements for modelling the Structural Funds interventions. One extension to the model made here is an explicit formulation of human capital accumulation following Jones (2002) in order to account for the significant part of Structural Fund investments in various human resource programmes.

4.1. Households

The household sector consists of a continuum of households $h \in [0,1]$. A share $(1-\varepsilon)$ of these households are not liquidity constrained and indexed by $i \in [0,1-\varepsilon]$. They have access to financial markets where they can buy and sell domestic and foreign assets (government bonds), accumulate physical capital which they rent out to the intermediate sector, and they also buy the patents of designs produced by the R&D sector and license them to the intermediate goods producing firms. Non-liquidity constrained household members offer medium- and high-skilled labour services indexed by $s \in \{M, H\}$. The remaining share ε of households is liquidity constrained and indexed by $k \in [1-\varepsilon,1]$. These households cannot trade in financial and physical assets and consume their disposable income each period. Members of liquidity constrained households offer low-skilled labour services only. For each skill group we assume that both types of households supply differentiated labour services to unions which act as wage setters in monopolistically competitive labour markets. The unions pool wage income and distribute it in equal proportions among their members. Nominal rigidity in wage setting is introduced by assuming that households face adjustment costs for changing wages.

4.1.1 Non liquidity constrained households

Each non liquidity constrained household maximise an intertemporal utility function in consumption and leisure subject to a budget constraint. These households makes decisions about consumption (C_t^i), labour supply (L_t^i), investments into domestic and foreign financial

assets (B_t^i and $B_t^{F,i}$), the purchases of investment good (J_t^i), the renting of physical capital stock (K_t^i), the corresponding degree of capacity utilisation ($ucap_t^i$), the purchases of new patents from the R&D sector ($J_t^{A,i}$), and the licensing of existing patents (A_t^i), and receives wage income (W_t^i), unemployment benefits ($b_t^s W_t^{i,s}$)⁹, transfer income from the government (TR_t^i), and interest income (i_t, i_t^K and i_t^A). Hence, non-liquidity constrained households face the following Lagrangian

$$\begin{aligned}
& \underset{\left\{ \begin{array}{l} C_t^i, L_t^i, B_t^i \\ B_t^{F,i}, J_t^i, K_t^i \\ J_t^{A,i}, A_t^i, ucap_t^i \end{array} \right\}_{t=0}^{\infty}}{\text{Max}} & V_0^i = E_0 \sum_{t=0}^{\infty} \beta^t \left(U(C_t^i) + \sum_s V(1 - L_t^{i,s}) \right) \\
& - E_0 \sum_{t=0}^{\infty} \lambda_t^i \beta^t & \left(\begin{array}{l} (1 + t_t^c) P_t^C C_t^i + B_t^i + E_t B_t^{F,i} + P_t^I (J_t^i + \Gamma_J(J_t^i)) + P_t^A J_t^{A,i} \\ - (1 + r_{t-1}) B_{t-1}^i - (1 + r_{t-1}^F - \Gamma_{BF}) (E_t B_{t-1}^F / Y_{t-1}) E_t B_{t-1}^{F,i} \\ - \sum_s (1 - t_t^{w,s}) W_t^{i,s} L_t^{i,s} - b_t^s W_t^{i,s} (1 - NPART_t^{i,s} - L_t^{i,s}) + \Gamma_W(W_t^{i,s}) \\ - (1 - t_{t-1}^K) (i_{t-1}^K ucap_{t-1}^i - rp_{t-1}^K - \Gamma_U(ucap_{t-1}^i)) P_t^J K_{t-1}^i - t_{t-1}^K \delta^K P_t^I K_{t-1}^i - \tau^K P_t^I J_t^i \\ - (1 - t_{t-1}^A) (i_{t-1}^A - rp_{t-1}^A) P_t^A A_{t-1}^i - t_{t-1}^A \delta^A P_t^A A_{t-1}^i - \tau^A P_t^A J_t^{A,i} \\ - TR_t^i - \sum_{j=1}^n PR_{j,t}^{f,i} - \sum_{j=1}^{A_t} PR_{j,t}^{x,i} \end{array} \right) \\
& - E_0 \sum_{t=0}^{\infty} \lambda_t^i \xi_t^i \beta^t & (K_t^i - J_t^i - (1 - \delta^K) K_{t-1}^i) - E_0 \sum_{t=0}^{\infty} \lambda_t^i \psi_t^i \beta^t (A_t^i - J_t^{A,i} - (1 - \delta^A) A_{t-1}^i) \\
& s \in \{M, H\} & \tag{1}
\end{aligned}$$

The budget constraints are written in real terms with all prices and wages normalized with P_t , the price of domestic final goods. All firms of the economy are owned by non liquidity constrained households who share the total profit of the final and intermediate sector firms, $\sum_{j=1}^n PR_{j,t}^{f,i}$ and $\sum_{j=1}^{A_t} PR_{j,t}^{x,i}$, where n and A_t denote the number of firms in the final and intermediate sector respectively. As shown by the budget constraints, all households pay t_t^w wage income taxes and t_t^K capital income taxes less tax credits (τ^K and τ^A) and depreciation allowances ($t_t^K \delta^K$ and $t_t^A \delta^A$) after their earnings on physical capital and patents. There is no perfect arbitrage between different types of assets. When taking a position in the international bond market, households face a financial intermediation premium $\Gamma_{BF}(\cdot)$ which depends on the economy-wide net holdings of internationally traded bonds. Also, when investing into tangible and intangible capital households require premia rp_t^K and rp_t^A in order to cover the increased risk on the return related to these assets. The real interest rate r_t is equal to the nominal interest rate minus expected inflation: $r_t = i_t - E_t(\pi_{t+1})$.

⁹ Notice, households only make a decision about the level of employment but there is no distinction on the part of households between unemployment and non participation. It is assumed that the government makes a decision how to classify the non-working part of the population into unemployed and non-participants. The non-participation rate $NPART$ must therefore be seen as a policy variable characterising the generosity of the benefit system.

The utility function is additively separable in consumption (C_t^i) and leisure ($1 - L_t^{i,s}$). We assume log-utility for consumption and allow for habit persistence.

$$U(C_t^i) = (1 - habc) \log(C_t^i - habcC_{t-1}^i). \quad (2a)$$

For leisure we assume CES preferences with common labour supply elasticity but a skill specific weight (ω_s) on leisure. This is necessary in order to capture differences in employment levels across skill groups. Thus preferences for leisure are given by

$$V(1 - L_t^{i,s}) = \frac{\omega_s}{1 - \kappa} (1 - L_t^{i,s})^{1 - \kappa}, \quad \text{with } \kappa > 0. \quad (2b)$$

The investment decisions w.r.t. real capital and decisions w.r.t. the degree of capacity utilisation are subject to convex adjustment costs Γ_J and Γ_U , which are given by

$$\Gamma_J(J_t^i) = \frac{\gamma_K}{2} \frac{(J_t^i)^2}{K_{t-1}^i} + \frac{\gamma_I}{2} (\Delta J_t^i)^2 \quad \text{and} \quad (3)$$

$$\Gamma_U(ucap_t^i) = a_1(ucap_t^i - ucap_t^{ss}) + a_2(ucap_t^i - ucap_t^{ss})^2, \quad (4)$$

where $ucap_t^{ss}$ is the steady state capacity utilisation.

Wages are also subject to convex adjustment costs given by

$$\Gamma_W(W_t^{i,s}) = \sum_s \frac{\gamma_W L_t^{i,s}}{2} \frac{\Delta W_t^{i,s,2}}{W_{t-1}^{i,s}} \quad (5)$$

We denote with P^C the corresponding utility based deflator for the C and J aggregate. The first order conditions of the household with respect to consumption, financial and real assets are given by the following equations:

$$\frac{\partial V_0}{\partial C_t^i} \Rightarrow U_{C,t}^i - \lambda_t^i (1 + t_t^c) P_t^C = 0, \quad (6a)$$

$$\frac{\partial V_0}{\partial B_t^i} \Rightarrow -\lambda_t^i + E_t(\lambda_{t+1}^i \beta (1 + r_t)) = 0, \quad (6b)$$

$$\frac{\partial V_0}{\partial B_t^{F,i}} \Rightarrow -\lambda_t^i + E_t(\lambda_{t+1}^i \beta (1 + r_t^F - \Gamma_{BF}(E_t B_t^F / Y_t)) E_{t+1} / E_t) = 0 \quad (6c)$$

$$\frac{\partial V_0}{\partial K_t^i} \Rightarrow -\lambda_t^i \xi_t^i + E_t(\lambda_{t+1}^i \xi_{t+1}^i \beta (1 - \delta) + \lambda_{t+1}^i \beta ((1 - t_t^K) (i_t^K ucap_t^i - r p_t^K - \Gamma_u(ucap_t^i)) + t_t^K \delta^K) P_{t+1}^C) = 0 \quad (6d)$$

$$\frac{\partial V_0}{\partial J_t^i} \Rightarrow -\lambda_t^i P_t^C \left(1 + \gamma_K \left(\frac{J_t^i}{K_{t-1}^i} \right) + \gamma_I \Delta J_t^i - \tau^K \right) + E_t \left(\lambda_{t+1}^i \beta P_{t+1}^C \gamma_I \Delta J_{t+1}^i \right) + \lambda_t^i \xi_t^i = 0 \quad (6e)$$

$$\frac{\partial V_0}{\partial ucap_t^i} \Rightarrow i_t^K - a_1 - 2a_2 (ucap_t^i - ucap_t^{ss}) = 0 \quad (6f)$$

All arbitrage conditions are standard, except for a trading friction ($\Gamma_{B^F}(\cdot)$) on foreign bonds, which is modelled as a function of the ratio of assets to GDP. Using the arbitrage conditions and neglecting the second order terms, investment is given as a function of the variable Q_t

$$Q_t - 1 = \gamma_K \left(\frac{J_t^i}{K_{t-1}^i} \right) + \gamma_I \Delta J_t^i - \tau^K - E_t \left(\frac{\gamma_I \Delta J_{t+1}^i}{1 + i_t - \pi_{t+1}^C} \right) \quad \text{with } Q_t = \frac{\xi_t}{P_t^C}, \quad (7a)$$

where Q_t is the present discounted value of the rental rate of return from investing in real assets

$$Q_t = E_t \left(\frac{1 - \delta}{1 + i_t - \pi_{t+1}^C} Q_{t+1} + \frac{(1 - t_t^K) (i_t^K ucap_t^i - r p_t^K - \Gamma_u (ucap_t^i)) + t_t^K \delta^K}{1 + i_t - \pi_{t+1}^C} \right) \quad (7b)$$

Notice, the relevant discount factor for the investor is the nominal interest rate adjusted by the trading friction minus the expected inflation of investment goods (π_{t+1}^C).

Non-liquidity constrained households buy new patents of designs produced by the R&D sector (I_t^A) and rent their total stock of design (A_t) at rental rate i_t^A to intermediate goods producers in period t . Households pay income tax at rate t_t^K on the period return of intangibles and they receive tax subsidies at rate τ^A . Hence, the first order conditions with respect to R&D investments are given by

$$\frac{\partial V_0}{\partial A_t^i} \Rightarrow -\lambda_t^i \psi_t^i + E_t \left(\lambda_{t+1}^i \psi_{t+1}^i \beta (1 - \delta^A) + \lambda_{t+1}^i \beta \left((1 - t_t^K) (i_t^A - r p_t^A) + t_t^K \delta^A \right) P_{t+1}^A \right) = 0 \quad (7c)$$

$$\frac{\partial V_0}{\partial J_t^{A,i}} \Rightarrow -\lambda_t^i P_t^A (1 - \tau^A) + \lambda_t^i \psi_t^i = 0 \quad (7d)$$

Therefore the rental rate can be obtained from (6b), (7c) and (7d) after neglecting the second order terms:

$$i_t^A \approx \frac{(1 - \tau^A) (i_t - \pi_{t+1}^A + \delta^A) - t_t^K \delta^A}{(1 - t_t^K)} + r p_t^A \quad (7c')$$

where $1 + \pi_{t+1}^A = \frac{P_{t+1}^A}{P_t^A}$.

Equation (7c') states that household require a rate of return on intangible capital which is equal to the nominal interest rate minus the rate of change of the value of intangible assets

and also covers the cost of economic depreciation plus a risk premium. Governments can affect investment decisions in intangible capital by giving tax incentives in the form of tax credits and depreciation allowances or by lowering the tax on the return from patents.

4.1.2 Liquidity constrained households

Liquidity constrained households do not optimize but simply consume their current income at each date. Real consumption of household k is thus determined by the net wage income plus net transfers

$$(1+t_t^c)P_t^C C_t^k + \sum_s \frac{\gamma_W L_t^{k,s}}{2} \frac{\Delta W_t^{k,s,2}}{W_t^{k,s}} = \sum_s \left((1-t_t^{w,s}) W_t^{k,s} L_t^{k,s} + b_t^s W_t^{k,s} (1 - NPART_t^{k,s} - L_t^{k,s}) \right) + TR_t^k. \quad (8)$$

4.1.3 Wage setting

Within each skill group a variety of labour services are supplied which are imperfect substitutes to each other. Thus trade unions can charge a wage mark-up ($1/\eta_t^W$) over the reservation wage¹⁰. The reservation wage is given as the marginal utility of leisure divided by the corresponding marginal utility of consumption. The relevant net real wage to which the mark up adjusted reservation wage is equated is the gross wage adjusted for labour taxes, consumption taxes and unemployment benefits which act as a subsidy to leisure. Thus the wage equation is given as

$$\frac{U_{1-L,t}^{h,s}}{U_{C,t}^h} \frac{1}{\eta_t^W} = \frac{W_t^s (1-t_t^{w,s} - b_t^s)}{(1+t_t^c)P_t^C} \text{ for } h \in \{i, k\} \text{ and } s \in \{L, M, H\}. \quad (9)$$

4.1.4 Aggregation

The aggregate of any household specific variable X_t^h in per capita terms is given by

$$X_t = \int_0^1 X_t^h dh = (1-\varepsilon)X_t^i + \varepsilon X_t^k, \quad (10)$$

Hence aggregate consumption and employment is given by

$$C_t = (1-\varepsilon)C_t^i + \varepsilon C_t^k \quad (11)$$

and

$$L_t = (1-\varepsilon)L_t^i + \varepsilon L_t^k. \quad (12)$$

¹⁰ The mark-up depends on the intratemporal elasticity of substitution between different types of labour σ_s and fluctuations in the mark-up arise because of wage adjustment costs and the fact that a fraction ($1-sfw$) of workers is indexing the growth rate of wages π^w to wage inflation in the previous period

$$\eta_t^w = 1 - 1/\sigma_s - \gamma_W / \sigma_s \left[\beta (sfw \pi_{t+1}^w - (1-sfw) \pi_{t-1}^w) - \pi_t^w \right]$$

4.2. Final goods production and public capital

We account for the productivity-enhancing effect of infrastructure investment via the following aggregate final goods production function:

$$Y_t = A_t^{(1-\alpha)\left(\frac{1}{\theta}-1\right)} (K_t^P)^{1-\alpha} (L_{Y,t})^\alpha (K_t^G)^{\alpha_G} - FC_Y, \quad \text{where } \sum_{i=1}^{A_t} x_{i,t} = K_t^P \quad (13)$$

The final good sector uses a labour aggregate ($L_{Y,t}$) and intermediate goods ($x_{i,t}$) using a Cobb-Douglas technology, subject to a fixed cost FC_Y . Our formulation assumes that investment in public capital stock (K_t^G) increases total factor productivity with an exponent of α_G set to 0.10. Final output (Y_t) is produced using A_t varieties of intermediate inputs with an elasticity of substitution $1/(1-\theta)$. One unit of intermediate goods is produced from one unit of private capital (K_t^P), therefore in a symmetric market framework the total output of the intermediate sector amounts to the total private capital stock as $\sum_{i=1}^{A_t} x_{i,t} = A_t x_t = K_t^P$.

Public infrastructure investment (I_t^G) accumulates into the public capital stock K^G according to

$$K_t^G = (1-\delta_G)K_{t-1}^G + I_t^G \quad (14)$$

where δ_G , the depreciation rate of public capital is set at 4 per cent. Infrastructure investment is assumed to be proportional to output

$$I_t^G = (IGS_t + \varepsilon_t^{IG})Y_t \quad (15)$$

where ε_t^{IG} is an exogenous shock to the share of government investment (IGS_t). It is through this shock that we simulate the increase in infrastructure investment.

4.3. Intermediate production and the R&D sector

The intermediate sector consists of monopolistically competitive firms which have entered the market by buying licenses for design from domestic households and by making an initial payment FC_A to overcome administrative entry barriers. Capital inputs are also rented from the household sector for a rental rate of i_t^K . Firms which have acquired a design can transform each unit of capital into a single unit of an intermediate input. Intermediate goods producing firms sell their products to domestic final good producers. In symmetric equilibrium the inverse demand function of domestic final good producers is given as

$$px_{i,t} = \eta_t (1-\alpha)Y \left(\sum_{i=1}^{A_t} (x_{i,t}^j)^\theta \right)^{-1} (x_{i,t})^{\theta-1} \quad (16)$$

where η_t is the inverse gross mark-up of the final goods sector.

Each domestic intermediate firm solves the following profit-maximisation problem.

$$PR_{i,t}^x = \max_{x_{i,t}} \{ px_{i,t} x_{i,t} - i_t^K P_t^C k_{i,t} - i_t^A P_t^A - FC_A \} \quad (17)$$

subject to a linear technology which allows to transform one unit of effective capital ($k_i \cdot u_{cap}$) into one unit of an intermediate good $x_i = k_i$.

The no-arbitrage condition requires that entry into the intermediate goods producing sector takes place until

$$PR_{i,t}^x = PR_t^x = i_t^A P_t^A + (i_t^A + \pi_{t+1}^A) FC_A \quad (18)$$

or equivalently, the present discounted value of profits is equated to the fixed entry costs plus the net value of patents

$$P_t^A \frac{1}{1 - i_t^K (1 - \delta^A) + \tau^A} + FC_A = \sum_{\tau=0}^{\infty} \prod_{j=0}^{\tau} \left(\frac{1}{1 + r_{t+j}} \right) PR_{t+\tau}^x. \quad (19)$$

For an intermediate producer, entry costs consist of 1. the licensing fee $i_t^A P_t^A$ for the design or patent, which is a prerequisite of production of innovative intermediate goods, and 2. the fixed entry cost FC_A .

Innovation corresponds to the discovery of a new variety of producer durables that provides an alternative way of producing the final good. The R&D sector hires high-skilled labour $L_{A,t}$ and generates new designs according to the following knowledge production function:

$$\Delta A_t = \nu A_{t-1}^{\varpi} A_{t-1}^{\phi} L_{A,t}^{\lambda}. \quad (20)$$

In this framework we allow for international R&D spillovers following Bottazzi and Peri (2007). Parameters ϖ and ϕ measure the foreign and domestic spillover effects from the aggregate international and domestic stock of knowledge (A^* and A) respectively. Negative value for these parameters can be interpreted as the "fishing out" effect, i.e. when innovation decreases with the level of knowledge, while positive values refer to the "standing on shoulders" effect and imply positive research spillovers. Note that $\phi = 1$ would give back the strong scale effect feature of fully endogenous growth models with respect to the domestic level of knowledge. Parameter ν can be interpreted as total factor efficiency of R&D production, while λ measures the elasticity of R&D production on the number of researchers (L_A). The international stock of knowledge is taken into account as the weighted average of all foreign stock of knowledge. We assume that the R&D sector is operated by a research institute which employs high skilled labour at their market wage W^H . We also assume that the research institute faces an adjustment cost of hiring new employees and maximizes the following discounted profit-stream:

$$\max_{L_{A,t}} \sum_{t=0}^{\infty} d_t \left(P_t^A \Delta A_t - W_t^H L_{A,t} - \frac{\gamma_A}{2} W_t^H \Delta L_{A,t}^2 \right) \quad (21)$$

Therefore the first order condition implies:

$$\lambda P_t^A \frac{\Delta A_t}{L_{A,t}} = W_t^H + \gamma_A (W_t^H \Delta L_{A,t} - d_t W_{t+1}^H \Delta L_{A,t+1}) \quad (22)$$

where d_t is the discount factor.

4.4. Human capital accumulation

The labour aggregate $L_{Y,t}$ is composed of three skill-types of labour force:

$$L_{Y,t} = \left(s_L^{\frac{1}{\sigma_L}} (h_t^L L_t^L)^{\frac{\sigma_L-1}{\sigma_L}} + s_M^{\frac{1}{\sigma_L}} (h_t^M L_t^M)^{\frac{\sigma_L-1}{\sigma_L}} + s_{H,Y}^{\frac{1}{\sigma_L}} (h_t^H L_t^{HY})^{\frac{\sigma_L-1}{\sigma_L}} \right)^{\frac{\sigma_L}{\sigma_L-1}}. \quad (23)$$

Parameter s_s is the population share of the labour-force in subgroup s (low-, medium- and high-skilled), L^s denotes the employment rate of population s , h_t^s is the corresponding accumulated human capital (efficiency unit), and σ_L is the elasticity of substitution between different labour types¹¹. An individual's human capital is produced by participating in education and Λ_t^s represents the amount of time an individual spends accumulating human capital :

$$h_t^s = h_s e^{\psi \Lambda_t^s}, \quad \psi > 0 \quad (24)$$

The exponential formulation used here adapts Jones (2002) into a disaggregated skill-structure by incorporating human capital in a way that is consistent with the substantial growth accounting literature with adjustments for education¹². The ψ parameter has been studied in a wealth of microeconomic research. Interpreting Λ_t^s as years of schooling, the parameter corresponds to the return to schooling estimated by Mincer (1974). The labour-market literature suggests that a reasonable value for ψ is 0.07, which we apply here. Investments in human capital can then be modelled by increasing the years of schooling (Λ_t^s) for the respective skill-groups (see annex B).

4.5. The government budget constraint

For the government sector various expenditure and revenue categories are separately modelled. On the expenditure side we assume that government consumption (G_t), government transfers (TR_t) and government investment (I_t^G) are proportional to GDP and unemployment benefits (BEN_t) are indexed to wages. The government provides subsidies

¹¹Note that high-skilled labour in the final goods sector L_t^{HY} is total high-skilled employment minus the high-skilled labour working in the R&D sector ($L_{A,t}$).

¹²See Barro and Sala-i-Martin (1995).

(S_t) on physical capital and R&D investments in the form of a tax-credit and depreciation allowances, with are exogenous in the model.

Government revenues (R_t^G) are made up of taxes on consumption as well as capital and labour income. Fiscal transfers for NMS received from the EU are denoted by COH_t (which is negative for the net contributors). Labour taxes gradually adjust to stabilise the debt to GDP ratio in the long run according to the following rule

$$\Delta t_t^L = \tau^B \left(\frac{B_{t-1}}{Y_{t-1}} - b^T \right) + \tau^{DEF} \Delta \left(\frac{B_t}{Y_t} \right) \quad (25)$$

where b^T is the government debt target, τ^B and τ^{DEF} are coefficients. Therefore, government debt (B_t) evolves according to

$$B_t = (1+r_t)B_{t-1} + G_t + IG_t + TR_t + BEN_t + S_t - R_t^G - COH_t \cdot \quad (26)$$

It is assumed that the additional contributions to the EU budget are financed in the donor countries through an increase in labour taxes.

Cohesion policy programmes are subject to the condition of additionality and co-financing. Additionality requires that Structural Funds are additional to domestically-financed expenditure and are not used as a substitute for it. The co-financing principle means the EU provides only matching funds to individual projects that are part of the operational programmes and that the EU funds are matched to a certain extent by domestic expenditure. The problem with defining a proper benchmark means that in practice this principle of additionality is hard to verify and is thus not always binding. Member States are not required to create new budgetary expenditure to co-finance cohesion policy support. Existing national resources that were used to finance similar areas of interventions (and are thus concerned by the additionality requirement) can be 'earmarked' to co-finance Structural Fund transfers. Total spending increases only by the amount of Structural Fund transfers.

More formally, assume a cofinancing rate of c , i.e. the EU transfer COH_t has to be matched by domestically-financed expenditure $c \cdot COH_t$. The additionality and co-financing principles can be expressed as the following condition for total government spending in a beneficiary country:

$$TOTEXP_t = COH_t + \max(EXP_0, c \cdot COH_t) \quad (27)$$

where $TOTEXP_t$ is total expenditure, COH_t is the fiscal transfer received from the EU cohesion funds, EXP_0 domestically-financed expenditure in the counterfactual situation (without Structural and Cohesion Funds), and c is the co-financing rate. Examining the additionality tables of Member States, it is apparent that national public expenditure concerned by additionality usually exceeds the co-financing needs by far. In this case $EXP_0 > c \cdot COH_t$, and total expenditure is given by¹³

¹³ Herve and Holzmann (1998) criticise earlier model-based studies of structural funds for grossly exaggerating the total impact because they assumed that the full Structural Fund spending is additional to investment in the

$$TOTEXP_t = COH_t + EXP_0 \quad (28)$$

As spending on infrastructure and education typically exceeds the co-financing requirements, this exercise takes domestically-financed expenditure EXP_0 in the counterfactual situation (without structural and cohesion funds) as the benchmark and only examines the impact of the fiscal transfer COH_t received from the EU cohesion funds.

