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International spillovers of domestic reforms:

The joint application of the Lisbon Strategy in the EU

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Abstract in English

Using the CGE model WorldScan, we assess the benefits for the EU member states of jointly reaching four of the Lisbon targets (i.e. 70% employment, skills upgrades, increased R&D expenditures and administrative burden reductions of 25%), compared with the alternative when each country unilaterally pursues these reforms. With this approach, we estimate the associated international spillovers of joint EU coordination. Spillovers associated with R&D expenditures are a key factor. When the R&D target is jointly reached in the EU, output almost doubles and consumption experiments an even greater increase. The other three targets also produce positive spillovers, but of a much lower magnitude.

Key words: International Policy Spillovers, CGE models, R&D spillovers
JEL code: F42, C68, O33

Abstract in Dutch

Wij evalueren de voordelen voor de EU-lidstaten om gezamenlijk vier Lissabon-doelstellingen te halen (de werkgelegenheidsdoelstelling van 70%, een verbetering van de vaardigheden, O&O-uitgaven tot 3% van het BBP, en een 25% vermindering van de administratieve lasten). De uitkomsten worden vergeleken met de situatie waarin de landen deze hervormingen alleen doorvoeren. We maken gebruik van het toegepaste algemeen-evenwichtsmodel WorldScan. Met deze benadering bepalen we de spillovers van gezamenlijke coördinatie in de EU. Spillovers die gerelateerd zijn aan O&O, zijn cruciaal. Als de O&O-doelstelling gezamenlijk wordt gehaald is de toename van productie twee maal zo hoog als wanneer landen deze doelstelling alleen bereiken. Het verschil in de consumptietoename is nog groter. Voor de andere drie doelstellingen zijn er ook positieve spillovers van gezamenlijk beleid, maar deze zijn veel minder groot.

Steekwoorden: Internationale beleidsspillovers, algemeen-evenwichtsmodel, O&O-spillovers

Contents

1 Introduction[1]

A stronger emphasis on job creation and economic growth is one of the main conclusions of the midterm review of the Lisbon strategy. It is one of the top priorities of the Barroso presidency of the European Commission together with more emphasis on implementation of the Lisbon Agenda through national action plans. The Sapir (2003) and Kok (2004) reports constitute important analytical building blocks underlying the mid-term review. Nevertheless, several questions remain unanswered, such as to assess the benefits of coordinating these reform policies in Europe.

There are several reasons why the member states want to act together. Countries could learn from each other, joint efforts are stimulating to carry on reforms, coordination could overcome national resistance against reforms, or joint efforts could increase the benefits from reforms. We focus in this last reason. Thus, the central question of this study is to assess the benefits for the EU member states of jointly reaching the Lisbon Agenda, compared with the alternative when each country unilaterally pursues these reforms.

Do structural reforms in products and labour markets in one member state cause an externality?[2] Do other member states benefit from reforms and higher growth in one member state? This externality is not entirely obvious. Does a member state in which factors are fully employed, benefit from higher growth elsewhere in Europe? Or, the other way around, is it possible for the smaller EU countries to grow fast when large members postpone reforms and follow a trajectory with historically low growth? These questions are central in this study.

To estimate the spillovers associated with joint action in the EU, we assume that member states reach the Lisbon targets. We focus, however, in four policy objectives: reaching the 70% employment target, several skills targets (less early school leavers, more graduates from secondary education and in mathematics, science and technology, increased reading literacy, and more lifelong learning), the 2.7% R&D expenditure target, and less administrative burdens on companies. We focus on these objectives for various reasons. First, the employment target represents the jobs pillar of the strategy. Second, on the productivity growth pillar, R&D comes to the fore, because it is an important input in innovation and it has high social returns. Third, human capital, as a factor of production directly contributes to productivity growth. Fourth, reducing administrative costs contributes to higher growth levels by increasing competition and smoothing the functioning of markets. Hence, this range of applications covers the main fields of the Lisbon strategy.

The interactions between these Lisbon policies and the rest of the economy are complex. The effects of reaching a Lisbon target can only be meaningfully considered by taking account of these interactions. Some of these interactions will reduce the initial effects of Lisbon policies,

[1] This paper is an offspring of the project International Spillovers of Domestic Reforms, carried out within the Framework Service Contract B2/ENTR/05/091 – FC of the European Commission. A summary of the results is published in EC (2007**).**

[2] This question was also recently addressed by Sapir (2007) at a recent meeting of a working group of the Economic Policy Committee on the evaluation of the Lisbon reforms.

while others will enforce the effects. Hence, it is only feasible to take all these interactions into account within a formal analytical framework in the form of an economic model: a computational general equilibrium (CGE) model for the world economy. In particular, we use WorldScan, the CGE model developed at CPB (Lejour *et al.*, 2006).

To assess the magnitude of the spillovers associated with the Lisbon policies, we compare the WorldScan simulation outcomes for the cases that all member states conduct Lisbon policies simultaneously; with respect to the outcomes when a single member state conducts these policies unilaterally. Using this approach we assess the benefits from coordination for each individual member state. We do this exercise for each of the four Lisbon policies aimed at increasing employment and productivity. In addition, we analyse the importance of the various inter-country linkages. The study identifies the channels, the magnitude and the distribution across member states of the potential spillovers.

Some economists[3] claim that labour market reforms and product market reforms are complementary. Are there spillovers between one type of policy and the impact of the other type of policy? We provide an analysis of the potential complementarities and also assess the synergies between the different policies.

The main finding of the study is that the spillovers associated with R&D expenditures are the key factor behind the joint implementation of EU policies. Not only are the spillovers associated with R&D expenditures the largest, but also R&D is the main channel from which the other three policies spill over between member states.

When the R&D target is jointly reached in the EU, output almost doubles and consumption experiments an even greater increase. The new member states (NMS) experience significant gains from increased R&D, not only because they are expected to make the biggest R&D expenditure increases, but also because they experience large spillovers of joint EU action. However, the spillover effects of R&D are also substantial in small member states (e.g. Belgium-Luxembourg, Denmark, Finland, Portugal), where the spillovers are bigger than the output gains when each country acts alone.

For the other three analysed Lisbon policies the spillovers are also positive, but of a much lower magnitude. Reaching these targets jointly in the EU, on average increases output and consumption by less then 6% according to our simulations. The results, however, vary much between member states. Usually smaller countries and NMS benefit most.

The paper is organized as follows. In Section 2 we present a short literature review on international spillovers and complementarities of domestic reforms. Section 3 explains in detail the four chosen Lisbon targets and how we assume they will be implemented and which associated costs are taken into account. We then explain how these policies are modelled in WorldScan in Section 4 and in the following section we present the economic outcomes of the simulations. Section 6 analyses the benefits for the EU of coordinated action. We conclude in Section 7.

[3] Section 2 discusses the relevant literature.

2 International spillovers and complementarities of domestic reforms

In this section, we overview the literature on international spillovers and consider the mechanism through which domestic reforms may spill over to other countries. In addition, we also survey the literature that analysis the potential complementarities between different domestic reforms.

2.1 International spillovers

The literature that studies the quantitative importance of policy spillovers between countries has mainly focused on fiscal policy and R&D spillovers. Few studies deal with the spillovers of other economic policies. However, the presence of such international spillovers is crucial to decide if coordinated economic policies between countries are necessary.

Following the work by Coe and Helpman (1995), it is well established that the spillovers in R&D are positive and significant. In their influential study they find high rates of return of R&D; both for domestic output, as well as for the international spillovers. In addition, the spillovers are positively associated with trade openness.

On the other hand, the most studied case is that of fiscal spillovers, especially within the European Monetary Union. Beetsma *et al.* (2006) find significant spillovers of fiscal policies within the EU through changes in trade. For example, if Germany increases public spending by 1% of GDP then foreign exports rise 2.2%. However, other studies find that these fiscal spillovers can be negative in some cases, particularly in the short run, see Gros and Hobza (2001) and In't Veld (2004).

Concerning other economic policies, Bayoumi *et al.* (2003) find significant spillovers to the US when market reforms are undertaken within the EU to increase competition in the internal market. In their study, the benefits to the US are provided by terms of trade gains.

International spillovers are of special relevance for the EU. Increased cross-border integration and the existence of common institutions increase both the gains and the scope for coordination of national economic policies. When international spillovers are present, the principle of subsidiarity can by applied to shift decision powers to the EU level (see Ederveen *et al.*, 2006). Thus, assessing the quantitative importance of economic policy spillovers can provide information about the need to coordinate policies within the EU.

2.2 Complementary of labour market and product market reforms

Another interesting issue is that some economists claim that labour market reforms and product market reforms are complementary. Are there spillovers between one type of policy and the impact of the other type of policy? We will provide an analysis of the potential complementarities.

Recent economic studies have found complementarities between labour market and product market reforms (PMRs). Surveying this literature, one can distinguish three main channels. First, PMRs can directly affect employment levels. Nicoletti *et al.* (2001) find that the product market regulatory environment can account for a deviation of up to 3 percentage points of the employment rate from the OECD average.

Secondly, there is evidence of synergies between both types of reform. Theoretically, the effectiveness of labour market reforms (LMRs) can be dampened by high product market regulations that constraint labour demand. Accordingly, PMRs can be limited by a regulated labour market with a low elasticity of labour supply (Berger and Danninger, 2005). The empirical evidence largely confirms these interactions. Using OECD panel data, Berger and Danninger (2005) find that low levels of regulation in the product and labour market are associated with higher employment growth. OECD countries with average regulation levels that move to low regulation levels stand to gain about 1 percentage point in annual employment growth. This sizable effect is partially due to the interaction term between both reforms. Griffith *et al.* (2007) conclude that product market deregulation by some OECD countries in the nineties is associated with increases in aggregate employment and the real wage. For countries with a higher level of collective bargaining the employment effects are more pronounced and the real wage effect less so.

