Project logo: TAXBEN

Project no. SCS8-CT-2004-502639

Project acronym TAXBEN

Project title: Tax/benefit systems and growth potential of the EU

Instrument: Specific Targeted Research Project

Thematic Priority: SSP Priority 8 Topic 3.1 Task 4

Deliverable reference number and title 27

Final Report

Due date of deliverable: Month 26
Actual submission date: Month 26

Start date of project: 1.12.2004   Duration: 26 months

Organisation name of lead contractor for this deliverable: ETLA

Revision [1]

TAXBEN −

Tax/benefit Policies and Growth Potential of the EU

Final Report

31.1.2007

Project No. SCS8-CT-2004-502639

Instrument: Specific Targeted Research Project

Thematic Priority: SSP Priority 8 Topic 3.1 Task 4

Start date of project: 1.12.2004, Duration: 24 + 2 months

Contents

ABSTRACT

The EU has ambitious goals in terms of economic performance. The goals are to be reached in combination with social cohesion and sustainable development in terms of environment. The key economic policy instruments to be used by the EU member states are comprised of taxes and benefits. The economic and political framework for carrying out measures in this field is currently delineated, both encouraged and constrained by factors such as ageing, globalisation and more intense international system competition in tax and social policies.

The aim of the project *Tax/benefit systems and potential growth of the EU − TAXBEN* (SCS8-CT-2004-502639), as outlined in SSP Priority 8 Topic 3.1. Task 4, has been to carry out an in-depth analysis of tax/benefit policies in five broad themes, where these policies play a crucial role in terms of the key EU goals: Employment; Corporate taxes under tax competition; Productivity growth and convergence; Macroeconomic policies under a single monetary policy; and Environment and climate change. The project was carried out by seven European economic policy research institutes within the ENEPRI (European Network of Economic Policy Research Institutes) network.

The project team has used many novel approaches, especially in building new tools that rely on the approach of general equilibrium models so that both the direct and indirect effects of taxation can be analysed. Also new applications of existing large-scale multi-country models were carried out to evaluate the impact of tax policies. In addition, recourse was taken to econometric estimation of the relationships between key economic target variables, on the one hand, and tax/benefit and other fiscal policies and other labour market indicators, on the other, using large international data sets. A number of theoretical approaches on economic policies under the single currency were carried out, too. The analysis covered the EU-15 countries, the New Member States, in some cases other OECD countries as well, and some research efforts made had a global approach to policy making.

Altogether, the project's output was 24 working papers in the five Work packages, and five seminars held, in addition to the Final Conference. The project delivered, on the one hand, a large number of research insights on actual behaviour related to tax/benefit systems and, on the other hand, reached conclusions which should be taken into account while considering policy-making in, and reforms related to, tax/benefit policies in the EU.

The project's web site at www.taxben.org provides detailed information on the whole output and events arranged within the project. Contact person: Kari.Alho@etla.fi.

1   EXECUTIVE SUMMARY

1.1   Objectives of the project

The overarching objective of the 26-month project *Tax/benefit systems and growth potential of the EU – TAXBEN* (SCS8-CT-2004-502639), financed by the European Commission under Framework 6 of Research, has been to contribute, in line with the issues specified in SSP Priority 8 Topic 3.1. Task 4, to a better knowledge of the functioning and need for reform of the tax/benefit systems in the EU and thereby contribute to the Lisbon process. The project tackled the current problems related to the slow potential growth of the EU and the role of the tax/benefit systems in this process.

The ultimate goal of the project was to provide policy options to improve the potential growth of the EU and attainment of a high level of employment, taking into account the challenges from enlargement and the environmental aspirations adopted in the EU. The extensive use of numerical general equilibrium models and econometric estimations permitted the evaluation of the impact of the existing different tax/benefits systems and yielded knowledge on policy options that have been primarily quantitative and to some extent theoretical which should be useful and in actual policy-making with different political constraints.

The project had the aim to analyse and to contribute to five areas relevant to the tax/benefit systems:

1) The link between tax/benefit systems and employment in the EU,
2) The EU tax systems under tax competition and enlargement,
3) The growth potential of the EU and its relation to the tax/benefit systems,
4) The macroeconomic role of tax systems in promoting reforms in tax systems in the EU under the single monetary policy,
5) Attainment of sustainable growth in the EU with a high quality of the environment and the role of green taxes and emission trading in the energy sector.

1.2   Organisation of the project

The project was organised along this division of objectives into five Work packages (WP). The sixth WP consisted of project management, organising the final conference and drafting this final report.

The project consortium consisted of the Centre for European Policy Studies (CEPS), Belgium, as the coordinator; The Research Institute of the Finnish Economy (ETLA), Finland, as the scientific coordinator; Centre d'Etudes Prospectives et d'Information Internationales (CEPII), France; Centre d'Etudes Prospectives d'Economie Mathématique (CEPREMAP), France; Netherlands Bureau for Economic Policy Analysis (CPB), The Netherlands; PRAXIS Center for Policy Studies, Estonia; and Zentrum für Europäische Wirtschaftsforschung (ZEW), Germany.

1.3   Research output of the project

The original plan of the project was to produce 16 working papers and to organise five seminars and a Final conference. During the work, the research effort widened so that altogether 24 work-

ing papers were produced and the planned five seminars on the different WPs were held and the Final conference arranged. In addition, the project team had three workshops on the whole project. All the material has been submitted to Commission representatives.

The deliverables have been uploaded on the web site of the project (www.taxben.org), organised and managed by CEPS. Also the seminar material has been available through this medium. Each partner institute has also disseminated information on their work through their own national networks and websites.

1.4   Concise summary of the scientific contributions

The project achieved its goals using relevant existing and building new tools of quantitative economic analysis. Hereby the project – although its main target was to address important policy issues – also made contributions on the scientific arena as well. In general, quantitative analysis of taxation can yield important insights as to the forming of policies. Computable General Equilibrium (CGE) models proved to be useful tools of policy analysis, when considered as such and when complemented with econometric evidence.

In **Work package 1** on employment two CGE models were built along basically a similar approach for an EU-15 country (Finland) and a NMS country (Estonia). This allowed for a similar kind of comparison of effectiveness of tax/benefit policies, based on evaluating the role of labour market institutions in terms of wage formation and their interaction with policies. A novel model based on search theory and linking to it endogenous productivity, provided by on-the-job training, allowed for an analysis of effectiveness and welfare of the French labour market policies and their comparison to those in the UK.

In **Work package 2** on tax competition and corporate taxation a methodological contribution was made by investigating, for the first time with an applied general equilibrium model, tax base consolidation with formula apportionment in the European Union.

A scientific contribution was also made by building a multi-country tax model, which goes in some directions one step further than earlier in the literature in that notably the savings decision is derived from dynamic utility maximisation. Not only does this do justice to the inherently dynamic nature of saving, but it also enriches the welfare analysis.

The project also carried out a new econometric evaluation of intra-EU FDI, focusing on the comparison between old and new member states of the EU.

In **Work package 3** on EU convergence and productivity growth an econometric evaluation of the tax/benefit system and its effect on EU convergence in terms of GDP per capita was carried out. The originality of the approach was to decompose GDP per capita into productivity and the labour market factors.

The search model built in WP 3 on R&D activity and labour market structure is a novel theoretical tool. The VAR modelling with elaboration of taxes is an extension of the literature analysing the relationship between productivity and employment.

In **Work package 4** on macroeconomics of the tax systems under EMU, a novel theoretical modelling was carried out of the tax policy under the single currency, and of considering the

structural reforms in the EU. Also the extensive econometric evidence produced on the spillovers of fiscal policy under EMU is a novel contribution.

In **Work package 5** on tax systems and climate policy designs, it proved useful to combine in a unique way various types of modelling approaches to tackle the long horizon of policies needed in the analysis up to 100 years, and to be able simultaneously to produce the sectoral breakdown of the optimal policies.

1.5 Summary of key policy findings

The orientation of the project was, in accordance with the research task specified in the concerned SSP priority, to produce policy-relevant research relevant at the EU level and the level of the member countries. The following key results on policy conclusions were found out. These are elaborated in more detail in respective parts of Section 3 below.

WP 1 (Employment)

1. The computable general equilibrium models built in the project imply that wage formation is essential in determining the outcome of the tax/benefit policies and their overall effectiveness. The apparent effectiveness of certain policies reached under fixed wages may be quite misleading, because the ensuing reaction of wages may neutralise much of the positive policy effects. However, there are also policy measures whose positive effects are strengthened by the reaction of wage formation. The former include measures affecting labour demand, like reducing the indirect labour costs of firms. The effects of such measures, which reduce wage claims, like benefit reductions, are, however, magnified under bargaining, while with fixed wages their positive effects are only marginal.

2. Wage-wage competition between the trade unions may make under decentralised bargaining futile the efforts to lower non-wage labour costs of the low-skilled workers. However, under nation-wide incomes policy this policy restores its effectiveness.

3. CGE model analysis of different wage formations for the Estonian and Finnish economies (market determined wages and bargained wages, respectively) implies that there is a need for different labour market and tax/benefit policies in different EU member states. Comparing the policy scenarios for Estonia implies that market determined wages outperform bargained wages, the latter representing more EU-like wage formation, so that the NMS should not be recommended to adopt EU-15 institutions in their labour markets.

4. The labour supply of low-skilled in the NMS is for all cases of wage formation most effectively increased by lowering the marginal income tax rate. Combining this in turn with strategies improving employment in general, e.g. lowering employers' social security contributions, could potentially improve the labour market position of those with lower skills.

5. Statistical analysis reveals that the quantitative impact of tax/benefit systems on employment in the new member states is more vigorous than in the EU-15.

6. The French system of minimum wage and payroll tax reductions for the low-wage earners is near the social welfare optimum, if endogenous productivity related to on-the-job training is taken into account.

7. The UK unemployment benefit system with a fixed benefit is preferable in terms of the employment to the French and continental one, with benefits linked to past income.

WP 2 (Tax competition and corporate taxes)

8. CGE model analysis reveals that even a unilateral reduction of the corporate income tax rate is not beneficial for all the EU countries if they have to finance the tax reduction by an increase in the tax rates on labour or consumption. The reduction in the corporate tax rate attracts foreign direct investment and foreign profits. However, the increase in the taxes on labour or consumption dampens the impact on employment, GDP and welfare, and might even offset it.