4.6. Trade

A specific feature of the model used in this exercise is the explicit modelling of bilateral trade. The economies trade their final goods. Private and public consumption (C , G) and investment (I , IG) are aggregates of domestic and foreign varieties of goods expressed by the following CES functions where the elasticity of substitution between bundles of domestic and foreign goods Z^D and Z^F is σ and s is the corresponding share parameter:

$$Z_t = \left((1-s)^{\frac{1}{\sigma}} \left(Z_t^D \right)^{\frac{\sigma-1}{\sigma}} + s^{\frac{1}{\sigma}} \left(Z_t^{IM} \right)^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}, Z \in \{C, I, G, IG\} \quad (29)$$

To account for the high degree of trade openness of many of the EU Member States we include trade in intermediate goods. Thus, aggregate imports are given by

$$IM_t = s \left(\frac{P_t^C}{P_t^{IM}} \right)^{\sigma} (C_t + I_t) + s^G \left(\frac{P_t^C}{P_t^{IM}} \right)^{\sigma} (G_t + IG_t) + IM_t^{INT} \quad (30)$$

where intermediate imports IM_t^{INT} are assumed to be proportional to output.

Total exports of country c is the sum of the quantities imported by all its trading partners, $IM_t^{c \rightarrow c'}$:

$$EX_t^c = \sum_{c' \neq c} IM_t^{c \rightarrow c'}. \quad (31)$$

The total imports from all trading partners is given by

$$IM_t^c = \left(\sum_{c \neq c'} \left(sim^{c \rightarrow c'} \right)^{\frac{1}{\sigma_i}} \left(IM_t^{c \rightarrow c'} \right)^{\frac{\sigma_i-1}{\sigma_i}} \right)^{\frac{\sigma_i}{\sigma_i-1}} \quad (32)$$

and the corresponding *bilateral* import demand and import price equations are

$$PIM_t^c = \left(\sum_{c' \neq c} sim_t^{c' \rightarrow c} \left(\frac{E_t^{c'} PX_t^{c' \rightarrow c}}{E_t^c} \right)^{1-\sigma_i} \right)^{\frac{1}{1-\sigma_i}} \quad (33)$$

counterfactual situation $TOTEXP_t = COH_t + c \cdot COH_t + EXP_0$ while the correct formulation of the additionality principle is given by equation (28).

$$IM_t^{c \rightarrow c'} = sim_t^{c' \rightarrow c} \left(\frac{E_t^{c'} PX_t^{c' \rightarrow c}}{E_t^c PIM_t^c} \right)^{-\sigma_i} IM_t^{c \rightarrow c'}. \quad (34)$$

Finally, the net foreign assets evolve according to

$$E_t B_t^F = (1 + r_t^F) E_t B_{t-1}^F + P_t^{EX} EX_t - P_t^{IM} IM_t. \quad (35)$$

4.6. Calibration and implementation of the interventions

For simulating Cohesion Policy expenditure in the EU, we use a multicountry version of the model with 28 regions (each of the 27 member states and one region representing the rest of the world). The calibration of this model is described in detail in D'Auria *et al.* (2009). In calibrating the model, we follow the literature of dynamic general equilibrium modelling and set the key steady-state ratios equal to their empirical counterparts for each region. While the calibration of the main steady state ratios (private consumption to output, investment to output, etc.) is based on EUROSTAT and OECD data, the remaining structural parameters and variables are adopted from the available estimates in empirical studies (see Ratto *et al.* 2009) or tied down by the equations of the model. This calibration of each of the individual country models uses country specific structural characteristics based on year 2000 data. The country models are linked together using bilateral trade data from the trade-matrix of 2004. The main parameters are summarised in Table C.1 in annex C. A detailed analysis of the calibration and country features of the model can be found in D'Auria *et al.* (2009).

The fiscal transfers under the Structural and Cohesion Policy programmes are modelled as lump-sum transfers between governments. Table 4 below shows the main fields of interventions and the way each of the interventions are captured as shocks to the model. We assume that these shares of the fields of interventions are constant for all the years of the payment horizon 2000-2009. Table A1 in the annex includes a full list of detailed fields of interventions and corresponding mapping to model variables¹⁴.

Investment in public infrastructure is modelled via a temporary increase in government investments ε_t^{IG} . Support to agriculture, industry and services-related programmes are introduced via a temporary or (depending on the nature of the programme) permanent decrease in fixed costs or tangible capital costs of final goods firms (FC_Y , rp^K). R&D promoting spending is modelled similarly, via decreasing the fixed costs faced by the intermediate sectors (FC_A) temporarily or permanently, depending on the nature of the programme. Concerning human capital investments we distinguish three subcategories of payments based on the detailed payment profile. Part of the funds devoted to human resources are spent on educational investments without specific skill-specification, and allocated in the model to all skill groups. A smaller share directly targeted investments in high-skilled human capital and captured in the model as a shock to Λ_t^H . The remainder is accounted for as temporary increase in government transfers to households. On the basis of available data on country-specific education expenditures an estimate can be made of the additional years of

¹⁴ Note that infrastructure-related interventions in the original category Agriculture, Industries and Services have been reclassified and been added to the category Infrastructure in our exercise.

schooling (increment to Λ_t^s) that can be financed by the fiscal transfers¹⁵. In order to account for the additional time spent on training, we assume that the last cohort of student population stays longer in the education system and enter into the active labour force later. Finally technical assistance is introduced as a temporary increase in government consumption.

The spending on cohesion policy is financed from the EU budget, to which all member states contribute. In this modelling exercise it is assumed that all countries that were a member of the European Union in 2000 contribute equally to the EU budget and these contributions are assumed to be proportional to GDP¹⁶. The contributions required to finance Cohesion expenditure amount to roughly 0.2 % of each country's GDP and are assumed to be financed by increases in labour taxes.

Table 4. Matching fields of interventions and model variables

Field	Variable to implement the shock
Infrastructure	Temporary increase in I^G , government investment (via ε_t^{IG})
Agriculture, Industry&Services	Temporary increase in other government expenditures (G_t) Reducing fixed costs of tangible capital costs faced by final goods firms (FC_Y and rp^K , permanent or temporary reductions)
RTD	Reducing the fixed costs or risk-premia faced by the users of R&D products, (FC_A and rp^A , permanent or temporary reductions)
Human resources	Raising human capital and government transfers expenditures - investment in high-skilled human capital (h_t^H via Λ_t^H) - educational investments in all skills (h_t^s via Λ_t^s)
Technical assistance	Temporary increase in government consumption (G_t)

¹⁵ See the Appendix for a detailed description of the calibration of human capital accumulation. We take 2001 as reference year for education spending from EUROSTAT.

¹⁶ Although net contributions differ widely across member states, a detailed modelling of contributions to the EU budget falls outside the scope of this paper.

5. Macroeconomic impact of cohesion spending

5.1. Overall results of spending

We first simulate EU Cohesion policy by adding for all countries all categories of cohesion spending to the model simultaneously. The model simulations show a gradual build-up of output gains in the beneficiary countries over time. In the short run the effects are mainly driven by the direct increase in spending and the private sector response to this additional spending. The productivity enhancing effects from cohesion expenditure only become gradually significant over the following years. In the long run, after spending is discontinued, the supply effects remain and can even become stronger reflecting the fact that a large share of the spending supports endogenous growth.

Table 5 shows the GDP effects for each of the 27 EU Member States. Note that this simulation incorporates international spillover effects from spending in other countries. Output in receiving countries increases gradually, while there are declines in output in donor countries, as taxes are raised to finance the increase in EU spending. Figure 5.1 shows the impact of cohesion spending on GDP and the funds received as a share of GDP¹⁷ in each of the recipient countries. The charts clearly show how the gains from cohesion spending build up over the years and continue even after the cohesion programme is finished. Tables D.1 to D.16 in annex D show detailed results for the main economic variables in the model and these are further discussed in section 5.3.

In general terms the results for the other main economic variables can be summarised as follows. In the receiving countries, consumption spending increases, in particular for Ricardian consumers who anticipate higher permanent income and who with access to financial markets can already raise their consumption early on. Liquidity-constrained consumption is driven by employment and wage developments and is also generally higher. Wages grow in the long run in line with productivity and as productivity gains become stronger over time, incomes rise. Higher contributions to the EU budget lead to an increase in government indebtedness and this in turn leads to a gradual increase in labour taxes, which has a negative impact on employment growth. However, higher growth in net-recipient countries boosts tax revenues. For the largest net recipients this effect outweighs the former and the fall in government debt creates room to lower labour taxes, giving rise to positive employment effects. Corporate investment is generally crowded out by the increase in cohesion spending in the short run. In the medium run productivity enhancing effects come to dominate and investment spending increases. There is generally upward pressure on inflation as the demand effects dominate in the short run, but in the medium term, as potential output increases, inflationary pressures subside. Imports are boosted by the increase in demand while the increase in spending leads to a sizeable real appreciation in the largest recipient countries and the loss in competitiveness reduces exports growth. As a result of this, trade balances deteriorate and current account deficits become larger.

¹⁷ Note that for the old member states this is the net cohesion fund receipts, i.e. received cohesion funds minus contribution to the EU budget.

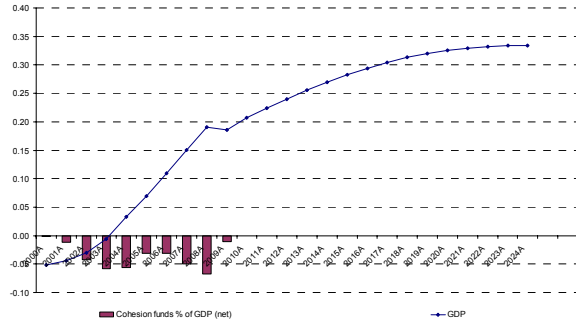
Table 5: GDP effects for each of EU Member States

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
GDP effects																					
Austria	-0.10	-0.13	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.14	-0.15	-0.14	-0.14	-0.13	-0.12	-0.11	-0.09	-0.08	-0.07	-0.06	-0.05	-0.05
Belgium	-0.12	-0.16	-0.17	-0.18	-0.18	-0.18	-0.17	-0.16	-0.15	-0.15	-0.14	-0.13	-0.12	-0.11	-0.09	-0.08	-0.07	-0.05	-0.04	-0.03	-0.02
Denmark	-0.01	-0.05	-0.07	-0.09	-0.11	-0.12	-0.13	-0.13	-0.13	-0.13	-0.12	-0.11	-0.11	-0.10	-0.09	-0.08	-0.08	-0.07	-0.06	-0.06	-0.05
Finland	-0.14	-0.17	-0.16	-0.15	-0.14	-0.14	-0.14	-0.14	-0.13	-0.14	-0.14	-0.14	-0.14	-0.13	-0.12	-0.11	-0.10	-0.09	-0.08	-0.07	-0.06
France	-0.19	-0.30	-0.35	-0.40	-0.45	-0.50	-0.55	-0.59	-0.62	-0.65	-0.67	-0.69	-0.69	-0.69	-0.68	-0.67	-0.66	-0.64	-0.61	-0.59	-0.56
Germany	-0.05	-0.04	-0.03	-0.01	0.03	0.07	0.11	0.15	0.19	0.19	0.21	0.22	0.24	0.26	0.27	0.28	0.29	0.30	0.31	0.32	0.33
Greece	0.19	0.87	0.66	0.69	1.10	1.20	1.60	2.06	2.55	2.07	2.34	2.50	2.60	2.67	2.73	2.77	2.81	2.84	2.86	2.88	2.89
Ireland	-0.10	-0.03	0.01	0.08	0.15	0.23	0.31	0.37	0.45	0.48	0.50	0.52	0.53	0.54	0.56	0.57	0.58	0.58	0.59	0.60	0.60
Italy	0.01	-0.08	-0.04	0.03	0.07	0.13	0.19	0.24	0.29	0.29	0.29	0.29	0.28	0.27	0.26	0.25	0.24	0.24	0.23	0.23	0.22
The Netherlands	-0.10	-0.11	-0.10	-0.09	-0.08	-0.08	-0.08	-0.08	-0.07	-0.07	-0.07	-0.07	-0.06	-0.06	-0.05	-0.05	-0.04	-0.03	-0.03	-0.02	-0.02
Portugal	0.56	0.64	0.96	1.13	1.41	1.62	1.89	2.20	2.75	2.53	2.74	2.90	3.00	3.08	3.13	3.16	3.18	3.20	3.20	3.20	3.20
Spain	0.16	0.47	0.66	0.76	0.91	1.06	1.16	1.33	1.51	1.48	1.58	1.66	1.73	1.79	1.84	1.88	1.92	1.95	1.97	1.99	2.01
Sweden	-0.04	-0.12	-0.16	-0.20	-0.23	-0.26	-0.27	-0.28	-0.28	-0.28	-0.27	-0.26	-0.24	-0.23	-0.22	-0.20	-0.19	-0.17	-0.16	-0.14	-0.13
UK	0.00	-0.03	-0.05	-0.06	-0.07	-0.08	-0.08	-0.08	-0.08	-0.08	-0.07	-0.06	-0.06	-0.05	-0.05	-0.04	-0.04	-0.03	-0.03	-0.03	-0.02
Bulgaria	-0.07	-0.06	-0.04	-0.02	0.01	0.03	0.05	0.07	0.08	0.05	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.05
Cyprus	-0.03	-0.03	-0.04	-0.05	-0.03	-0.01	0.02	0.09	0.14	0.07	0.08	0.09	0.09	0.10	0.10	0.10	0.11	0.11	0.11	0.11	0.11
Czech Republic	0.00	0.00	0.00	0.00	0.06	0.07	0.23	0.29	0.40	0.35	0.39	0.41	0.41	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.41
Estonia	-0.07	-0.03	0.00	0.05	0.23	0.39	0.63	0.74	0.89	0.69	0.77	0.81	0.82	0.81	0.80	0.79	0.77	0.76	0.74	0.72	0.70
Hungary	0.01	0.03	0.04	0.05	0.13	0.26	0.49	0.67	0.70	0.70	0.75	0.79	0.82	0.84	0.86	0.88	0.89	0.90	0.90	0.90	0.90
Latvia	0.03	0.12	0.20	0.33	0.67	1.23	1.64	2.33	2.59	2.51	2.64	2.69	2.72	2.72	2.72	2.71	2.70	2.68	2.66	2.63	2.60
Lithuania	0.03	0.11	0.21	0.27	0.49	0.80	1.02	1.41	1.78	1.55	1.68	1.77	1.83	1.88	1.92	1.95	1.98	2.00	2.02	2.03	2.04
Malta	-0.05	-0.09	-0.10	-0.09	-0.03	-0.01	0.12	0.31	0.34	0.28	0.31	0.32	0.33	0.33	0.34	0.34	0.35	0.35	0.35	0.35	0.35
Poland	0.00	0.00	0.02	0.01	0.20	0.29	0.63	1.04	1.38	1.41	1.51	1.57	1.61	1.64	1.67	1.69	1.70	1.70	1.70	1.69	1.67
Romania	0.00	-0.01	-0.01	-0.01	0.00	0.00	0.01	0.01	0.02	0.00	0.01	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03
Slovakia	-0.02	-0.07	-0.05	-0.04	0.11	0.24	0.40	0.55	0.71	0.49	0.57	0.60	0.61	0.62	0.63	0.64	0.65	0.66	0.67	0.67	0.68
Slovenia	0.00	-0.01	-0.01	-0.02	0.01	0.05	0.16	0.20	0.27	0.19	0.22	0.23	0.24	0.24	0.24	0.24	0.24	0.23	0.23	0.23	0.23

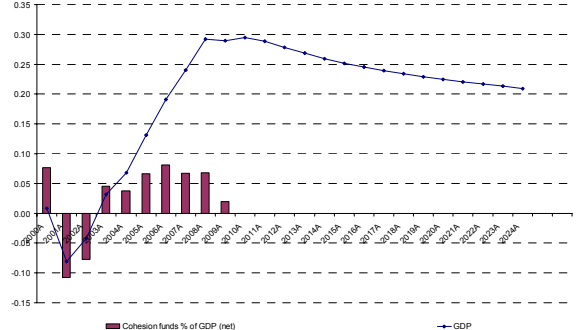
Note: percentage difference from baseline

Figure 5.1 Net Cohesion receipts (as % of GDP) and GDP impact (% difference from baseline)

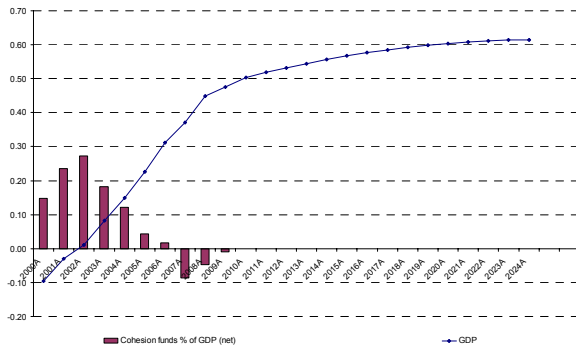
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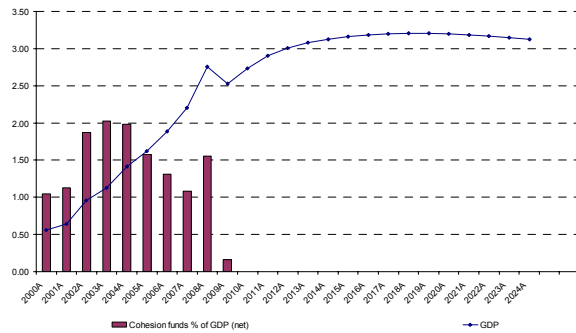
Italy:



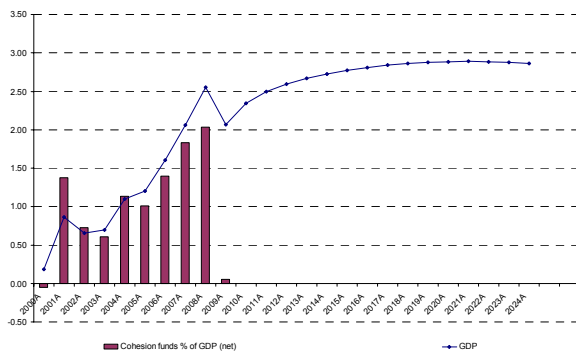
Ireland:



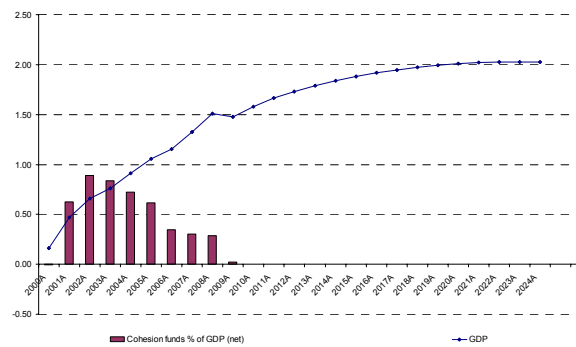
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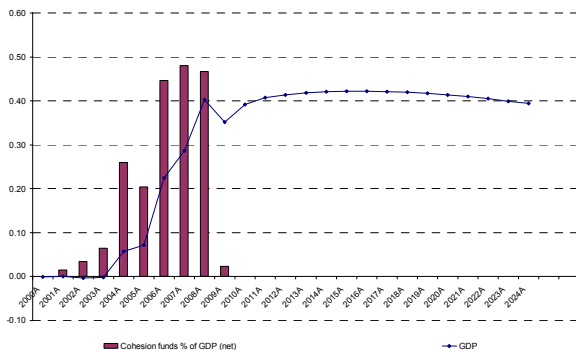
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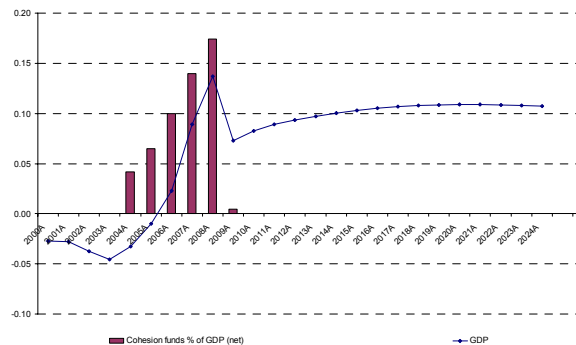
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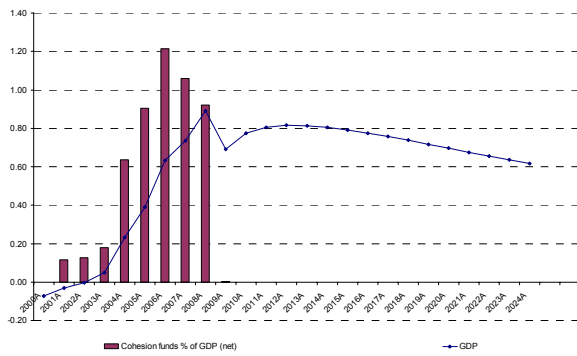
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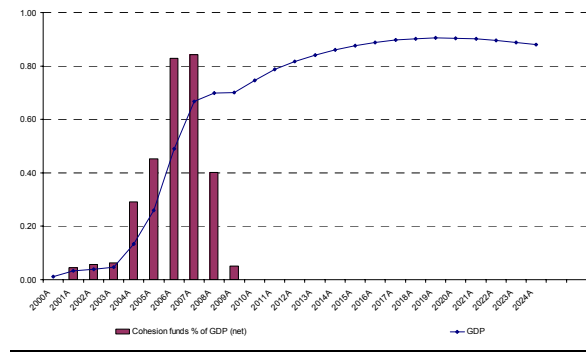
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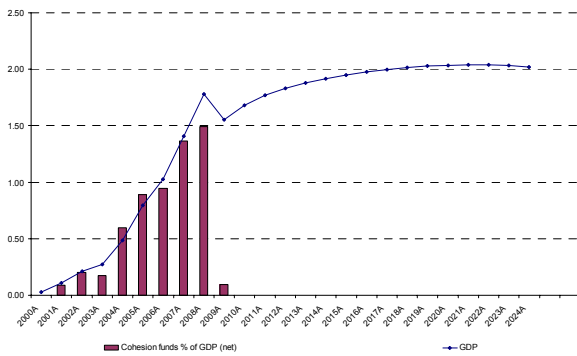
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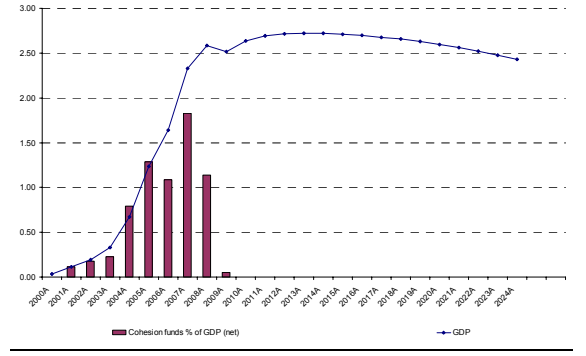
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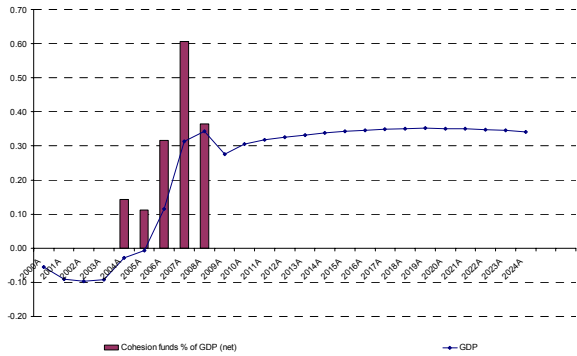
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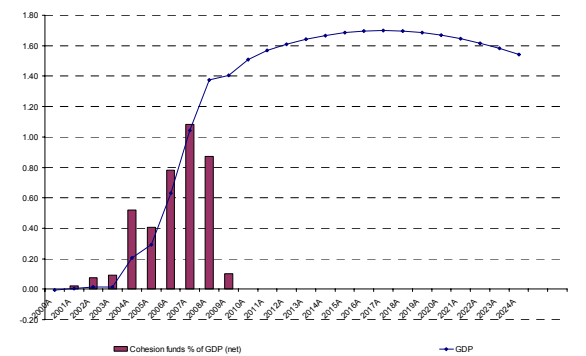
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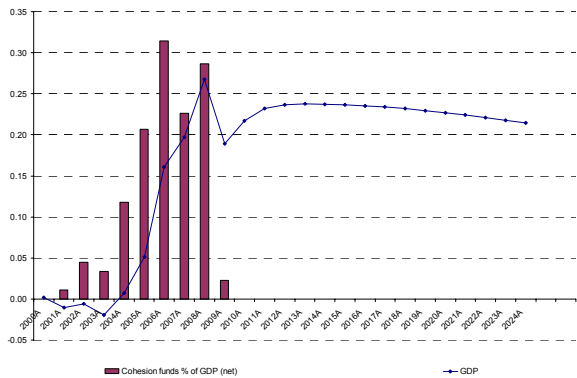
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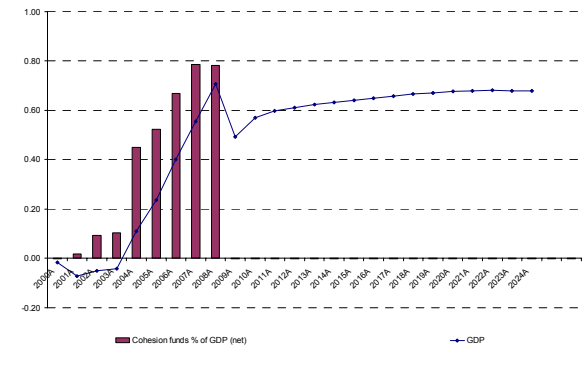
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Slovenia:



Slovakia:



5.2. Breakdown by category of spending

Figure 5.2 shows the impact of cohesion spending on GDP broken down into the different categories of spending. In this figure each band represents the results from a model simulation in which one additional category of spending is added, i.e. the lowest band shows the results when only spending on agriculture, industry & services, and technical assistance is taken into account, the second band adds infrastructure spending to these simulations, the third adds R&D and the fourth investment in human capital. These charts illustrate the net contribution of each field of intervention and the time profile over which the output effects for each of these categories materialise. In general, the impact of infrastructure investment comes through fastest, while R&D and human capital investment effects take longer to materialise. Note that these results include spillover effects from other countries.