Finally, there are political economy complementarities between reforms. PMRs can facilitate the implementation of LMRs. This can be achieved by increasing the effectiveness of the LMRs (as discussed above) or by reducing the opposition to these reforms. For instance, if PMRs reduce the rents associated with certain activities, then labour unions will have fewer incentives to benefit from those rents. The IMF (2004) finds strong interactions between both reforms with some evidence that PMRs lead to later LMRs, but not vice versa. Estevão (2005), for example, concludes that the overly regulated product markets in the Euro area are undermining the effects of labour market reforms. In a dynamic setting, Blanchard and Giavazzi (2003) emphasize the importance of a sequential structural reform, where PMRs are implemented before LMRs.

It is not clear that the complementarities mentioned above can easily be quantified in an applied general equilibrium model. In WorldScan, for example, the unemployment rate is exogenous. However, for each target simulation we discuss the associated spillovers and synergies in light of the existing literature. The overall analysis of the results obtained should lead to, at least tentative, policy recommendations.

3 The Lisbon Strategy: domestic reform policies in the EU

The study analyses in particular the spillovers associated with the following four Lisbon policy targets:

- Skills upgrading. Assuming that several skills targets are attained: less early school leavers, more graduates from secondary education, and from mathematics, science and technology, increased reading literacy and more lifelong learning.
- R&D targets. Reaching a 2.7% R&D expenditure share of GDP, as announced by EU member states in the 2006 Spring Council.
- A decrease in administrative burdens on companies. Assuming a 25% reduction in administrative burdens by 2012 as suggested by the European Commission in its Action Programme.
- The employment target. Supposing that EU member states reach the Lisbon 70% employment target.

The productivity policies will be a mix of three policies: increasing skills, increasing R&D expenditures and reducing the administrative burden. Reaching the employment target will be a mix of two policies: increasing labour-market participation and lowering unemployment.

The European Commission (2004) emphasises that the skills targets apply to the EU as a whole and not to individual countries. In accordance, we follow the general rule to compute country specific targets for all four simulations. We set an upper limit above the specific target and above the highest base level value (sometimes countries already in the base data exceed the specific target). We then set the target for a country proportional to the distance of the base level value of that country and the upper limit. In this way countries that are at the largest distance from the target have to make the largest effort. At the same time, because the upper limit exceeds the target, countries that have reached or exceeded the target are still assumed to make some –although generally small– effort.

To assess how each target will be reached and the main costs involved with such policies, this study follows closely on Gelauff and Lejour (2006). For the four Lisbon targets, Gelauff and Lejour have derived time paths for the Lisbon targets. We follow these time paths – with only minor changes for the employment target, as explained below. Moreover, we also apply the 'lower bound' case where the elasticity of domestic and foreign total factor productivity (TFP) to changes in R&D stock, is on 25% of the estimated elasticities.

The current study, however, has some new and distinct features. In particular, it introduces imperfect competition and uses the recently compiled trade in services data documented in van Leeuwen and Lejour (2006).

When modelling the Lisbon strategy, we do not explicitly deal with the policies required to reach the targets. Nevertheless, some simulations still capture relevant costs of achieving the

targets. The following sections analyse each target separately, and in some cases, the relevant costs involved.

3.1 Skills

As part of the Lisbon process, the Barcelona summit of 2002 endorsed common objectives for education and training in Europe. The May 2003 Council agreed on five targets (European Commission, 2004b) by 2010:

- An EU average rate of no more than 10% early school leavers should be achieved.
- At least 85% of 22 year olds in the European Union should have completed upper secondary education or higher.
- The percentage of low-achieving 15 year olds in reading literacy in the European Union should have decreased by at least 20% compared to the year 2000.
- The European Union average level of participation in lifelong learning should be at least 12.5% of the adult working age population (the age group between 25-64 years old).
- The total number of graduates in mathematics, science and technology (MS&T) in the European Union should increase by at least 15% by 2010 while at the same time the level of gender imbalance should decrease.

To compute the impact of reaching the targets on education and training, Jacobs (2005) developed a model, which incorporates various aspects of skill-formation needed to simulate the targets. The model contains stylised cohorts to compute the impact of reaching the targets in 2010, on the skill structure of the labour force in the period 2010-2040. It takes many years before the skill structure of the labour force has adjusted to the higher educated cohorts that leave formal education. The model calculates a time path of the increase of labour efficiency reaching the skill targets in 2010. This reduction in the population of working age and the progressive increase in labour efficiency is subsequently inserted in WorldScan, which computes the general equilibrium effects of these education and training policies.

To get some idea of the extra costs involved in schooling by the government we used the time inputs in Jacobs (2005). For target 2 and 5 extra time for schooling is needed. The completion of upper secondary education needs extra schooling years and the same holds for the increase for student in math and sciences, because in general these studies require an extra year of schooling compared to studies in arts. For target 4 of lifelong-learning, we assume this is mainly on the job learning so no extra costs for teaching are required. Also for decreasing illiteracy we assume that no extra education costs are required because pupils do not stay for a longer time period at school. Of course it could require extra costs due to specialized teaching, but we do not take this into account. Data are hard to come by to estimate these extra costs and we guess that we overestimate the costs for the two other targets, 2 and 5.

Table 3.1 present the relative increase in schooling years in 2010 needed to fulfil the Lisbon skills targets. Ignoring fixed costs in schooling it is possible to estimate the extra government costs for teaching and school buildings by relating the average increase in schooling years to the average costs in schooling. Because we do not have recent and accurate data on costs per student, our rough estimate is based on total government expenditures on schooling as a share of GDP.

Table 3.1 Extra schooling years and government spending

Countries	Relative increase in schooling years	Government spending in education (% of GDP)	Increase in government spending (% of GDP)
EU	2.99	5.2	0.16
Austria	0.93	5.5	0.05
Belgium	3.64	6.1	0.22
Czech Republic	0.21	4.5	0.01
Germany	1.16	4.7	0.05
Denmark	1.28	8.3	0.11
Spain	5.86	4.3	0.25
Finland	2.61	6.4	0.17
France	6.36	5.9	0.38
UK	2.84	5.4	0.15
Greece	4.83	3.9	0.19
Hungary	0.45	5.9	0.03
Ireland	5.36	4.4	0.24
Italy	2.06	4.7	0.10
The Netherlands	2.93	5.1	0.15
Poland	2.38	5.6	0.13
Portugal	8.43	5.6	0.47
Slovakia	0.97	4.3	0.04
Slovenia	1.51	6	0.09
Sweden	2.54	7.5	0.19
Rest EU 27	1.44	4.7	0.07

Sources: column (2): Jacobs (2005); column (3): Eurostat 2003 data; column (4) own estimates

On average, schooling increases from 12.3 to 12.5 years in Europe, which is about a 3% rise. Since government expenditure on schooling is 5.2% of GDP on average, then government costs increase by 0.16% of GDP if the target is reached in 2010. In time, it is expected that expenditure on schooling will decrease because the number of pupils and students will drop due to ageing. Based on the demographic patterns, we reduced the share of government spending on education in GDP. This last pattern, in turn, reduces the increase in costs associated with achieving the skills targets. Ideally we should use marginal costs on education instead of average costs. Given the existence of fixed costs in education, the numbers in table 3.1 are probably an upper bound.

3.2 Less red tape in Europe

Firms often complain about the time and costs involved to deal with administrative activities. To implement the reduction of administrative cost in WorldScan we assume that these costs largely consist of wages for workers that firms need to hire to comply with government regulations and to provide the government with information. Reducing the administrative burden implies that some of these workers can contribute directly to production. The reduction therefore takes the form of an increase in labour efficiency: fewer workers are needed, while production is not affected directly. Furthermore, we assume that the cost reduction is achieved by making the administrative process more efficient; it does not undermine government regulations.

The Netherlands is one of the very few countries, which currently has detailed information on the administrative burden of government regulations. For 2002, the administrative burden in the Netherlands is equivalent to 3.7% of GDP (of which about 40% is due to EU regulation) and is projected to fall with 25%, e.g. with 0.9% of GDP. Therefore, we use the key figures for the Netherlands as a benchmark for the other member states of the European Union. To arrive at a meaningful international comparison Kox (2005) combined the Dutch data on the total administrative burden with the Djankov *et al.* (2002) data on inter-country differences in firm-start-up costs to obtain estimates of the administrative burden per country.

In WorldScan the reduction in the administrative burden is introduced in the form of a labour efficiency shock suggesting that the burden or administrative regulation depends on sales

3.3 Research and Development

Research and Development (R&D) is a key factor for technological change, and consequently economic growth. New technologies can boost productivity and raise incomes. Amounting to 2% of GDP in 2003, public and private R&D expenditures are lagging behind in Europe compared to the United States (2.8%) and the rest of the OECD (3.1%). The EU member states proposed to raise these R&D expenditures in their national action plans from 1.9% in 2004 to 2.7% of GDP in 2010. In the WorldScan simulations we assume that the targets are reached in 2010.[4] We do not claim that this assumption is realistic. In particular, for the new member states current R&D expenditures are less than 1% percent. It is very difficult to increase these expenditure levels substantially within a few years and to attract or train sufficient researchers in such a relatively short period of time.