9. Econometric analysis of FDI gives the outcome that social competition has a more powerful effect on FDI than tax competition. This conclusion is based on the observation that FDI depends more on differences in employment protection and union bargaining coverage than on differences in statutory or effective corporate tax rates.

10. The largest gains from consolidating the corporate income tax base (CCTB) might be expected if all enterprises, both domestic and multinational, are treated equally. Proposals for consolidation which exclude part of the firms, like domestic firms, introduces uneven competition. This might induce a large restructuring both within and between EU member states.

11. CGE model analysis implies that the full benefits from tax base consolidation can only be reaped if all firms participate and apply to a common tax base. If domestic firms are excluded, the EU-average gains in terms of GDP and welfare from CCBT equal respectively 0.08% and 0.03% of GDP in the long run, with the most favourable apportionment formula. The gains would be much larger, with additional gains for both GDP and welfare of about 0.10%, if not only MNEs, but all firms participate.

12. Formula apportionment distorts the investment and labour demand behaviour of multinational enterprises. The incentives for reallocating production or the production factors are minimised if apportionment depends on the share of production by multinationals in each EU member country. The largest distortions are introduced if apportionment is based on a single production factor, like either on employment or on capital.

13. A common consolidated tax base to which only multinationals may apply creates GDP and welfare gains in EU member states with a broad tax base, but harms countries with narrow bases.

14. The economic and welfare effects of CCBT are unevenly distributed. Simulation of the CCBT, where apportionment is based on employment, capital and production in equal proportions, gives the result that the change in welfare ranges between a reduction of 0.4% of GDP and an increase of 0.6% of GDP, whereas the change in GDP ranges between a reduction and an increase both of 0.7%.

WP 3 (Productivity and catching up)

15. According to pooled panel data estimations and cross-country comparisons of the OECD countries, the growth rate of labour productivity has been affected positively by higher fixed investment, lower inflation, higher R&D investment, and ICT investment as a percentage of GDP, a higher share of young adults with at least upper secondary education, and lower product market regulation, and increased exports. In most specifications taxes and gross replacement rates had no statistically significant effect on the productivity growth rates. We found a negative effect from taxes and a positive one from gross replacement rates when they appeared together with fixed investment or inflation. However, with this evidence we conclude that taxes and gross replacement rates are unlikely to have had an effect on productivity growth.

16. On the other hand, the taxes-to-GDP ratio has had a significant negative effect on the number of hours worked by the working-aged population. We find further a negative correlation between the average number of hours worked, on the one hand, and production market regulation, and gross replacement rates, on the other hand. Income inequality and trade union density do not correlate with the number of hours worked, but collective bargaining coverage has a negative correlation. There is also a negative correlation between the ratio of collective bargaining coverage and trade union density, on the one hand, and the average number of hours worked, on the other hand.

17. Theoretical analysis shows that powerful trade unions or higher labour costs associated with increases in, e.g., the unemployment compensation, the payroll taxes paid by employers, the taxes paid by workers or the cost of employment protection, cause more unemployment and a slowdown of economic growth. A coordinated bargaining process increases employment at the price of a lower growth rate.

18. These theoretical predictions are consistent with the empirical analysis on convergence using data on regions in the EU-15. The tax wedge and unemployment benefits are found to lower the growth rate and increase the unemployment rate. Employment protection increases unemployment rates, without a significant effect on the growth rate of GDP per capita. The coordination of the wage bargaining lowers the growth rate and the unemployment rate. The growth rate of the Total Factor Productivity (TFP) increases the growth of the GDP per capita but decreases the unemployment rate.

19. Econometric evidence shows that the faster productivity growth rates in the new EU member states are due more to catching up from their lower initial levels of output per worker, rather than their policy choices regarding the design of labour market institutions.

20. Theoretical modelling of an open economy shows that the equilibrium unemployment rate depends negatively on labour taxes, but not on the capital income tax, as a higher rate of it only leads to a lower level of productivity and income. On the other hand, a permanent change in labour taxes only has a long-run negative impact on employment, but not on productivity.

21. Vector autoregressive model (VAR) analysis for the EU-15 shows that labour taxes have a marked and statistically significant negative effect on employment, while the effects of the corporate taxes are more neutral with respect to productivity and employment. The results also show that in the short term there is in the EU a trade-off between the two key economic goals of productivity rises and employment. This is less severe in the long run, although does not fully dis-

appear, but turns over time to become statistically insignificant, in contrast to the US where price flexibility is the case. This calls for more flexibility in the EU labour markets in order to smoothly adjust to technological changes and possible negative supply shocks. Simulation of an econometric model for the Finnish labour market shows that, although not in the short, but in the medium run there may be quite essential employment gains from an acceleration in productivity, although in the long run there is no connection between them.

WP 4 (Macroeconomics of tax systems)

22. The theoretical modelling of the Monetary Union shows that if the economies are mainly hurt by demand shocks, then flatter tax systems tend to destabilize output whereas indexation of taxes on prices tend to stabilize it. If the economies are mainly hurt by supply shocks, then the progressiveness of taxation has little impact on output stability. On the whole, the move towards flatter tax systems would likely lead to more unstable output in the Euro Area.

23. Considering that (i) the ECB does smoothen the interest rate, (ii) net tax shocks do have supply-side effects, and (iii) spending shocks may have a declining impact on aggregate demand due to financial liberalization, it is found out that public spending expansions may produce lower positive spillovers in the Euro Area today than they used to in the past, whereas tax cuts may now produce negative spillovers.

24. Estimation of a Dynamic Stochastic General Equilibrium model shows that a positive spending shock in Germany has a positive, Keynesian impact on German GDP and a positive but small spillover on French GDP. A positive spending shock in France has symmetrical effects. Spillovers between the EMU countries are small due to a significant reaction of the common interest rate to spending shocks in either country.

25. VAR analysis of the EU countries shows that both domestic and cross-border effects of German tax shocks have tended to weaken over time. However they have remained positive, i.e. an expansionary shock in Germany has a positive impact on partner countries, especially neighbouring ones. The impact on the interest rate is, however, found to be weak. It is also found empirically that tax shocks are generally more effective in spurring domestic output than government spending shocks in the Euro Area. This might be due to the fact that tax policies may rise potential growth in the long run, especially when distortionary taxes are removed thus increasing economic efficiency and competitiveness. When the VAR estimation is performed recursively over samples of 17 years of data, it emerges that GDP multipliers drop drastically from early 1990s onwards, especially in Germany (tax shocks) and in the US (both tax and government spending shocks). Moreover, the conduct of fiscal policy seems to have become less erratic, as documented by a lower variance of fiscal shocks over time. Fiscal "surprises", in the form of unexpected reductions in taxation and expansions in government consumption and investment, have become progressively less successful in stimulating the economic activity at the domestic level, indicating that, in the framework of the EMU, policymakers can only marginally rely on this discretionary instrument as a substitute for national monetary policy.

26. Political myopia has a negative impact on the willingness to reduce the labour tax, and the Stability and Growth Pact (SGP) reinforces this pattern since excessive deficits lead to sanctions. Political myopia also reduces the willingness to reduce the welfare state, but this time the SGP has a positive impact on the willingness to reform. Myopia has little impact on the willingness of governments to reform labour and goods markets, and the SGP produces the missing incentive.

Given that all reforms but the reform of the goods market have a negative impact on neighbouring countries, EU countries should continue to coordinate product market reforms but leave the reforms of the welfare state and of the labour markets to peer pressure, with the positive SGP catalyst.

WP 5 (Climate change and energy taxation)

27. An extension of the Californian initiative of curbing emissions to the whole of the US would yield it a positive gain from free permit trading with the EU.

28. Considering the policy goal to limit the rise in temperature to 2°C up to 2100 shows that delayed action may induce large excess cost of transitional climate policies and suggest that the burden sharing debate may become substantially more critical over time due to "foregone action".

29. There is a non-negligible trade-off between limited and global coverage from a perspective of the leadership of the 20 core countries in global climate policies if the leadership is assumed to last for ever. If, however, leadership is restricted to a transitional phase – until 2030 – the welfare implications might be reduced substantially.

30. Using two large-scale models of the global economy in combination shows that in an optimal emission policy over the next 100 years developing countries reduce considerably more their emissions than industrialized countries. This result is mainly driven by the share of coal in the baseline fuel use mix. The reduction in production differs between sectors, with a similar pattern in all regions. Plausibly, the fossil fuel sectors are most affected, whereas the non-energy sectors hardly decline at all.

31. A unilateral energy tax will not affect EU-wide emissions and always raises abatement costs, in general especially in the country that introduces the tax, and cannot be justified from the point of climate change policy. The implication of the analysis is that existing energy taxes for installations covered by the EU emission trading system are better removed from the point of view of abatement efficiency.

32. The conversion of existing energy taxes to uniform carbon taxes is a powerful instrument both in terms of emissions reduction and economic welfare relative to cap-and-trade. The position of the new member states deserves special attention when energy taxes would be rearranged. Existing energy taxes are very distortionary and, by the same token, rearranging them may provide potentially very powerful instruments within the context of climate change policies.

33. Revenue recycling is beneficial, relative to recycling in a lump-sum fashion. There is accordingly a double dividend in climate policies.

34. In the endogenous technology case R&D in less-polluting energy technologies is fostered by high permit prices, but it anyway requires a large initial subsidy for technology. Carbon leakage may entail a substantial extra cost to the EU in terms of economic growth.

The website of the project (www.taxben.org) provides details on the output of the project, the seminars organised and their material and the participants of the research consortium.

2. BACKGROUND AND OBJECTIVES OF THE PROJECT

The overarching objective of the 26-month project *Tax/benefit systems and growth potential of the EU – TAXBEN* (SCS8-CT-2004-502639) has been to contribute, in line with the issues specified in SSP Priority 8 Topic 3.1. Task 4, to a better knowledge of the functioning and need for reform of the tax/benefit systems in the EU, and thereby contribute to the Lisbon process. The project tackled the current problems related to the unsatisfactory potential growth of the EU and the role of the tax/benefit systems in this process.

2.1   Objectives

The ultimate goal of the project was to provide policy options to improve the potential growth of the EU and attainment of a high level of employment, taking into account the challenges from enlargement and the environmental aspirations adopted in the EU. The extensive use of numerical general equilibrium models and econometric estimations permitted the evaluation of the impact of the existing different tax/benefits systems and yielded policy options that could be quantified under different political constraints.