The category *Technical assistance, agriculture, industry and services* includes a diverse range of interventions. Examples are support to processing and marketing of agricultural and fisheries products, agricultural waste resources management, co-financing of state aids to industries and services, supporting plant and equipment investment, as well as expenditure on technical assistance related to preparation, implementation, monitoring and evaluation (Annex A shows the complete listing of interventions and the matching to corresponding model variables). Some of these interventions are modelled as reductions in fixed costs (lowering startup costs and increasing entry of new firms) or as lower capital costs for tangible capital (increasing investment and capital accumulation). Another part of this spending is modelled as unproductive government spending, like e.g. technical assistance, monitoring and evaluation costs. The latter only has a growth boosting effect in the short run, i.e. during the years of the programming period when the spending occurs, but the former has a permanent output enhancing effect even after spending has discontinued.

Infrastructure spending is assumed in the model to have a positive productivity effect and accounts for a large share of the total output enhancing effects in the model simulations. This category includes investment in transport, telecommunications, energy and environmental infrastructure, as well as social infrastructure. All this spending is modelled as government investment with the exception of social infrastructure investment which we treat in the first instance as unproductive government consumption (this is a relatively small category and the effects when we model this as productive investment are only slightly larger- see section on sensitivity analysis). In the short run the effects of government investment (productive) and government consumption (unproductive) are similar. Both lead to higher aggregate demand but are partly crowded out by lowering private consumption and private investment and some of the demand impulse leaks abroad through higher imports. However, in the medium term government investment raises productivity (this in contrast to unproductive government consumption) and the output enhancing effects of infrastructure investment become stronger in the following years. As can be seen in the charts, when investment is discontinued, the productivity effect slowly declines due to depreciation of public capital.

Support to R&D includes all spending on research, technological development and innovation (RTDI), including the establishment of networks and partnerships between businesses and/or research institutes (see Annex A). In the model this is captured as reductions in fixed costs and reductions in intangible capital costs for the intermediate sector, the users of the output of the R&D sector. The mechanism through which this R&D spending supports growth in the model is as follows. By reducing costs, the cohesion programme spending makes it easier for

new start-ups to enter the market and so support the introduction of new products. This is because although both existing firms and newcomers face similar problems when marketing new products, start-ups typically have less access to capital markets and have to overcome administrative hurdles (and costs) to set up a new business. By supporting innovation, high skilled workers are reallocated in the model from the production sector to the R&D sector. Initially, this reallocation reduces final goods production and has a negative impact on growth, but over time the positive output effects dominate as productivity increases, and this also stimulates physical investment. It is interesting to note that while it takes time for these effects to become apparent, the output gains are significant and, importantly, continue to increase long after spending is discontinued (reflecting the endogenous growth nature of the modelling approach). From Figure 5.2 it is also clear that there can be cross-country spillover effects. Cyprus, and to a lesser extent Malta, have no (or only a small) allocation for R&D interventions, yet the simulation in which R&D spending is added to cohesion expenditure shows positive output effects, illustrating the international R&D spillovers as modelled in the knowledge production function (eq.20).

Expenditure on *human resources* includes all spending on educational and vocational training as well as more generally defined labour market policies and spending on social inclusion. This is partly modelled as non-productive government spending and direct transfers to households, but the productivity enhancing effects are captured through their effects on skills. Total human capital in the models depends on the efforts individuals spend on accumulating human capital and an increase in the years of schooling (participation in training) for a respective skill group raises the skill efficiency of that group (see appendix). The effects of this on average skill efficiencies take time to build up, taking into account cohort effects, and the gains are only becoming apparent in the medium term, not dissimilar to those of R&D spending, but they are equally significant and highly persistent. The efficiency effects depreciate according to the exit rate of working age population in the long run. However, there may be an underestimation of the depreciation rate if a large part of vocational training targets unemployed or inactive people in older age groups, with a shorter remaining productive working life. Also, the impact of training on skill efficiencies depend on the subsequent employment status and human capital may depreciate faster after training if they remain unemployed/inactive or become unemployed after a short period of employment. For these reasons the simulated effects should be considered an upper bound of the likely outcomes¹⁸.

5.3. Country results

A comparison across countries shows GDP effects roughly proportional to the funds received, when the financing of EU contributions is also taken into account. Hence, the largest recipients, Portugal, Greece and Spain, show the largest increases in GDP (see detailed tables in Annex D).

Portugal received EU Cohesion support for up to 22.5 bn. euros over this period, amounting to between 1 and 2 percent of its GDP each year. In the model simulations this leads to a large

¹⁸ Note that the participation rate is exogenous in the model. Some of the labour market programmes and interventions could raise labour force participation and so increase the employment rate. To capture this effect, one would also have to endogenously model the participation decision.

increase in output. After a decade, GDP is 2.7 per cent higher and output continues to increase in the years after spending is discontinued, reflecting the endogenous growth enhancing effects of R&D and human capital accumulation. The impact of R&D supporting policies on growth is reflected in an increase in 'patents' A in the model. Higher productivity leads to an increase in wages, more so for high-skilled workers that benefit from the increase in R&D spending. Consumption increases and is almost 5 percent higher after 10 years. Inflation is up in the first years as the increase in demand exceeds the increase in supply, but when potential output gradually rises the inflationary pressures subside. Higher real interest rates in the medium run lead to higher capital costs and this depresses corporate investment spending, but in the long run investment increases. There is a real appreciation of the exchange rate and this leads to a decline in exports, while the increase in demand boosts imports. The trade balance deteriorates by 1.8 per cent of GDP at its peak before slightly recovering in later years.

The results for *Greece* are similar to those for Portugal. Greece received a similar share of its GDP from EU Cohesion support but this was slightly more backloaded to later years in the programme. It therefore takes longer for the output effects to become apparent. But after a decade GDP is more than 2.3 per cent higher in the model simulations and the effects become stronger in later years. Like for Portugal, the increase in R&D spending is reflected in an increase in 'patents', but with a smaller share devoted to R&D promotion, the increase in patents is lower than that in Portugal. Wages increase as productivity rises and consumption is higher for both non-constrained and liquidity-constrained households. Corporate investment initially falls due to higher real interest rates which raises capital costs, but in later years investment rises again supported by higher demand. There is an increase in inflation in the first years of the simulation. The real appreciation reduces export growth and imports are higher due to the increase in domestic demand. The trade balance deteriorates by up to 1.3 per cent of GDP.

Spain received up to 54 bn. euros from EU Cohesion support, amounting to up to 1 per cent of its GDP each year of the decade. The model simulations show significant positive output effects, with GDP 1.6 per cent higher after 10 years and continuing to increase in the years after. Consumption is higher for both constrained and unconstrained households, and while private investment is initially lower, investment increases in later years. Initially the additional spending leads to higher inflationary pressures while real wages increases due to higher productivity. The wage increase for high-skilled workers is strongest as there is an increase in R&D spending. The real appreciation of the exchange rate depresses exports, while higher demand boosts imports and this worsens the trade balance by up to 0.8 per cent of GDP.

Ireland received up to 0.4 per cent of GDP from Cohesion policy support, largely front loaded to the first half of the decade and became a net contributor in the last years of the programme. The model simulations show an increase in aggregate consumption as the positive effect on non-constrained consumption, due to higher permanent income, outweighs the negative effect on liquidity-constrained consumption (due to higher taxes and lower employment). Initially corporate investment is depressed by higher capital costs but in later years private investment increases. Imports increase and exports decline and the current account worsens. After a decade of support, GDP is 0.5 per cent higher.

It is interesting to notice that even in *Germany*, which is a net contributor to cohesion (EU budget) spending, the GDP effect is positive. Although labour taxes increase, and hence employment falls, the productivity enhancing effects of the cohesion spending come to

dominate after three to four years. Consumption of non-constrained consumers rises as households anticipate the increase in permanent income, but consumption of liquidity constrained households falls as employment declines and taxes are raised. Real wage growth is higher as productivity rises. There is a small increase in inflation and a real appreciation reduces exports growth and boost imports, leading to a deterioration of the trade balance. After a decade, GDP is around 0.2 per cent higher.

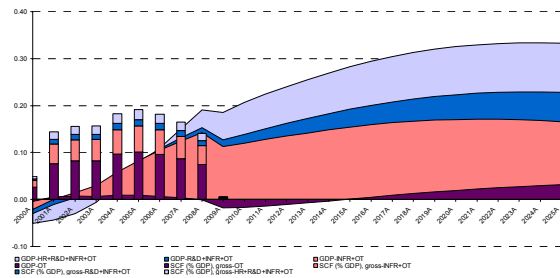
In *Italy*, the time profile of spending is such that it becomes a net contributor in 2001 and 2002, reducing the output effects from cohesion receipts, but these become positive again in later years. Consumption and corporate investment also increases in the medium term. There is an increase in real wage growth and inflation is higher. GDP is 0.3 per cent higher after a decade, slightly more than in Germany, as net receipts in Italy exceed those of Germany. Consumption is 0.4 percent higher after a decade.

The *New Member States* only joined the EU in 2004 and became eligible for cohesion support from then onwards, but several countries already received pre-accession aid from 2001. For all these countries the model simulations show significant output gains. Consumption is higher, in particular that of Ricardian non-constrained households as permanent income increases. As demand exceeds supply in the short run, inflation rises and the increase in demand leads in most of the New Member States to a real appreciation of the exchange rate, which worsens current account deficits. For those countries that did not receive pre-accession aid (notably Malta and Cyprus) the model shows small negative GDP effects in the years prior to accession, due to negative trade effects, but the output effects become positive in later years. Note also that the results for Cyprus and Malta show positive international spill-over effects from R&D spending, despite no (or low) allocations of their own funds to R&D investment. Of all the New Member States, Latvia, Lithuania and Poland show the largest output gains.

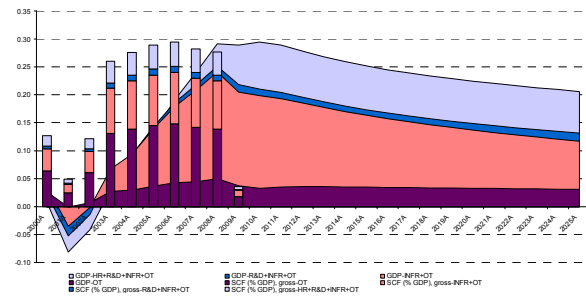
Table 5 also shows the GDP effects on *donor countries*. Output falls in these net contributors due to the distortionary effects from higher taxes that are required to pay for EU cohesion policy. While this is partly offset by higher export growth for those countries that have close trading links to the recipient countries, the overall effect on output is in most cases negative, and this is largest for France.

Figure 5.2 Cohesion receipts (% of GDP) and GDP impact by category

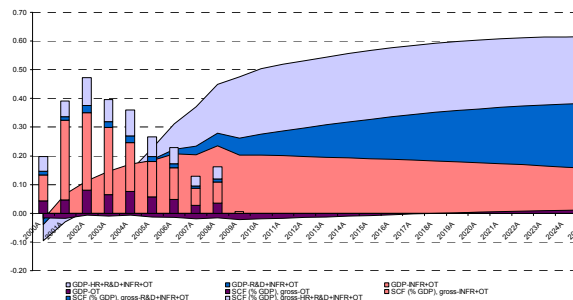
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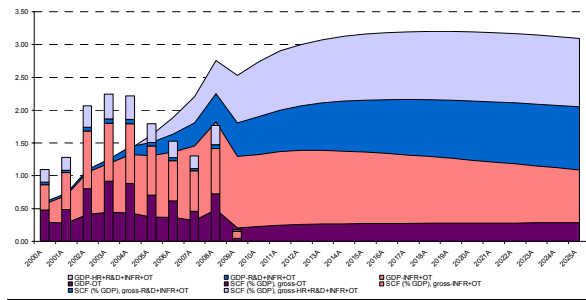
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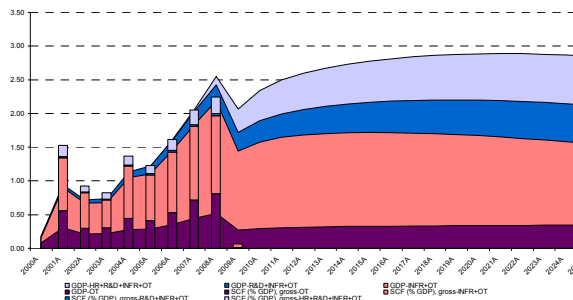
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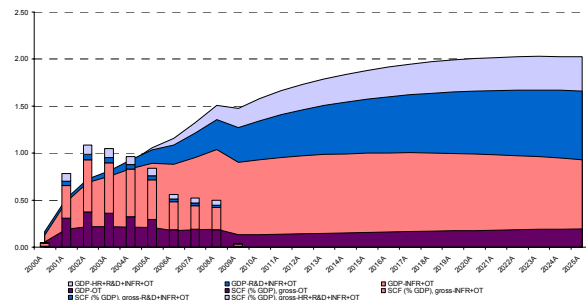
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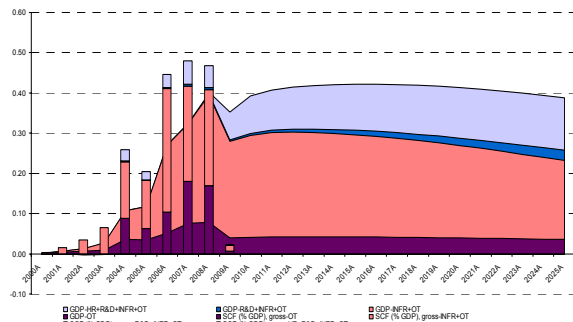
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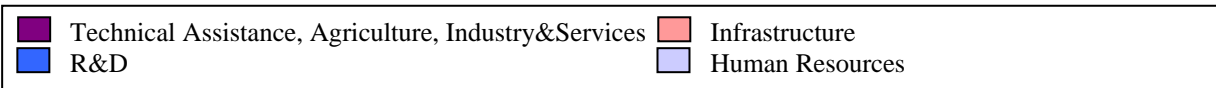
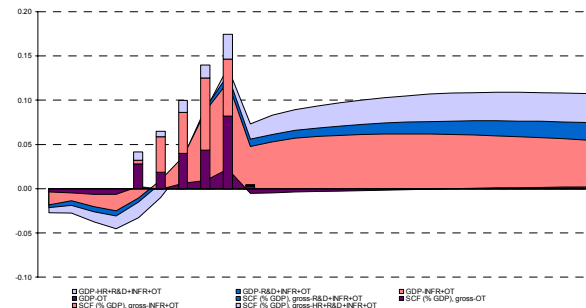
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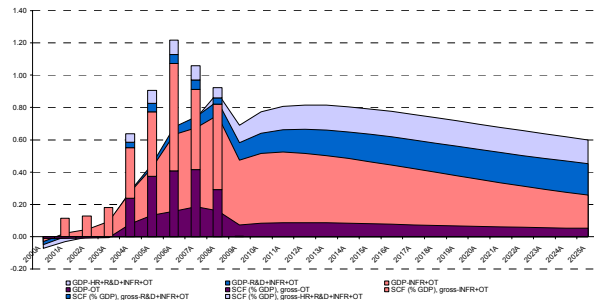
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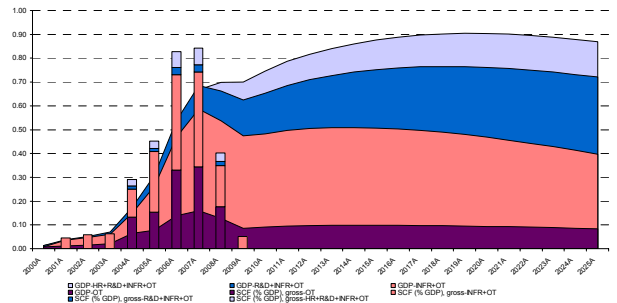
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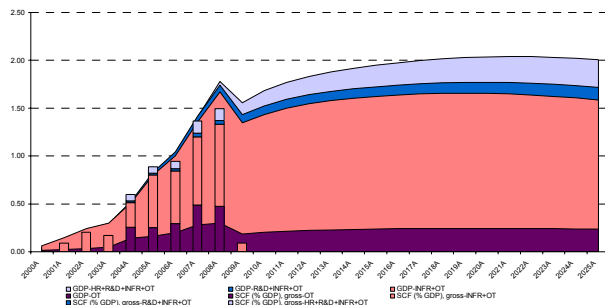
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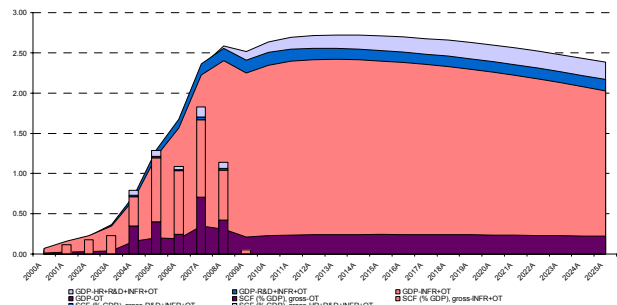
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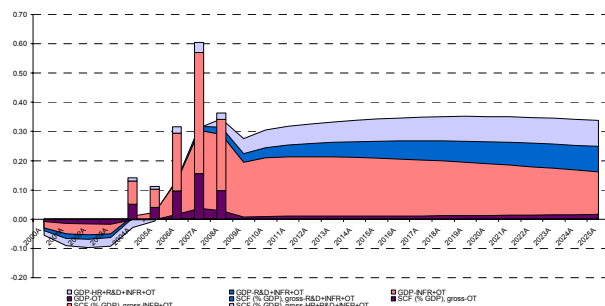
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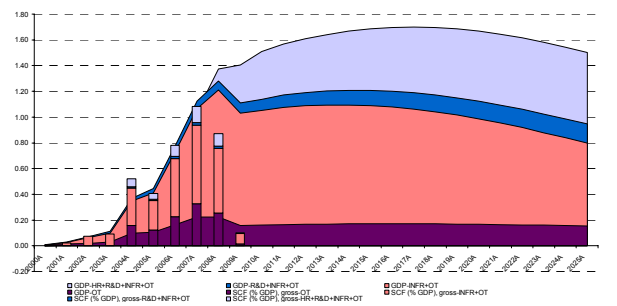
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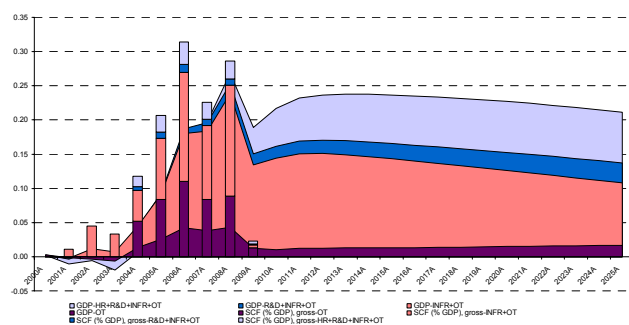
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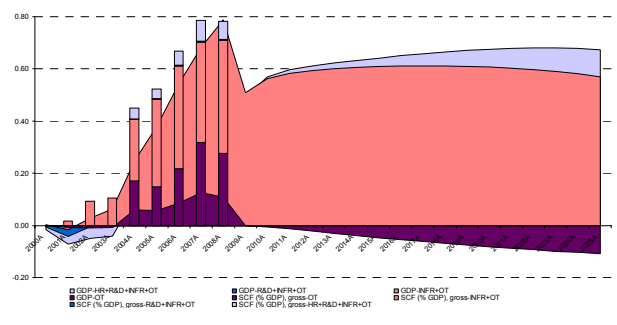
Poland:



Slovenia:



Slovakia:



5.4. Cumulative growth impacts

In order to examine the relative efficiency of cohesion spending across all categories and countries, it can be instructive to look at the cumulative output gains and compare these to the cumulative amounts of support received. Table 6 below shows the cumulative GDP effect from cohesion spending both in 2009, the (de facto) end of the programme period, as well as in 2020, to illustrate the long run effects of cohesion expenditure.

Cumulative GDP gains are largest in Portugal, followed by Greece, Latvia and Spain. Output gains are generally smaller in the New Member States, which only started receiving significant cohesion support from 2004 onwards. The cumulative multipliers, calculated as the ratio between the cumulative percentage change in GDP over the cumulative percentage share of (gross) Cohesion Policy spending in GDP, for the recipients in the old Member States ranges between 0.44 (Germany) and 1.49 (Spain) at the end of the programme period. They are lower for member States that are net contributors. They continue to increase in following years as output gains persist while fiscal transfers are terminated (leading to ever increasing cumulative multipliers). By the end of the programming period the average cumulative multiplier across the New Member States is of a similar order of magnitude, although the full supply side effects of the spending have not come through yet. There are also some outliers at the bottom of the range, in particular Cyprus and Malta. These two countries did not receive any pre-accession assistance in earlier years but received most of their funds only in the second half of this decade. In the medium term, there is a convergence of cumulative multipliers across beneficiaries. As shown in table 6, in 2020 the highest 'effectiveness', as measured by the cumulative multiplier, is achieved in Latvia, Poland, Lithuania and Spain.

Table 6: Cumulative output gains and multipliers of Cohesion Policy spending:

	End of programming period 2009			Long term 2020		
	Cumulative GDP (% diff. from baseline) (1)	Cumulative cohesion receipts (% of GDP) (2)	Cumulative Multiplier (1)/(2)	Cumulative GDP (% diff. from baseline) (1)	Cumulative cohesion receipts (% of GDP) (2)	Cumulative Multiplier (1)/(2)
Germany	0.61	1.37	0.44	3.64	1.37	2.65
Italy	1.13	2.01	0.56	3.94	2.01	1.96
Ireland	1.95	2.61	0.75	8.13	2.61	3.12
Portugal	15.69	15.47	1.01	49.68	15.47	3.21
Greece	12.99	11.85	1.10	42.87	11.85	3.62
Spain	9.49	6.38	1.49	29.81	6.38	4.67
Czech Republic	1.39	1.99	0.70	5.96	1.99	2.99
Cyprus	0.14	0.52	0.27	1.24	0.52	2.37
Estonia	3.51	5.16	0.68	12.00	5.16	2.33
Hungary	3.08	3.03	1.02	12.50	3.03	4.12
Lithuania	7.67	5.85	1.31	28.75	5.85	4.91
Latvia	11.65	6.70	1.74	41.10	6.70	6.13
Malta	0.68	1.54	0.44	4.39	1.54	2.85
Poland	4.98	3.96	1.26	23.11	3.96	5.84
Slovenia	0.84	1.26	0.66	3.39	1.26	2.69
Slovakia	2.32	3.42	0.68	9.32	3.42	2.72

6. Sensitivity analysis

The results described in the previous section are based on assumptions, as represented in the modelling approach and the specific values of certain model parameters, and on the mapping of interventions onto specific model variables. They are therefore surrounded by a high degree of uncertainty and it is worth exploring how sensitive results are to some of these assumptions. Concerning sensitivity to model parameters, a major source of uncertainty is in the value of the output elasticity of public capital (infrastructure) α_G . The first subsection deals with this. Another parameter that is surrounded by uncertainty is the share of liquidity constrained consumers and this is discussed in the second section. Finally, the exact mapping of cohesion policy spending onto specific model variables is complicated by the lack of detailed information on some spending items and although we have made an effort to come up with the most appropriate mapping, there are undoubtedly alternative classifications possible. We illustrate one variant in which we classify social infrastructure spending as productive. For each of these assumptions Figure 6.1 shows the impact on the overall GDP effect for each of the recipient country.

6.1. Output elasticity of public capital

There exists much uncertainty about the appropriate value for the output elasticity of public capital (infrastructure) α_G . There is a large literature on infrastructure investment and economic growth, starting with Aschauer's (1989, 1990) estimates for the U.S. that a 1 percent increase in the public capital stock would raise output by 0.39 percent. Many economists have questioned these estimates as implausibly high and this has given rise to a large literature¹⁹. Econometric problems relating to common trends, missing variables, simultaneity bias and reverse causation hamper a proper identification of this elasticity from macro-economic timeseries. Studies using pooled time series, cross-section data across states, have generally yielded lower estimates with an implied rate of return on public investment equal to the rate of return on private capital or lower (e.g. Bougheas et al. (2000)). Estimated effects of other infrastructure investment like telecommunications are often smaller. The extremely wide range of estimates found in the literature means these production function based studies are of little use from a policy perspective (Romp and de Haan, p.43)²⁰.

Gramlich (1994) argues there is a "logical" problem with the high implied econometric rates of return and makes a case for an identical rate of return on private and public capital²¹. This is the assumption adopted in the model and the output elasticity of public capital is set such that the marginal product of public capital is identical to that of private capital ($\alpha_G = 0.10$)²².