It is well established that investment in R&D generates international spillovers: R&D in one country has an external effect on productivity in the country itself as well as for its trading partners. Therefore, we incorporate an empirical relation between total factor productivity

[4] For some countries, these targets are reached in other years: Greece in 2015, Ireland in 2013, Poland in 2008, and the UK in 2014.

(TFP) growth and the growth of R&D stocks in WorldScan. We distinguish three types of R&D stocks: the R&D stocks of the own sector, of other sectors in the economy to reflect domestic spillovers, and of foreign sectors to reflect international spillovers. In addition, we have incorporated the R&D decision of firms in our model based on profit maximisation.

We take account of some of the policy costs of achieving the R&D target by using a national R&D subsidy to reduce the investment price for R&D. This probably underestimates the costs for two reasons. First, we assume that the subsidy is spent effectively leading to more R&D expenditure. The literature suggests this is not the case, a part of the subsidies carry a deadweight loss. Second, the subsidy is paid by a lump-sum transfer from the domestic households in WorldScan. In practice, most taxes are proportional such as the income tax, so we abstract from the excess-burden of proportional taxes.

The estimated TFP equation in WorldScan expresses the impact of a marginal increase in R&D. The 50% increase to meet the Lisbon target is not a marginal increase at all. Hence, we may doubt whether the extra R&D is as productive as current R&D. For these reasons, the elasticities of TFP to R&D stocks are calibrated such that the social rate of return on R&D equals the lower bound of the estimates in the literature (Jones and Williams, 1998).[5]

To take country differences into account, we cover proportionally the gap between current R&D spending and the country-specific target by increasing R&D expenditure between 2005 and 2010. Countries with initially less spending on R&D have to increase their R&D effort substantially, while countries with initially high R&D spending face less ambitious targets.

Since countries face different initial values and proposed targets, the overall effects of increased R&D spending can differ substantially and because of several factors. To simplify the analytical interpretation of these results, we conduct an additional exercise were R&D expenditure is increased by 20% – for all countries– with respect to the 2010 baseline values.

3.4 Employment policies

A very important goal in the 'jobs and growth' strategy is the employment target. It is set at 70% in 2010, which implies that 70% of the population between 15 and 64 aged should have at least a part-time job. The employment policies will be a mix of two policies: increasing labour-market participation and lowering unemployment. In previous work for the commission CPB has derived time paths for the targets on labour-market participation and unemployment for each member state such that in 2010 the 70% employment rate goal is met (see Gelauff and Lejour, 2006).

The difficulty in obtaining this target depends on the baseline. In 2005, the employment rate was about 64% and is expected to increase even without specific Lisbon policies because of increased participation of women and elderly at the labour market. With respect to unemployment we use a recent baseline from NiGEM (Barrell and Kirby, 2007). This baseline

[5] In the Appendix, we present the results when the upper bound elasticities of TFP to R&D are employed.

starts at 2006 with unemployment at around 7.4 percentage points, and over the first 7 years takes account of both a slow return to equilibrium output and employment from the current situation where there may be some spare capacity. Unemployment slowly trends downwards on the baseline because of the impacts of policies, such as the Hartz reforms in Germany that are currently implemented. This would still leave EU unemployment at around 6.5 percentage points in 2025. This is not sufficient to meet the employment target, labour market participation has to be increased as well.

We have simulated an employment scenario with increasing participation rates for women and elderly workers and less unemployment. The 70% employment target has to be reached on average in the EU. To derive country-specific targets, we set an upper limit for the employment rate of 75%. Each country will proportionally reduce the gap between the maximum of 75% and the 2003 rate. This implies that a country with a low employment rate, such as Poland, still faces a very ambitious target, but it will be lower than 70%. Countries that already have met the 70% target also increase employment to some extent. For the years after 2010 we assume that the unemployment rates and the age-specific labour-market participation rates per gender stay constant.

4 The WorldScan model and the international spillovers channels

The analysis will be based on the CPB WorldScan model (Lejour *et al.*, 2006). WorldScan is a multi-sector, multi-region Computational General Equilibrium (CGE) model. It is developed to study long-term global issues, such as globalisation and climate change policy. The model builds upon neoclassical theory, has strong micro-foundations and solves for the equilibrium that maximizes welfare across the entire economy, subject to technological constraints and budget constraints, among others. For this particular application, the basic version of WorldScan is extended with endogenous R&D decisions and spillovers, and with imperfect competition.

In WorldScan we deal primarily with four spillovers mechanisms: R&D, terms of trade, export demand and capital market spillovers (Lejour and Tang, 2004). When the country increases its production and exports, it is expected to observe losses in its terms of trade vis-à-vis its trading partners. However, if the export increase is simultaneously experienced by most trading partners –as is expected to occur in member states after a joint EU policy reform– then the terms of trade do not deteriorate as much as with a unilateral reform. Therefore, there is a positive spillover associated with this channel. Closely related, when a country grows it increases its export demand and this benefits its trading partners, creating positive international spillovers.

On the other hand, there is a negative spillover mechanism through the capital markets. The production shock can be transmitted to other countries through an increase in the international interest rates. However, if capital markets are relatively well integrated, then it will be easier to absorb the production shock and downplay the negative spillover associated with higher interest rates.

Finally, R&D expenditures in one country can transmit positive spillovers to other countries, in particular when both economies are close trading partners. These conclusions are based on the literature that followed the influential study by Coe and Helpman (1995), which was discussed above. The particular mechanism through which R&D spillovers are endogenously determined in WorldScan is explained in Gelauff and Lejour (2006) and Lejour *et al.* (2006).

To summarize this mechanism, for each country the growth in sectoral TFP is associated with the overall R&D stock of that country and its trading partners. The specific elasticities for each region follow econometric estimations of the relationship between these R&D stocks and TFP growth. The costs of increasing R&D expenditures are modelled with a governmental subsidy to the rates of return. However, there are reasons to believe this can be an underestimation of these costs. To compensate for this factor, we use the lower-bound estimates of these elasticities to compensate for the possibilities of higher costs. Finally, welfare changes cannot be directly obtained from WorldScan. However, private consumption is a proxy for welfare in WorldScan, since it takes into account the final expenditure possibilities of the

representative household. In the case of R&D expenditures, this is reflected in lower consumption levels due to the high subsidies that are necessary to increase R&D levels, which in the end are paid by the households.

In Table 4.1 we summarize the four spillover mechanisms present in WorldScan. When the home country is implementing a policy reform that results in a positive production shock, its private consumption (used as a proxy for welfare) directly increases. However, through the terms of trade channel there will be an indirect decrease in consumption, while the R&D mechanism provides an indirect increase (column 1). When the foreign country is passive while the home country is acting (column 2), then the foreign country experiences positive spillovers associated with terms of trade gains, an increase in export demand and R&D spillovers; but a negative impact through the capital market. Accordingly, the results for both countries acting together are given in column 3, while the type of spillovers for the home country –associated with collective action– are given in the last column.

Table 4.1 Spillover mechanisms in WorldScan, as expected private consumption changes

Spillover channel	Changes in (acting) home country	Changes in (passive) foreign country	Changes if both countries act together	Type of spillover for home country
Terms of trade	–	+	0	+
Export demand	0	+	+	+
Capital markets	0	–	–	–
R&D	+	+	++	+

The scenarios will run until 2040, but we present simulation results for the period until 2025. We run the scenarios for a maximum number of economic sectors and regions. Because most of the policies are not sector-specific, we concentrate on the national effects for all countries. Consequently, this version of the model will be rich in regional detail but less so in sectoral detail. The regions and sectors distinguished in this study are based on the GTAP6 database. The GTAP6 database contains input-output tables for 87 regions and 57 sectors and bilateral trade data connecting these input-output tables.

We distinguish 23 regions and 10 sectors (see Table 4.2). All EU countries are modelled separately, except for Belgium and Luxembourg and the region: RestEU27, which comprises the three Baltic States, Cyprus, Malta, Bulgaria and Romania. Moreover, we distinguish the United States, Rest OECD, and Rest of the World (ROW). For each region, we distinguish 10 sectors. These consist of agriculture, energy (primary energy and electricity), four manufacturing sectors (high, high-medium, low-medium and low technology) and three services sectors (transport, other commercial and other). The last sector is the R&D sector. It deviates from the other sectors in the sense that we assume that there is no international trade in R&D goods.

Table 4.2 Overview of regions, sectors and production inputs in WorldScan

Austria	Agriculture	Value added
Belgium-Luxembourg	Low-tech manufacturing	High-skilled labour
Czech Republic	Medium low-tech manufacturing	Low-skilled Labour
Germany	Medium high-tech manufacturing	Capital
Denmark	High-tech manufacturing	R&D stock
Spain	Transport services	Fixed factor
Finland	Other commercial services	
France	Other services (government)	Intermediate goods
United Kingdom	Energy	Agriculture
Greece	R&D	Low tech manufacturing
Hungary		Medium low-tech manufacturing
Ireland		Medium high-tech manufacturing
Italy		High-tech manufacturing
The Netherlands		Transport services
Poland		Other commercial services
Portugal		Other services (government)
Slovakia		Energy
Slovenia		
Sweden		
Rest EU27		
United States		
Rest OECD		
Non OECD		

4.1 Baseline

In order to evaluate the impact of the various Lisbon policies, we have developed a baseline in which these goals are not implemented. The baseline describes a time path of economic development between 2006 and the final year of our simulations, 2040. The differences between the policy variant simulation and the baseline represent the effects of implementing the Lisbon policy.