The project aimed to analyse and make contributions in five areas relevant to the tax/benefit systems:

1)   The link between tax/benefit systems and employment in the EU,
2)   The EU tax systems under tax competition and enlargement,
3)   The growth potential of the EU and its relation to the tax/benefit systems,
4   The macroeconomic role of tax systems in promoting reforms in tax systems
   in the EU under the single monetary policy,
5)   Attainment of sustainable growth in the EU with a high quality of the environment and the role of green taxes and emission trading in the energy sector.

The project was organised along this division of objectives into five Work packages (WP). The sixth WP consisted of project management, organising the final conference and drafting the final report. In the various Work packages the specific goals were the following.

In **WP 1** the aim was to consider tax/benefit systems and the functioning of EU labour markets using several novel approaches. First, two similar numerical general equilibrium models of the labour market were built making a distinction between workers of various skill levels, working as distinctive and cooperative labour inputs from the firms' point of view, as well as together with the capital stock. We separated two situations: wage formation and fixation of the relative wages in a monopolistic labour market and wage formation in a fully decentralised labour market and contrasted the results concerning reforms of tax/benefit systems, as to their size and distribution, in these two cases from the point of view of employment and the equality of the income distribution. Thereby we reached an analysis of the magnitude of the consequent wage and non-wage labour cost adjustment and the interaction and trade-off between reforms of the tax/benefit system, on the one hand, and the wage flexibility in the labour market, on the other. We adapted the model to an EU-15 country, Finland, and a new member country, Estonia, to use these models to determine the optimal course of reform in tax/benefit systems. It was also the aim to combine some information on SMEs to this analysis. However, this issue was found out

not to be in the core line of the approach, as the firm sector was not divided into several sectors or firm size categories due to the extensive modelling work already adopted. Neither was this issue considered to be vital as to the policy conclusions.

One of our aims was also to analyse the basic role of investment in firm-specific skills and its relation to the labour market policies. The aim was to build a numerical equilibrium model where wage, productivity and unemployment are endogenous.

Our aim was also to consider whether the EU accession countries should adopt similar kinds of tax/benefit systems as the EU-15 countries have at the moment. We gave an overview of the current situation and trends in these countries, outlining the main differences found in the systems in place in the old member countries of the EU.

WP 2 had two related objectives. First, a gravity approach was applied to foreign direct investment (FDI), using as key explanatory variables the unit labour cost and indicators of corporate taxation. The aim was to provide quantitative insights on the scope for tax competition and tax harmonisation. The analysis relied on econometric estimations of the semi-elasticity of bilateral FDI flows to various measures of tax differentials and labour market institutions. It was then possible to provide equivalencies between tax differentials, differences in unit labour costs (including labour taxes) and distances to the centre of the EU. The recent evolution of corporate taxation in the EU, as well as the existing level of taxes in new member countries, was then evaluated from this perspective. Finally, several scenarios of tax co-ordination were studied, following the forthcoming developments of EU discussions on this issue.

Second, we aimed to develop a CGE model for the EU to describe the allocation of international capital flows. This was combined with information about institutional details on European tax systems. The model was used to explore the economic implications of (i) competition and harmonisation in EU corporate income tax rates and (ii) reforms of tax bases in the European Union. We included some of the new member countries in our model. In calibrating the model, we could make use of the empirical information from the first leg of this part of the project. We considered in this connection reform that shifts the tax burden from corporate to energy taxation. This implies that there is an important relationship between this part of the project and part 5 on environmental policies.

In **WP 3** the goal was to contribute to the Lisbon process by evaluating the various channels of tax/benefit systems and EU convergence, or the lack of it, with respect to the US and the operation of the labour market in this respect. We built, i.a., on the identity decomposing the growth of per capita incomes into changes in productivity, hours worked, unemployment, participation and age structure and tried to see the quantitative impact of reforms of tax/benefit systems, via reduced unemployment and enhanced TFP (total factor productivity) growth, to an acceleration in the catching up by the EU. We also considered the role of labour institutions of the NMS countries with respect to their convergence to the EU. As there prevails a high rate of unemployment in many of the NMS countries, this is also very relevant for their convergence in terms of income levels towards the EU-15, essential for future EU coherence.

The second approach used here in order to evaluate the quantitative effects of labour market policies, especially changes in the tax/benefit systems, on the growth potential of the EU consisted of using Vector Autoregressive Models (VAR) and an econometric model of the labour market. In this perspective, we simulated the effects of an acceleration of productivity growth in the EU on the unemployment rate. We intended to analyse this reaction using a model built to

derive an estimate of the equilibrium rate of unemployment in the case of Finland, but the overall pattern should emerge in other EU countries as well. All these analyses reinforced the link between WP 1 and WP 3.

In **WP 4** we strived to obtain a coherent view of reforms of tax systems and macroeconomic balance in the EU. We started from the essential dual role of taxes, i.e. that of a demand factor and a supply factor through, i.a., wage setting. We considered the working of EMU against this background of reforming EU tax policies. We also considered the coordination of structural policies aiming to increase supply and growth potential of the EU in combination with the spur created towards this direction by the single monetary policy, under the constraints of the Stability and Growth Pact. The aim was to describe the spillovers of fiscal policies within EMU. The various types of spillovers (through trade, imported inflation, monetary policy, FDI) were integrated in a simple, theoretical model. Econometric estimations were then carried out to try to figure out the sign of the overall spillovers.

We also aimed to analyse with the aid of a theoretical model the coordination of structural policies in the EU. In a third step, VAR models were estimated for the key Euro member countries with four endogenous variables: output growth and inflation in the specific country, and Euro-wide growth and inflation. It was then be possible to look at the cross effects of tax cuts and spending rises amongst Euro countries.
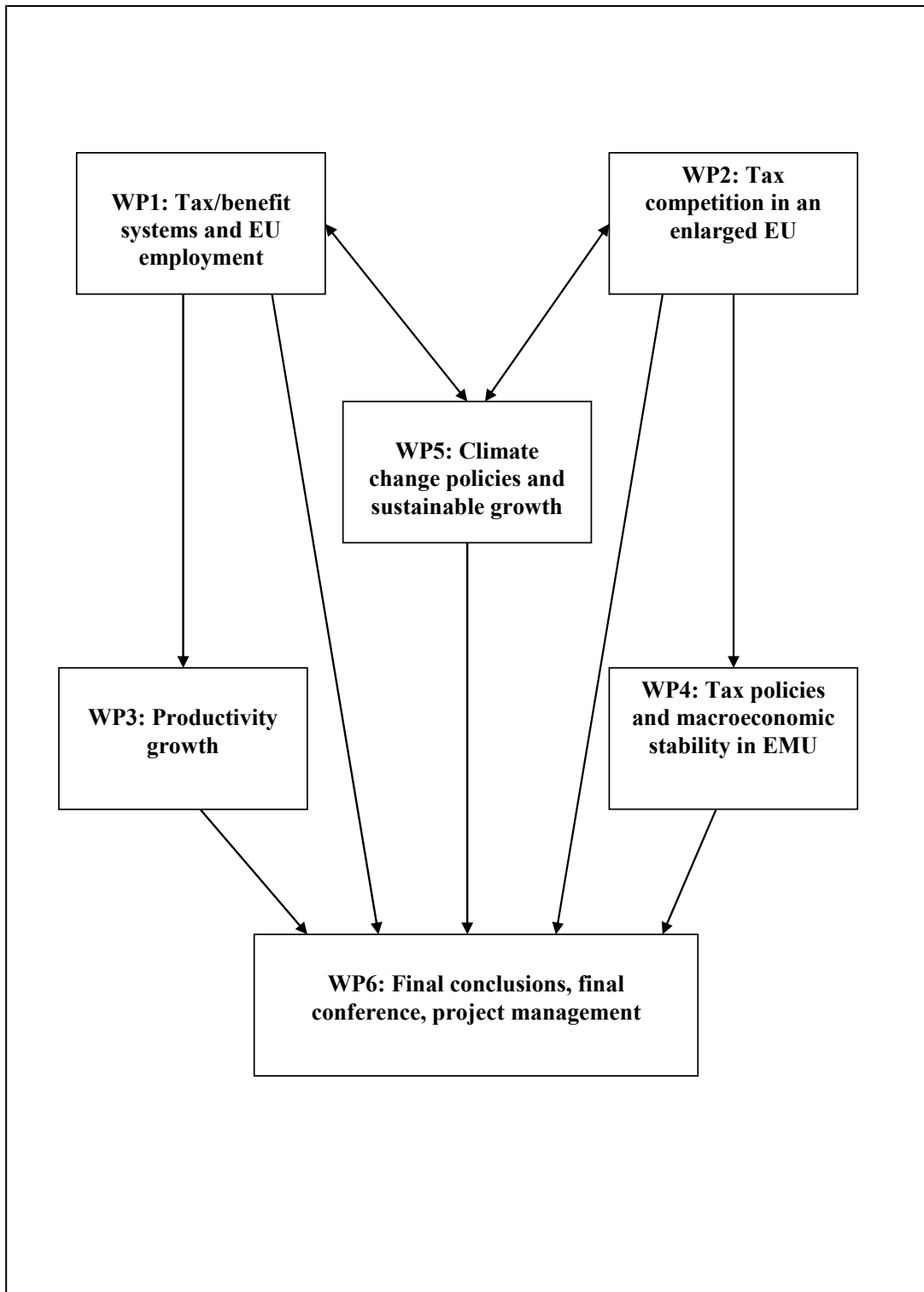
Fourthly, the aim was to supplement the results of the theoretical model and the econometric analysis by a survey of the existing research on the effects of fiscal and structural policies in the EU countries under the monetary union, paying attention to both own- and cross-country effects. The survey aimed to concentrate on the results of large multi-country macroeconometric models and as such would be a natural complement to the theoretical and empirical contribution of the three preceding steps. However, due to the current reduced role of the existing large-scale econometric models in policy analysis, it was contemplated to substitute this effort with building a Dynamic Stochastic General Equilibrium model for the Euro Area and to estimate it in order to see the spillovers of fiscal policies and the single monetary policy between Germany and France.