To see the impact of a higher elasticity on the overall results, we raise the elasticity by 50 per cent to 0.15. As infrastructure spending amounts for a large share of overall spending (between 30-40 per cent) this has a significant impact on the results. As can be seen in Figure 6.1, in the case of Portugal it raises the long term GDP effect from 3.1 per cent to 3.7 per cent.

¹⁹ For an overview see the surveys by Gramlich (1994), Sturm (1998) and Romp and de Haan (2005)

²⁰ Implementing the upper range of estimates of output elasticities in micro-founded macro-economic models would imply such high rates of return on public capital that the implied level for the optimal stock of public capital would be implausibly high.

²¹ Gramlich (1994), p. 1187.

²² Note that this does not exclude the possibility that the marginal product of capital (private and public) is higher in poorer countries.

6.2. Share of liquidity constrained households

The model distinguishes two types of households. The first group of households, Ricardians or non-constrained, base their consumption decisions on intertemporal optimisation and smooth their consumption over time. They are assumed to have access to capital markets and can borrow against future income. A second group of households is liquidity-constrained and cannot borrow, but can only consume their disposable income each period. It is assumed in this version of the model that this group corresponds to the group of low-skilled workers, while medium and high-skilled workers are non-constrained. The share of liquidity-constrained households is generally an important parameter as it determines the degree of so-called non-Ricardian behaviour in the model for non-productive government spending shocks. The lower the share of liquidity-constrained households, the higher the degree of crowding out of government spending shocks due to an offsetting response of Ricardian households who raise their precautionary savings in anticipation of higher future tax liabilities.

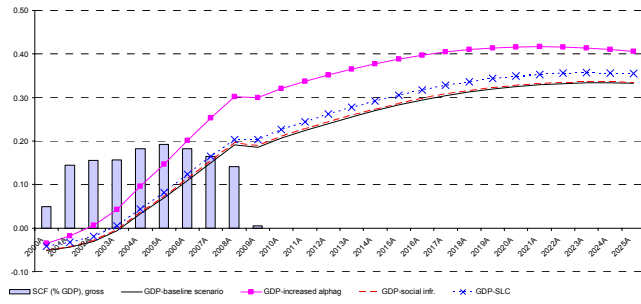
The share of liquidity constrained households in the euro area is typically estimated to lie in the range between 0.2 and 0.4 (e.g. Ratto *et al.*, 2009, Coenen *et al.*, 2008). The assumption in the model version used here, that this share is equal to the share of low skilled workers, implies substantial differences across countries. Labour force data on skill groups shows a large dispersion in the share of low skilled workers across countries and our model assumption implies a similar dispersion in the share of liquidity constrained households. As a sensitivity analysis we set the share of liquidity constrained households in all countries equal to 0.5. As is clear from Figure 6.1, the impact of this assumption on simulation results is not particularly large. The reasons for this small impact are twofold. First, cohesion spending is financed by fiscal transfers from the EU budget. This spending does not give rise to proportionally higher tax liabilities in the future but is a pure fiscal transfer from contributor countries to recipient countries. Second, consumption by Ricardian households is also positively affected as most spending is productive and leads to a rise in permanent incomes.

6.3. Social infrastructure spending

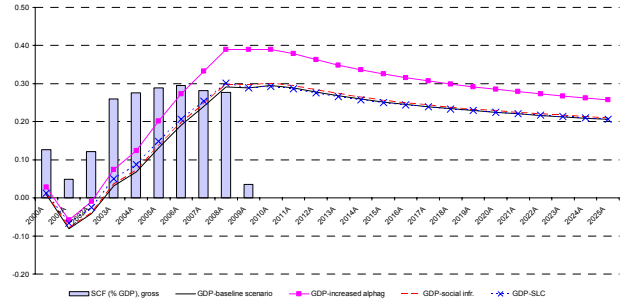
As an example of how the mapping of cohesion policy spending onto specific model variables can affect the simulation results, we also show the sensitivity with respect to whether social infrastructure is classified as productive or unproductive spending. One could argue that some of this expenditure on social infrastructure and public health boosts the long run productive potential of the economy and that the results reported in the previous section, assuming this spending was 'wasteful' like other government consumption, was underestimating the benefits of this category of spending. Figure 6.1 shows the impact on GDP if one assumed this spending to be as productive as infrastructure investment. Considering the relatively small share of social infrastructure in total spending, the effects of this assumption are relatively minor, with the possible exceptions of Estonia, Lithuania, Hungary and Portugal, where this category amounts to close to 10 percent of total spending or more.

Figure 6.1 Sensitivity of GDP effects to specific assumptions

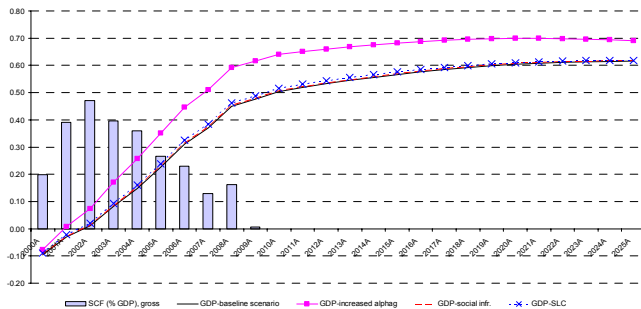
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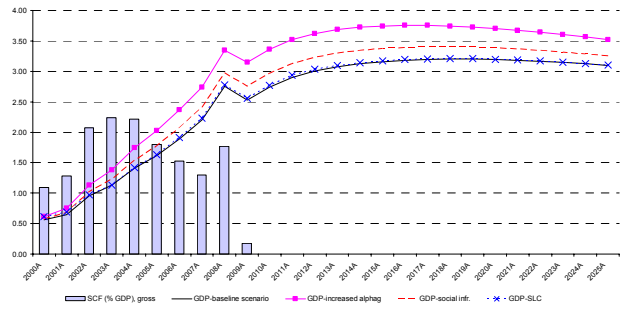
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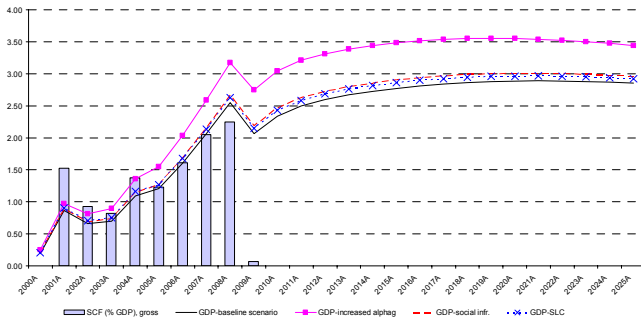
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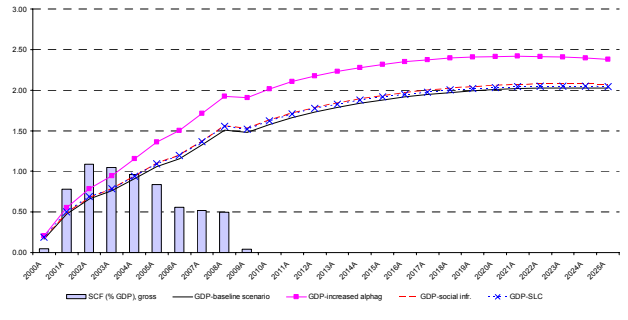
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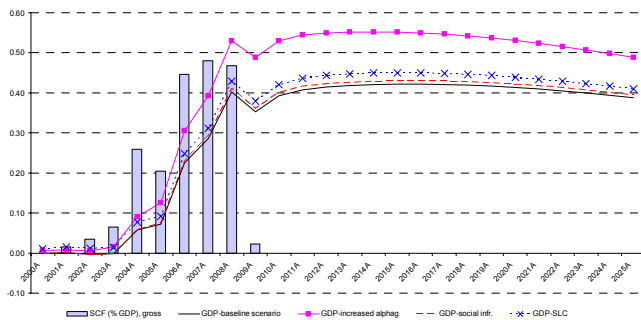
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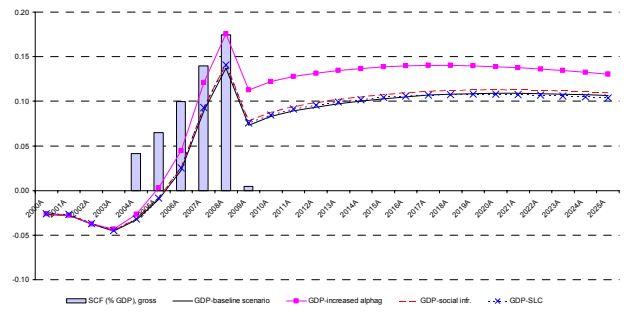
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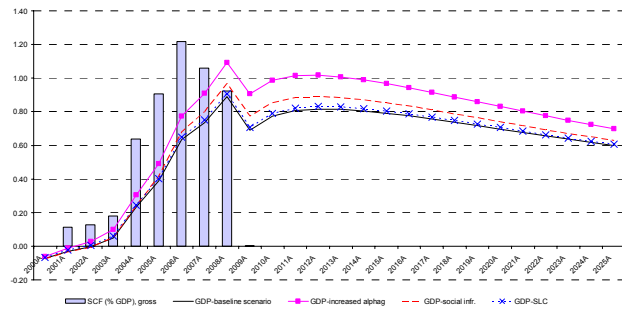
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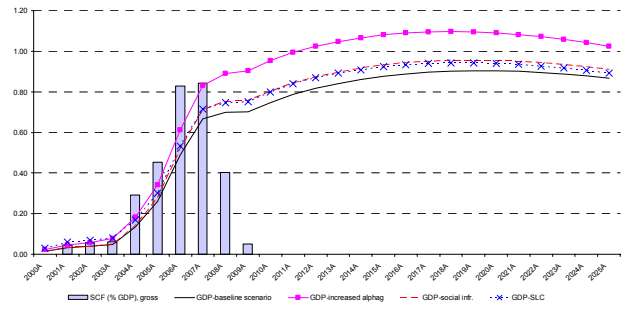
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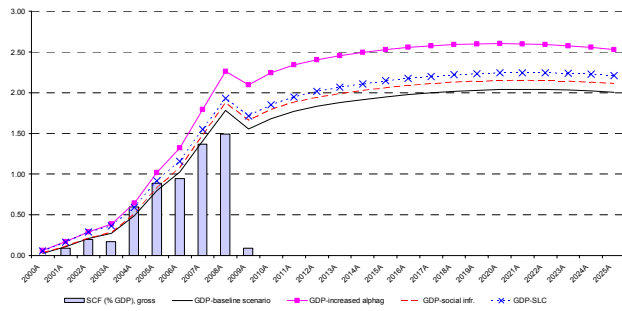
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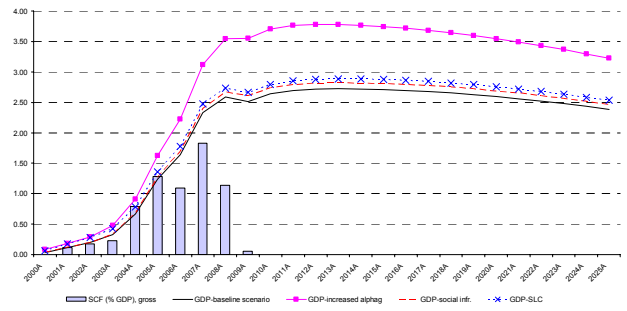
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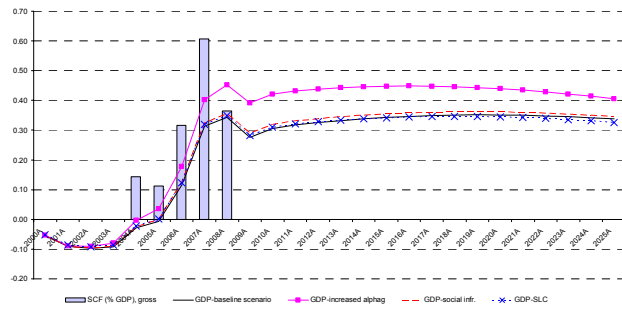
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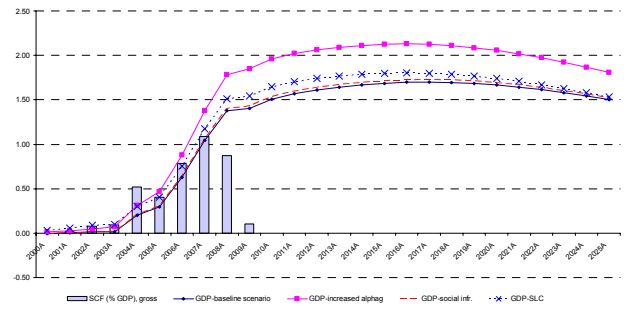
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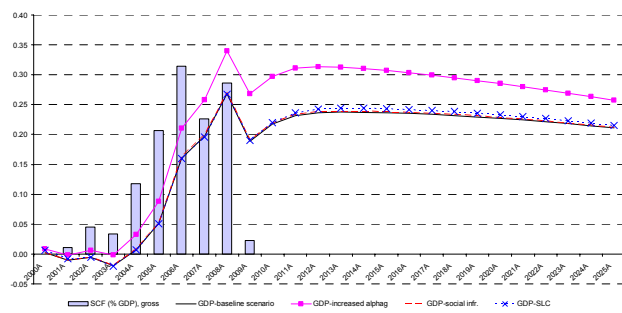
Malta:



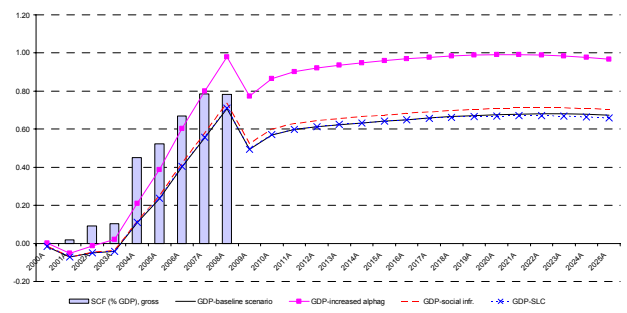
Poland:



Slovenia:



Slovakia:



7. Conclusions

This paper has used a modern dynamic general equilibrium model with endogenous growth and human capital accumulation to analyse the effects of the EU Cohesion Policy programme over the period 2000-6. The analysis has shown there are potentially significant long run benefits from EU Cohesion Policy spending in the less developed regions of the EU. These positive benefits become stronger in the medium and long run and are able to deliver a significant improvement in incomes and output in the regions supported.

However, these interventions are likely to bear fruit only in the medium term and significant effects from these policies should only be expected some years after implementation. In the short run, the additional spending could lead to crowding out of productive private investment due to intertemporal consumption-investment decisions and the transfers could give rise to real appreciations which lower export growth. Also, R&D promoting policies could drive up wages of researchers and crowd out high skilled employment in other sectors. In addition, there is little benefit one can expect in the short run from training and other human capital investments. But in the medium term the productivity enhancing effects of infrastructure investment, R&D promoting policies, and human capital investments become gradually stronger and even when the programme is terminated and spending discontinued there are permanent positive output gains.

It is important to point out that the success or failure of EU Cohesion Policy programmes should not exclusively be judged on the basis of its effect on gross domestic product. The objective of Cohesion policy is to foster social and economic cohesion and to achieve real convergence in the Union. GDP is the yardstick most commonly used, and GDP per capita is the measure on which eligibility for Cohesion support is determined, and this is therefore the logical first measure to use in an assessment. But one should be aware that even as an indicator of market activity, gross domestic product is not a measure without flaws. Alternative measures like gross national product, which includes net capital paid to and from abroad, or net national income, which includes profits exported and imported, may be preferred. But more generally, other measures of wellbeing should also be taken into account in a wider assessment of EU Cohesion Policy.

It should also be stressed that these results are based on a macroeconomic analysis and depend crucially on the underlying assumption that the money is spent efficiently. Hence, this aggregate macroeconomic modelling approach gives an estimate of the *potential* effect of Cohesion spending and the long run output gains reflect the assumed productive impact of investment in infrastructure, human capital and R&D in the model. This modelling approach should be complemented with an analysis based on micro data from individual projects as only such a project-based analysis could shed light on the question whether the positive impacts shown here are achievable.

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Annex A: Fields of interventions

FOI Code	Field of Intervention	Category	Model Instrument
1	Productive Environment	Agriculture&Industries&Services	Fixed costs reduction
11	Agriculture	Agriculture&Industries&Services	Fixed costs reduction
111	Investments in agricultural holdings	Agriculture&Industries&Services	Government consumption
112	Setting up young farmers	Agriculture&Industries&Services	Fixed costs reduction
113	Agriculture-specific vocational training	HR, low-skilled	Training, low-skilled
114	Improving processing and marketing of agricultural products	Agriculture&Industries&Services	Fixed costs reduction
1182	Meeting standards: use of farm advisory services	Agriculture&Industries&Services	Government consumption
12	Forestry	Agriculture&Industries&Services	Government consumption
121	Investments in forest holdings	Agriculture&Industries&Services	Government consumption
122	Improving harvesting, processing and marketing of forestry products	Agriculture&Industries&Services	Fixed costs reduction
123	Promoting new outlets for the use and marketing of forestry products	Agriculture&Industries&Services	Government consumption
124	Establishment of associations of forest holders	Agriculture&Industries&Services	Government consumption
125	Restoring forestry production potential damaged by natural disasters and fire and introducing appropriate prevention instruments	Agriculture&Industries&Services	Government consumption
126	Planting of non-farm land	Agriculture&Industries&Services	Government consumption
127	Improving and maintaining the ecological stability of protected woodlands	Agriculture&Industries&Services	Fixed costs reduction
128	Forestry-specific vocational training	HR, low-skilled	Training, low-skilled
13	Promoting the adaptation and the development of rural areas	Agriculture&Industries&Services	Government consumption
1301	Land improvement	Agriculture&Industries&Services	Fixed costs reduction
1302	Reparcelling	Agriculture&Industries&Services	Fixed costs reduction
1303	Setting up of farm relief and farm management services	Agriculture&Industries&Services	Fixed costs reduction
1304	Marketing of quality agricultural products	Agriculture&Industries&Services	Government consumption
1305	Basic services for the rural economy and population	Agriculture&Industries&Services	Government consumption
1306	Renovation and development of villages and protection and conservation of the rural heritage	Agriculture&Industries&Services	Government investment, (INFR)
1307	Diversification of agricultural activities and activities close to agriculture, to provide multiple activities or alternative incomes	Agriculture&Industries&Services	Government consumption

1308	Agricultural water resources management	Agriculture&Industries&Services	Government investment, (INFR)
1309	Development and improvement of infrastructure connected with the development of agriculture	Agriculture&Industries&Services	Government investment, (INFR)
1310	Encouragement for tourist activities	Agriculture&Industries&Services	Government consumption
1311	Encouragement for craft activities	Agriculture&Industries&Services	Government consumption
1312	Preservation of the environment in connection with land, forestry and landscape conservation as well as with the improvement of animal welfare	Agriculture&Industries&Services	Government consumption
1313	Restoring agricultural production potential damaged by natural disasters and introducing appropriate prevention instruments	Agriculture&Industries&Services	Fixed costs reduction
1314	Financial engineering	Agriculture&Industries&Services	Government consumption
1315	Leader + LAG overhead and animation costs	Agriculture&Industries&Services	Government consumption
1316	Leader + Inter-territorial co-operation	Agriculture&Industries&Services	Government consumption
1317	Leader + Transnational co-operation	Agriculture&Industries&Services	Government consumption
1318	Leader + National networks	Agriculture&Industries&Services	Government consumption
1399	LEADER+	Agriculture&Industries&Services	Government consumption
14	Fisheries	Agriculture&Industries&Services	Government consumption
141	Adjustment of the fishing effort	Agriculture&Industries&Services	Government consumption
142	Renewal and modernisation of the fishing fleet	Agriculture&Industries&Services	Fixed costs reduction
143	Processing, marketing and promoting of fisheries products	Agriculture&Industries&Services	Government consumption
144	Aquaculture	Agriculture&Industries&Services	Government consumption
145	Equipment of the fishing ports and protection of the coastal marine zones	Agriculture&Industries&Services	Government consumption
146	Socio-economic measures (including aids to the temporary stopping and compensation for technical restrictions)	Agriculture&Industries&Services	Government consumption
147	Actions by professionals (including vocational training, small coastal fishing)	Agriculture&Industries&Services	Government consumption
148	Measures financed by other Structural Funds (ERDF, ESF)	Agriculture&Industries&Services	Government consumption
15	Assisting large business organisations	Agriculture&Industries&Services	Government consumption
151	Investment in physical capital (plant and equipment, cofinancing of state aids)	Agriculture&Industries&Services	Risk premia (tangible) reduction
152	Environment-friendly technologies, clean and economical energy technologies	Agriculture&Industries&Services	Risk premia (tangible) reduction
153	Business advisory services (including internationalisation, exporting and environmental management, purchase of technology)	Agriculture&Industries&Services	Government consumption

154	Services to stakeholders (health and safety, providing care for dependants)	Agriculture&Industries&Services	Government consumption
155	Financial engineering	Agriculture&Industries&Services	Government consumption
16	Assisting SMEs and the craft sector	Agriculture&Industries&Services	Government consumption
161	Investment in physical capital (plant and equipment, cofinancing of state aids)	Agriculture&Industries&Services	Risk premia (tangible) reduction
162	Environment-friendly technologies, clean and economical energy technologies	Agriculture&Industries&Services	Risk premia (tangible) reduction
163	Business advisory services (information, business planning, consultancy services, marketing, management, design, internationalisation, exporting, environmental management, purchase of technology)	Agriculture&Industries&Services	Government consumption
164	Shared business services (business estates, incubator units, stimulation, promotional services, networking, conferences, trade fairs)	Agriculture&Industries&Services	Government consumption
165	Financial engineering	Agriculture&Industries&Services	Government consumption
166	Services in support of the social economy (providing care for dependents, health and safety, cultural activities)	Agriculture&Industries&Services (Transfers)	Transfers
167	Vocational training	HR, all	Training, all
17	Tourism	Agriculture&Industries&Services	Government consumption
171	Physical investment (information centres, tourist accommodation, catering, facilities)	Agriculture&Industries&Services	Risk premia (tangible) reduction
172	Non-physical investments (development and provision of tourist services, sporting, cultural and leisure activities, heritage)	Agriculture&Industries&Services	Risk premia (tangible) reduction
173	Shared services for the tourism industry (including promotional activities, networking, conferences and trade fairs)	Agriculture&Industries&Services	Government consumption
174	Vocational training	HR, all	Training, all
18	Research, technological development and innovation (RTDI)	RTDI	Risk premia (intangible) reduction
181	Research projects based in universities and research institutes	RTDI	Risk premia (intangible) reduction
182	Innovation and technology transfers, establishment of networks and partnerships between businesses and/or research institutes	RTDI	Fixed costs reduction, intermediate
183	RTDI Infrastructure	RTDI	Risk premia (intangible) reduction
184	Training for researchers	HR, high-skilled	Training, high-skilled
2	Human Resources	HR, all	Training, all
21	Labour market policy	HR, overhead labour	Overhead labour costs reduction
22	Social inclusion	HR (transfers)	Transfers

23	Developing educational and vocational training (persons, firms)	HR, all	Training, all
24	Workforce flexibility, entrepreneurial activity, innovation, information and communication technologies (persons, firms)	HR, all	Training, all
25	Positive labour market actions for woman	HR, overhead labour	Overhead labour costs reduction
3	Basic infrastructure	Infrastructure	Government investment, (INFR)
31	Transport infrastructure	Infrastructure	Government investment, (INFR)
311	Rail	Infrastructure	Government investment, (INFR)
312	Roads	Infrastructure	Government investment, (INFR)
3121	National roads	Infrastructure	Government investment, (INFR)
3122	Regional/local roads	Infrastructure	Government investment, (INFR)
3123	Cycle tracks	Infrastructure	Government investment, (INFR)
313	Motorways	Infrastructure	Government investment, (INFR)
314	Airports	Infrastructure	Government investment, (INFR)
315	Ports	Infrastructure	Government investment, (INFR)
316	Waterways	Infrastructure	Government investment, (INFR)
317	Urban Transport	Infrastructure	Government investment, (INFR)
318	Multimodal Transport	Infrastructure	Government investment, (INFR)
319	Intelligent Transport Systems	Infrastructure	Government investment, (INFR)
32	Telecommunications infrastructure and information society	Infrastructure	Government investment, (INFR)
321	Basic infrastructure	Infrastructure	Government investment, (INFR)
322	Information and Communication Technology (including security and safe transmission measures)	Infrastructure	Government investment, (INFR)
323	Services and applications for the citizen (health, administration, education)	Infrastructure	Government investment, (INFR)
324	Services and applications for SMEs (electronic commerce and transactions, education and training, networking)	Infrastructure	Government investment, (INFR)
33	Energy infrastructures (production, delivery)	Infrastructure	Government investment, (INFR)
331	Electricity, gas, petrol, solid fuel	Infrastructure	Government investment, (INFR)
332	Renewable sources of energy (solar power, wind power, hydro-electricity, biomass)	Infrastructure	Government investment, (INFR)
333	Energy efficiency, cogeneration, energy control	Infrastructure	Government investment, (INFR)
34	Environmental infrastructure (including water)	Infrastructure	Government investment, (INFR)
341	Air	Infrastructure	Government investment, (INFR)
342	Noise	Infrastructure	Government investment, (INFR)
343	Urban and industrial waste (including hospital and dangerous waste)	Infrastructure	Government investment, (INFR)

344	Drinking water (collection, storage, treatment and distribution)	Infrastructure	Government investment, (INFR)
345	Sewerage and purification	Infrastructure	Government investment, (INFR)
35	Planning and rehabilitation	Infrastructure	Government investment, (INFR)
351	Upgrading and Rehabilitation of industrial and military sites	Infrastructure	Government investment, (INFR)
352	Rehabilitation of urban areas	Infrastructure	Government investment, (INFR)
353	Protection, improvement and regeneration of the natural environment	Infrastructure	Government investment, (INFR)
354	Maintenance and restoration of the cultural heritage	Infrastructure	Government investment, (INFR)
36	Social infrastructure and public health	Infrastructure	Government consumption
4	Miscellaneous	TA	Government consumption
41	Technical assistance and innovative actions (ERDF, ESF, EAGGF, FIG)	TA	Government consumption
411	Preparation, implementation, monitoring, publicity	TA	Government consumption
412	Evaluation	TA	Government consumption
413	Studies	TA	Government consumption
414	Innovative actions	TA	Government consumption
415	Information to the public	TA	Government consumption
499	Data not available	TA	Government consumption
Grand Total			

Annex B: Human capital accumulation

Labour force is disaggregated into three skill-groups: low-, medium- and high-skilled labour. The CES-aggregate for labour has the following form:

$$L_{Y,t} = \left(s_L^{\frac{1}{\sigma_L}} (h_t^L L_t^L)^{\frac{\sigma_L-1}{\sigma_L}} + s_M^{\frac{1}{\sigma_L}} (h_t^M L_t^M)^{\frac{\sigma_L-1}{\sigma_L}} + s_{H,Y}^{\frac{1}{\sigma_L}} (h_t^H L_t^{HY})^{\frac{\sigma_L-1}{\sigma_L}} \right)^{\frac{\sigma_L}{\sigma_L-1}},$$

where the subscripts denote the skill-groups (low- L , medium- M and high- H), s_s is the population share of labour-force in subgroup s , L_s denotes the employment rate of population s , h_t^s is the skill-specific efficiency unit of labour, and σ_L is the elasticity of substitution between different labour types. Note that high-skilled labour in the final goods sector is the total high-skill employment minus the high-skilled labour working for the R&D sector ($L_{A,t}$).