The baseline has to fulfil certain conditions. First, it has to comply with recent economic developments. The starting year of our simulations is 2001, because that is the latest year for which data are available to calibrate the model. Therefore, the time path between 2001 and 2006 has to include the accession of the new member states to the internal market. Moreover, we expect some catching up of these countries towards the old ones. Second, the baseline has to be neutral with respect to the implementation of the policy variants. If we would incorporate a large increase in skills or increase in R&D expenditures in the baseline, it would become easier to reach the Lisbon targets. This means that we aim at moderate economic growth within the EU in the baseline.

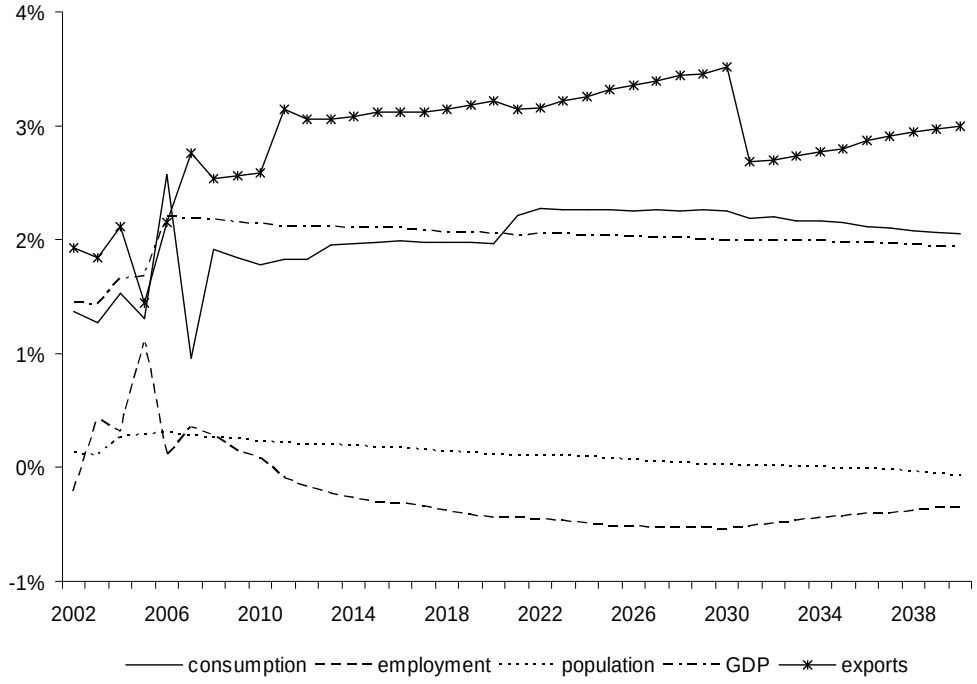
Taking in mind these considerations, our baseline is built upon one of our long-term scenarios for Europe. CPB has developed four long-term scenarios of the European economy (Lejour, 2003). As a starting point for our baseline we chose the Strong Europe scenario. In this

scenario economic growth in Europe is moderate and markets integrate further, regionally and globally. Below we describe some of the characteristics of the baseline.

4.2 Macroeconomic characteristics of baseline

Population grows slowly within the EU due to aging. Figure 1 shows that population growth declines in time from 0.35% per year to zero. In the Central and Eastern European countries population will diminish. The population projections are derived from Eurostat (2002) for the EU15 countries and the United Nations (2002) for the other member states.

Figure 4.1 Annual growth rates for the EU27, 2002-2040



Source: WorldScan simulation

GDP growth slightly decreases over time due to the decline in population growth. GDP growth per capita is more or less constant. Between 2001 and 2005 GDP growth will be targeted on the actual numbers of the World Bank (2006). From 2006 onwards we assume a constant growth of total factor productivity. This leads to a GDP per capita growth rate within the EU of about 1.9%. In most new EU member states on average growth is about 2% points higher. We expect that these countries gradually catch up to the welfare level of the older members states. In time participation rates decline, because people become older. We assume that participation of the various age cohorts remain constant in time. The increase in female labour market participation does not offset lower participation due to ageing. Therefore employment growth falls over time,

on average by 0.3% in the EU (see Figure 1). This is mainly caused by the reduction in employment in Germany, Italy, Spain and the countries in Central and Eastern Europe. These countries are most affected by population aging.

Exports grow faster than GDP. This in line with observed developments in trade, on average trade grows about twice as fast as GDP. Between 2010 and 2030, export growth is stimulated by reduced tariff and non-tariff trade barriers due to assumed successful WTO negotiations and a further integration of the internal market. After 2030 market integration is not further stimulated. Therefore exports grow less fast.

5 Simulating the Lisbon targets

In this section, we compare the simulation outcomes for the cases that all member states jointly achieve the Lisbon target, with respect to the case were a single member state conducts these policies unilaterally. With this approach we can assess the benefits from coordination for each individual member state. We do this for all four policy targets mentioned above and assess the international spillovers associated with the joint policy implementation. We present the magnitude and the distribution across member States of the potential spillovers. The following section analyses these results and the overall outcome for the EU when it jointly implements the Lisbon Strategy.

5.1 Skills target

We analyse first the increase in skills within the EU. As noted before, this includes a series of reforms that rise human capital levels in Europe. In Table 5.1 we present the effects on output, consumption and average wages of the skills target when the policies are jointly implemented compared with the case when countries act unilaterally.

The spillovers related to the joint implementation of this specific Lisbon target is the difference between column (2) and column (1) in Table 5.1. In other words, how much more GDP is obtained when all 27 member states jointly implement the Lisbon Strategy.

The impacts of the policy vary significantly between countries, especially in regard to the impacts on employment. These impacts depend on the increase in years in education, see table 3.1, and the increase in the school aged population reduces the labour force available for employment. The increase is fully absorbed by the existing labour force. We assume that young workers withdrawn from the workforce have half of normal productivity.

First, the economic effects of these policies are limited to increases of less than 1% in GDP and consumption. Only Portugal has a noticeable increase in output of 3% due to this policy. Moreover, the changes are proportional to the increase in real average wages that is associated with higher levels of human capital. Secondly, spillovers amount also to small effects. Only Ireland and Slovenia experience positive increases, while for the rest of the EU the spillover effects are negligible.

It is important to mention here the time-pattern of the policy implications. We have presented only the accumulated results between 2006 and 2025. However, for the case of the skills target, only well after 2025 is the full policy impact expected to occur. Increasing the level of human capital implies that more years of education and training will be required, and thus, there will be less working years available. In compensation for the extra training, labour will likely increase its returns later on. This dynamic of lower returns in early years and higher ones later on, implies that there will be an inter-temporal adjustment in the average returns to labour after the policy implementation. Thus, for 2015 the output changes related to the skills

targets are negative for the EU (-0.4%) and not until 2040 are the full effects of a 2.1% in GDP present.

Table 5.1 Implementing the skills target: joint and unilateral results, 2006-2025

	GDP		Consumption		Real average wages	
Acting	Together	Alone	Together	Alone	Together	Alone
Column	(1)	(2)	(3)	(4)	(5)	(6)
EU27	0.6		0.5		0.6	
Austria	0.2	0.2	0.2	0.2	0.2	0.2
Belgium-Luxembourg	0.6	0.6	0.5	0.5	0.6	0.5
Czech Republic	0.3	0.3	0.2	0.2	0.2	0.2
Germany	0.6	0.6	0.5	0.5	0.5	0.6
Denmark	0.6	0.6	0.6	0.6	0.6	0.6
Spain	0.8	0.8	0.7	0.6	0.7	0.8
Finland	0.1	0.1	0.1	0.1	0.1	0.1
France	0.4	0.4	0.3	0.3	0.4	0.4
United Kingdom	0.8	0.8	0.7	0.7	0.8	0.8
Greece	1.0	1.0	0.8	0.8	1.0	1.0
Hungary	0.4	0.4	0.3	0.3	0.4	0.4
Ireland	0.5	0.4	0.4	0.3	0.4	0.4
Italy	0.6	0.6	0.5	0.5	0.5	0.5
The Netherlands	0.3	0.3	0.3	0.3	0.3	0.3
Poland	0.6	0.6	0.5	0.5	0.5	0.5
Portugal	3.0	3.0	2.4	2.4	2.9	2.9
Slovakia	0.3	0.3	0.2	0.2	0.2	0.3
Slovenia	0.5	0.4	0.4	0.4	0.4	0.4
Sweden	0.4	0.4	0.4	0.4	0.4	0.4
Rest EU27	0.1	0.1	0.1	0.1	0.1	0.1
Average	0.6	0.6	0.5	0.5	0.6	0.6

Source: WorldScan simulations. The numbers are relative changes from the baseline simulations in the year 2025. Averages in last row are not weighted.

Hence, Table 5.2 shows the accumulated economic results for the skills target from 2006 to 2040. For this last year, the international spillover effects are on average around 0.1 p.p. while these where close to zero in 2025. This is roughly a 3% increase in output and a 6% increase in the consumption effects, which are directly associated with the spillovers of a joint EU-wide policy.