In **WP 5**, the aim was to investigate the impacts of alternative climate change policies, with an emphasis on current practices of energy taxation in EU member states. The aims were to analyse the optimal timing of the abatement of global warming, to assess the post-Kyoto policy options and to analyse the scope of emissions trading in the EU vis-à-vis existing energy taxes. The analysis compared the economic and environmental effects of different environmental instruments and explicitly addressed revenue raising and revenue recycling aspects of climate change policies.

An integrated assessment model (PACE-IAM) was used to determine optimal responses to exogenous long-term targets for temperature (or likewise atmospheric concentrations of greenhouse gases). The integrated assessment model combines an intertemporal multi-sector, multi-region computable general equilibrium model of global trade and energy use with a reduced form description of the climate system. In order to cope with computational constraints and data limitations (in particular with respect to long-term country-specific projections on economic growth and energy use), PACE-IAM is aggregated to a few world regions and energy-intensive sectors that are key to the greenhouse gas problem. To gain more detailed insights into the adjustment process triggered by long-term climate policies, it was envisaged to link the policy (design) output of the intertemporal PACE-IAM model as an exogenous input to the more disaggregated dynamic-recursive WorldScan CGE model. The combination of both models allowed in-

forming EU policy makers on economic implications of climate policies at a sufficiently detailed level while keeping an overall coherent view of long-term cost-effective climate policy design. In addition, the combined model system can be used in a "pure" simulation setting where the climate sub-module simply accounts for climate impacts of exogenous climate change mitigation strategies. Thus, various climate policy proposals could be benchmarked against a cost-efficient strategy. It was also the aim to carry out a concise analysis demonstrating by using an aggregative production function the link between economic growth and climate policies.

The interdependencies of the project are depicted in the following.

WP1: Tax/benefit systems and EU employment

WP2: Tax competition in an enlarged EU

WP5: Climate change policies and sustainable growth

WP3: Productivity growth

WP4: Tax policies and macroeconomic stability in EMU

WP6: Final conclusions, final conference, project management

2.2   Organisation of the project

The project consortium consisted of Centre for European Policy Studies (CEPS), Belgium, as the coordinator institute; The Research Institute of the Finnish Economy (ETLA), Finland, as the scientific coordinator institute; Centre d'Etudes Prospectives et d'Information Internationales (CEPII), France; Centre d'Etudes Prospectives d'Economie Mathématique (CEPREMAP), France; Netherlands Bureau for Economic Policy Analysis (CPB), The Netherlands; PRAXIS Center for Policy Studies, Estonia; and Zentrum für Europäische Wirtschaftsforschung (ZEW), Germany.

The coordinator of the project was **Daniel Gros**, Director of CEPS, and Scientific Coordinator **Kari E.O. Alho**, Research Director at ETLA. The work package leaders were Kari E.O. Alho, ETLA in WP 1 (employment), **Albert van der Horst**, Research Fellow of CPB, in WP 2 (tax competition), **François Langot**, Research Fellow at CEPREMAP, in WP 3 (productivity), **Agnés Bénassy-Quéré**, Director of CEPII, in WP 4 (macroeconomics of tax systems) and **Paul Veenendaal**, Programme Leader at CPB, in WP 5 (environment). The Steering Committee of the project consisted of the above persons and in addition of **Christoph Böhringer**, Professor at ZEW and **Sten Anspal**, Research Fellow at PRAXIS.

Administration was taken care by **Sally Scott**, Head of Finance and Administration, CEPS, and **Olivier Millard** from October 2006 onwards.

The Scientific Officer in the European Commission of the project was Dr. **Ian Perry** from DG Research. The key Commission representative who followed closely and commented the work was Ms. **Katri Kosonen** from DG Taxud. In addition, representatives of these and other DGs, i.e., DG ECFIN and DG Employment, Social Affairs and Equal Opportunities, in various stages commented on the work done and to be done in the project.

2.3   The overall output of the project

In the original plan of the project it was the aim to produce 16 working papers and to organise 5 seminars. During the work, the research effort widened so that altogether 24 working papers were produced (see Annex 1) and the five seminars held (see Section 5 below). All the material has been submitted to the Commission representatives and distributed through the website of the project, see below Section 5. The number of working papers produced within the WPs is indicated below in connection with the presentation of the respective WP.

Seminars were held for each of the Work package. In addition, a kick-off meeting and two joint workshops for the whole project were held and the Final conference arranged in Brussels on November 27, 2006, see Section 5.

3 DESCRIPTION OF THE PROJECT RESULTS

3.1 Tax/benefit systems and employment in the EU (WP 1)

3.1.1 Summary of WP 1

Introduction

The key target of the EU is to reach, under conditions set especially by globalisation and ageing, full employment by reducing unemployment and inactivity through increasing the demand for and supply of labour. Other targets are to enhance job quality, productivity, social and territorial cohesion. There has been a positive tendency in the EU labour market so that employment has risen, similarly as productivity, and in the current revival the rate of unemployment has gone down. However, there is still a way to go towards a satisfactory balance and so there is room for further policy interventions at the EU and national level to improve the functioning of the EU labour markets.

The bulk of the approaches of TAXBEN in WP 1 concern the functioning of the labour market. The EU and the OECD want to encourage the social partners to set the right framework for wage bargaining in order to reflect productivity and labour market challenges. The member countries are advised to review the impact of non-wage labour costs and especially reduce the burden of the low-paid. The goal is to make the labour market more flexible, and to make work pay by using in-work benefits, and to lower the non-wage labour costs, especially for the low-wage earners.

Policy interventions have recently been made in the field of taxation more than in benefits, and some changes made in the labour market institutions to make them more decentralised. However, it should be noted that social benefits contribute more to redistribution than taxes. One key task of policy is to consider them jointly.

Research tasks adopted

In Work package 1 the TAXBEN project has adopted three broad research tasks:

(i) To find out what is the interaction between the labour market institutions with respect to wage formation and the tax/benefit system as to the effectiveness of labour market and economic policies,
(ii) The interaction between endogenous productivity through on-the-job-training and labour market policies related to minimum wage and payroll taxes, and
(iii) Evaluation of the tax/benefit policies and employment especially in the New Member States.

The second task (ii) is closely linked to the research carried out in Work package 3.

Methodological approaches used

The methodological approaches used in the five papers under this Work package can be divided into three. First, to shed light on task (i), we have built computable general equilibrium models for the Finnish and Estonian labour markets, based to some extent on a similar idea and approach with, however, some modifications and differences. The models also achieve to reach a broader EU relevance in that they are used to evaluate several kinds of institutional settings in terms of wage formation, and to find out their interaction with policies.

Both models identify workers of three categories based on their level of educational attainment: basic, secondary and tertiary. The wage formation hypotheses analysed are fixed real wages, market-determined wages with a fixed unemployment rate, wage bargaining either on a union or national level, the latter being also called incomes policy. The Finnish model in addition makes a separation between the short and long run, identifying these alternatives in such a way that the short – or rather, medium run – is determined by a fixed capital stock, while the long run is determined by endogenous capital stock, determined by a given (international) required rate of return on capital.

The second approach in task (ii) builds a search-theoretical model identifying search between three labour market positions: employment, short-term and long-term unemployment and derives the respective reservation wages. The model makes labour productivity endogenous through on-the-job training, so that the training decisions by the firms are negatively based on the turnover of labour. The firm has a low incentive to train the employee if there is a high risk that he or she will leave the firm. Thereby the analysis tackles the question of the impact of labour market policies with respect to minimum wage and targeted indirect labour cost reductions basically in the French labour market, but carrying also out a comparison to the UK labour market and policies.

The third methodological approach in (iii) has been to build an econometric model for the labour market performance of the NMS and contrast them to that in the EU-15.

Key results and policy conclusions

The CGE models for Finland and Estonia in broad terms confirm the hypothesis specified at the outset that there is an important interaction between wage formation and the effects and effectiveness of tax/benefit policies. The results are also dependent on the time span. It may be that some policies will loose, and some gain, their effectiveness only over time.

It was also concluded that with respect to wage bargaining that measures, which treat asymmetrically various groups in the labour market such as low-skilled workers and others, can totally lose their effectiveness due to wage-wage competition links. On the other hand, under bargaining the curtailment of benefit levels may produce an effective incentive for labour supply and labour demand so that simultaneously both the labour supply rises and the unemployment rate goes down.

Based on the French search model on the labour market it was concluded that labour market policy may have important repercussion through endogenous productivity. The structure of benefit systems, whether linked to past income or of being a fixed sum independent of past income, can also have quite sizeable implications in the labour market. When the endogenous productivity is

taken into account, the current French employment policy with minimum wages and payroll tax relief of low-skilled workers is quite near the social optimum.

The EU should pay attention to the interaction between the tax and benefit policies so that contradictory policies are not carried out in the sense that policy measures on the one field neutralises that of the other. In the new member states (NMS) the tax/benefit systems matter more in quantitative terms on employment than in the EU-15. It was also concluded that the new member states of the EU should not follow the pattern of the majority of EU-15 and adopt more monopolistic labour market institutions.

3.1.2 Summaries of the deliverables

There have been altogether five Working papers prepared under this WP.

3.1.2.1 Labour market institutions and the effectiveness of tax and benefit policies in enhancing employment: A general equilibrium analysis − Author: Kari E.O. Alho (ETLA) (Deliverable No. 4)

Introduction

Taxes and benefits are key policy instruments which affect the functioning of the labour market and employment so that these and other instruments of economic and labour market policies should be analysed in conjunction with wage formation, the role of which is often neglected when considering policies affecting the demand or supply side of the labour market, despite the potentially large impact wage formation can have on the effect of these policies. Although having been able to improve markedly the imbalance in its labour market since the deep recession in the early 1990s, Finland still suffers from high unemployment. So, there is room for adjustment and further policy measures. There are wide and persistent differences in the balance in terms of employment of the various skill categories, not only in Finland, but in other EU countries as well.

Research task adopted

In this paper we make a distinction between four cases of wage formation to shed light on its role as to the effectiveness of various policies in enhancing employment. The first case assumes fixed wages, the second market-determined wage formation where wages correspond to the marginal revenue product of labour at the given level of unemployment, and the third wage bargaining, where wages are negotiated between the employer and employee trade union organisations in an uncoordinated way. The fourth case is that of coordinated wage bargaining under a nation-wide incomes policy. The second case, i.e., market-based wages, allows us to consider also the hypothetical case of a fully flexible labour market and contrast this to the effects of various labour market policies. The computable general equilibrium model built in the paper is static, but also makes a distinction between short- and long-run equilibria in the labour market so that in the long run the capital stock of firms changes in response to shifts in profitability in the short run. This gives us an estimate of the change in the equilibrium rate of unemployment, too.