The calibration is mostly based on EUROSTAT and OECD data. Data on skill-specific population shares, participation rates and wage-premiums are obtained from the Labour Force Survey and Science and Technology databases of EUROSTAT. The elasticity of substitution between different labour types (σ_L) is one of the major issue addressed in the labour-economics literature. We use the Katz and Murphy (1992) estimate of 1.4. We normalize the efficiency of low-skilled at 1 the other efficiency units are restricted by the labour demand equations which imply the following relationship between wages, labour-types and efficiency units:

$$h_t^M = \left(\frac{w_M}{w_L} \right)^{\frac{\sigma_L-1}{\sigma_L}} \left(\frac{s_M L_M}{s_L L_L} \right)^{\frac{1}{\sigma_L-1}} h_t^L, \quad \text{and} \quad h_t^H = \left(\frac{w_H}{w_M} \right)^{\frac{\sigma_L-1}{\sigma_L}} \left(\frac{s_H L_H}{s_M L_M} \right)^{\frac{1}{\sigma_L-1}} h_t^M.$$

In the next step we adapt Jones (2002) into a disaggregated skill-structure and impose that the functional form of $h_t^s = h_s e^{\psi \Lambda_t^s}$ describes the evolution of skill-specific human capital. In line with Jones (2002), we fix the return to schooling parameter of ψ at 0.07. The number of school years, Λ_t^s for the respective skill-groups are obtained from OECD (2006). For simulation purposes, the participation in trainings can be interpreted as an addition to the years of schooling with a depreciation according to the exit rate of working age population, i.e.:

$$\Lambda_t^s = \Lambda^s + l_t^{s,TR}, \quad \text{where} \quad l_t^{s,TR} = (1 - \chi_s) l_{t-1}^{s,TR} + \varepsilon_t^{s,TR},$$

where for each skill-group s , Λ^s is the average number of years of schooling in the regular education system, $l_t^{s,TR}$ is the year equivalent of the average time spent in training in period t , χ_s is the exit-rate of the working age population, and $\varepsilon_t^{s,TR}$ is the average year-equivalent of training in period t . Finally, in the baseline we set the variables of training $l_t^{s,TR}$ and $\varepsilon_t^{s,TR}$ to zero and given the years of schooling from OECD (2006) we can compute h_s from the definition of efficiency. In order to simulate the educational investments in human capital we increase the years of schooling (Λ_t^s) for the respective skill-groups by the additional years of schooling that can be financed from the fiscal transfers (shock to $\varepsilon_t^{s,TR}$).

Annex C: Model parameters

	DE	ES	HL	IR	IT	PO
R&D sector						
researchers ($L_{\{A\}}$, % employment)	1.173	0.916	0.733	0.948	0.562	0.594
R&D (% GDP)	2.450	0.910	0.567	1.120	1.050	0.760
elast. of R&D wrt. labour (λ)	0.380	0.881	0.891	0.527	0.362	0.849
elast. of R&D wrt. dom. ideas (φ)	0.714	0.337	0.335	0.604	0.727	0.361
elast. of R&D wrt. for. ideas (ϖ)	0.269	0.624	0.632	0.373	0.257	0.602
R&D efficiency (ν)	0.153	2.471	3.639	0.366	0.209	2.629
depr. rate of ideas ($\delta^{\{A\}}$)	0.013	0.013	0.013	0.013	0.013	0.013
growth rate of ideas ($g^{\{A\}}$)	0.011	0.011	0.013	0.011	0.011	0.011
Intermediate sector						
mark up ($1/\theta-1$)	0.100	0.080	0.111	0.090	0.100	0.090
entry costs ($FC_{\{A\}}$)	0.325	0.501	0.730	0.180	0.448	0.488
risk premia on intangibles ($rp^{\{A\}}$)	0.004	0.023	0.021	0.019	0.019	0.024
Final g. sector mark up ($1/\eta-1$)	0.182	0.168	0.213	0.258	0.235	0.163
depr. rate of capital (δ)	0.015	0.022	0.013	0.025	0.016	0.031
Labour market						
low skilled pop. share ($s_{\{L\}}$)	0.187	0.617	0.486	0.427	0.548	0.804
medium skilled pop. share ($s_{\{M\}}$)	0.733	0.296	0.459	0.489	0.421	0.156
high skilled pop. share ($s_{\{H\}}$)	0.080	0.087	0.055	0.084	0.031	0.040
low skilled employment ($L_{\{L\}}$)	0.553	0.515	0.493	0.481	0.441	0.668
medium skilled employment ($L_{\{M\}}$)	0.699	0.549	0.570	0.726	0.635	0.642
high skilled employment ($L_{\{H\}}$)	0.830	0.751	0.806	0.865	0.810	0.898
skill elast. of subs. ($\sigma_{\{L\}}$)	2.000	2.000	2.000	2.000	2.000	2.000
employment rate (L)	0.682	0.546	0.546	0.633	0.534	0.673
wage prem. high vs. medium	0.441	0.373	0.220	0.333	0.373	0.160
wage prem. medium vs. low	0.136	0.176	0.237	0.163	0.266	0.754
low skilled efficiency level ($ef_{\{L\}}$)	0.238	0.307	0.204	0.276	0.301	0.331
medium skilled efficiency level ($ef_{\{M\}}$)	0.307	0.425	0.312	0.373	0.483	1.020
high skilled efficiency level ($ef_{\{H\}}$)	0.638	0.800	0.464	0.662	0.910	1.372
labour adj. costs ($\gamma_{\{L\}}$, % of total)	18.000	18.000	18.000	18.000	18.000	18.000
inv. Elasticity of lab. Supply	-5.000	-5.000	-5.000	-5.000	-5.000	-5.000
Taxes/subsidies						
Benefit repl. Rate	0.400	0.400	0.300	0.400	0.400	0.400
tax credit ($\tau^{\{A\}}$)	0.175	0.462	0.150	0.105	0.300	0.343
tax rate on capital income ($t^{\{K\}}$)	0.387	0.350	0.320	0.125	0.330	0.275
consumption tax ($t^{\{C\}}$)	0.174	0.162	0.158	0.234	0.168	0.205
labour tax ($t^{\{L\}}$)	0.410	0.386	0.457	0.240	0.503	0.377
transfers (tr, % GDP)	18.411	11.974	14.789	7.768	16.407	11.677
wage share	0.593	0.588	0.545	0.491	0.533	0.627
capital/output ratio	11.220	9.687	12.541	7.820	10.052	7.693

Table C.1 (cont'd)

	BG	CY	CZ	EE	HU	LT
R&D sector						
researchers ($L_{\{A\}}$, % employment)	0.393	0.316	0.594	0.813	0.717	0.688
R&D (% GDP)	0.520	0.240	1.210	0.610	0.780	0.590
elast. of R&D wrt. labour (λ)	0.417	0.863	0.328	0.851	0.656	0.845
elast. of R&D wrt. dom. ideas (φ)	0.689	0.356	0.755	0.365	0.511	0.369
elast. of R&D wrt. for. ideas (ϖ)	0.296	0.611	0.232	0.603	0.465	0.599
R&D efficiency (ν)	0.350	6.297	0.154	2.376	0.951	2.647
depr. rate of ideas ($\delta^{\{A\}}$)	0.013	0.013	0.013	0.013	0.013	0.013
growth rate of ideas ($g^{\{A\}}$)	0.013	0.013	0.013	0.013	0.013	0.013
Intermediate sector						
mark up ($1/\theta-1$)	0.070	0.140	0.090	0.090	0.140	0.090
entry costs ($FC_{\{A\}}$)	0.333	0.811	0.423	0.458	1.096	0.320
risk premia on intangibles ($rp^{\{A\}}$)	0.008	0.016	0.025	0.022	0.010	0.020
Final g. sector mark up ($1/\eta-1$)	0.346	0.253	0.187	0.249	0.246	0.300
depr. rate of capital (δ)	0.019	0.021	0.020	0.031	0.026	0.024
Labour market						
low skilled pop. share ($s_{\{L\}}$)	0.329	0.385	0.139	0.153	0.307	0.158
medium skilled pop. share ($s_{\{M\}}$)	0.609	0.543	0.816	0.736	0.648	0.754
high skilled pop. share ($s_{\{H\}}$)	0.061	0.071	0.045	0.111	0.044	0.088
low skilled employment ($L_{\{L\}}$)	0.304	0.515	0.291	0.282	0.291	0.255
medium skilled employment ($L_{\{M\}}$)	0.593	0.686	0.728	0.652	0.667	0.624
high skilled employment ($L_{\{H\}}$)	0.774	0.856	0.851	0.827	0.820	0.793
skill elast. of subs. ($\sigma_{\{L\}}$)	2.000	2.000	2.000	2.000	2.000	2.000
employment rate (L)	0.509	0.632	0.673	0.615	0.558	0.581
wage prem. high vs. medium	0.157	0.343	0.216	0.343	0.343	0.473
wage prem. medium vs. low	0.249	0.235	0.389	0.237	0.370	0.237
low skilled efficiency level ($ef_{\{L\}}$)	0.488	0.416	0.088	0.225	0.250	0.358
medium skilled efficiency level ($ef_{\{L\}}$)	0.762	0.634	0.169	0.345	0.469	0.548
high skilled efficiency level ($ef_{\{L\}}$)	1.019	1.142	0.250	0.621	0.846	1.188
labour adj. costs ($\gamma_{\{L\}}$, % of total)	18.000	18.000	18.000	18.000	18.000	18.000
inv. Elasticity of lab. Supply	-5.000	-5.000	-5.000	-5.000	-5.000	-5.000
Taxes/subsidies						
Benefit repl. Rate	0.300	0.300	0.300	0.300	0.300	0.300
tax credit ($\tau^{\{A\}}$)	0.173	0.150	0.353	0.173	0.216	0.173
tax rate on capital income ($t^{\{K\}}$)	0.199	0.320	0.260	0.199	0.160	0.199
consumption tax ($t^{\{C\}}$)	0.239	0.225	0.204	0.222	0.276	0.171
labour tax ($t^{\{L\}}$)	0.461	0.222	0.477	0.444	0.450	0.575
transfers (tr , % GDP)	12.672	8.964	12.055	9.578	12.395	10.675
wage share	0.481	0.556	0.507	0.501	0.511	0.491
capital/output ratio	6.656	6.674	11.410	7.419	7.603	6.537

Table C.1 (cont'd)

	LV	MT	PL	RO	SI	SK
R&D sector						
researchers ($L_{\{A\}}$, % employment)	0.690	0.561	0.531	0.155	0.796	0.686
R&D (% GDP)	0.440	0.470	0.640	0.370	1.390	0.650
elast. of R&D wrt. labour (λ)	0.962	0.955	0.645	0.550	0.452	0.585
elast. of R&D wrt. dom. ideas (φ)	0.282	0.287	0.518	0.589	0.663	0.564
elast. of R&D wrt. for. ideas (ϖ)	0.681	0.677	0.457	0.390	0.320	0.414
R&D efficiency (v)	5.521	6.397	1.002	0.950	0.294	0.618
depr. rate of ideas ($\delta^{\{A\}}$)	0.013	0.013	0.013	0.013	0.013	0.013
growth rate of ideas ($g^{\{A\}}$)	0.013	0.013	0.013	0.013	0.013	0.013
Intermediate sector						
mark up ($1/\theta-1$)	0.090	0.130	0.111	0.111	0.111	0.090
entry costs ($FC_{\{A\}}$)	0.597	0.811	0.568	0.622	0.480	0.582
risk premia on intangibles ($rp^{\{A\}}$)	0.017	0.019	0.019	0.017	0.016	0.016
Final g. sector mark up ($1/\eta-1$)	0.269	0.230	0.175	0.215	0.160	0.259
depr. rate of capital (δ)	0.025	0.025	0.027	0.022	0.027	0.024
Labour market						
low skilled pop. share ($s_{\{L\}}$)	0.169	0.818	0.203	0.307	0.252	0.164
medium skilled pop. share ($s_{\{M\}}$)	0.791	0.163	0.745	0.645	0.697	0.790
high skilled pop. share ($s_{\{H\}}$)	0.040	0.019	0.052	0.048	0.051	0.045
low skilled employment ($L_{\{L\}}$)	0.292	0.494	0.281	0.539	0.397	0.175
medium skilled employment ($L_{\{M\}}$)	0.631	0.703	0.623	0.682	0.695	0.652
high skilled employment ($L_{\{H\}}$)	0.796	0.855	0.838	0.839	0.858	0.849
skill elast. of subs. ($\sigma_{\{L\}}$)	2.000	2.000	2.000	2.000	2.000	2.000
employment rate (L)	0.580	0.535	0.565	0.646	0.628	0.583
wage prem. high vs. medium	0.343	0.343	0.215	0.367	0.340	0.134
wage prem. medium vs. low	0.237	0.237	0.282	0.498	0.347	0.413
low skilled efficiency level ($ef_{\{L\}}$)	0.283	0.325	0.301	0.323	0.275	0.122
medium skilled efficiency level ($ef_{\{L\}}$)	0.432	0.497	0.495	0.726	0.499	0.244
high skilled efficiency level ($ef_{\{L\}}$)	0.779	0.896	0.732	1.357	0.896	0.314
labour adj. costs ($\gamma_{\{L\}}$, % of total)	18.000	18.000	18.000	18.000	18.000	18.000
inv. Elasticity of lab. Supply	-5.000	-5.000	-5.000	-5.000	-5.000	-5.000
Taxes/subsidies						
Benefit repl. Rate	0.300	0.300	0.300	0.300	0.300	0.300
tax credit ($\tau^{\{A\}}$)	0.173	0.150	0.086	0.146	0.173	0.173
tax rate on capital income ($t^{\{K\}}$)	0.199	0.320	0.190	0.320	0.199	0.199
consumption tax ($t^{\{C\}}$)	0.186	0.204	0.188	0.171	0.240	0.209
labour tax ($t^{\{L\}}$)	0.512	0.427	0.486	0.286	0.398	0.610
transfers (tr , % GDP)	12.386	11.866	16.014	9.659	16.003	13.551
wage share	0.486	0.497	0.554	0.634	0.631	0.444
capital/output ratio	8.181	7.829	7.517	7.306	8.310	9.099

Annex D: Country tables

Table D.1 : Germany

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020
GDP	-0.05	-0.04	-0.03	-0.01	0.03	0.07	0.11	0.15	0.19	0.19	0.21	0.22	0.24	0.26	0.27	0.28	0.33
Employment	-0.06	-0.09	-0.11	-0.11	-0.10	-0.09	-0.08	-0.06	-0.04	-0.03	0.00	0.03	0.06	0.08	0.10	0.12	0.17
. Empl.low	-0.06	-0.11	-0.13	-0.13	-0.11	-0.10	-0.07	-0.04	-0.01	0.01	0.05	0.09	0.13	0.16	0.19	0.22	0.30
. Empl.medium	-0.06	-0.09	-0.11	-0.11	-0.10	-0.10	-0.09	-0.07	-0.05	-0.03	-0.01	0.02	0.05	0.07	0.09	0.11	0.16
. Empl.high	-0.03	-0.04	-0.05	-0.05	-0.05	-0.04	-0.04	-0.03	-0.02	-0.02	0.00	0.01	0.02	0.04	0.05	0.05	0.08
Consumption	0.02	0.01	0.01	0.03	0.05	0.07	0.11	0.14	0.18	0.24	0.27	0.28	0.30	0.32	0.33	0.34	0.39
. Cons.liq.constr.	-0.02	-0.11	-0.21	-0.28	-0.35	-0.37	-0.37	-0.37	-0.34	-0.20	-0.12	-0.05	0.02	0.08	0.13	0.18	0.36
. Cons.non-constr.	0.03	0.03	0.05	0.07	0.10	0.14	0.17	0.21	0.26	0.30	0.32	0.33	0.34	0.35	0.36	0.37	0.40
Investment	-0.07	-0.15	-0.19	-0.19	-0.18	-0.15	-0.11	-0.06	-0.01	0.04	0.07	0.09	0.11	0.13	0.14	0.16	0.23
Exports	-0.10	-0.12	-0.09	-0.06	-0.01	0.03	0.09	0.15	0.21	0.20	0.22	0.24	0.25	0.27	0.28	0.29	0.33
Imports	0.15	0.16	0.12	0.08	0.07	0.07	0.07	0.07	0.07	0.04	0.06	0.07	0.08	0.08	0.08	0.08	0.11
Real.wages	0.02	0.03	0.05	0.08	0.10	0.13	0.15	0.17	0.18	0.18	0.16	0.15	0.13	0.12	0.11	0.10	0.07
. Real.wages.l	0.03	0.05	0.07	0.09	0.11	0.12	0.14	0.14	0.14	0.14	0.11	0.09	0.07	0.05	0.03	0.02	-0.01
. Real.wages.m	0.02	0.02	0.04	0.07	0.10	0.12	0.15	0.17	0.18	0.19	0.17	0.15	0.14	0.13	0.11	0.11	0.08
. Real.wages.h	0.02	0.03	0.05	0.08	0.11	0.14	0.16	0.18	0.19	0.20	0.18	0.17	0.17	0.16	0.16	0.15	0.15
Patents	0.00	0.01	0.03	0.05	0.07	0.08	0.10	0.13	0.15	0.17	0.20	0.22	0.25	0.27	0.30	0.33	0.47
Price.level.GDP	0.02	0.09	0.18	0.27	0.37	0.45	0.51	0.55	0.56	0.53	0.51	0.48	0.45	0.42	0.39	0.35	0.21
Consumer.price.level	0.00	0.07	0.17	0.27	0.37	0.45	0.52	0.55	0.56	0.54	0.52	0.49	0.46	0.43	0.40	0.37	0.22
Terms of trade	0.09	0.08	0.05	0.03	0.00	-0.01	-0.03	-0.04	-0.05	-0.06	-0.06	-0.06	-0.06	-0.07	-0.07	-0.08	-0.08
Dollar exch. rate	-0.13	-0.08	0.02	0.14	0.26	0.37	0.46	0.53	0.58	0.59	0.57	0.55	0.52	0.50	0.47	0.45	0.31
Euro exch.rate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nom.int.rate (%p)	0.03	0.10	0.13	0.13	0.13	0.11	0.09	0.07	0.04	-0.01	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
Real.int.rate (%p)	-0.02	0.02	0.04	0.03	0.04	0.04	0.04	0.05	0.06	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.00
Infl (%p)	0.04	0.08	0.09	0.10	0.09	0.07	0.05	0.03	-0.01	-0.03	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
Gov.debt (% of GDP)	0.06	0.13	0.22	0.28	0.30	0.27	0.20	0.12	0.02	-0.11	-0.30	-0.46	-0.58	-0.68	-0.75	-0.79	-0.74
Gov.balance (% GDP)	-0.07	-0.15	-0.16	-0.13	-0.09	-0.03	0.02	0.05	0.08	0.19	0.19	0.17	0.14	0.12	0.10	0.08	0.00
Coh.funds (% GDP) net	0.00	-0.01	-0.04	-0.06	-0.06	-0.03	-0.03	-0.05	-0.07	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Contr.to CF (% GDP)	0.05	0.16	0.20	0.21	0.24	0.22	0.21	0.21	0.21	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trade.bal.(% GDP)	-0.06	-0.07	-0.05	-0.04	-0.03	-0.02	0.00	0.01	0.03	0.03	0.03	0.04	0.04	0.04	0.04	0.05	0.05

Note: percentage (points) difference from baseline

Table D.2: Italy

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020
GDP	0.01	-0.08	-0.04	0.03	0.07	0.13	0.19	0.24	0.29	0.29	0.29	0.29	0.28	0.27	0.26	0.25	0.22
Employment	-0.03	-0.11	-0.10	-0.06	-0.05	-0.03	-0.02	0.00	0.00	0.00	0.00	0.00	-0.01	-0.02	-0.02	-0.03	-0.03
. Empl.low	-0.02	-0.09	-0.08	-0.04	-0.02	0.00	0.02	0.03	0.03	0.01	0.01	-0.01	-0.02	-0.03	-0.04	-0.04	-0.04
. Empl.medium	-0.03	-0.12	-0.12	-0.09	-0.08	-0.06	-0.05	-0.03	-0.02	-0.02	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.02
. Empl.high	-0.01	-0.09	-0.06	-0.03	-0.03	-0.02	-0.01	-0.01	0.00	-0.01	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.01
Consumption	0.02	-0.15	-0.14	-0.12	-0.11	-0.03	0.04	0.09	0.15	0.36	0.41	0.40	0.38	0.37	0.36	0.35	0.32
. Cons.liq.constr.	-0.01	-0.65	-0.65	-0.61	-0.68	-0.52	-0.40	-0.33	-0.23	0.38	0.52	0.51	0.48	0.45	0.42	0.40	0.33
. Cons.non-constr.	0.03	0.05	0.07	0.09	0.13	0.17	0.22	0.26	0.31	0.35	0.36	0.35	0.35	0.34	0.33	0.33	0.31
Investment	-0.04	-0.08	-0.08	-0.07	-0.03	0.02	0.07	0.13	0.18	0.22	0.24	0.24	0.23	0.23	0.22	0.22	0.20
Exports	-0.07	-0.01	0.01	0.03	0.08	0.11	0.16	0.22	0.26	0.22	0.22	0.23	0.23	0.24	0.24	0.24	0.26
Imports	0.22	0.05	0.05	0.10	0.06	0.07	0.08	0.07	0.08	0.10	0.15	0.18	0.20	0.22	0.24	0.25	0.31
Real.wages	0.01	0.05	0.05	0.05	0.08	0.10	0.13	0.16	0.19	0.22	0.23	0.23	0.23	0.23	0.23	0.22	0.20
. Real.wages.l	0.01	0.05	0.05	0.04	0.06	0.08	0.11	0.14	0.18	0.21	0.23	0.24	0.24	0.24	0.24	0.24	0.21
. Real.wages.m	0.01	0.06	0.06	0.07	0.09	0.12	0.15	0.18	0.20	0.22	0.23	0.23	0.23	0.22	0.22	0.21	0.19
. Real.wages.h	0.00	0.04	0.05	0.06	0.09	0.12	0.15	0.19	0.21	0.22	0.22	0.22	0.21	0.21	0.20	0.20	0.18
Patents	0.00	0.00	0.01	0.02	0.03	0.04	0.05	0.07	0.09	0.10	0.12	0.14	0.15	0.17	0.18	0.20	0.26
Price.level.GDP	0.04	0.09	0.19	0.30	0.38	0.45	0.50	0.53	0.53	0.51	0.50	0.49	0.48	0.46	0.44	0.42	0.30
Consumer.price.level	0.03	0.08	0.18	0.29	0.38	0.45	0.50	0.53	0.54	0.52	0.51	0.50	0.48	0.46	0.44	0.42	0.30
Terms of trade	0.08	0.06	0.04	0.02	0.00	-0.02	-0.05	-0.06	-0.08	-0.07	-0.06	-0.05	-0.03	-0.02	-0.01	0.00	0.03
Dollar exch. rate	-0.13	-0.08	0.02	0.14	0.26	0.37	0.46	0.53	0.58	0.59	0.57	0.55	0.52	0.50	0.47	0.45	0.31
Euro exch.rate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nom.int.rate (%p)	0.03	0.10	0.13	0.13	0.12	0.11	0.09	0.06	0.03	-0.02	-0.02	-0.02	-0.02	-0.03	-0.03	-0.03	-0.03
Real.int.rate (%p)	-0.01	0.01	0.02	0.05	0.05	0.05	0.05	0.05	0.05	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	0.00
Infl (%p)	0.06	0.06	0.11	0.10	0.08	0.06	0.04	0.02	-0.01	-0.01	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02	-0.02
Gov.debt (% of GDP)	-0.01	0.08	0.04	-0.04	-0.08	-0.13	-0.18	-0.22	-0.25	-0.22	-0.21	-0.18	-0.15	-0.13	-0.11	-0.09	-0.03
Gov.balance (% GDP)	-0.04	-0.06	-0.11	-0.10	-0.08	-0.07	-0.05	-0.03	-0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.02	0.02
Coh.funds (% GDP) net	0.08	-0.11	-0.08	0.05	0.04	0.07	0.08	0.07	0.07	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Contr.to CF (% GDP)	0.05	0.16	0.20	0.21	0.24	0.22	0.21	0.21	0.21	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trade.bal.(% GDP)	-0.05	0.00	0.00	-0.01	0.00	0.00	0.01	0.02	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	-0.01