Table 5.2 Implementing the skills target: joint and unilateral results, 2006-2040

	GDP		Consumption		Real average wages	
Acting	Together	Alone	Together	Alone	Together	Alone
Column	(1)	(2)	(3)	(4)	(5)	(6)
EU27	2.1		1.9		2.1	
Austria	1.7	1.6	1.5	1.4	1.6	1.6
Belgium-Luxembourg	2.4	2.2	2.0	1.9	2.2	2.1
Czech Republic	2.2	1.9	1.9	1.7	2.0	1.7
Germany	2.5	2.5	2.4	2.3	2.4	2.4
Denmark	1.7	1.6	1.6	1.5	1.6	1.6
Spain	2.7	2.7	2.4	2.3	2.6	2.6
Finland	0.6	0.6	0.6	0.5	0.6	0.5
France	2.0	2.0	1.8	1.7	2.1	2.1
United Kingdom	1.5	1.5	1.4	1.4	1.5	1.5
Greece	3.6	3.6	3.0	2.9	3.4	3.4
Hungary	2.6	2.4	2.3	2.1	2.4	2.2
Ireland	1.8	1.7	1.7	1.6	1.8	1.8
Italy	2.4	2.4	2.2	2.1	2.2	2.2
The Netherlands	1.1	1.1	1.0	1.0	1.1	1.1
Poland	2.8	2.8	2.5	2.5	2.6	2.6
Portugal	6.4	6.3	5.4	5.3	6.0	6.0
Slovakia	1.9	1.8	1.8	1.5	1.8	1.6
Slovenia	2.2	2.1	2.0	1.9	2.1	1.9
Sweden	1.3	1.2	1.2	1.1	1.2	1.2
Rest EU27	1.9	1.9	1.7	1.6	1.8	1.8
Average	2.3	2.2	2.0	1.9	2.2	2.1

Source: WorldScan simulations. The numbers are relative changes from the baseline simulations in the year 2040. Averages in last row are not weighted.

5.2 Administrative burden target

The economic outcome of less red tape in the EU is presented in Table 5.3. The output and consumption increase by 1.9% and 1.8%, respectively, in the EU when the target is jointly achieved by all member states. Between countries there is small variance, with only Greece and Rest EU27 with gains of 3% or more. The international spillovers for this simulation are on average 0.1 p.p. For consumption the results are very similar, with spillovers of 0.2 p.p. on average. Concerted action adds about 6% (in GDP terms) to 8% (in consumption terms) to unilateral actions.

Table 5.3 Reduction in administrative burden by 25%: joint and unilateral results, 2006-2025

	GDP		Consumption	
Acting	Together	Alone	Together	Alone
Column	(1)	(2)	(3)	(4)
EU27	1.9		1.8	
Austria	2.3	2.2	2.2	2.0
Belgium-Luxembourg	1.5	1.3	1.3	1.1
Czech Republic	2.3	1.9	2.1	1.8
Germany	2.0	1.9	2.0	1.9
Denmark	1.2	1.2	1.2	1.1
Spain	2.1	2.1	1.9	1.8
Finland	1.3	1.3	1.4	1.3
France	2.0	2.0	1.9	1.8
United Kingdom	1.2	1.1	1.1	1.1
Greece	2.6	2.6	2.3	2.2
Hungary	3.2	2.9	3.0	2.8
Ireland	1.4	1.3	1.5	1.3
Italy	2.3	2.3	2.1	2.1
The Netherlands	1.9	1.8	1.8	1.7
Poland	2.5	2.5	2.3	2.2
Portugal	2.3	2.2	1.9	1.8
Slovakia	2.9	2.6	2.7	2.3
Slovenia	2.0	1.8	1.9	1.7
Sweden	1.2	1.1	1.3	1.2
Rest EU27	3.5	3.4	3.1	3.0
Average	2.1	2.0	2.0	1.8

Source: WorldScan simulations. The numbers are relative changes from the baseline simulations in the year 2025. Averages in last row are not weighted.

5.3 R&D target

Table 5.4 shows the simulation results when the expenditure share of R&D in total GDP reaches 2.7% –on average for the EU. This is the policy implementation that produces the largest spillover effects. As a whole, the EU can potentially increase output by 3.3%, while the spillovers account for roughly half of these gains. Moreover, in some of the small countries and NMS the output spillovers are even higher than the gains from unilateral action.

However, these significant spillovers are a direct consequence of the huge increase in R&D expenditures required to meet the Lisbon target. In fact, from columns 5 and 6 of Table 5.3 it is clear that for most of the countries this target is unrealistic. For example, countries like Ireland, The Netherlands and Portugal must almost double their R&D stock by 2025, while other member states may even require higher efforts (e.g. Spain, Italy, Poland and Slovakia). Greece and Rest EU27, for instance, have to triple and quadruple their R&D stocks, respectively. The reduction of the initial target from a 3% to a 2.7% of GDP has not made this task more realistic.

Even in countries with lower requirements (i.e. Germany, United Kingdom, Denmark and Finland) the effort seems to be considerable in 2025. Another reason why this target is difficult to achieve, is because the economy gradually changes towards a less R&D intensive services economy.

The high costs of subsidising the R&D target can also be observed on the changes in consumption. First, consumption increases by around half the GDP rates, implicitly reflecting the higher savings needed to finance the required investments in R&D. Secondly, the importance of the international spillovers is magnified when looking at consumption levels. When the member states act alone, consumption increases on average by less than 1 p.p., while acting together results in more than a 2 p.p. rise.

Table 5.4 Reaching a 2.7% GDP share of R&D expenditures: joint and unilateral results, 2006-2025

	GDP		Consumption		R&D stocks	
Acting	Together	Alone	Together	Alone	Together	Alone
Column	(1)	(2)	(3)	(4)	(5)	(6)
EU27	3.3		1.6		53.6	
Austria	3.5	1.9	1.5	0.1	62.4	60.4
Belgium-Luxembourg	4.1	1.9	1.6	0.0	75.1	70.5
Czech Republic	2.9	0.9	2.1	0.3	15.3	13.5
Germany	2.5	1.3	1.3	0.2	28.1	27.1
Denmark	2.2	0.9	1.0	0.0	28.4	27.0
Spain	4.1	3.1	2.2	1.2	119.0	116.7
Finland	2.3	1.1	0.8	– 0.3	42.7	39.3
France	3.1	1.8	1.2	0.1	58.6	57.4
United Kingdom	1.9	1.2	0.9	0.3	34.4	33.5
Greece	4.3	2.9	2.7	1.5	210.6	200.0
Hungary	4.2	2.2	2.6	0.7	61.7	58.9
Ireland	3.5	2.3	1.3	0.1	98.0	94.9
Italy	4.7	3.7	2.1	1.2	140.8	139.2
The Netherlands	4.2	3.2	1.9	1.0	93.9	90.7
Poland	4.6	3.8	2.7	1.9	147.7	144.9
Portugal	4.2	2.0	2.5	0.7	90.9	86.2
Slovakia	5.7	2.6	4.4	1.5	106.2	100.7
Slovenia	4.2	1.5	2.5	0.3	34.3	31.3
Sweden	2.3	1.0	0.8	– 0.4	41.3	40.1
Rest EU27	11.1	8.8	8.2	6.4	323.6	314.6
Average	4.0	2.4	2.2	0.8	90.7	87.3

Source: WorldScan simulations. The numbers are relative changes from the baseline simulations in the year 2025. Averages in last row are not weighted.

Regardless of the practical difficulties in attaining this particular Lisbon target, an increase in R&D has the greatest potential for spillover effects within the EU. To analyse the impact of an expenditure increase that is more likely to occur, in Table 5.5 we present the results of a 20% increase from the 2010 baseline levels for all countries. With this simulation we obtain an homogenous increase across countries –in contrast to the country-specific targets analysed before, and we also simulate the effects of a moderate shock, instead of the extreme situation needed to reach the 2.7% target.

Table 5.5 20% increase of R&D expenditures: joint and unilateral results, 2006-2025

	GDP		Consumption		R&D stocks	
Acting	Together	Alone	Together	Alone	Together	Alone
Column	(1)	(2)	(3)	(4)	(5)	(6)
EU27	1.4		0.6		25.0	
Austria	1.6	0.8	0.8	0.1	23.2	22.4
Belgium-Luxembourg	1.7	0.7	0.8	0.0	23.9	22.5
Czech Republic	1.1	0.2	0.9	0.1	1.8	1.0
Germany	1.6	1.1	0.6	0.2	24.9	24.5
Denmark	1.4	0.8	0.5	0.0	23.5	22.8
Spain	1.3	0.8	0.8	0.4	24.1	23.5
Finland	1.3	0.8	0.3	– 0.2	29.1	27.2
France	1.7	1.2	0.6	0.1	35.3	34.9
United Kingdom	1.0	0.7	0.4	0.2	17.0	16.6
Greece	1.2	0.7	0.8	0.4	26.6	30.0
Hungary	1.3	0.6	0.9	0.2	12.6	11.7
Ireland	1.1	0.5	0.7	0.1	13.8	12.7
Italy	1.5	1.1	0.9	0.5	31.3	30.8
The Netherlands	1.4	0.9	0.8	0.4	23.1	22.2
Poland	1.2	0.8	0.8	0.5	21.9	21.2
Portugal	1.5	0.6	1.0	0.3	21.4	20.5
Slovakia	2.4	1.6	1.8	1.0	38.7	56.0
Slovenia	1.2	0.1	0.9	0.1	1.0	– 0.1
Sweden	1.4	0.7	0.3	– 0.3	29.0	28.5
Rest EU27	2.3	1.5	1.8	1.1	30.2	30.1
Average	1.5	0.8	0.8	0.3	22.6	23.0

Source: WorldScan simulations. The numbers are relative changes from the baseline simulations in the year 2025. Averages in last row are not weighted.