The motivation for this extensive modelling was that we wanted to shed light on the relationship between policies and institutions of wage formation, which, to our knowledge, has not been studied earlier so thoroughly. This way the paper strives to be of wider relevance as the EU countries differ with respect to their labour market institutions and wage formation, and given the current intensive debate in the EU on how to reform the tax and benefit systems and to improve the functioning of the labour market in order to enhance employment.

Methodological approach used

To obtain empirical results, an aggregative numerical general equilibrium model is built for the Finnish economy. So, the approach taken here is that it is best to illuminate empirically the effects of policies and how they depend on the various possible labour market institutions using a single-country model. Of course, data limitations and differences, for example, in tax and benefit structures between various EU countries also justify this kind of approach.

We distinguish between workers of various skill levels because they have a different position in the labour market and which may be differently affected by various policies. The model comprises blocks for labour demand and labour supply, in combination with job flows for recruitment of new workers, various types of wage formation, and a goods market with aggregate production. We also identify the key government policy instruments affecting the economy and the labour market and the government budget constraint.

Our model has some similar features with the CGE model of the Dutch labour market by Bovenberg et al. (2000), but also elements which are quite different. The latter are basically related to the key role given to the various assumptions of wage formations and the cooperative structure of production combining the different components of labour, allowing for the case of subsidised labour recruited under an employment support scheme, and the specification adopted on how to combine the job flow market with recruitment costs in the model. In the spirit of the recent literature on behavioural economics, we introduce under bargaining the wage-wage links between the worker categories in such a way that the marginal utility of a trade union also depends on the its relative wage in relation to that of the other unions.

We analyse several policy measures, such as reductions in average and marginal income taxes, indirect labour costs of firms, both uniformly and targeted to low-skilled employees only, and in unemployment benefits, and an increase in the employment subsidy scheme, all of which, in principle, boost the economy. The ex ante size of the measures is 0.5% of GDP.

Key results and policy conclusions

Wage formation is found to be essential in determining the outcome of tax/benefit policies and their overall effectiveness. Basically, the apparent effectiveness of certain policies reached under fixed wages may be quite misleading, because the ensuing reaction of wages may neutralise much of the positive policy effects. However, there are also policy measures whose positive effects are strengthened by the reaction of wage formation. The former include measures affecting labour demand, like reducing the indirect labour costs of firms. The effects of such measures, which reduce wage claims directly or indirectly, are, however, magnified by wage reactions, while with fixed wages their positive effects are only marginal.

Of the more specific results, the role of tax policies is problematic under wage bargaining. Typically, a reduction of marginal tax rates does not work in a satisfactory manner, as it will lead to a

rise in wage claims by the labour unions. Under wage bargaining, the tax reduction should be targeted to low-income earners. However, the interaction between a reform to create a more competitive labour market and tax policy leads to another kind of result. Under a flexible labour market, the incentives to work created by a reduction of the marginal tax rates, as channelled to in-work labour, work best. The situation existing in wage negotiations, like the intensity of wage-wage competition between the trade unions, also plays a key role with respect to the outcome of some policies. This is especially so if the policy concerned affects the negotiation positions of the various worker groups in an asymmetric way, as does a lowering of the indirect labour costs of firms targeted to apply only one group of workers. The role of benefit policies should, on the other hand, deserve more attention than perhaps that of tax policies because, under bargaining, a very clear expansion in the economy occurs, if benefit levels are curtailed. Of course, this is quite a harsh policy in social terms. But, combined with tax reductions, the policy tool is effective under bargaining, and more neutral in terms of its social impacts.

Overall, we have found that wage formation bears quite a strong impact on the effects of various policies aimed at enhancing employment. The case of fixed wages and those where wages react to policies yield the most of contrasting results. In some cases, the expansionary effect on the economy and employment can be even bigger under wage bargaining than under market-determined wages, which bears importance as to policy making in a European context and to a consideration of labour market institutions.

The diverse wage reactions and their relationship with the effects of policies should be recognised when planning actual policies, e.g., by taking into consideration that policies may have quite different outcomes depending on labour market institutions and the respective type of wage formation prevailing in various EU countries. The other angle is that the reactions of wages are also different over time, and thus cause variation in the results of economic policies during the course of time.

As expected, a lowering of firms' indirect labour costs is not effective under flexible wages. The effects of policies in enhancing labour demand directly, resulting under fixed wages, are in many cases fully neutralised through wage changes over time. One conclusion from the results concerning policies aimed at boosting labour demand is that, when formulating policies, the short-run gains in employment reached under fixed wages have to be weighed against the long-run neutrality of such policies.

As is plausible in connection with the tool built here, policies that boost the supply side of the labour market, including wage moderation caused by these measures, work better and the activity of the economy will expand as a result of them. The welfare system, described here by the size of the replacement rate, seems to play quite a substantial role in the outcome of the labour market. On the other hand, it is also important to note that these measures lead to large enough wage moderation which expands the economy and employment to an extent that could absorb the increase in labour supply, created by changes in incentives, and thus could lead to a fall in the unemployment rate, too.

Wage bargaining turned out to yield quite small impacts, and not always as positive, which is notably the case with respect to lowering the marginal tax rates. But, on the other hand, centralised bargaining could deliver a positive result with respect to the unemployment rate of the targeted group of workers, when their indirect labour costs are lowered, which uncoordinated bargaining cannot do. It is, of course, a totally different matter whether it is at all likely

that a centralised wage agreement can be reached in this type of a case, where the labour market partners are treated in such a mutually asymmetric way by economic policies.

The best policy is liberalising wage formation, which polarises the society. However, we suggest that under bargaining there should be a combination of tax policies, namely lowering average taxes, while simultaneously curtailing social security benefits with an equivalent amount, which is an effective policy under a bargained labour market structure. The results call for coordination of measures in tax and benefit policies, so that incentives both to seek employment and to stay out of work are not created simultaneously.

3.1.2.2 A comparative general equilibrium analysis of the Estonian labour market – Authors Alari Paulus, Andres Võrk (PRAXIS) and Kari E. O. Alho (ETLA) (Deliverable No. 7B)

Introduction

The European Union member countries are increasingly concerned about their competitiveness in the global market. One of the central issues is related to the functioning of the labour market and social protection systems. In comparisons of the US and the EU labour market, the latter has been considered more regulated and rigid, which again has been associated with higher unemployment rates. On the other hand, labour in Europe enjoys higher social protection standards.

Under the pressure of global processes, current trends are towards adjustments in tax-benefit systems, which could increase work incentives and improve flexibility of labour market without scaling back social protection too much (Carone and Salomäki, 2001). Also the re-launched Lisbon Strategy and the underpinning integrated guidelines advocate more employment friendly tax-benefit systems.

The enlargement of the EU in 2004 introduced new member states, which, having relatively decentralised labour markets, also contrast with the EU-15 countries. There are some concerns that this could lead to social dumping. In this context, the new member states have a dilemma as to which way to proceed – continuing the market-oriented flexible approach or shifting to a more centralised bargaining and protective system. There is some empirical evidence that a bell-shaped relationship exists between the centralisation of wage bargaining and the unemployment level (Calmfors and Driffill, 1988), possibly making choice of an intermediate position between the polar cases as relatively unfavourable.

Research task adopted

In this paper we take Estonia as one example of the new member states and try to answer whether it would be beneficial to implement a tax/benefit system more akin to those found in the old EU countries. Estonia is a small open economy conducting a liberal economic and tax policy. Recent and on-going tax/benefit reforms aimed at lowering the income tax burden and to increase unemployment and subsistence benefits represent a good opportunity to model the outcome under various wage formation hypotheses.

Methodological approach used

We adopt a computable general equilibrium (CGE) model initially developed for Finnish economy as a part of the TAXBEN project, see Alho (2006), but also with elements from the models of Bovenberg et al. (2000) for the Dutch and Hinnosaar (2004a, b) for the Estonian economy.

The main features of the model are the following. There are two production factors – capital and labour, the latter divided further into three skill groups based on educational attainment. Firms are symmetric and produce one homogeneous good. The goods market is characterised by monopolistic competition, implying positive profits for firms. The foreign sector is not explicitly modelled, domestic firms compete with foreign firms in the international market and it is assumed that the domestic price level of goods equals the international price level. Households earn labour income, receive distributed profits and unemployment benefits. Their utility depends on leisure, private consumption, on which all the income is spent, and public consumption. Government has a passive role of spending all tax income on unemployment benefits and public consumption. Tax revenue is generated by income taxes on labour and capital and employers' social security contributions.

Three different structures of wage formation are modelled. First, fixed wages, which in case of a tax/benefit policy change would reflect the first reaction in the (very) short run. Second, market determined wages, which may correspond to the Estonian case under current circumstances in the medium run. (We do not consider the long run as capital is held fixed.) Third, wage bargaining by each skill group, representing a more EU-oriented hypothetical case.

Overall, labour supply and wage bargaining are modelled in the manner of Bovenberg *et al.* (2000) and Hinnosaar (2004a, b), while the production side and other wage formation schemes (fixed and market determined) are modelled as in Alho (2006).

General equilibrium effects of Estonian tax/benefit system have not been extensively researched. To our knowledge, there are no previous studies apart from Hinnosaar (2004a, b). Compared to the latter, we consider several alternative wage formation systems. We also introduce capital as a production factor, although fixed, and employ more recent data. Additionally, having available a similar model to the Finnish case allows to compare tax/benefit effects on employment in an old and a new member state, where the coverage of wage bargaining differs notably: 90% and 20-30%, respectively, in 2003 (European Industrial Relations Observatory, 2005). Modelling several skill groups allows us also to analyse separately the situation of low-skilled labour, whose employment rate is particularly low.

Key results and policy conclusions

There are four policy scenarios evaluated under all three wage systems, altogether up to 9 different simulations. The following policy changes are considered: 1) lowering the marginal income tax rate, 2) increasing the income tax allowance, 3) lowering employers' social security contributions, 4) increasing the replacement rate. All policy simulations are financed by an ex-ante reduction in the level of public consumption by 0.5%.