Note: percentage (points) difference from baseline

Table D.3: Ireland

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020
GDP	-0.10	-0.03	0.01	0.08	0.15	0.23	0.31	0.37	0.45	0.48	0.50	0.52	0.53	0.54	0.56	0.57	0.60
Employment	-0.03	-0.03	-0.03	-0.05	-0.05	-0.06	-0.06	-0.05	-0.02	-0.04	-0.03	-0.01	0.00	0.02	0.03	0.04	0.08
. Empl.low	-0.03	-0.04	-0.03	-0.06	-0.06	-0.07	-0.06	-0.05	-0.01	-0.03	-0.01	0.01	0.03	0.05	0.07	0.09	0.15
. Empl.medium	-0.04	-0.04	-0.03	-0.06	-0.06	-0.07	-0.07	-0.06	-0.03	-0.05	-0.04	-0.02	-0.01	0.00	0.01	0.02	0.06
. Empl.high	0.01	0.01	0.01	-0.02	-0.01	-0.02	-0.02	-0.03	0.01	-0.03	-0.01	0.00	0.00	0.01	0.01	0.02	0.03
Consumption	0.13	0.18	0.20	0.23	0.26	0.30	0.34	0.38	0.41	0.46	0.50	0.52	0.53	0.55	0.57	0.58	0.64
. Cons.liq.constr.	0.07	0.00	-0.02	-0.08	-0.12	-0.14	-0.14	-0.15	-0.11	0.01	0.10	0.18	0.26	0.33	0.39	0.46	0.68
. Cons.non-constr.	0.14	0.22	0.26	0.30	0.36	0.41	0.46	0.50	0.54	0.57	0.59	0.60	0.60	0.60	0.61	0.61	0.63
Investment	-0.04	-0.08	-0.09	-0.07	-0.03	0.02	0.07	0.12	0.17	0.20	0.23	0.25	0.26	0.28	0.29	0.30	0.34
Exports	-0.16	-0.22	-0.20	-0.13	-0.06	0.02	0.09	0.17	0.25	0.30	0.33	0.35	0.36	0.37	0.38	0.39	0.42
Imports	0.24	0.36	0.34	0.24	0.15	0.07	0.03	-0.02	0.00	-0.06	-0.05	-0.03	-0.02	-0.01	0.00	0.01	0.05
Real.wages	0.03	0.07	0.13	0.21	0.29	0.37	0.44	0.50	0.53	0.57	0.56	0.56	0.55	0.55	0.54	0.54	0.52
. Real.wages.l	0.02	0.05	0.09	0.17	0.24	0.32	0.38	0.43	0.45	0.49	0.49	0.48	0.47	0.47	0.46	0.45	0.44
. Real.wages.m	0.01	0.03	0.08	0.16	0.24	0.33	0.41	0.48	0.52	0.56	0.56	0.55	0.55	0.54	0.54	0.54	0.52
. Real.wages.h	0.11	0.25	0.36	0.45	0.52	0.59	0.65	0.71	0.74	0.74	0.73	0.73	0.72	0.72	0.72	0.71	0.70
Patents	0.05	0.21	0.43	0.70	1.00	1.31	1.63	1.95	2.26	2.56	2.85	3.12	3.37	3.61	3.84	4.05	4.93
Price.level.GDP	0.03	0.11	0.18	0.21	0.26	0.29	0.32	0.34	0.36	0.32	0.30	0.28	0.25	0.23	0.20	0.17	0.04
Consumer.price.level	-0.04	0.03	0.12	0.20	0.28	0.34	0.40	0.44	0.47	0.45	0.43	0.41	0.39	0.36	0.34	0.31	0.18
Terms of trade	0.15	0.16	0.11	0.03	-0.05	-0.12	-0.18	-0.23	-0.27	-0.30	-0.30	-0.30	-0.30	-0.30	-0.31	-0.31	-0.31
Dollar exch. rate	-0.13	-0.08	0.02	0.14	0.26	0.37	0.46	0.53	0.58	0.59	0.57	0.55	0.52	0.50	0.47	0.45	0.31
Euro exch.rate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nom.int.rate (%p)	0.03	0.10	0.13	0.13	0.13	0.11	0.09	0.07	0.04	-0.01	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
Real.int.rate (%p)	-0.03	0.02	0.09	0.09	0.09	0.08	0.07	0.04	0.06	0.02	0.00	0.00	0.01	0.01	0.01	0.01	0.00
Infl (%p)	0.05	0.08	0.06	0.04	0.04	0.03	0.03	0.02	0.00	-0.04	-0.02	-0.02	-0.02	-0.03	-0.03	-0.03	-0.03
Gov.debt (% of GDP)	0.05	0.08	0.16	0.23	0.28	0.30	0.28	0.24	0.16	0.02	-0.17	-0.34	-0.49	-0.60	-0.69	-0.76	-0.83
Gov.balance (% GDP)	-0.03	-0.11	-0.12	-0.12	-0.10	-0.05	-0.01	0.01	0.05	0.19	0.19	0.17	0.15	0.13	0.11	0.09	0.02
Coh.funds (% GDP) net	0.15	0.24	0.27	0.18	0.12	0.04	0.02	-0.09	-0.05	-0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Contr.to CF (% GDP)	0.05	0.16	0.20	0.21	0.24	0.22	0.21	0.21	0.21	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trade.bal.(% GDP)	-0.22	-0.37	-0.37	-0.30	-0.23	-0.15	-0.10	-0.03	-0.01	0.06	0.07	0.07	0.06	0.06	0.06	0.06	0.06

Note: percentage (points) difference from baseline

Table D.4: Portugal

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020
GDP	0.56	0.64	0.96	1.13	1.41	1.62	1.89	2.20	2.75	2.53	2.74	2.90	3.00	3.08	3.13	3.16	3.20
Employment	0.52	0.67	0.72	0.61	0.48	0.33	0.28	0.33	0.47	0.15	0.18	0.30	0.38	0.44	0.47	0.50	0.54
. Empl.low	0.51	0.70	0.77	0.67	0.55	0.40	0.36	0.41	0.53	0.25	0.27	0.38	0.46	0.52	0.55	0.57	0.61
. Empl.medium	0.59	0.59	0.60	0.44	0.26	0.04	-0.04	0.02	0.23	-0.28	-0.24	-0.06	0.07	0.15	0.20	0.24	0.33
. Empl.high	0.56	0.29	0.21	0.12	0.10	0.03	0.01	0.04	0.23	-0.14	-0.04	0.05	0.06	0.06	0.07	0.07	0.09
Consumption	1.34	2.21	2.56	2.82	3.08	3.38	3.68	3.97	4.28	4.64	4.88	5.05	5.19	5.30	5.39	5.46	5.55
. Cons.liq.constr.	0.26	0.73	1.20	1.58	1.85	2.09	2.31	2.52	2.82	3.11	3.27	3.46	3.65	3.82	3.97	4.08	4.30
. Cons.non-constr.	3.04	4.53	4.69	4.76	5.01	5.40	5.85	6.25	6.58	7.04	7.40	7.56	7.62	7.64	7.64	7.63	7.52
Investment	0.01	-0.22	-0.50	-0.69	-0.72	-0.60	-0.40	-0.15	0.13	0.49	0.81	1.05	1.23	1.37	1.48	1.57	1.87
Exports	-0.37	-0.54	-0.61	-0.55	-0.38	-0.14	0.09	0.32	0.51	0.81	0.96	1.02	1.05	1.07	1.08	1.09	1.09
Imports	2.38	4.05	4.98	4.93	4.36	3.37	2.50	1.85	1.61	0.02	-0.50	-0.54	-0.51	-0.46	-0.40	-0.34	-0.11
Real.wages	0.02	0.27	0.43	0.63	0.85	1.11	1.34	1.52	1.60	1.90	1.98	1.99	2.01	2.02	2.03	2.03	1.99
. Real.wages.l	-0.15	0.03	0.20	0.43	0.68	0.97	1.22	1.42	1.50	1.87	1.97	1.98	2.00	2.02	2.04	2.04	2.00
. Real.wages.m	0.06	0.38	0.52	0.67	0.83	1.03	1.21	1.35	1.38	1.66	1.70	1.70	1.71	1.73	1.74	1.75	1.73
. Real.wages.h	1.06	2.08	2.34	2.47	2.62	2.80	3.00	3.23	3.28	3.31	3.28	3.31	3.30	3.25	3.18	3.12	2.94
Patents	0.38	1.52	3.03	4.69	6.40	8.14	9.84	11.45	12.92	14.24	15.45	16.50	17.37	18.08	18.64	19.08	20.08
Price.level.GDP	0.75	1.40	1.76	1.73	1.46	1.02	0.60	0.24	-0.05	-0.69	-0.99	-1.10	-1.17	-1.21	-1.24	-1.27	-1.37
Consumer.price.level	0.60	1.15	1.45	1.45	1.25	0.91	0.58	0.29	0.06	-0.46	-0.71	-0.80	-0.86	-0.91	-0.94	-0.97	-1.08
Terms of trade	0.49	1.04	1.27	1.22	0.95	0.55	0.14	-0.24	-0.60	-1.02	-1.30	-1.44	-1.49	-1.51	-1.52	-1.52	-1.46
Dollar exch. rate	-0.13	-0.08	0.02	0.14	0.26	0.37	0.46	0.53	0.58	0.59	0.57	0.55	0.52	0.50	0.47	0.45	0.31
Euro exch.rate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nom.int.rate (%p)	0.03	0.10	0.13	0.13	0.12	0.10	0.08	0.05	0.02	-0.03	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.05
Real.int.rate (%p)	-0.83	-0.35	0.03	0.33	0.52	0.53	0.47	0.31	0.62	0.40	0.11	0.04	0.01	0.00	-0.01	-0.02	-0.03
Infl (%p)	1.08	0.48	0.23	-0.13	-0.34	-0.44	-0.40	-0.32	-0.38	-0.61	-0.20	-0.09	-0.06	-0.04	-0.03	-0.03	-0.01
Gov.debt (% of GDP)	-0.73	-1.53	-2.21	-2.55	-2.71	-2.67	-2.62	-2.63	-2.88	-2.57	-2.55	-2.63	-2.70	-2.74	-2.74	-2.69	-1.96
Gov.balance (% GDP)	0.50	0.44	0.43	0.31	0.22	0.13	0.12	0.14	0.28	0.11	0.14	0.16	0.15	0.11	0.08	0.04	-0.12
Coh.funds (% GDP) net	1.05	1.13	1.87	2.03	1.98	1.57	1.31	1.09	1.56	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Contr.to CF (% GDP)	0.05	0.16	0.20	0.21	0.24	0.22	0.21	0.21	0.21	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trade.bal.(% GDP)	-0.86	-1.35	-1.64	-1.62	-1.44	-1.12	-0.86	-0.67	-0.64	-0.09	0.06	0.05	0.03	0.01	-0.02	-0.04	-0.10

Note: percentage (points) difference from baseline

Table D.5: Greece

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020
GDP	0.19	0.87	0.66	0.69	1.10	1.20	1.60	2.06	2.55	2.07	2.34	2.50	2.60	2.67	2.73	2.77	2.89
Employment	0.30	0.75	0.44	0.31	0.43	0.40	0.54	0.70	0.68	0.13	0.25	0.42	0.54	0.62	0.69	0.74	0.88
. Empl.low	0.38	0.91	0.69	0.58	0.69	0.66	0.81	0.96	0.93	0.40	0.49	0.67	0.80	0.89	0.96	1.01	1.15
. Empl.medium	0.25	0.65	0.28	0.12	0.25	0.21	0.36	0.53	0.52	-0.06	0.07	0.25	0.38	0.46	0.53	0.58	0.74
. Empl.high	0.21	0.50	0.07	-0.04	0.12	0.04	0.14	0.28	0.32	-0.21	-0.02	0.12	0.15	0.17	0.18	0.20	0.25
Consumption	1.22	1.85	1.99	2.13	2.24	2.39	2.57	2.77	3.04	3.41	3.71	3.86	3.96	4.04	4.11	4.16	4.29
. Cons.liq.constr.	0.10	0.53	0.68	0.78	0.95	1.12	1.36	1.66	1.96	2.05	2.21	2.42	2.63	2.83	3.00	3.15	3.56
. Cons.non-constr.	1.68	2.38	2.53	2.67	2.76	2.90	3.05	3.22	3.47	3.96	4.31	4.44	4.50	4.53	4.55	4.57	4.59
Investment	-0.09	-0.37	-0.58	-0.67	-0.70	-0.64	-0.51	-0.28	0.13	0.67	1.14	1.45	1.65	1.79	1.89	1.96	2.15
Exports	-0.39	-0.76	-0.70	-0.59	-0.51	-0.35	-0.20	-0.03	0.25	0.66	0.80	0.85	0.88	0.90	0.93	0.95	1.01
Imports	1.48	3.61	3.31	2.99	3.20	2.85	2.83	2.78	2.26	0.16	-0.23	-0.24	-0.24	-0.24	-0.25	-0.26	-0.28
Real.wages	-0.01	-0.12	0.11	0.26	0.30	0.47	0.56	0.66	0.84	1.27	1.32	1.30	1.29	1.28	1.26	1.24	1.18
. Real.wages.l	-0.11	-0.31	-0.05	0.12	0.16	0.32	0.40	0.48	0.66	1.12	1.16	1.12	1.10	1.09	1.07	1.06	1.01
. Real.wages.m	0.03	-0.06	0.19	0.34	0.38	0.54	0.64	0.74	0.92	1.38	1.43	1.42	1.41	1.40	1.38	1.36	1.29
. Real.wages.h	0.28	0.45	0.62	0.67	0.73	0.92	1.08	1.24	1.35	1.59	1.61	1.66	1.69	1.68	1.65	1.63	1.57
Patents	0.11	0.39	0.73	1.14	1.59	2.05	2.52	2.98	3.45	3.98	4.57	5.13	5.62	6.03	6.36	6.62	7.27
Price.level.GDP	0.40	1.02	1.01	0.99	1.06	0.96	0.90	0.77	0.43	-0.28	-0.51	-0.59	-0.66	-0.71	-0.77	-0.82	-1.01
Consumer.price.level	0.32	0.84	0.85	0.86	0.93	0.87	0.83	0.74	0.46	-0.13	-0.32	-0.39	-0.45	-0.50	-0.55	-0.60	-0.78
Terms of trade	0.38	0.78	0.84	0.76	0.67	0.52	0.35	0.12	-0.25	-0.72	-1.00	-1.12	-1.19	-1.22	-1.25	-1.28	-1.33
Dollar exch. rate	-0.13	-0.08	0.02	0.14	0.26	0.37	0.46	0.53	0.58	0.59	0.57	0.55	0.52	0.50	0.47	0.45	0.31
Euro exch.rate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nom.int.rate (%p)	0.03	0.10	0.13	0.14	0.13	0.11	0.09	0.06	0.03	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
Real.int.rate (%p)	-0.70	-0.04	0.18	0.06	0.19	0.17	0.17	0.30	0.72	0.36	0.07	0.04	0.03	0.02	0.02	0.01	-0.01
Infl (%p)	0.66	0.42	-0.09	0.02	0.03	-0.11	-0.07	-0.18	-0.47	-0.63	-0.13	-0.07	-0.06	-0.06	-0.05	-0.05	-0.03
Gov.debt (% of GDP)	-0.55	-2.13	-2.07	-2.03	-2.46	-2.48	-2.85	-3.32	-3.67	-2.64	-2.76	-2.99	-3.17	-3.28	-3.34	-3.34	-2.68
Gov.balance (% GDP)	0.23	0.43	0.08	0.00	0.11	0.08	0.20	0.30	0.36	0.11	0.25	0.27	0.24	0.20	0.15	0.10	-0.08
Coh.funds (% GDP) net	-0.05	1.37	0.73	0.61	1.13	1.01	1.40	1.84	2.04	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Contr.to CF (% GDP)	0.05	0.16	0.20	0.21	0.24	0.22	0.21	0.21	0.21	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trade.bal.(% GDP)	-0.50	-1.18	-1.05	-0.93	-1.00	-0.88	-0.88	-0.88	-0.74	-0.07	0.01	-0.01	-0.02	-0.02	-0.02	-0.02	-0.01

Note: percentage (points) difference from baseline

Table D.6: Spain

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020
GDP	0.16	0.47	0.66	0.76	0.91	1.06	1.16	1.33	1.51	1.48	1.58	1.66	1.73	1.79	1.84	1.88	2.01
Employment	0.24	0.47	0.48	0.38	0.30	0.24	0.20	0.23	0.27	0.24	0.30	0.38	0.44	0.50	0.55	0.59	0.73
. Empl.low	0.26	0.54	0.59	0.51	0.44	0.38	0.35	0.38	0.42	0.40	0.46	0.53	0.60	0.66	0.71	0.75	0.88
. Empl.medium	0.18	0.36	0.34	0.20	0.11	0.03	-0.01	0.02	0.06	0.02	0.09	0.18	0.26	0.33	0.39	0.44	0.60
. Empl.high	0.30	0.45	0.34	0.18	0.11	0.07	0.03	0.07	0.09	0.01	0.05	0.10	0.14	0.17	0.19	0.21	0.28
Consumption	0.77	1.18	1.30	1.43	1.59	1.77	1.96	2.12	2.28	2.50	2.63	2.72	2.80	2.87	2.93	2.98	3.13
. Cons.liq.constr.	0.03	0.16	0.34	0.51	0.64	0.78	0.91	1.03	1.17	1.43	1.59	1.73	1.86	1.99	2.10	2.20	2.50
. Cons.non-constr.	1.38	2.01	2.08	2.18	2.36	2.57	2.81	3.01	3.18	3.36	3.47	3.53	3.56	3.58	3.60	3.62	3.65
Investment	-0.06	-0.25	-0.41	-0.46	-0.41	-0.27	-0.10	0.10	0.29	0.48	0.63	0.75	0.84	0.92	0.98	1.04	1.26
Exports	-0.18	-0.33	-0.31	-0.20	-0.07	0.06	0.20	0.33	0.46	0.49	0.53	0.57	0.60	0.62	0.65	0.67	0.73
Imports	1.10	2.34	2.68	2.40	1.96	1.47	0.95	0.64	0.41	-0.01	-0.12	-0.14	-0.15	-0.16	-0.17	-0.17	-0.15
Real.wages	0.04	0.09	0.21	0.38	0.54	0.69	0.83	0.91	0.96	1.03	1.03	1.01	0.99	0.97	0.95	0.94	0.90
. Real.wages.l	-0.07	-0.12	-0.03	0.15	0.33	0.50	0.65	0.74	0.81	0.90	0.92	0.90	0.89	0.87	0.86	0.85	0.81
. Real.wages.m	0.03	0.07	0.18	0.34	0.50	0.65	0.78	0.87	0.92	1.00	1.00	0.98	0.96	0.94	0.93	0.91	0.87
. Real.wages.h	0.36	0.79	1.07	1.26	1.38	1.49	1.57	1.61	1.62	1.63	1.59	1.55	1.52	1.50	1.48	1.46	1.42
Patents	0.29	1.20	2.42	3.75	5.10	6.39	7.59	8.65	9.55	10.28	10.88	11.35	11.72	12.00	12.23	12.40	12.86
Price.level.GDP	0.31	0.72	0.87	0.83	0.72	0.57	0.40	0.28	0.14	-0.04	-0.14	-0.20	-0.26	-0.31	-0.36	-0.40	-0.59
Consumer.price.level	0.25	0.61	0.76	0.75	0.67	0.55	0.42	0.32	0.21	0.06	-0.03	-0.09	-0.14	-0.19	-0.23	-0.28	-0.46
Terms of trade	0.28	0.55	0.62	0.52	0.33	0.11	-0.11	-0.30	-0.46	-0.59	-0.68	-0.73	-0.77	-0.79	-0.82	-0.84	-0.88
Dollar exch. rate	-0.13	-0.08	0.02	0.14	0.26	0.37	0.46	0.53	0.58	0.59	0.57	0.55	0.52	0.50	0.47	0.45	0.31
Euro exch.rate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nom.int.rate (%p)	0.03	0.10	0.13	0.13	0.12	0.10	0.08	0.06	0.03	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
Real.int.rate (%p)	-0.45	-0.14	0.12	0.23	0.26	0.27	0.22	0.18	0.21	0.11	0.04	0.03	0.02	0.02	0.02	0.01	0.00
Infl (%p)	0.48	0.32	0.07	-0.08	-0.13	-0.16	-0.16	-0.12	-0.15	-0.17	-0.08	-0.06	-0.05	-0.05	-0.05	-0.04	-0.03
Gov.debt (% of GDP)	-0.27	-0.86	-1.20	-1.31	-1.34	-1.34	-1.31	-1.35	-1.45	-1.46	-1.60	-1.76	-1.88	-1.96	-2.01	-2.03	-1.74
Gov.balance (% GDP)	0.14	0.22	0.17	0.09	0.05	0.06	0.05	0.09	0.14	0.20	0.21	0.19	0.17	0.14	0.11	0.08	-0.03
Coh.funds (% GDP) net	0.00	0.63	0.89	0.83	0.72	0.62	0.35	0.31	0.29	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Contr.to CF (% GDP)	0.05	0.16	0.20	0.21	0.24	0.22	0.21	0.21	0.21	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trade.bal.(% GDP)	-0.28	-0.60	-0.67	-0.59	-0.48	-0.37	-0.24	-0.17	-0.11	-0.03	-0.01	-0.01	0.00	0.00	0.00	0.00	0.00

Note: percentage (points) difference from baseline

Table D.7: Czech Republic

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020
GDP	0.00	0.00	0.00	0.00	0.06	0.07	0.23	0.29	0.40	0.35	0.39	0.41	0.41	0.42	0.42	0.42	0.41
Employment	0.00	0.00	-0.01	0.00	0.04	0.05	0.13	0.17	0.17	0.08	0.09	0.11	0.12	0.13	0.14	0.14	0.13
. Empl.low	0.03	0.08	0.13	0.21	0.33	0.44	0.59	0.69	0.71	0.63	0.62	0.63	0.65	0.66	0.68	0.68	0.63
. Empl.medium	0.00	-0.01	-0.02	-0.01	0.02	0.03	0.11	0.14	0.14	0.05	0.06	0.08	0.09	0.10	0.10	0.11	0.10
. Empl.high	0.00	0.00	-0.01	-0.01	0.02	0.00	0.06	0.08	0.09	0.00	0.02	0.04	0.05	0.05	0.05	0.05	0.05
Consumption	0.17	0.26	0.28	0.30	0.31	0.34	0.37	0.44	0.53	0.64	0.70	0.70	0.70	0.69	0.69	0.68	0.64
. Cons.liq.constr.	0.00	-0.02	-0.04	-0.06	-0.05	-0.07	-0.06	-0.01	0.04	0.07	0.13	0.18	0.23	0.27	0.30	0.33	0.42
. Cons.non-constr.	0.18	0.28	0.30	0.32	0.33	0.36	0.40	0.46	0.56	0.67	0.73	0.73	0.73	0.72	0.71	0.70	0.66
Investment	-0.04	-0.09	-0.12	-0.14	-0.14	-0.12	-0.08	-0.01	0.08	0.17	0.24	0.28	0.30	0.32	0.33	0.34	0.36
Exports	-0.02	-0.04	-0.05	-0.05	-0.03	0.01	0.04	0.10	0.16	0.17	0.20	0.22	0.23	0.24	0.24	0.25	0.28
Imports	0.12	0.18	0.23	0.29	0.43	0.43	0.59	0.55	0.46	0.14	0.11	0.13	0.13	0.14	0.14	0.14	0.17
Real.wages	0.00	0.00	0.01	0.01	0.00	0.04	0.04	0.08	0.11	0.19	0.20	0.20	0.19	0.19	0.19	0.19	0.19
. Real.wages.l	-0.01	-0.03	-0.04	-0.06	-0.12	-0.14	-0.21	-0.23	-0.21	-0.11	-0.10	-0.11	-0.12	-0.13	-0.14	-0.14	-0.10
. Real.wages.m	0.01	0.01	0.01	0.02	0.01	0.05	0.06	0.09	0.13	0.22	0.23	0.22	0.22	0.22	0.21	0.21	0.21
. Real.wages.h	0.01	0.00	0.00	0.01	0.02	0.08	0.11	0.16	0.19	0.22	0.21	0.21	0.22	0.22	0.22	0.22	0.22
Patents	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.04	0.06	0.09	0.11	0.13	0.15	0.25
Price.level.GDP	0.04	0.11	0.18	0.26	0.38	0.45	0.54	0.57	0.52	0.36	0.28	0.23	0.18	0.13	0.08	0.04	-0.13
Consumer.price.level	0.03	0.09	0.15	0.22	0.32	0.40	0.49	0.53	0.52	0.41	0.34	0.28	0.23	0.18	0.14	0.09	-0.08
Terms of trade	0.04	0.06	0.09	0.12	0.14	0.14	0.12	0.06	-0.03	-0.11	-0.14	-0.15	-0.15	-0.15	-0.15	-0.15	-0.13
Dollar exch. rate	-0.12	-0.09	-0.04	0.02	0.11	0.21	0.32	0.44	0.53	0.55	0.50	0.45	0.40	0.36	0.31	0.27	0.09
Euro exch.rate	0.01	-0.01	-0.06	-0.12	-0.15	-0.16	-0.14	-0.09	-0.04	-0.04	-0.07	-0.10	-0.12	-0.14	-0.16	-0.18	-0.22
Nom.int.rate (%p)	0.02	0.06	0.08	0.10	0.13	0.12	0.14	0.11	0.05	-0.05	-0.07	-0.06	-0.06	-0.06	-0.05	-0.05	-0.04
Real.int.rate (%p)	-0.05	-0.01	0.00	-0.01	0.05	0.03	0.09	0.13	0.19	0.05	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
Infl (%p)	0.07	0.07	0.07	0.09	0.10	0.07	0.08	0.00	-0.09	-0.15	-0.06	-0.05	-0.05	-0.05	-0.04	-0.04	-0.03
Gov.debt (% of GDP)	-0.02	-0.05	-0.09	-0.12	-0.20	-0.27	-0.39	-0.51	-0.63	-0.66	-0.68	-0.70	-0.70	-0.68	-0.65	-0.61	-0.30
Gov.balance (% GDP)	0.02	0.03	0.02	0.03	0.06	0.06	0.11	0.13	0.13	0.06	0.06	0.04	0.03	0.01	0.00	-0.02	-0.05
Coh.funds (% GDP) net	0.00	0.01	0.03	0.07	0.26	0.20	0.45	0.48	0.47	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Contr.to CF (% GDP)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trade.bal.(% GDP)	-0.06	-0.10	-0.12	-0.15	-0.20	-0.19	-0.27	-0.24	-0.21	-0.05	-0.03	-0.04	-0.04	-0.03	-0.03	-0.03	-0.02