As expected, the magnitude of the effects is smaller and the variation between countries is also diminished in this simulation. Output increases by 1.4% in the EU, while consumption raises 0.6%. These figures make the economic effects of the R&D target comparable in scale to those of the skills and administrative burden targets.

The R&D stocks increase now by a more realistic 25% in average, although with some country variation. For the case of the Czech Republic and Slovenia, R&D stocks barely increase

because in the baseline both countries where already experiencing significant increases in their R&D expenditures. This lower than average increase in R&D stocks was also present in the previous experiment (see Table 5.4).

However, even when the overall impact of the policy is greatly diminished, the large international spillovers associated with R&D expenditures are still present. Again, output spillovers nearly double the unilateral outcomes, and for many small and NMS countries the spillovers are even higher. Moreover, the consumption spillovers are even more important, and almost triple the results from unilateral action.

Therefore, using more realistic expenditure increases does reduce the magnitude of the overall consumption and output effects, but the spillovers associated with R&D expenditure increases remain substantial.

5.4 Employment target

Table 5.6 shows the effects on GDP and consumption of implementing the target; as well as the employment increase necessary to achieve 70% employment in each individual country.[6] For the EU as a whole, the joint implementation will represent an increase in GDP of 7.0%. For individual countries GDP changes are in a wide range (14.9% in Hungary and 0.2% in Denmark).

These changes are proportional to the required employment changes necessary to achieve the 70% target. Clearly, the countries required to make the greatest employment increases (e.g. Belgium-Luxembourg, Greece, Hungary, France, Italy and the NMS), obtain the largest GDP and consumption gains.

For much of the countries, the spillovers associated with joint action add less than 0.5 p.p. of extra GDP. Only Slovakia has output spillovers that exceed 1 p.p. On average for the EU27, the spillovers represent around a 0.3 p.p. addition of output and 0.4 p.p. of consumption. This represents roughly around a 5% output increase and a 9% consumption increase from the gains of unilateral reform.

Achieving the 70% employment target yields the highest GDP and consumption gains from any other target. However, the spillovers are modest and still, the most important channel is given by R&D stocks. By the increase in GDP caused by higher employment, R&D expenditures increase as well, and the output of these extra expenditures spill over to the other member states through trade.

[6] Note that the 70% target is an EU average. Thus, some individual countries will be above this level and others below.

Table 5.6 Reaching the 70% employment target: joint and unilateral results, 2006-2025

	GDP		Consumption		Employment	
Acting	Together	Alone	Together	Alone	Together	Alone
Column	(1)	(2)	(3)	(4)	(5)	(6)
EU27	7.0		6.4		8.5	
Austria	4.4	3.8	4.3	3.4	4.9	4.2
Belgium-Luxembourg	14.8	14.4	12.7	12.3	17.2	17.2
Czech Republic	6.8	5.9	6.1	5.3	6.1	6.1
Germany	4.4	4.2	4.3	4.1	4.9	4.9
Denmark	0.2	0.1	0.3	0.0	0.2	0.2
Spain	6.7	6.7	5.9	5.7	7.4	7.4
Finland	4.5	4.6	4.8	4.7	5.4	5.4
France	9.9	9.8	9.0	8.8	11.5	11.5
United Kingdom	3.1	3.1	3.0	2.8	3.2	3.2
Greece	11.2	11.1	9.4	9.2	11.6	11.6
Hungary	14.9	14.2	13.9	13.2	16.2	16.2
Ireland	4.7	4.3	4.7	4.3	5.2	5.2
Italy	14.2	14.2	12.7	12.6	17.3	17.3
The Netherlands	1.4	1.2	1.5	1.1	1.5	1.5
Poland	14.7	14.7	13.1	13.0	14.7	14.7
Portugal	5.3	5.0	4.4	4.1	4.9	4.9
Slovakia	10.6	9.5	9.6	8.1	10.3	10.3
Slovenia	8.6	7.9	8.0	7.3	8.4	8.4
Sweden	2.2	2.0	2.3	2.1	2.2	2.2
Rest EU27	13.2	13.1	11.3	11.1	12.1	12.1
Average	7.8	7.5	7.1	6.7	8.3	8.2

Source: WorldScan simulations. The numbers are relative changes from the baseline simulations in the year 2025. Averages in last row are not weighted.

6 The benefits of the EU acting together

In this section, we first analyse the previous results and identify the main channels through which the international spillovers are associated with the Lisbon policies. Finally, in Section 6.2 we present the simulation results when all four targets are simultaneously implemented.

6.1 Assessing the importance of the spillover channels

The first observation is that none of the Lisbon policies results in negative international spillovers within the EU. It is useful to recall the main channels through which policies spill over within the analytical CGE framework of WorldScan: terms of trade, exports, capital markets and R&D spillovers. Of these channels only the capital markets and terms of trade effects can cause negative spillovers. However, both effects are relatively small and the dominating channel is R&D expenditures.

From additional material (Lejour and Tang, 2004), we know that terms of trade effects are usually small in WorldScan. From the table in the appendix, we observe that the spillovers associated with this channel are also small and the sign of the effect is usually negative. For the first two targets: less red tape and skills, the spillovers are close to zero. For the R&D and employment targets the spillovers associated with the terms of trade channel are negative. However, the effects are still very small.

The export spillover, on the other hand, is always positive. In the appendix we present the changes in exports associated with the implementation of each Lisbon policy. For the R&D and employment target the effect is substantial and higher when the EU acts jointly.

With respect to the interest rate channel, the effects are not significant for all target simulations (see appendix). Not only are the overall interest rate effects small, but there are barely any changes when jointly implementing the Lisbon policies

Finally, the appendix reports the changes in the R&D stock related with each Lisbon policy target. As expected, for the R&D target the R&D stock is changing the most and the spillover effect is also positive. This is a result of both the high R&D expenditures needed to meet the Lisbon target and the positive spillovers directly modelled into WorldScan, i.e., that the stock level of R&D in neighbouring countries directly affects productivity in the home country.

Since the R&D channel is directly modelled into WorldScan, we can simply ‘switch off’ this specific effects. In additional simulations (not reported here), we run the Lisbon target simulations when the elasticity of the home productivity with respect to the foreign R&D stock is equal to zero. In these simulations, most of the international spillover effects are lost. This results highlight the fact that the other three spillover channels: terms of trade, exports and interest rates have relatively small overall impacts.

A first conclusion following the analysis of the spillover channels is that the R&D effect dominates the other three. This is a result of the interest rate and terms of trade spillover effect being small for most simulations. The exports channel, on the other hand may produce higher spillover effects, but in general, the positive spillovers associated with all four simulations are highly correlated to positive R&D spillover effects. This is particularly clear for the case when the R&D target is implemented, but it also applies in the remaining three policy simulations. It is important to remember, however, that the R&D targets are highly ambitious. Therefore, the large expected output increase of implementing this target is not probable to occur.

To sum up, the 70% employment target achieves the highest increase in output and consumption, but the R&D target is the main channel through which domestic reforms spillover to other economies. Thus, the coordination of R&D policies within the EU has the greatest potential for cooperation (see also Ederveen et al. 2005), but also the greatest possibility of reducing private sector saving because of the increase in government spending it induces.

6.2 Combined implementation of the four targets

The Lisbon programme is about putting a package together to raise output and employment, and the combination of the skills and employment package, R&D expenditure increases and reductions in administrative burdens will do that. In Table 6.1 we present the WorldScan results of the overall impact on GDP and consumption of reaching the four targets simultaneously by all EU27 member states, against the sum of the results of implementing the individual targets separately.

These results provide information on the synergies between the different policies. In the context of WorldScan, this accounts for the increased R&D expenditure associated with higher levels of GDP attained by reaching the other Lisbon targets. In turn, the additional R&D stocks create national and international spillover effects for the member states.

In particular, for the EU27 this particular synergy channel represents an extra 0.4 p.p. increase in output and 0.3 p.p. of consumption. While for some member states (e.g. Belgium-Luxembourg, Hungary, Italy, Poland, Slovakia and the Rest EU27) the simultaneous application of the four targets increases output by 1 p.p. or more.

Table 6.1 Reaching the four targets simultaneously and cumulative effects, 2006-2025

	GDP		Consumption	
Reaching targets:	Simultaneously	Sum of individual results	Simultaneously	Sum of individual results
Column	(1)	(2)	(3)	(4)
EU27	13.2	12.8	10.6	10.3
Austria	10.4	10.4	7.8	8.2
Belgium-Luxembourg	22.0	21.0	16.6	16.1
Czech Republic	12.6	12.3	10.7	10.5
Germany	9.7	9.5	8.3	8.1
Denmark	4.3	4.2	3.1	3.1
Spain	14.3	13.7	10.9	10.7
Finland	8.7	8.3	7.1	7.1
France	15.9	15.4	12.8	12.4
United Kingdom	7.1	7.0	5.8	5.7
Greece	20.0	19.1	15.8	15.2
Hungary	24.2	22.7	20.8	19.8
Ireland	10.4	10.1	8.1	7.9
Italy	22.8	21.8	18.1	17.4
The Netherlands	8.1	7.8	5.6	5.5
Poland	23.6	22.4	19.4	18.6
Portugal	15.4	14.8	11.7	11.2
Slovakia	20.6	19.5	17.8	16.9
Slovenia	15.7	15.3	13.1	12.8
Sweden	6.3	6.1	4.8	4.8
Rest EU27	29.9	27.9	24.2	22.7
Average	15.1	14.5	12.1	11.7

Source: WorldScan simulations. The numbers are relative changes from the baseline simulations in the year 2025. Averages in last row are not weighted.