The policy simulations considered show that alternative ways to affect the labour market can lead to very different outcomes, e.g. on labour supply and unemployment. An initial improvement in terms of households' disposable income might even turn out to be welfare reducing in the new equilibrium. The effects of policy changes also vary under different wage formation

schemes – lowering the marginal income tax rate is for example most effective in enhancing private consumption and social welfare under market determined wages while a reduction in the social tax rate works most successfully under fixed wages. A combination of lowering marginal income tax rate and increasing tax allowance, basically the 2005 tax reform in Estonia, has a potential to increase production and social welfare without increasing unemployment rates under market determined wages.

Assuming that different wage formations are relevant for Estonian and Finnish economies (market determined wages and bargained wages, respectively), we can stress the need for different labour market and tax/benefit policies in different EU member states. Comparing the policy scenarios for Estonia under market determined wages and wage bargaining implies that market determined wages outperform bargained wages, the latter representing more EU-15 type wage formation.

Although no policy scenarios targeted at specific skill groups were carried out, some implications could be still noted. The labour supply of low-skilled is most effectively increased by lowering the marginal income tax rate, valid under every wage scheme. Combining this in turn with strategies improving employment in general, e.g. lowering employers' social security contributions, could potentially improve the labour market position of those with lower skills.

3.1.2.3 A Quantitative evaluation of payroll tax subsidies: A structural approach — A reform of the French tax/benefit system – Authors: Arnaud Chéron (PSE-Jourdan & Cepremap & GAINS (Université du Maine)), Jean-Olivier Hairault (Cepremap & EUREQua (Université de Paris 1) & IUF & IZA) and François Langot (PSE-Jourdan & Cepremap & GAINS (Université du Maine) (Deliverable No. 6A)

Introduction

High labour costs are typically considered the primary cause for high unemployment levels in continental European countries (see Blanchard and Wolfers, 2000). During the 1990s, these countries used a large set of policy tools to decrease the unemployment rate, in particular that of low-skilled workers. France experimented with an original strategy which consisted of a high minimum wage level compensated by large and permanent payroll tax subsidies on low-wage employment.

Research on the French labour market has pointed out extensively the negative role played by the minimum wage legislation due to increasing labour costs. In the mid-1990s, the introduction of payroll tax subsidies for low-wage workers was meant to compensate for the negative impact of minimum wage on employment without exacerbating wage inequality. The policy is designed specifically to avoid a significant job reallocation towards poorly paid jobs. Subsidies are not concentrated at the minimum wage level and, instead, consist of a maximum reduction of 18.2 points at the minimum wage level and a decreasing reduction in payroll taxes up to 1.33 times the minimum wage. Several econometric papers have already highlighted the positive impact of this policy on employment. Malinvaud (1998), however, underscores a potential negative impact on productivity due to a bias in job creation at the bottom of the wage distribution. When the wage distribution is strongly interrelated with the productivity distribution, payroll tax subsidies that are concentrated at the bottom of the wage distribution could shrink productivity, which in turn could dampen the output. Figure 1 shows the downward shift and flattening of the wage dis-

tribution of manual workers since the 1990s. The change in labour cost units during the period 1997-2002 supports this observation: at the minimum wage level, unit labour cost increased despite the negative impact of payroll tax subsidies.

Research task adopted

In this paper, we evaluate the payroll tax exemption policy and its impact on employment when we take into account the productivity channel.

Figure 1: Observed Wage Distributions of Manual Workers (France)
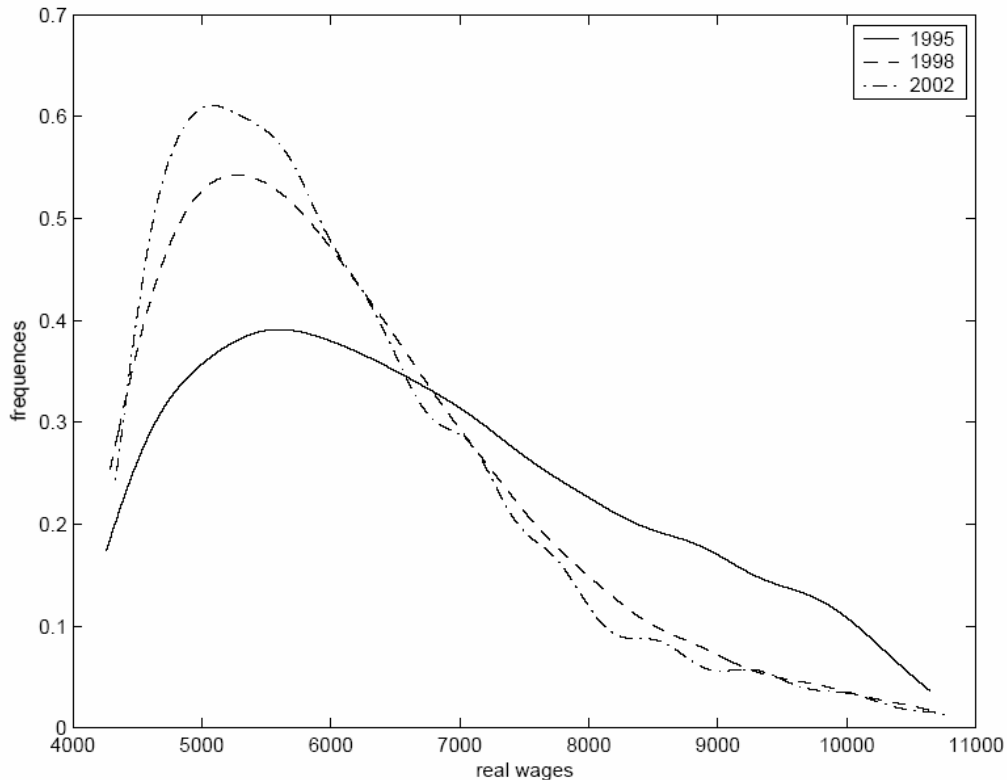
Methodology used

We build a structural model of the French low-skilled workers labour market that enables us to evaluate quantitatively the employment-plus-productivity effects of the French labour cost reducing policy. This structural strategy differs from recent econometric exercises and allows us to examine several policy experiments.

We propose a wage posting model with specific human capital investments and a bilateral endogenous search, similar to Mortensen (2000), to consistently generate wage and productivity distributions and an unemployment equilibrium rate. In this framework, the expected job duration determines to what extent firms invest in firm-specific human capital. In addition, we set that the wage posting strategies of firms and their training investments are strongly related, as suggested in Manning (2003). As such, the negative relationship between wage and labour turnover creates incentives for training employees. In equilibrium, firms choose different levels of training and wage offers, which result in endogenous within-market productivity differences and,

consequently, a dispersed equilibrium wage offer distribution. Moreover, the wage posting approach is incorporated into the search equilibria in order to determine unemployment and vacancy rates in a consistent manner. This method leads to a joint theory of wage (as well as productivity) and employment, where the effects of labour market institutions are not determined a priori by job creation disincentives or the reduction of the monopsony power of firms.

This paper also incorporates realistic features to analyze the efficiency of French labour market policies. First, we take into account the existence of a minimum wage which influences the cost of labour and the recruiting effort of firms. Second, we assume the existence of transition periods between short-term and long-term unemployment as well as some heterogeneity in the search intensity of employees and of short- and long-term unemployed. As such, we obtain a time-varying unemployment benefit system and differences in offer arrival rates per the status of individuals (in employment, short- or long-term unemployment). These features generate an endogenous distribution of the unemployed workers' reservation wage, which enhances the evaluation of the minimum wage legislation.

Our strategy relies on at least two key points: the wage posting hypothesis and the fact that productivity is governed by specific human capital investments. The former seems consistent with empirical findings for low-wage workers and the assumption that firms have monopsony power is not rejected for these workers in the French panel data set. Regarding the second point, Postel-Vinay and Robin (2002) show that the productivity differential across firms explains about half of the French low-skilled wage variance. The remaining part is due entirely to search friction, leaving no room for individual fixed effects. We interpret this as general human capital, which increases with the skill of workers. We estimate key parameters of the model on French data using the Simulated Method of Moments. Based on statistical tests, we cannot reject the hypothesis that the theoretical wage distribution is generated by the same law as the observed one. In particular, because the productivity distribution plays a central role in the replication of the observed unimodal wage density, it provides a powerful identification strategy to estimate the elasticity of productivity relative to human capital investment.

Key results and policy conclusions

We investigate the various implications of a minimum wage on output. The optimal level for a minimum wage seems to be slightly lower than the observed one: a decrease in the minimum wage leads to an employment boost, but is not totally compensated by a decline in labour productivity. The opposite occurs when considering values below the optimal minimum wage level. If we remove the productivity channel, we obtain a very different conclusion and find that short-term unemployment benefits are binding as to employment. Despite the existence of long-term unemployed workers who would be willing to work for a lower wage, we show that no firms would propose a wage below the reservation wage of the short-term unemployed workers. In that sense, the minimum wage legislation is unnecessary. Alternatively, including the productivity channel emphasizes the importance of a minimum wage. Given that the payroll tax subsidies are implemented to lower labour costs without removing the minimum wage legislation, we show that this policy is welfare-improving. It is implemented relatively well because it allocates subsidies over a large range of wages, not only at the minimum wage level. Existing exemptions lead to an employment boost which is offset in part by a deterioration of the productivity level. Here again, removing the productivity channel from the analysis leads to an opposite recommendation, namely the concentration of exemptions at the minimum wage level.

3.1.2.3 Why is unemployment higher in France than in the UK? A wage posting answer – Authors: Arnaud Chéron (PSE-Jourdan & Cepremap & GAINS (Université du Maine)), Jean-Olivier Hairault (Cepremap & EUREQua (Université de Paris 1) & IUF) and François Langot (PSE-Jourdan & Cepremap & GAINS (Université du Maine)) (Deliverable No. 6B)

Introduction

The French and the UK economies have access to the same technology and use the same organizational process of production. In these two economies, there is a high minimum wage. Nevertheless, the level of unemployment, and more specifically the unemployment of the low-skilled workers, is higher in France. How can we explain this difference?