Note: percentage (points) difference from baseline

Table D.8: Cyprus

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020
GDP	-0.03	-0.03	-0.04	-0.05	-0.03	-0.01	0.02	0.09	0.14	0.07	0.08	0.09	0.09	0.10	0.10	0.10	0.11
Employment	-0.02	-0.02	-0.03	-0.03	-0.02	-0.01	0.02	0.07	0.08	0.03	0.02	0.03	0.03	0.03	0.03	0.04	0.04
. Empl.low	-0.03	-0.04	-0.05	-0.05	-0.04	-0.01	0.03	0.08	0.10	0.05	0.04	0.04	0.04	0.04	0.04	0.05	0.05
. Empl.medium	-0.02	-0.02	-0.02	-0.03	-0.02	0.00	0.02	0.06	0.08	0.02	0.01	0.02	0.03	0.03	0.03	0.04	0.04
. Empl.high	-0.01	0.00	-0.01	-0.01	-0.01	0.00	0.00	0.03	0.05	-0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01
Consumption	-0.09	-0.15	-0.17	-0.17	-0.18	-0.18	-0.16	-0.14	-0.09	-0.04	-0.01	0.00	0.00	0.01	0.01	0.01	0.02
. Cons.liq.constr.	-0.05	-0.11	-0.14	-0.15	-0.13	-0.12	-0.09	-0.07	-0.02	-0.02	0.01	0.04	0.06	0.08	0.10	0.12	0.18
. Cons.non-constr.	-0.10	-0.17	-0.18	-0.18	-0.19	-0.19	-0.18	-0.15	-0.10	-0.05	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02
Investment	-0.03	-0.07	-0.08	-0.09	-0.10	-0.11	-0.09	-0.06	-0.01	0.03	0.06	0.08	0.09	0.10	0.11	0.11	0.13
Exports	-0.03	0.00	-0.01	0.00	0.03	0.06	0.12	0.19	0.26	0.22	0.23	0.24	0.25	0.26	0.26	0.27	0.29
Imports	-0.15	-0.25	-0.28	-0.25	-0.19	-0.13	-0.06	0.01	0.06	0.06	0.10	0.13	0.15	0.16	0.17	0.18	0.21
Real.wages	-0.01	-0.03	-0.03	-0.03	-0.03	-0.01	0.02	0.04	0.05	0.07	0.06	0.05	0.05	0.05	0.05	0.05	0.05
. Real.wages.l	0.00	-0.01	-0.02	-0.02	-0.01	0.00	0.01	0.02	0.02	0.06	0.06	0.05	0.05	0.04	0.04	0.04	0.05
. Real.wages.m	-0.01	-0.03	-0.04	-0.04	-0.03	-0.01	0.02	0.05	0.06	0.08	0.07	0.06	0.06	0.05	0.05	0.05	0.05
. Real.wages.h	-0.02	-0.04	-0.05	-0.05	-0.04	-0.02	0.02	0.08	0.10	0.08	0.06	0.06	0.06	0.06	0.06	0.06	0.06
Patents	0.00	0.00	0.00	0.00	-0.01	-0.02	-0.04	-0.05	-0.06	-0.04	-0.02	0.00	0.03	0.05	0.06	0.07	0.10
Price.level.GDP	-0.01	0.00	0.03	0.08	0.17	0.27	0.39	0.50	0.56	0.53	0.51	0.50	0.48	0.46	0.43	0.41	0.29
Consumer.price.level	0.03	0.06	0.09	0.13	0.20	0.29	0.39	0.50	0.56	0.52	0.50	0.48	0.45	0.43	0.40	0.38	0.25
Terms of trade	-0.13	-0.20	-0.21	-0.17	-0.12	-0.07	-0.04	-0.04	-0.03	0.03	0.07	0.09	0.10	0.11	0.12	0.13	0.16
Dollar exch. rate	0.01	0.03	0.05	0.08	0.13	0.21	0.32	0.46	0.57	0.59	0.57	0.55	0.52	0.50	0.47	0.45	0.31
Euro exch.rate	0.14	0.11	0.03	-0.06	-0.13	-0.16	-0.13	-0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nom.int.rate (%p)	0.02	0.03	0.04	0.05	0.08	0.11	0.14	0.16	0.04	-0.01	-0.02	-0.02	-0.02	-0.02	-0.03	-0.03	-0.03
Real.int.rate (%p)	0.02	0.01	0.00	-0.02	-0.02	0.00	0.02	0.07	0.05	0.01	-0.01	0.00	0.00	0.00	0.00	0.00	0.00
Infl (%p)	-0.01	0.02	0.03	0.06	0.09	0.11	0.12	0.10	0.03	-0.04	-0.01	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
Gov.debt (% of GDP)	0.03	0.07	0.10	0.12	0.10	0.07	0.02	-0.05	-0.13	-0.14	-0.18	-0.23	-0.25	-0.27	-0.28	-0.28	-0.20
Gov.balance (% GDP)	-0.03	-0.05	-0.05	-0.04	-0.04	-0.04	-0.03	-0.02	0.05	0.06	0.06	0.05	0.04	0.03	0.03	0.02	0.00
Coh.funds (% GDP) net	0.00	0.00	0.00	0.00	0.04	0.06	0.10	0.14	0.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Contr.to CF (% GDP)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trade.bal.(% GDP)	0.00	0.03	0.03	0.04	0.06	0.06	0.07	0.07	0.08	0.09	0.10	0.10	0.10	0.10	0.11	0.11	0.12

Note: percentage (points) difference from baseline

Table D.9: Estonia

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020
GDP	-0.07	-0.03	0.00	0.05	0.23	0.39	0.63	0.74	0.89	0.69	0.77	0.81	0.82	0.81	0.80	0.79	0.70
Employment	-0.06	-0.06	-0.04	0.00	0.12	0.19	0.24	0.19	0.12	-0.09	-0.07	-0.03	-0.01	0.00	0.00	-0.01	-0.03
. Empl.low	-0.04	-0.02	0.05	0.19	0.41	0.57	0.64	0.56	0.37	0.07	-0.01	-0.02	-0.02	-0.02	-0.02	-0.03	-0.13
. Empl.medium	-0.06	-0.06	-0.05	-0.01	0.10	0.18	0.23	0.18	0.10	-0.10	-0.08	-0.03	-0.01	0.00	0.00	0.00	-0.03
. Empl.high	-0.05	-0.03	-0.03	-0.01	0.07	0.10	0.13	0.10	0.07	-0.10	-0.04	0.00	0.01	0.00	0.00	0.00	-0.01
Consumption	0.09	0.14	0.17	0.19	0.21	0.24	0.30	0.38	0.48	0.59	0.63	0.60	0.56	0.51	0.47	0.43	0.27
. Cons.liq.constr.	0.03	0.02	-0.01	-0.02	0.01	0.07	0.15	0.24	0.31	0.33	0.34	0.34	0.34	0.33	0.33	0.32	0.25
. Cons.non-constr.	0.09	0.15	0.18	0.21	0.22	0.25	0.30	0.39	0.49	0.60	0.64	0.62	0.57	0.52	0.47	0.43	0.28
Investment	-0.02	-0.03	-0.03	-0.02	-0.02	-0.02	0.00	0.03	0.10	0.18	0.24	0.27	0.28	0.27	0.26	0.25	0.18
Exports	-0.12	-0.15	-0.14	-0.11	-0.06	0.03	0.13	0.31	0.47	0.58	0.65	0.69	0.71	0.73	0.73	0.74	0.70
Imports	0.01	0.07	0.09	0.13	0.32	0.45	0.59	0.52	0.46	0.05	0.02	0.01	-0.01	-0.02	-0.03	-0.04	-0.06
Real.wages	0.02	0.04	0.08	0.13	0.16	0.23	0.32	0.42	0.51	0.63	0.64	0.64	0.64	0.64	0.63	0.63	0.57
. Real.wages.l	0.04	0.05	0.06	0.04	-0.01	-0.03	0.02	0.14	0.29	0.51	0.55	0.55	0.54	0.54	0.53	0.53	0.53
. Real.wages.m	0.03	0.03	0.07	0.11	0.14	0.20	0.28	0.39	0.48	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.56
. Real.wages.h	0.02	0.05	0.12	0.24	0.35	0.48	0.59	0.67	0.68	0.72	0.71	0.73	0.73	0.73	0.71	0.69	0.60
Patents	0.03	0.15	0.36	0.67	1.06	1.49	1.94	2.38	2.79	3.19	3.57	3.89	4.16	4.36	4.51	4.62	4.74
Price.level.GDP	0.00	0.06	0.14	0.25	0.39	0.44	0.40	0.21	-0.04	-0.37	-0.50	-0.57	-0.61	-0.64	-0.66	-0.67	-0.66
Consumer.price.level	-0.03	0.04	0.13	0.24	0.36	0.44	0.45	0.37	0.25	0.07	-0.01	-0.06	-0.10	-0.12	-0.15	-0.17	-0.23
Terms of trade	0.07	0.05	0.03	0.01	0.00	-0.04	-0.16	-0.35	-0.59	-0.81	-0.94	-1.01	-1.03	-1.04	-1.03	-1.02	-0.87
Dollar exch. rate	-0.13	-0.08	0.02	0.14	0.26	0.37	0.46	0.53	0.58	0.59	0.57	0.55	0.52	0.50	0.47	0.45	0.31
Euro exch.rate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nom.int.rate (%p)	0.03	0.10	0.14	0.14	0.13	0.09	0.05	0.00	-0.05	-0.10	-0.10	-0.09	-0.08	-0.07	-0.06	-0.06	-0.03
Real.int.rate (%p)	-0.01	0.03	0.04	0.00	0.03	0.09	0.19	0.23	0.29	0.10	-0.02	-0.04	-0.05	-0.05	-0.05	-0.05	-0.04
Infl (%p)	0.01	0.08	0.09	0.12	0.12	0.02	-0.10	-0.21	-0.29	-0.29	-0.09	-0.06	-0.04	-0.02	-0.02	-0.01	0.01
Gov.debt (% of GDP)	0.01	0.01	-0.01	-0.05	-0.16	-0.31	-0.47	-0.60	-0.66	-0.60	-0.51	-0.43	-0.37	-0.30	-0.22	-0.15	0.16
Gov.balance (% GDP)	-0.01	0.00	0.02	0.05	0.12	0.16	0.17	0.13	0.07	-0.07	-0.06	-0.05	-0.05	-0.06	-0.06	-0.06	-0.05
Coh.funds (% GDP) net	0.00	0.11	0.13	0.18	0.64	0.91	1.22	1.06	0.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Contr.to CF (% GDP)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trade.bal.(% GDP)	-0.06	-0.16	-0.18	-0.21	-0.35	-0.43	-0.58	-0.53	-0.54	-0.27	-0.29	-0.30	-0.29	-0.27	-0.25	-0.22	-0.11

Note: percentage (points) difference from baseline

Table D.10 Hungary

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020
GDP	0.01	0.03	0.04	0.05	0.13	0.26	0.49	0.67	0.70	0.70	0.75	0.79	0.82	0.84	0.86	0.88	0.90
Employment	0.02	0.03	0.03	0.05	0.11	0.20	0.31	0.36	0.30	0.25	0.27	0.30	0.33	0.35	0.37	0.38	0.39
. Empl.low	0.07	0.17	0.25	0.35	0.51	0.70	0.91	1.01	0.98	0.94	0.96	1.01	1.06	1.10	1.13	1.15	1.13
. Empl.medium	0.01	0.01	-0.01	-0.01	0.04	0.10	0.21	0.24	0.17	0.12	0.14	0.17	0.20	0.22	0.23	0.24	0.26
. Empl.high	0.02	0.01	-0.01	-0.01	0.03	0.07	0.15	0.16	0.09	0.04	0.07	0.09	0.10	0.10	0.11	0.12	0.12
Consumption	0.32	0.49	0.54	0.57	0.61	0.66	0.73	0.85	0.99	1.12	1.19	1.23	1.25	1.27	1.28	1.29	1.31
. Cons.liq.constr.	0.00	0.00	-0.01	-0.02	0.02	0.04	0.13	0.20	0.25	0.31	0.43	0.53	0.63	0.72	0.80	0.87	1.09
. Cons.non-constr.	0.36	0.56	0.61	0.64	0.68	0.73	0.81	0.93	1.08	1.22	1.29	1.31	1.33	1.34	1.34	1.35	1.33
Investment	-0.03	-0.08	-0.11	-0.11	-0.10	-0.08	-0.03	0.04	0.14	0.24	0.32	0.37	0.42	0.45	0.48	0.51	0.62
Exports	-0.05	-0.09	-0.09	-0.09	-0.06	-0.03	0.03	0.15	0.28	0.31	0.35	0.38	0.40	0.41	0.43	0.44	0.47
Imports	0.21	0.38	0.43	0.47	0.59	0.70	0.82	0.68	0.32	0.06	0.00	-0.01	-0.02	-0.03	-0.03	-0.03	-0.01
Real.wages	0.01	0.02	0.03	0.05	0.06	0.10	0.14	0.21	0.31	0.37	0.38	0.38	0.37	0.37	0.36	0.36	0.37
. Real.wages.l	-0.03	-0.06	-0.08	-0.09	-0.13	-0.17	-0.20	-0.18	-0.08	-0.01	0.00	-0.02	-0.03	-0.05	-0.06	-0.06	-0.03
. Real.wages.m	0.02	0.03	0.04	0.07	0.08	0.13	0.18	0.26	0.36	0.43	0.44	0.44	0.44	0.44	0.44	0.44	0.45
. Real.wages.h	0.05	0.10	0.15	0.23	0.33	0.47	0.59	0.69	0.74	0.76	0.74	0.73	0.71	0.70	0.68	0.67	0.64
Patents	0.02	0.07	0.17	0.31	0.50	0.75	1.02	1.31	1.60	1.88	2.14	2.37	2.56	2.72	2.86	2.97	3.31
Price.level.GDP	0.08	0.20	0.32	0.43	0.57	0.70	0.79	0.78	0.65	0.50	0.40	0.32	0.23	0.15	0.06	-0.02	-0.37
Consumer.price.level	0.05	0.16	0.27	0.38	0.52	0.64	0.75	0.79	0.73	0.62	0.54	0.46	0.38	0.31	0.23	0.15	-0.20
Terms of trade	0.06	0.11	0.13	0.14	0.15	0.13	0.06	-0.08	-0.23	-0.33	-0.39	-0.42	-0.43	-0.45	-0.46	-0.47	-0.47
Dollar exch. rate	-0.09	-0.03	0.07	0.18	0.31	0.46	0.62	0.78	0.87	0.88	0.83	0.77	0.70	0.63	0.56	0.49	0.15
Euro exch.rate	0.04	0.05	0.05	0.04	0.05	0.09	0.16	0.25	0.29	0.29	0.26	0.22	0.18	0.14	0.09	0.05	-0.16
Nom.int.rate (%p)	0.05	0.11	0.14	0.16	0.19	0.20	0.20	0.15	0.04	-0.04	-0.07	-0.07	-0.07	-0.07	-0.07	-0.08	-0.07
Real.int.rate (%p)	-0.08	0.00	0.03	0.02	0.05	0.08	0.17	0.25	0.19	0.07	0.02	0.02	0.01	0.01	0.01	0.00	-0.01
Infl (%p)	0.13	0.12	0.11	0.12	0.14	0.11	0.07	-0.06	-0.15	-0.14	-0.09	-0.08	-0.08	-0.08	-0.08	-0.08	-0.06
Gov.debt (% of GDP)	-0.06	-0.18	-0.26	-0.34	-0.48	-0.66	-0.92	-1.13	-1.21	-1.27	-1.36	-1.44	-1.48	-1.49	-1.47	-1.42	-0.93
Gov.balance (% GDP)	0.05	0.04	0.03	0.02	0.05	0.08	0.14	0.18	0.18	0.17	0.17	0.14	0.11	0.08	0.05	0.03	-0.06
Coh.funds (% GDP) net	0.00	0.05	0.06	0.06	0.29	0.45	0.83	0.84	0.40	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Contr.to CF (% GDP)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trade.bal.(% GDP)	-0.13	-0.24	-0.26	-0.27	-0.33	-0.40	-0.47	-0.40	-0.18	-0.05	-0.02	-0.01	-0.01	0.00	0.00	0.00	0.01

Note: percentage (points) difference from baseline

Table D.11: Lithuania

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020
GDP	0.03	0.11	0.21	0.27	0.49	0.80	1.02	1.41	1.78	1.55	1.68	1.77	1.83	1.88	1.92	1.95	2.04
Employment	0.04	0.12	0.19	0.25	0.43	0.61	0.72	0.89	0.95	0.70	0.80	0.94	1.06	1.15	1.23	1.30	1.50
. Empl.low	0.23	0.62	1.01	1.39	1.87	2.33	2.72	3.11	3.33	3.28	3.50	3.79	4.08	4.34	4.59	4.81	5.50
. Empl.medium	0.03	0.09	0.14	0.19	0.35	0.51	0.61	0.77	0.82	0.56	0.65	0.78	0.89	0.98	1.05	1.12	1.30
. Empl.high	0.01	0.05	0.06	0.06	0.17	0.26	0.28	0.42	0.44	0.13	0.24	0.36	0.42	0.45	0.48	0.51	0.58
Consumption	0.69	1.07	1.18	1.27	1.36	1.49	1.67	1.87	2.10	2.38	2.56	2.64	2.69	2.72	2.74	2.76	2.79
. Cons.liq.constr.	0.00	-0.01	-0.02	0.00	0.06	0.16	0.33	0.56	0.82	1.03	1.17	1.28	1.37	1.46	1.54	1.61	1.84
. Cons.non-constr.	0.72	1.13	1.24	1.33	1.43	1.55	1.73	1.93	2.16	2.45	2.63	2.71	2.75	2.78	2.80	2.82	2.84
Investment	-0.08	-0.17	-0.21	-0.20	-0.17	-0.10	0.00	0.14	0.30	0.51	0.70	0.83	0.92	1.00	1.07	1.13	1.40
Exports	-0.16	-0.22	-0.21	-0.15	-0.07	0.04	0.17	0.32	0.47	0.64	0.73	0.77	0.81	0.83	0.86	0.88	0.94
Imports	0.42	0.73	0.84	0.81	0.95	1.09	1.00	1.05	0.92	-0.01	-0.20	-0.22	-0.25	-0.27	-0.29	-0.31	-0.34
Real.wages	0.02	0.03	0.05	0.09	0.09	0.13	0.22	0.28	0.38	0.58	0.58	0.53	0.48	0.43	0.39	0.35	0.23
. Real.wages.l	-0.09	-0.24	-0.37	-0.48	-0.64	-0.76	-0.81	-0.87	-0.84	-0.66	-0.72	-0.86	-1.00	-1.14	-1.26	-1.37	-1.70
. Real.wages.m	0.03	0.05	0.08	0.13	0.14	0.19	0.29	0.36	0.47	0.69	0.69	0.64	0.59	0.55	0.52	0.48	0.38
. Real.wages.h	0.04	0.10	0.16	0.24	0.30	0.40	0.54	0.62	0.71	0.87	0.87	0.86	0.86	0.86	0.84	0.83	0.76
Patents	0.02	0.08	0.18	0.31	0.47	0.63	0.76	0.85	0.89	0.92	0.97	1.04	1.13	1.22	1.31	1.40	1.80
Price.level.GDP	0.08	0.22	0.32	0.39	0.48	0.49	0.39	0.26	0.01	-0.40	-0.56	-0.64	-0.71	-0.77	-0.82	-0.87	-1.06
Consumer.price.level	0.04	0.15	0.26	0.34	0.44	0.48	0.43	0.36	0.19	-0.09	-0.21	-0.27	-0.33	-0.38	-0.42	-0.46	-0.63
Terms of trade	0.12	0.17	0.16	0.12	0.07	-0.02	-0.15	-0.31	-0.53	-0.78	-0.95	-1.03	-1.08	-1.12	-1.15	-1.17	-1.23
Dollar exch. rate	-0.13	-0.08	0.02	0.14	0.26	0.37	0.46	0.53	0.58	0.59	0.57	0.55	0.52	0.50	0.47	0.45	0.31
Euro exch.rate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nom.int.rate (%p)	0.04	0.13	0.17	0.19	0.19	0.17	0.14	0.10	0.05	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
Real.int.rate (%p)	-0.11	0.01	0.10	0.10	0.14	0.25	0.25	0.30	0.46	0.22	0.07	0.04	0.04	0.03	0.02	0.02	-0.01
Infl (%p)	0.14	0.12	0.09	0.07	0.07	-0.03	-0.12	-0.16	-0.31	-0.36	-0.11	-0.07	-0.06	-0.06	-0.05	-0.05	-0.03
Gov.debt (% of GDP)	-0.07	-0.24	-0.43	-0.61	-0.87	-1.19	-1.48	-1.84	-2.16	-2.19	-2.26	-2.34	-2.40	-2.43	-2.43	-2.40	-1.92
Gov.balance (% GDP)	0.09	0.15	0.16	0.17	0.25	0.30	0.32	0.38	0.36	0.16	0.16	0.16	0.14	0.11	0.08	0.05	-0.06
Coh.funds (% GDP) net	0.00	0.09	0.20	0.17	0.60	0.89	0.94	1.37	1.49	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Contr.to CF (% GDP)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trade.bal.(% GDP)	-0.31	-0.53	-0.59	-0.56	-0.63	-0.71	-0.65	-0.69	-0.64	-0.09	-0.01	-0.02	-0.01	-0.01	0.00	0.01	0.03