7 Conclusions

The Lisbon strategy is an ambitious agenda to increase employment and growth in the EU. From a policy perspective, it is interesting to know if the joint implementation of these reforms produces different results if compared with the case where individual member states reform unilaterally. Put differently, are there positive international spillovers associated with the implementation of the Lisbon strategy within the EU?

Simulating four of the Lisbon policies in the CGE model WorldScan, we conclude that indeed, there are potential gains from implementing these reforms jointly across the EU. In particular, the R&D target has the greatest spillover potential, with GDP roughly doubling in the EU when the target is jointly implemented. For the other three targets analysed˜ employment, skills and administrative burden˜ the associated spillovers are less significant and only represent an additional increase in output and consumption of around 6% or less, compared to the case where the reforms are unilaterally implemented in each member state. This suggests that the existence of spillovers is not an argument of coordinating these policies in Europe.

Even in these three targets, the main channel through which spillovers are created is the increase in the R&D stock. Following the influential conclusions found by Coe and Helpman (1995), WorldScan directly links the R&D stock of neighbouring countries to increases in domestic TFP. Thus, our results are not surprising. However, the scale of the effect and its quantification provides important information. First, the R&D effect outweighs other potential spillover channels, such as terms of trade effects, capital market effects and increases in export demand. It also provides policy-makers with an estimation of the potential gains associated with a sharp increase in R&D expenditures. These estimates are based on conservative rates of return on R&D and on the assumption that these rates of return remain constant even if the targeted increase in R&D spending is substantial.

The combination of all four policies do not deliver much extra economic gains in terms of GDP and employment above the economic effects of the separate policies. However, not all possible synergies such as the supply of R&D workers (skills target) and the R&D target are modelled.

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Appendix

Upper-bound estimations for all four targets

Implementing the skills target: joint and unilateral results, upper bound simulations, 2006-2040

	GDP		Consumption		Real average wages	
Acting	Together	Alone	Together	Alone	Together	Alone
Column	(1)	(2)	(3)	(4)	(5)	(6)
EU27	2.3		2.1		2.2	
Austria	1.9	1.7	1.7	1.4	1.8	1.6
Belgium-Luxembourg	2.5	2.3	2.2	1.9	2.4	2.1
Czech Republic	2.6	2.0	2.2	1.7	2.3	1.8
Germany	2.7	2.6	2.5	2.4	2.6	2.5
Denmark	1.9	1.7	1.7	1.6	1.8	1.7
Spain	3.0	2.9	2.6	2.4	2.8	2.7
Finland	0.7	0.6	0.7	0.5	0.7	0.6
France	2.2	2.1	1.9	1.8	2.3	2.2
United Kingdom	1.6	1.6	1.5	1.4	1.6	1.5
Greece	3.8	3.7	3.2	3.1	3.6	3.5
Hungary	2.9	2.5	2.5	2.2	2.6	2.3
Ireland	2.0	1.7	1.9	1.6	2.0	1.8
Italy	2.6	2.5	2.3	2.2	2.4	2.3
The Netherlands	1.3	1.1	1.2	1.0	1.2	1.1
Poland	3.0	2.9	2.7	2.6	2.8	2.7
Portugal	6.9	6.6	5.7	5.5	6.5	6.2
Slovakia	2.2	1.8	2.1	1.6	2.1	1.7
Slovenia	2.5	2.1	2.3	1.9	2.3	2.0
Sweden	1.4	1.2	1.4	1.2	1.3	1.2
Rest EU27	2.2	2.0	1.9	1.7	2.0	1.9
Average	2.5	2.3	2.2	2.0	2.4	2.2

Source: WorldScan simulations. The numbers are relative changes from the baseline simulations in the year 2040. We use the upper bound full TFP elasticities with respect to R&D stocks. Averages in last row are not weighted.

Reduction in administrative burden by 25%: joint and unilateral results, upper bound simulations, 2006-2025

	GDP		Consumption	
Acting	Together	Alone	Together	Alone
Column	(1)	(2)	(3)	(4)
EU27	2.1		2.0	
Austria	2.6	2.3	2.4	2.1
Belgium-Luxembourg	1.7	1.3	1.5	1.2
Czech Republic	2.8	2.0	2.5	1.9
Germany	2.2	2.0	2.2	2.0
Denmark	1.4	1.2	1.4	1.2
Spain	1.5	1.4	1.6	1.4
Finland	2.2	2.1	2.1	1.9
France	1.3	1.2	1.2	1.1
United Kingdom	2.8	2.7	2.5	2.3
Greece	3.7	3.1	3.4	2.9
Hungary	1.7	1.3	1.7	1.4
Ireland	2.5	2.4	2.3	2.2
Italy	2.1	1.9	1.9	1.7
The Netherlands	2.8	2.6	2.6	2.4
Poland	2.6	2.3	2.2	1.9
Portugal	3.5	2.7	3.2	2.4
Slovakia	2.4	1.8	2.3	1.8
Slovenia	2.4	2.2	2.1	2.0
Sweden	1.4	1.2	1.4	1.2
Rest EU27	4.0	3.8	3.5	3.3
Average	2.4	2.1	2.2	1.9

Source: WorldScan simulations. The numbers are relative changes from the baseline simulations in the year 2040. We use the upper bound full TFP elasticities with respect to R&D stocks. Averages in last row are not weighted.

Reaching a 2.7% GDP share of R&D expenditures: joint and unilateral results, upper bound simulations, 2006-2025

	GDP		Consumption		R&D stocks	
Acting	Together	Alone	Together	Alone	Together	Alone
Column	(1)	(2)	(3)	(4)	(5)	(6)
EU27	11.0		8.3		60.1	
Austria	11.1	4.3	8.1	2.2	70.5	64.0
Belgium-Luxembourg	12.8	3.7	8.3	1.5	86.7	73.9
Czech Republic	15.8	2.0	12.8	1.4	18.8	14.4
Germany	8.2	2.9	6.7	1.7	31.8	28.1
Denmark	7.1	2.1	5.4	1.0	30.6	26.6
Spain	13.7	9.1	10.1	6.2	130.3	123.6
Finland	6.7	2.3	4.8	0.8	38.9	37.7
France	9.8	4.8	7.3	2.9	64.4	60.2
United Kingdom	6.0	3.0	4.5	1.8	39.1	36.3
Greece	19.3	13.4	15.1	10.1	260.6	245.0
Hungary	18.9	6.6	14.8	4.6	71.8	64.6
Ireland	13.4	6.1	9.7	3.6	109.0	100.8
Italy	14.5	10.0	10.4	6.5	154.6	148.6
The Netherlands	11.1	5.8	8.1	3.4	104.6	94.9
Poland	17.8	4.4	13.9	3.0	162.4	45.9
Portugal	15.2	7.2	11.3	4.9	104.5	96.7
Slovakia	33.8	20.1	26.6	15.1	364.3	337.1
Slovenia	16.4	3.5	13.0	2.3	40.8	34.0
Sweden	7.5	2.3	5.5	0.8	47.0	43.0
Rest EU27	47.8	38.1	38.8	30.7	387.4	379.7
Average	15.3	7.6	11.8	5.2	115.9	102.7

Source: WorldScan simulations. The numbers are relative changes from the baseline simulations in the year 2040. We use the upper bound full TFP elasticities with respect to R&D stocks. Averages in last row are not weighted.

Reaching the 70% employment target: joint and unilateral results, upper bound simulations, 2006-2025

	GDP		Consumption		Employment	
Acting	Together	Alone	Together	Alone	Together	Alone
Column	(1)	(2)	(3)	(4)	(5)	(6)
EU27	8.1		7.4		9.8	
Austria	4.4	3.8	4.1	3.5	4.2	4.2
Belgium-Luxembourg	15.0	14.3	12.9	12.2	17.2	17.2
Czech Republic	9.2	7.2	8.2	6.5	7.5	7.5
Germany	5.9	5.5	5.8	5.3	6.2	6.2
Denmark	0.1	– 0.2	0.2	– 0.2	– 0.2	– 0.2
Spain	9.3	9.1	8.1	7.7	9.8	9.8
Finland	6.0	5.9	6.2	5.9	6.6	6.6
France	10.5	10.1	9.5	9.1	11.7	11.7
United Kingdom	2.6	2.5	2.5	2.3	2.6	2.6
Greece	13.5	13.3	11.4	11.1	13.6	13.6
Hungary	14.2	12.7	13.1	11.8	14.5	14.5
Ireland	5.0	4.4	5.0	4.4	5.3	5.3
Italy	15.9	15.8	14.3	14.0	18.8	18.8
The Netherlands	2.3	1.8	2.3	1.7	2.2	2.2
Poland	23.3	23.1	20.7	20.4	22.2	22.0
Portugal	4.6	3.9	3.9	3.2	3.8	3.8
Slovakia	18.2	15.9	16.2	13.6	16.8	16.8
Slovenia	9.8	8.3	9.1	7.8	8.7	8.7
Sweden	1.7	1.4	1.8	1.4	1.5	1.5
Rest EU27	16.5	16.1	14.1	13.6	14.5	14.5
Average	9.4	8.7	8.5	7.8	9.4	9.4

Source: WorldScan simulations. The numbers are relative changes from the baseline simulations in the year 2040. We use the upper bound full TFP elasticities with respect to R&D stocks. Averages in last row are not weighted.