The taxes or the average rate of the unemployment benefits are not the same but the key difference is the calculation of the unemployment benefits for an unemployed worker. Indeed, in France, there is a system where the calculation of the unemployment benefit depends on the preceding wage. This leads to a large dispersion of the unemployment benefits. At the opposite, in UK, there is an unemployment insurance system à la Beveridge: The unemployment benefits do not depend on the preceding wage. In this last case, the distribution of the unemployment compensations is a mass point. The French system allows smoothing of the consumption by the workers, whereas in the UK, one can observe a large decrease of the consumption over the life-cycle for the unemployed.

Research task adopted

In this contribution, we focus on the costs of the unemployment benefit (UB) system based on the logic of the consumption smoothing. This difference in the dispersion of the unemployment benefit can lead to large differences in the equilibrium, if one focuses on the unemployment rate, the aggregate production or the welfare. Indeed, a large dispersion of the UB leads the firms which have wage offers lower than the higher UB to meet any unemployed workers who reject the job proposal. Hence, by introducing heterogeneity among the workers, the French UB system can lead to a large inefficient mismatch. This mismatch increases the delays for a firm (worker) to find a worker (firm) and then increase unemployment.

Without any dispersion of the UB, there is no job refusal in the UK and then the unemployment rate is lower. One can introduce a minimum wage in order to reduce the number of job refusal. Without any dispersion of the UB, the impact of the minimum wage on unemployment is trivial in UK: if the minimum wage is higher than the level of the unemployment benefits, then the labour costs are higher, the number of the vacant jobs is lower and then the unemployment rate is higher.

At the opposite, in France, the minimum wage has more complex impacts: an increase of the minimum wage (MW) leads to a reduction of the number of vacant jobs, as in the UK, but this policy implies that the number of job rejection decreases. This last effect can reduce the equilibrium rate of unemployment. Nevertheless, in France the MW does not insure that all the wage offers will be accepted in the equilibrium, because any individual has access to high unemployment benefits.

Beyond its impact on unemployment, the MW introduces an arbitration between employment and productivity: a higher MW leads to reduce turnover and gives some incentives to invest in job-specific capital. Then, in the UK the decrease of employment can be compensated by the increase of productivity and then leads to a higher welfare. In France, if the MW increases employment, its positive impact on the productivity magnifies its first positive effect on welfare.

Methodology used

The methodology used in the paper comprises of building a search model for the labour market, distinguishing the various labour market positions and be thereby able to derive the reservation wages of the workers and to identify the frictional and inefficient unemployment.

Key results and policy conclusions

The simulation results for the French economy are as follows. The introduction of a MW leads to a decrease of the vacancy rate and then to the frictional unemployment (u_f). This increase of the labour costs reduces the number of job offers but largely reduces the number of job refusals. Then the aggregate unemployment decreases because there is a large decrease of the inefficient unemployment (u_{in}). This decrease of the inefficient unemployment can be decomposed into two parts. The decrease of u_{in} due only to the reduction of job refusal is from 12.1% to 10%. Indeed, in this simulation the firms can not adjust the number of vacant jobs after the introduction of the MW: the rate of meeting is the same as in an economy without MW. When the number of vacant jobs is endogenous, it leads also to reduce the number of job refusals and then the inefficient unemployment (from 10 to 7.1%).

In the United Kingdom, the unemployment benefits do not depend on the previous wage. We assume that the distribution of the UB is restricted to one point in UK for the level of UB which correspond to 0.34 of the average wage rate. Given these assumptions on the tax/benefit system in the UK economy, the "inefficient unemployment" is equal to zero because the lower wage offer is equal to the UB which is the same for all the workers. In the case of the UK, the equilibrium rate of unemployment is equal to the frictional unemployment. Because we assume that the creation/destruction process is the same in the two economies, the equilibrium rate of unemployment in UK is equal to the frictional unemployment rate in France.

When the MW is fixed at the same level as in the French economy, the introduction of a minimum wage leads to a decrease in the vacancies and then explains the increase in unemployment. With this UB system, the aggregate unemployment is largely lower in the UK. But the two UB systems are different in two points: the level of the replacement rate and the existence of an UB distribution. If the level of the UB in France is reduced in order to have in average the same replacement ratio, then the equilibrium rate of unemployment is lower, but the impact of the dispersion of the UB implies that the unemployment is more than two times larger than in the UK. In general equilibrium, i.e. when the number of vacant jobs is endogenous and is reduced by the increase in the wage costs, the increase in the frictional unemployment offsets the large decrease in the inefficient unemployment. This leads to a small decrease in the aggregate unemployment.

Moreover, simulations of the model also show that the minimum wage increases the production and the welfare in these two economies. Finally, we show that the minimum wage allows to decrease significantly the income inequalities. These results give some support to the adoption of the UK unemployment benefit system by European countries. They also underline that there is in

each economy an optimal MW. Its level depends on the arbitration between productivity and employment.

3.1.2.3 Tax-benefit systems in the new member states and their impact on labour supply and employment – Authors: Andres Võrk, Reelika Leetmaa, Alari Paulus and Sten Anspal (PRAXIS Center for Policy Studies) (Deliverable No. 7A)

Introduction

The level and structure of taxes and benefits have been the subject of much attention and discussion in recent years in EU countries. The existing research suggests that labour market institutions matter for labour market outcome and that disincentives generated by the structure of tax/benefit systems are one cause of low employment and slow economic growth in the European Union (European Commission, 2000). Tax-benefit systems create incentives that influence the behaviour of both employees and firms. On the demand side, high tax burdens can increase the cost of labour. On the supply side, generous out-of-work benefit payments may lead to reduced efforts to seek employment and also high marginal tax rates reduce the reward for additional work efforts (Carone and Salomäki, 2001).

Eight new member states, formerly planned economies from Central and Eastern Europe (NMS-8) that entered the EU in 2004 have had rapid economic reforms since 1990s, but still in several new member states the unemployment rates have remained high and the employment rates low. Meanwhile, considerable differences exist in labour taxation and disincentives created by the tax/benefit systems. How much these differences in the tax/benefit systems can explain differences in labour market outcome is the issue that we address.

There are a few studies that have analysed the labour market institutions, including tax-benefit systems, and their impact on labour market outcomes in new member states or transition countries. Mainly the cross-country studies have covered the four new member states that belong to the OECD countries. The dominant conclusion from previous studies is that labour market institutions are less rigid and labour markets are more flexible in the new member states than in the EU-15, but still they find that taxes and benefits influence employment and unemployment rates.

Research task adopted

In this paper we analyse whether cross-country differences in the labour market outcomes, especially activity rates and employment rates, in the eight new member states can be explained by the characteristics of the tax and benefit systems.

Methodological approach used

We use macro-level panel data from eight new member states over the years 1998-2004. We apply graphical analysis and panel data regression models to investigate whether the variation in the incentives created by the tax and benefit systems, measured by the tax wedge and marginal effective tax rates, can explain variation in the labour market outcome. We analyse the impact on activity rates, employment rates, unemployment rates, the share of part-time workers and weekly work-hours. We use pooled OLS and country-specific fixed effects regression models. In our

regression models we also control for other macroeconomic variables that may influence labour market developments: GDP growth, inflation and openness (trade volume to GDP ratio).

Key results and policy conclusions

The new member states from Central and Eastern Europe are characterised by lower overall tax burdens. Still they display relatively high taxes on labour and in all the countries the tax wedge on labour is higher than the average of the EU-15 countries. On the other hand, also social expenditures, including expenditures on unemployment benefits are low, which increase incentives to work.

In our econometric analysis, despite the small sample period, we find statistically significant effects of the tax/benefit indicators on the labour market outcomes in several of our regression models. As tax/benefit systems do not change very rapidly and we have relatively short time period, it is not surprising that there are more significant results in pooled OLS regressions than in the models with country-specific fixed effects.

Our statistical and econometric analysis shows that higher tax wedge has a significant negative impact on labour force participation and employment rate in NMS-8. Our estimates suggest that an increase of the tax wedge by 1 percentage point reduces employment rate by 0.2-0.7 percentage points, depending whether we include country specific effects in the model or not. Negative relationship exists both for men and women, older workers (the strongest effect), and low-educated people.

Concerning high marginal effective tax rates when moving from unemployment to work (unemployment trap indicator), we find that they decrease the activity rate and the employment rate of elderly, and increase the unemployment rate. We also find some effects of the low-wage traps on the activity rate of elderly people and the low-educated.

Our estimation results also suggest that the progressivity of the tax/benefit system, at least at the low-wage level, measured by the size of the trap indicators, is positively related to the average of usual weekly working hours and negatively to the share of part-time workers. It suggests that in the countries where the system is more progressive, those people who work prefer to work more hours and not to be employed part-time.

As both the time series and number of countries in our analysis is small, and in several models we have encountered statistically significant coefficients with unexpected signs, the results should be interpreted with caution. Still, given that other labour market institutions (e.g. employment protection legislation, unions, and active labour market policy) are less important in the new member states and we observe high tax wedge and large variation in unemployment traps, our general results do not conflict with our expectations.

Several new member states have reduced in recent years or plan to reduce the tax burden of low-paid workers by increasing income tax allowances and/or decreasing marginal income tax rates (e.g. Estonia, Lithuania, the Czech Republic, and Slovenia). Given our results that lower taxes are associated with higher activity rates and employment, these policies should lead to increased employment rates. In the new member states, where wages are more flexible, a simple reduction of marginal income tax rate and increasing tax allowance might encourage the employment of low-wage earners.

3.2 The tax/benefit systems in the EU under tax competition (WP 2)

3.2.1 Summary of WP 2

Introduction

The Lisbon process also implies that the European social model, which is relatively generous, be preserved through its modernisation. This goal could possibly be endangered by rising mobility of capital and high-skilled labour mobility, which could lead to some tax competition amongst EU members. The outcome would be either reduced resources for the benefit systems or higher inequality of the financing between the various kinds of tax payers.

The free movement of capital in the Single Market is hampered by the existence of separate systems of corporate taxation. Consolidating the tax base for multinational enterprises would enormously reduce these tax obstacles. However, consolidation might overrule the primacy of member states in fiscal policy. Is there a way out of this dilemma?