Note: percentage (points) difference from baseline

Table D.12: Latvia

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020
GDP	0.03	0.12	0.20	0.33	0.67	1.23	1.64	2.33	2.59	2.51	2.64	2.69	2.72	2.72	2.72	2.71	2.60
Employment	0.03	0.08	0.10	0.16	0.31	0.47	0.51	0.60	0.49	0.39	0.53	0.66	0.76	0.83	0.88	0.93	1.02
. Empl.low	0.20	0.50	0.75	1.03	1.38	1.70	1.88	2.06	2.01	1.97	2.16	2.39	2.60	2.78	2.93	3.05	3.28
. Empl.medium	0.02	0.04	0.04	0.08	0.22	0.36	0.39	0.47	0.36	0.26	0.39	0.52	0.60	0.67	0.72	0.75	0.84
. Empl.high	0.01	0.01	-0.01	0.04	0.17	0.25	0.23	0.31	0.13	0.01	0.16	0.26	0.29	0.31	0.33	0.35	0.38
Consumption	0.99	1.55	1.71	1.84	1.99	2.21	2.53	2.89	3.28	3.62	3.79	3.85	3.86	3.86	3.84	3.81	3.61
. Cons.liq.constr.	0.02	0.05	0.11	0.20	0.40	0.65	0.96	1.39	1.73	1.96	2.12	2.24	2.35	2.43	2.51	2.56	2.64
. Cons.non-constr.	1.06	1.65	1.82	1.95	2.10	2.32	2.64	2.99	3.38	3.73	3.90	3.96	3.96	3.95	3.93	3.90	3.68
Investment	-0.15	-0.34	-0.43	-0.44	-0.37	-0.22	0.02	0.32	0.65	0.97	1.22	1.38	1.50	1.59	1.66	1.73	1.93
Exports	-0.25	-0.35	-0.34	-0.27	-0.15	0.04	0.31	0.57	0.89	1.05	1.12	1.14	1.16	1.16	1.17	1.17	1.15
Imports	0.53	0.94	1.03	1.02	1.14	1.23	0.88	0.77	0.14	-0.57	-0.63	-0.59	-0.55	-0.53	-0.50	-0.48	-0.37
Real.wages	0.05	0.11	0.18	0.28	0.39	0.58	0.87	1.09	1.36	1.55	1.54	1.49	1.44	1.38	1.32	1.27	1.07
. Real.wages.l	-0.06	-0.14	-0.17	-0.17	-0.17	-0.08	0.13	0.32	0.59	0.76	0.70	0.57	0.45	0.33	0.23	0.15	-0.09
. Real.wages.m	0.06	0.13	0.21	0.31	0.42	0.62	0.92	1.15	1.43	1.63	1.63	1.58	1.53	1.48	1.43	1.38	1.19
. Real.wages.h	0.09	0.21	0.37	0.58	0.81	1.08	1.38	1.56	1.72	1.82	1.82	1.82	1.81	1.77	1.72	1.67	1.48
Patents	0.02	0.10	0.26	0.52	0.88	1.26	1.62	1.93	2.13	2.26	2.38	2.51	2.63	2.74	2.82	2.90	3.09
Price.level.GDP	0.11	0.28	0.37	0.42	0.44	0.32	0.01	-0.31	-0.76	-1.13	-1.26	-1.30	-1.33	-1.36	-1.38	-1.39	-1.42
Consumer.price.level	0.06	0.20	0.29	0.37	0.41	0.36	0.18	-0.03	-0.34	-0.61	-0.71	-0.75	-0.78	-0.81	-0.83	-0.85	-0.92
Terms of trade	0.13	0.20	0.20	0.13	0.01	-0.20	-0.51	-0.85	-1.19	-1.46	-1.58	-1.62	-1.63	-1.63	-1.62	-1.61	-1.51
Dollar exch. rate	-0.13	-0.08	0.02	0.14	0.26	0.37	0.46	0.53	0.58	0.59	0.57	0.55	0.52	0.50	0.47	0.44	0.31
Euro exch.rate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nom.int.rate (%p)	0.04	0.13	0.19	0.21	0.22	0.20	0.16	0.11	0.04	-0.03	-0.04	-0.04	-0.05	-0.05	-0.05	-0.05	-0.06
Real.int.rate (%p)	-0.15	0.02	0.13	0.17	0.27	0.46	0.46	0.55	0.48	0.17	0.02	-0.01	-0.02	-0.03	-0.03	-0.04	-0.07
Infl (%p)	0.19	0.14	0.07	0.04	-0.02	-0.20	-0.32	-0.37	-0.45	-0.29	-0.08	-0.04	-0.03	-0.02	-0.02	-0.02	0.00
Gov.debt (% of GDP)	-0.08	-0.30	-0.52	-0.75	-1.04	-1.42	-1.75	-2.12	-2.39	-2.49	-2.58	-2.67	-2.73	-2.74	-2.71	-2.63	-1.81
Gov.balance (% GDP)	0.13	0.21	0.22	0.23	0.33	0.39	0.36	0.43	0.32	0.18	0.19	0.18	0.14	0.10	0.05	0.01	-0.14
Coh.funds (% GDP) net	0.00	0.11	0.18	0.23	0.79	1.28	1.09	1.83	1.14	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Contr.to CF (% GDP)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trade.bal.(% GDP)	-0.42	-0.71	-0.76	-0.75	-0.83	-0.90	-0.69	-0.67	-0.28	0.10	0.11	0.07	0.05	0.04	0.03	0.03	0.01

Note: percentage (points) difference from baseline

Table D.13: Malta

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020
GDP	-0.05	-0.09	-0.10	-0.09	-0.03	-0.01	0.12	0.31	0.34	0.28	0.31	0.32	0.33	0.33	0.34	0.34	0.35
Employment	-0.05	-0.09	-0.10	-0.09	-0.05	-0.03	0.07	0.17	0.14	0.05	0.06	0.08	0.09	0.10	0.11	0.12	0.15
. Empl.low	-0.05	-0.10	-0.11	-0.10	-0.06	-0.02	0.08	0.18	0.16	0.07	0.08	0.09	0.11	0.12	0.13	0.14	0.17
. Empl.medium	-0.04	-0.07	-0.07	-0.06	-0.03	-0.03	0.04	0.14	0.09	-0.01	0.01	0.04	0.05	0.06	0.07	0.08	0.10
. Empl.high	-0.03	-0.03	-0.02	-0.02	-0.01	-0.03	0.01	0.08	0.05	-0.01	0.02	0.02	0.02	0.03	0.03	0.03	0.04
Consumption	-0.07	-0.11	-0.13	-0.14	-0.12	-0.11	-0.08	-0.03	0.00	0.04	0.08	0.11	0.13	0.15	0.17	0.18	0.23
. Cons.liq.constr.	-0.08	-0.16	-0.20	-0.21	-0.17	-0.15	-0.08	-0.01	0.00	0.02	0.07	0.12	0.17	0.22	0.26	0.29	0.42
. Cons.non-constr.	-0.05	-0.07	-0.07	-0.07	-0.08	-0.08	-0.07	-0.05	0.01	0.07	0.09	0.09	0.09	0.09	0.09	0.08	0.08
Investment	-0.03	-0.05	-0.05	-0.04	-0.04	-0.03	-0.02	0.00	0.03	0.07	0.10	0.12	0.13	0.14	0.15	0.15	0.18
Exports	-0.10	-0.16	-0.16	-0.14	-0.10	-0.05	0.02	0.12	0.25	0.33	0.36	0.37	0.37	0.38	0.39	0.39	0.40
Imports	-0.11	-0.18	-0.19	-0.16	-0.07	-0.03	0.10	0.26	0.18	0.06	0.07	0.09	0.11	0.12	0.13	0.14	0.19
Real.wages	0.00	0.01	0.01	0.01	0.01	0.04	0.05	0.06	0.12	0.18	0.18	0.17	0.16	0.15	0.15	0.14	0.12
. Real.wages.l	0.01	0.01	0.01	0.02	0.01	0.04	0.04	0.04	0.11	0.17	0.18	0.17	0.16	0.15	0.15	0.14	0.12
. Real.wages.m	-0.01	-0.02	-0.02	-0.01	0.00	0.04	0.08	0.11	0.16	0.19	0.17	0.16	0.16	0.15	0.15	0.14	0.13
. Real.wages.h	-0.02	-0.02	0.00	0.02	0.03	0.06	0.11	0.19	0.26	0.29	0.29	0.28	0.27	0.25	0.24	0.22	0.19
Patents	0.00	0.01	0.04	0.07	0.09	0.11	0.12	0.13	0.16	0.23	0.30	0.38	0.44	0.49	0.52	0.55	0.62
Price.level.GDP	-0.01	-0.01	0.03	0.09	0.19	0.27	0.39	0.48	0.46	0.39	0.37	0.35	0.33	0.31	0.29	0.27	0.17
Consumer.price.level	0.05	0.08	0.11	0.15	0.22	0.29	0.38	0.49	0.53	0.50	0.48	0.46	0.44	0.42	0.40	0.37	0.25
Terms of trade	-0.11	-0.16	-0.15	-0.11	-0.06	-0.03	-0.02	-0.07	-0.16	-0.20	-0.21	-0.21	-0.21	-0.20	-0.20	-0.19	-0.15
Dollar exch. rate	0.04	0.07	0.09	0.12	0.16	0.23	0.33	0.46	0.57	0.59	0.57	0.55	0.52	0.50	0.47	0.45	0.31
Euro exch.rate	0.17	0.15	0.07	-0.02	-0.10	-0.14	-0.13	-0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nom.int.rate (%p)	0.04	0.04	0.04	0.05	0.07	0.09	0.13	0.16	0.04	-0.01	-0.02	-0.02	-0.02	-0.02	-0.03	-0.03	-0.03
Real.int.rate (%p)	0.05	0.01	-0.01	-0.04	-0.01	-0.02	0.02	0.14	0.11	0.02	-0.01	-0.01	0.00	0.00	0.00	0.00	-0.01
Infl (%p)	-0.01	0.02	0.04	0.07	0.10	0.09	0.12	0.06	-0.05	-0.06	-0.01	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
Gov.debt (% of GDP)	0.06	0.15	0.19	0.21	0.14	0.08	-0.07	-0.29	-0.37	-0.37	-0.44	-0.50	-0.54	-0.57	-0.59	-0.60	-0.49
Gov.balance (% GDP)	-0.05	-0.07	-0.06	-0.05	-0.01	-0.01	0.04	0.09	0.10	0.08	0.08	0.07	0.06	0.05	0.04	0.03	-0.01
Coh.funds (% GDP) net	0.00	0.00	0.00	0.00	0.14	0.11	0.32	0.61	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Contr.to CF (% GDP)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trade.bal.(% GDP)	-0.10	-0.13	-0.12	-0.09	-0.09	-0.04	-0.09	-0.20	-0.09	0.07	0.07	0.07	0.06	0.06	0.06	0.06	0.06

Note: percentage (points) difference from baseline

Table D.14: Poland

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020
GDP	0.00	0.00	0.02	0.01	0.20	0.29	0.63	1.04	1.38	1.41	1.51	1.57	1.61	1.64	1.67	1.69	1.67
Employment	0.00	0.01	0.01	0.05	0.23	0.28	0.52	0.75	0.77	0.58	0.61	0.68	0.74	0.78	0.81	0.83	0.78
. Empl.low	0.09	0.25	0.43	0.68	1.10	1.43	1.92	2.34	2.44	2.28	2.32	2.41	2.50	2.58	2.63	2.66	2.41
. Empl.medium	-0.01	-0.02	-0.04	-0.02	0.13	0.16	0.39	0.60	0.61	0.42	0.45	0.52	0.57	0.61	0.64	0.67	0.64
. Empl.high	0.00	-0.01	-0.03	-0.04	0.08	0.02	0.16	0.30	0.26	0.05	0.11	0.17	0.19	0.21	0.21	0.22	0.21
Consumption	0.52	0.77	0.82	0.85	0.87	0.98	1.11	1.31	1.63	1.99	2.19	2.26	2.30	2.32	2.34	2.35	2.28
. Cons.liq.constr.	0.00	-0.05	-0.12	-0.19	-0.27	-0.30	-0.30	-0.22	-0.03	0.25	0.50	0.71	0.90	1.07	1.23	1.37	1.77
. Cons.non-constr.	0.57	0.85	0.91	0.94	0.97	1.10	1.25	1.46	1.79	2.16	2.35	2.41	2.43	2.44	2.44	2.44	2.33
Investment	-0.10	-0.24	-0.35	-0.42	-0.44	-0.40	-0.29	-0.10	0.17	0.47	0.68	0.82	0.93	1.01	1.09	1.16	1.40
Exports	-0.19	-0.28	-0.30	-0.29	-0.27	-0.16	-0.07	0.09	0.35	0.54	0.59	0.61	0.63	0.64	0.66	0.67	0.68
Imports	0.69	1.05	1.18	1.27	1.54	1.34	1.44	1.28	0.59	-0.30	-0.41	-0.37	-0.35	-0.35	-0.34	-0.33	-0.22
Real.wages	0.01	0.01	0.01	0.01	-0.03	0.05	0.08	0.15	0.34	0.58	0.62	0.61	0.59	0.58	0.57	0.56	0.59
. Real.wages.l	-0.04	-0.10	-0.15	-0.23	-0.39	-0.45	-0.60	-0.70	-0.61	-0.40	-0.38	-0.42	-0.47	-0.50	-0.52	-0.53	-0.37
. Real.wages.m	0.02	0.03	0.03	0.05	0.01	0.11	0.15	0.23	0.44	0.70	0.75	0.74	0.73	0.71	0.70	0.69	0.71
. Real.wages.h	0.03	0.05	0.06	0.12	0.16	0.33	0.47	0.63	0.76	0.86	0.84	0.84	0.85	0.85	0.85	0.85	0.84
Patents	0.01	0.05	0.11	0.18	0.28	0.38	0.51	0.64	0.80	0.98	1.18	1.39	1.57	1.75	1.90	2.04	2.52
Price.level.GDP	0.12	0.34	0.56	0.81	1.15	1.35	1.60	1.73	1.56	1.17	0.94	0.75	0.57	0.38	0.20	0.02	-0.76
Consumer.price.level	0.07	0.26	0.47	0.72	1.04	1.28	1.54	1.71	1.63	1.33	1.11	0.92	0.74	0.56	0.37	0.19	-0.59
Terms of trade	0.26	0.36	0.41	0.45	0.44	0.34	0.20	-0.06	-0.42	-0.70	-0.78	-0.81	-0.83	-0.84	-0.85	-0.85	-0.80
Dollar exch. rate	-0.23	-0.14	0.04	0.27	0.56	0.91	1.26	1.63	1.90	1.94	1.78	1.61	1.43	1.26	1.09	0.91	0.09
Euro exch.rate	-0.10	-0.06	0.02	0.12	0.30	0.54	0.80	1.09	1.32	1.34	1.21	1.05	0.90	0.76	0.61	0.46	-0.22
Nom.int.rate (%p)	0.06	0.19	0.26	0.32	0.43	0.40	0.43	0.38	0.16	-0.12	-0.17	-0.17	-0.18	-0.18	-0.18	-0.19	-0.17
Real.int.rate (%p)	-0.15	-0.03	0.03	-0.02	0.19	0.15	0.24	0.45	0.52	0.16	0.01	0.01	0.01	0.01	0.00	-0.01	-0.05
Infl (%p)	0.20	0.21	0.22	0.28	0.31	0.20	0.23	0.04	-0.26	-0.37	-0.20	-0.18	-0.19	-0.19	-0.18	-0.18	-0.13
Gov.debt (% of GDP)	-0.06	-0.20	-0.32	-0.45	-0.71	-0.92	-1.31	-1.77	-2.15	-2.32	-2.52	-2.67	-2.73	-2.72	-2.64	-2.51	-1.33
Gov.balance (% GDP)	0.06	0.06	0.05	0.05	0.13	0.15	0.27	0.37	0.40	0.34	0.32	0.25	0.18	0.11	0.05	0.00	-0.18
Coh.funds (% GDP) net	0.00	0.02	0.08	0.09	0.52	0.41	0.78	1.08	0.87	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Contr.to CF (% GDP)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trade.bal.(% GDP)	-0.25	-0.39	-0.42	-0.44	-0.54	-0.46	-0.51	-0.49	-0.26	0.05	0.09	0.07	0.06	0.06	0.06	0.06	0.04

Note: percentage (points) difference from baseline

Table D.15: Slovenia

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020
GDP	0.00	-0.01	-0.01	-0.02	0.01	0.05	0.16	0.20	0.27	0.19	0.22	0.23	0.24	0.24	0.24	0.24	0.23
Employment	0.00	0.00	-0.01	-0.01	0.02	0.05	0.11	0.11	0.11	0.02	0.03	0.05	0.06	0.06	0.06	0.06	0.06
. Empl.low	-0.01	-0.03	-0.03	-0.02	0.04	0.12	0.20	0.22	0.21	0.12	0.10	0.11	0.13	0.13	0.14	0.14	0.13
. Empl.medium	0.01	0.00	0.00	-0.01	0.01	0.04	0.10	0.10	0.09	0.01	0.02	0.03	0.04	0.05	0.05	0.05	0.05
. Empl.high	0.01	0.00	0.00	-0.01	0.01	0.02	0.05	0.04	0.05	-0.02	0.00	0.02	0.02	0.02	0.02	0.02	0.02
Consumption	-0.15	-0.25	-0.28	-0.28	-0.28	-0.27	-0.24	-0.18	-0.11	-0.02	0.02	0.04	0.05	0.05	0.06	0.06	0.06
. Cons.liq.constr.	-0.03	-0.06	-0.09	-0.11	-0.13	-0.15	-0.15	-0.14	-0.09	-0.05	-0.03	-0.01	0.02	0.04	0.06	0.08	0.13
. Cons.non-constr.	-0.17	-0.28	-0.31	-0.31	-0.30	-0.29	-0.26	-0.19	-0.11	-0.02	0.03	0.05	0.05	0.06	0.06	0.06	0.04
Investment	-0.05	-0.11	-0.15	-0.18	-0.20	-0.21	-0.20	-0.16	-0.10	-0.04	0.01	0.04	0.06	0.07	0.08	0.10	0.13
Exports	0.06	0.07	0.07	0.08	0.12	0.14	0.20	0.26	0.25	0.20	0.22	0.24	0.24	0.25	0.25	0.25	0.27
Imports	-0.09	-0.16	-0.16	-0.15	-0.08	-0.01	0.04	-0.02	0.01	-0.17	-0.17	-0.15	-0.13	-0.12	-0.10	-0.09	-0.03
Real.wages	-0.01	-0.02	-0.02	-0.01	-0.01	0.00	0.02	0.05	0.07	0.12	0.12	0.11	0.11	0.11	0.11	0.10	0.10
. Real.wages.l	0.00	0.01	0.02	0.02	0.00	-0.02	-0.04	-0.03	-0.01	0.06	0.06	0.05	0.04	0.03	0.03	0.03	0.04
. Real.wages.m	-0.01	-0.02	-0.02	-0.01	-0.01	0.01	0.02	0.07	0.09	0.13	0.13	0.13	0.12	0.12	0.12	0.12	0.11
. Real.wages.h	-0.01	-0.01	-0.01	0.00	0.01	0.05	0.08	0.11	0.10	0.10	0.09	0.10	0.11	0.11	0.11	0.10	0.10
Patents	0.00	0.01	0.01	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.04	0.05	0.07	0.08	0.09	0.14
Price.level.GDP	0.03	0.07	0.12	0.19	0.30	0.40	0.49	0.51	0.48	0.37	0.33	0.30	0.28	0.26	0.24	0.21	0.11
Consumer.price.level	0.04	0.08	0.14	0.20	0.29	0.40	0.50	0.53	0.51	0.43	0.39	0.36	0.34	0.31	0.29	0.26	0.15
Terms of trade	-0.03	-0.04	-0.03	-0.02	0.00	0.00	-0.04	-0.08	-0.10	-0.13	-0.15	-0.15	-0.15	-0.14	-0.14	-0.13	-0.10
Dollar exch. rate	-0.06	-0.03	0.01	0.07	0.16	0.27	0.41	0.53	0.58	0.59	0.57	0.55	0.52	0.50	0.47	0.45	0.31
Euro exch.rate	0.07	0.05	-0.01	-0.07	-0.10	-0.10	-0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nom.int.rate (%p)	0.03	0.05	0.07	0.08	0.12	0.14	0.15	0.07	0.04	-0.01	-0.02	-0.02	-0.02	-0.02	-0.03	-0.03	-0.03
Real.int.rate (%p)	-0.01	0.00	0.01	-0.01	0.01	0.04	0.11	0.08	0.13	0.05	0.00	0.00	0.00	0.00	0.00	0.00	-0.01
Infl (%p)	0.04	0.05	0.06	0.08	0.11	0.10	0.07	-0.01	-0.06	-0.10	-0.03	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
Gov.debt (% of GDP)	0.01	0.03	0.05	0.06	0.03	-0.03	-0.12	-0.20	-0.29	-0.28	-0.30	-0.32	-0.33	-0.33	-0.32	-0.30	-0.15
Gov.balance (% GDP)	-0.02	-0.04	-0.03	-0.02	0.00	0.03	0.06	0.08	0.08	0.03	0.03	0.03	0.02	0.01	0.00	0.00	-0.02
Coh.funds (% GDP) net	0.00	0.01	0.04	0.03	0.12	0.21	0.31	0.23	0.29	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Contr.to CF (% GDP)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trade.bal.(% GDP)	0.09	0.14	0.15	0.16	0.14	0.11	0.09	0.14	0.10	0.17	0.18	0.17	0.16	0.16	0.16	0.15	0.14

Note: percentage (points) difference from baseline

Table D.16: Slovakia

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020
GDP	-0.02	-0.07	-0.05	-0.04	0.11	0.24	0.40	0.55	0.71	0.49	0.57	0.60	0.61	0.62	0.63	0.64	0.68
Employment	-0.02	-0.07	-0.07	-0.06	0.01	0.06	0.10	0.11	0.07	-0.09	-0.04	0.02	0.06	0.10	0.13	0.16	0.28
. Empl.low	-0.04	-0.12	-0.13	-0.10	0.00	0.10	0.17	0.20	0.16	0.01	0.06	0.15	0.26	0.38	0.51	0.64	1.19
. Empl.medium	-0.02	-0.07	-0.07	-0.06	0.01	0.06	0.10	0.11	0.07	-0.09	-0.05	0.01	0.05	0.08	0.11	0.14	0.25
. Empl.high	-0.01	-0.05	-0.04	-0.04	0.01	0.04	0.07	0.08	0.05	-0.10	-0.04	0.00	0.02	0.03	0.04	0.05	0.09
Consumption	-0.32	-0.51	-0.55	-0.56	-0.55	-0.52	-0.45	-0.37	-0.26	-0.14	-0.07	-0.05	-0.04	-0.03	-0.02	-0.02	0.00
. Cons.liq.constr.	-0.06	-0.11	-0.17	-0.23	-0.27	-0.32	-0.32	-0.25	-0.15	-0.04	0.00	0.03	0.05	0.08	0.10	0.12	0.21
. Cons.non-constr.	-0.34	-0.53	-0.57	-0.57	-0.57	-0.53	-0.46	-0.37	-0.27	-0.15	-0.07	-0.05	-0.04	-0.04	-0.03	-0.03	-0.01
Investment	-0.08	-0.16	-0.21	-0.24	-0.26	-0.25	-0.22	-0.16	-0.08	0.01	0.08	0.13	0.16	0.18	0.20	0.21	0.29
Exports	0.02	-0.02	-0.02	0.01	0.05	0.12	0.22	0.32	0.41	0.48	0.52	0.54	0.56	0.57	0.57	0.58	0.62
Imports	-0.39	-0.58	-0.56	-0.53	-0.37	-0.35	-0.37	-0.43	-0.52	-0.99	-1.05	-1.04	-1.03	-1.03	-1.03	-1.02	-1.01
Real.wages	0.00	0.02	0.03	0.05	0.04	0.07	0.11	0.17	0.27	0.44	0.45	0.43	0.41	0.38	0.35	0.33	0.22
. Real.wages.l	0.03	0.08	0.10	0.11	0.07	0.06	0.06	0.11	0.21	0.38	0.38	0.32	0.25	0.17	0.09	0.02	-0.30
. Real.wages.m	0.00	0.02	0.03	0.04	0.04	0.06	0.11	0.17	0.27	0.44	0.46	0.44	0.41	0.39	0.37	0.34	0.25
. Real.wages.h	-0.01	0.00	0.01	0.04	0.07	0.13	0.20	0.26	0.34	0.46	0.46	0.45	0.44	0.42	0.41	0.39	0.33
Patents	0.00	0.00	0.00	0.00	0.00	0.02	0.04	0.07	0.12	0.19	0.26	0.34	0.41	0.48	0.55	0.60	0.82
Price.level.GDP	0.03	0.07	0.14	0.22	0.32	0.37	0.38	0.32	0.19	-0.03	-0.10	-0.13	-0.16	-0.19	-0.22	-0.25	-0.40
Consumer.price.level	0.08	0.13	0.20	0.27	0.37	0.43	0.46	0.43	0.33	0.15	0.10	0.07	0.04	0.01	-0.02	-0.05	-0.19
Terms of trade	-0.16	-0.18	-0.18	-0.17	-0.18	-0.23	-0.31	-0.40	-0.48	-0.56	-0.63	-0.65	-0.66	-0.67	-0.67	-0.67	-0.68
Dollar exch. rate	0.07	0.13	0.19	0.27	0.36	0.48	0.58	0.64	0.64	0.59	0.57	0.55	0.52	0.50	0.47	0.45	0.31
Euro exch.rate	0.20	0.21	0.17	0.12	0.10	0.11	0.12	0.11	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Nom.int.rate (%p)	0.07	0.07	0.08	0.10	0.13	0.12	0.09	0.04	-0.05	-0.02	-0.02	-0.02	-0.02	-0.02	-0.03	-0.03	-0.03
Real.int.rate (%p)	0.03	0.01	0.01	0.00	0.06	0.09	0.12	0.13	0.18	0.09	0.01	0.01	0.01	0.01	0.01	0.01	0.00
Infl (%p)	0.04	0.05	0.07	0.09	0.09	0.03	-0.01	-0.08	-0.18	-0.19	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
Gov.debt (% of GDP)	0.03	0.13	0.18	0.21	0.13	0.04	-0.09	-0.22	-0.35	-0.22	-0.27	-0.35	-0.41	-0.46	-0.50	-0.53	-0.54
Gov.balance (% GDP)	-0.06	-0.10	-0.09	-0.07	-0.03	0.01	0.06	0.10	0.14	0.05	0.08	0.09	0.08	0.07	0.07	0.06	0.01
Coh.funds (% GDP) net	0.00	0.02	0.09	0.10	0.45	0.52	0.67	0.79	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Contr.to CF (% GDP)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trade.bal.(% GDP)	0.15	0.22	0.21	0.21	0.14	0.14	0.17	0.21	0.26	0.53	0.55	0.54	0.54	0.54	0.54	0.54	0.55

Note: percentage (points) difference from baseline