Analysing the main spillover channels

Terms of trade changes for each Lisbon target: joint and unilateral results, 2006-2025

Target	Skills		Administrative burden		R&D		Employment	
Acting	Together	Alone	Together	Alone	Together	Alone	Together	Alone
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
EU27	0.0		0.0		– 0.4		– 0.2	
Austria	0.0	0.0	– 0.1	– 0.1	– 0.5	– 0.6	– 0.1	– 0.1
Belgium-Luxembourg	0.0	0.0	0.0	0.0	– 0.6	– 0.6	– 0.4	– 0.4
Czech Republic	0.0	0.0	– 0.1	– 0.1	– 0.5	– 0.1	– 0.2	– 0.2
Germany	0.0	0.0	0.0	– 0.1	– 0.4	– 0.3	– 0.1	– 0.1
Denmark	0.0	0.0	0.0	0.0	– 0.1	– 0.2	0.1	0.0
Spain	0.0	0.0	– 0.1	– 0.1	– 0.4	– 0.5	– 0.2	– 0.3
Finland	0.0	0.0	0.0	0.0	– 0.5	– 0.6	0.0	0.0
France	0.0	0.0	– 0.1	– 0.1	– 0.4	– 0.4	– 0.3	– 0.3
United Kingdom	0.0	0.0	0.0	0.0	– 0.3	– 0.4	0.0	– 0.1
Greece	– 0.1	– 0.1	– 0.1	– 0.1	0.2	– 0.1	– 0.5	– 0.6
Hungary	0.0	0.0	– 0.1	– 0.1	– 0.4	– 0.3	– 0.3	– 0.3
Ireland	0.0	0.0	0.0	0.0	– 0.6	– 0.4	0.0	0.0
Italy	0.0	0.0	– 0.1	– 0.1	– 0.6	– 0.7	– 0.5	– 0.5
The Netherlands	0.0	0.0	0.0	0.0	– 0.6	– 0.8	0.2	0.0
Poland	0.0	0.0	– 0.1	– 0.1	– 0.4	– 0.7	– 0.8	– 0.8
Portugal	– 0.1	– 0.1	– 0.1	– 0.1	0.2	– 0.2	– 0.1	– 0.1
Slovakia	0.0	0.0	0.0	– 0.1	0.3	– 0.3	0.1	– 0.4
Slovenia	0.0	0.0	0.0	0.0	– 0.5	– 0.3	– 0.2	– 0.1
Sweden	0.0	0.0	0.0	0.0	– 0.3	– 0.4	0.0	0.0
Rest EU27	0.0	0.0	– 0.1	– 0.1	– 0.3	– 0.5	– 0.5	– 0.5
Average	0.0	0.0	– 0.1	– 0.1	– 0.3	– 0.4	– 0.2	– 0.2

Source: WorldScan simulations. The numbers are relative changes from the baseline simulations in the year 2040. Averages in last row are not weighted.

Export changes for each Lisbon target: joint and unilateral results, 2006-2025

Target	Skills		Administrative burden		R&D		Employment	
Acting	Together	Alone	Together	Alone	Together	Alone	Together	Alone
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
EU27	0.5		1.6		5.6		6.6	
Austria	0.3	0.3	2.1	1.7	7.2	5.9	4.2	3.0
Belgium-Luxembourg	0.6	0.5	1.5	1.0	7.8	5.6	13.9	12.6
Czech Republic	0.3	0.2	2.3	1.3	3.1	1.5	7.2	3.9
Germany	0.5	0.5	1.6	1.2	4.4	3.3	4.2	2.7
Denmark	0.5	0.4	1.0	0.7	2.8	1.8	0.7	0.1
Spain	0.9	0.8	1.9	1.5	6.4	5.0	6.6	5.4
Finland	0.1	0.1	1.1	0.7	9.0	7.0	3.1	2.3
France	0.4	0.4	1.7	1.4	5.2	3.5	8.5	7.1
United Kingdom	0.6	0.6	1.0	0.7	4.5	3.8	3.2	2.1
Greece	0.9	0.9	2.1	1.8	1.9	0.0	9.2	8.0
Hungary	0.4	0.3	2.9	2.1	5.9	4.4	12.8	10.0
Ireland	0.3	0.1	1.2	0.6	6.9	5.8	4.5	2.8
Italy	0.6	0.5	1.9	1.6	6.7	5.2	11.9	10.8
The Netherlands	0.3	0.3	1.4	1.2	7.7	6.8	1.8	0.9
Poland	0.6	0.6	2.4	1.9	6.2	5.8	13.6	11.8
Portugal	2.6	2.4	2.1	1.6	5.3	1.6	5.6	3.9
Slovakia	0.3	0.2	2.4	1.7	5.5	2.5	9.0	6.4
Slovenia	0.4	0.3	1.9	1.1	6.1	3.2	8.1	5.1
Sweden	0.3	0.2	1.0	0.7	5.1	3.4	2.2	1.3
Rest EU27	0.1	0.1	2.5	2.1	9.1	4.4	9.6	8.2
Average	0.6	0.5	1.8	1.3	5.8	4.0	7.0	5.4

Source: WorldScan simulations. The numbers are relative changes from the baseline simulations in the year 2040. Averages in last row are not weighted.

Real interest rates changes for each Lisbon target: joint and unilateral results, 2006-2025

Target	Skills		Administrative burden		R&D		Employment	
Acting	Together	Alone	Together	Alone	Together	Alone	Together	Alone
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
EU27	0.0		0.1		0.1		0.2	
Austria	0.0	0.0	0.1	0.1	0.1	0.1	0.2	0.1
Belgium-Luxembourg	0.0	0.0	0.0	0.0	0.1	0.0	0.3	0.3
Czech Republic	0.0	0.0	0.1	0.1	0.1	0.0	0.2	0.2
Germany	0.0	0.0	0.1	0.1	0.1	0.0	0.2	0.1
Denmark	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Spain	0.0	0.0	0.1	0.0	0.1	0.0	0.2	0.2
Finland	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.1
France	0.0	0.0	0.1	0.1	0.1	0.1	0.3	0.3
United Kingdom	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
Greece	0.0	0.0	0.1	0.0	0.1	0.1	0.3	0.2
Hungary	0.0	0.0	0.1	0.1	0.2	0.1	0.5	0.4
Ireland	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
Italy	0.0	0.0	0.1	0.1	0.2	0.1	0.5	0.4
The Netherlands	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.0
Poland	0.1	0.1	0.1	0.1	0.2	0.2	0.5	0.5
Portugal	0.1	0.1	0.0	0.0	0.1	0.0	0.1	0.1
Slovakia	0.0	0.0	0.1	0.1	0.2	0.1	0.3	0.3
Slovenia	0.0	0.0	0.0	0.0	0.1	0.0	0.2	0.2
Sweden	0.0	0.0	0.0	0.0	0.2	0.1	0.1	0.0
Rest EU27	0.0	0.0	0.1	0.1	0.5	0.4	0.6	0.5
Average	0.0	0.0	0.1	0.0	0.2	0.1	0.2	0.2

Source: WorldScan simulations. The numbers are relative changes from the baseline simulations in the year 2025. Averages in last row are not weighted.

Table 7.1 Changes in the R&D stock for each Lisbon target: joint and unilateral results, 2006-2025

Target	Skills		Administrative burden		R&D		Employment	
Acting	Together	Alone	Together	Alone	Together	Alone	Together	Alone
Column	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
EU27	0.6		1.7		53.6		3.2	
Austria	0.3	0.3	2.2	2.1	62.4	60.4	1.9	1.6
Belgium-Luxembourg	0.6	0.5	1.5	1.0	75.1	70.5	5.7	3.5
Czech Republic	0.2	0.2	2.1	1.6	15.3	13.5	3.6	2.0
Germany	0.5	0.6	1.7	1.6	28.1	27.1	1.9	1.3
Denmark	0.6	0.6	1.1	1.1	28.4	27.0	0.0	0.1
Spain	1.1	1.2	2.3	2.4	119.0	116.7	4.8	4.8
Finland	0.2	0.1	1.1	0.8	42.7	39.3	– 0.3	– 1.3
France	0.6	0.7	2.3	2.5	58.6	57.4	6.6	6.6
United Kingdom	0.7	0.7	1.0	1.0	34.4	33.5	1.6	1.5
Greece	1.1	1.3	2.4	2.9	210.6	200.0	7.4	9.1
Hungary	0.3	0.3	2.9	2.4	61.7	58.9	5.9	4.3
Ireland	0.2	0.0	1.1	0.7	98.0	94.9	2.2	0.7
Italy	0.8	0.9	2.7	2.9	140.8	139.2	9.7	9.8
The Netherlands	0.2	0.3	1.7	1.7	93.9	90.7	0.7	0.4
Poland	0.6	0.6	2.5	2.5	147.7	144.9	8.2	7.8
Portugal	3.2	3.4	2.1	2.3	90.9	86.2	3.2	3.7
Slovakia	0.2	0.3	2.3	2.5	106.2	100.7	3.5	4.5
Slovenia	0.3	0.3	1.8	1.4	34.3	31.3	4.4	2.6
Sweden	0.3	0.3	0.7	0.8	41.3	40.1	0.3	0.3
Rest EU27	0.1	0.2	3.2	3.6	323.6	314.6	7.2	8.2
Average	0.6	0.6	1.9	1.9	90.7	87.3	3.9	3.6

Source: WorldScan simulations. The numbers are relative changes from the baseline simulations in the year 2025. Averages in last row are not weighted.