Research tasks adopted

The focus of WP 2 is on the economic impact of corporate tax policy. Two types of policy scenarios concerning corporate taxation have been studied. The first type analyses the implications of competition and co-ordination in statutory tax rates. Specifically, the impact of cross-country discrepancies in corporate taxes and in unit labour costs on foreign direct investments (FDI), gross domestic product (GDP) and welfare are investigated. The second type focuses on tax base harmonisation and is inspired by proposals in the 2002 Tax Communication of the European Commission to consolidate taxable profits across member states. Together with consolidation, we study the effect of apportionment formula, which is needed to allocate the tax base over the member states.

Methodological approaches used

The analysis relies on econometric estimates and model simulations. Semi-elasticities of bilateral FDI flows to various measures of corporate tax differentials and of differences in unit labour costs are estimated. The economic and welfare implications of both tax-rate reforms and the consolidation of the tax base are simulated with a computable general equilibrium model.

Key results and policy conclusions

The main policy implication of work package 2 are as follows.

Tax differentials are important determinants of FDI in the EU-15, but not in the new member states. This conclusion is based on econometric estimates for 22 EU countries between 1990 and 2002.

Even a unilateral reduction of the tax rate is not beneficial for all countries if they have to finance the tax rate reduction by an increase in the tax rates on labour or consumption. The reduction in the corporate tax rate attracts foreign direct investment and foreign profits. However, the

increase in the taxes on labour or consumption dampens the impact on employment, GDP and welfare, and might even offset it.

Social competition is more powerful than tax competition. This conclusion is based on the observation that FDI depends more on differences in employment protection and union bargaining coverage than on differences in (statutory or effective) corporate tax rates.

This conclusion is confirmed by model simulations showing that policies to remedy tax competition, like setting a minimum tax rate or even harmonising the CIT-rates, hardly enhance growth and welfare in the European Union: the winners just gain enough to compensate the losers.

The largest gains from consolidating the corporate income tax base might be expected if all enterprises, both domestic and multinational, are treated equally. Proposals for consolidation which exclude part of the firms, like domestic firms, creates an uneven playing field. This might induce a large restructuring both within and between member states.

Formula apportionment distorts the investment and labour demand behaviour of multinational enterprises (MNE), which are minimised if the apportionment formula reflects the distribution of corporate income of MNEs. The largest distortions are introduced if apportionment is based on a single production factor, like either on employment or on capital. The incentives for reallocating production or the production factors are minimised in the simulations if apportionment depends on the share of production by multinationals in each member state.

The economic effects of consolidation with formula apportionment are unevenly distributed. Due to formula apportionment, low-tax countries are attractive for the location of production, whereas GDP and welfare in high-tax countries decline. In addition, a common consolidated tax base to which only multinationals may apply creates GDP and welfare gains in member states with a broad tax base, but harms countries with narrow bases.

Tax competition is intensified with common consolidated base taxation. All member states, but in particular those with relatively open economies, have stronger incentives to reduce their tax rate with a consolidated tax base than with separate accounting. Would formula apportionment be based on an internationally mobile production factor, like capital, tax competition might even result in a race to the bottom. Would apportionment be based on an internationally less mobile factor, like employment, tax rates are likely to be cut, but not to the bottom.

3.2.2 Summaries of the deliverables

There are four working papers prepared under this Work package.

3.2.2.1   Who is afraid of tax competition? – Author: Amina Lahrèche-Révil (CEPII) (Deliverable No. 9A)

Introduction

The tax competition literature has long been stating that increasing international integration might impose a growing pressure on tax policies, as raising taxes creates an incentive for mobile tax payers to relocate abroad. Because tax base relocation is proportionally more important in small countries than in large ones, this literature further shows that small countries have stronger incentives than large ones to cut taxes, which could eventually lead tax rates on mobile income to converge toward zero. Such a conclusion has, however, been challenged by a number of alternative approaches, pointing for instance to the fact that higher taxes can be the counterpart of higher attractiveness, or to the fact that taxation is a second order determinant of location decisions, well behind e.g. proximity to the market.

As far as corporate taxation is concerned, most existing empirical studies focus on the sensitiveness of foreign direct investment or firms location decision to taxation. These show that multinational enterprises do react to tax incentives, be they embedded in tax rules or tax rates.

While most existing studies focus on the OECD, tax competition may be tighter within the EU due to the single market. In this context, low rates observed in new member states are raising fears of a race-to-the bottom.

Research task adopted

This paper investigates the impact of tax incentives on foreign direct investment (FDI) within the enlarged EU, using bilateral FDI flows from the EU-15 countries to 18 to 22 EU-25 countries (depending on tax measures), from 1990 to 2002.

Methodological approach used

The empirical investigation relies on two alternative specifications of a gravitational model of FDI flows, where the impact of various definitions of corporate taxation (namely, implicit tax rates, statutory tax rates and effective average tax rates) is investigated, together with the impact of unit labour costs.

Key results and policy conclusions

The main result of the paper is that, over the period considered, FDI reacted to tax differentials only within the EU-15. By contrast, FDI flowing from the EU-15 to new member states seems to be unrelated to tax differentials. Other factors, such as the real exchange rate and unit labour costs, also fail to significantly explain FDI inflows into the NMS.

3.2.2.2   Do EU member states compete on social systems? – Authors: Vincent Delbecque and Amina Lahrèche-Révil (CEPII) (Deliverable No. 9B)

Introduction

Deepening integration within the European Union increases the mobility of firms. While tax competition is a well-documented tool for attracting foreign direct investment (see, for instance, de Mooij and Ederveen, 2003), room for tax competition is progressively vanishing as tax rates converge downward. The case for social competition has been less scrutinised so far, partly due to measurement problems, partly because social systems are multidimensional. For instance, a reduction in employment protection can be partially offset by an increase in trade unions bargaining power, which has been observed in the OECD during the period 1992-2004.

Research task adopted

This paper intends to measure the impact of social factors on FDI across EU member states within a gravity framework from 1992 to 2004. To the extent that they affect labour costs, labour market regulation and unions bargaining power may impact on location decisions.

Methodology used

Labour market regulation and employment protection legislation are related to fixed costs, whereas centralised bargaining and coordination have an impact on variable costs. Both types of indicators are used here through a Heckman methodology that allows us to highlight the impact of social systems on the probability of investing in a given country (which should be related to fixed costs) from the amount invested (which should be linked to variable costs).

Key results and policy conclusions

We find that labour market institutions and trade union strength both have an effect on the probability of attracting FDI and the amount of FDI received. For instance, an increase of the mean employment protection legislation index by one standard deviation reduces the amount of investment by 30%, while an increase by 10 percentage points of collective bargaining coverage reduces inward investment by 32%, ceteris paribus. Hence, we find no evidence of a positive impact of labour protection or unionisation on investment through gains in productivity.

3.2.2.3 Who benefits from tax competition in the European Union? – Authors: Leon Bettendorf, Joeri Gorter and Albert van der Horst (CPB) (Deliverable No. 19)

Introduction

Capital market integration within the European Union has been successful. It brings about a superior allocation of capital over member states by linking capital markets. But capital market integration also links national capital income taxes. Member states have indeed reduced their statutory corporate income tax rates in order to attract highly mobile paper profits of multinational firms. Yet effective capital income tax rates have remained relatively stable. The evidence thus suggests that there is more to tax competition than the canonical tax race to the bottom.

The theoretical tax competition literature provides an abundance of often contrastive tenets. The corporate income tax (CIT) of one member state leads to capital flight to other member states, and thus entails a positive spillover as capital flight increases foreign CIT bases and labour productivities. The domestic CIT bill is, however, picked up by foreigners insofar they own stocks of domestic firms, and thus entails also a negative spillover. Moreover, if a member state decides to engage in tax competition and reduces its CIT rate, then it must mend the resulting budgetary hole, either by cutting public expenditure or by increasing the burden of alternative taxes. In particular the labour income tax carries heavy domestic distortions that make it unattractive to go down this route, even in the face of the high capital mobility within the EU.

Research task adopted

Economists still grope in the dark regarding the empirical relevance of the contrastive tenets. Does the downward pressure on CIT rates dominate the upward pressure, and if so, to what extent? And what is the welfare cost of tax competition, or similarly, the potential welfare gain of tax coordination?

Methodology used

Investigating these questions requires an integrated framework, allowing for numerical assessments of the economic outcomes of corporate income tax reforms. CORTAX is an applied general equilibrium model of the EU tailor made for the problem at hand. The model captures the main features of corporate income taxation in 17 EU member states. It distinguishes between domestic and multinational firms in order to simulate the simultaneous impact of capital income taxation on foreign direct investment, profit shifting and tax exporting.

Moreover, the model allows for a welfare analysis by considering the optimal response of households to changes in taxes and factor rewards. This welfare analysis will answer questions on the efficiency of the corporate income tax system in the European Union and on the distribution of the gains and losses of consolidation.

CORTAX is an applied general equilibrium model of the EU tailor made for the problem at hand. It builds on a model presented by Sørensen (2004). *CORTAX* goes, however, in some directions one step further. Notably the savings decision is derived from dynamic utility maximisation. Not only does this do justice to the inherently dynamic nature of saving, but it also enriches the welfare analysis. With *CORTAX*, we investigate a wider array of tax coordination proposals, starting with unilateral tax rate reductions and then proceed with multilateral and coordinated tax reforms.

Our contribution to this literature is a thorough investigation of the economic and welfare effects of unilateral and multilateral tax reforms in Europe, by developing and simulating the applied general equilibrium model *CORTAX* for corporate taxation in Europe. This provides insight in how individual member states might be affected by CIT reductions in either the home country or in other member states. In addition, we show which countries gain from imposing a European minimum tax rate or, similar to Sørensen (2004), from even harmonising their tax rates.

Key results and policy conclusions

In an integrated Union, member states respond to each other's changes in corporate income taxation – and for good reasons: a CIT rate reduction in one country harms other member states, which they offset by reducing their CIT rates, too.

This is not to say that all countries benefit from playing at leapfrog. Even a unilateral reduction of the tax rate is not beneficial for all countries if they have to finance the tax rate reduction by a more distortive tax on labour or consumption. A central result of the simulations is that a typical member state has only a small incentive to unilaterally reduce its CIT rate. Consequently, the welfare cost of tax competition is relatively small, and may even be negative for some member states. The main reason is that if alternative tax instruments are used as balancing items, the benefits of a lower CIT are partly or entirely outweighed by the costs of a higher labour income or consumption tax.

If member states take into account that other states may respond, the potential gains from a CIT reform are significantly reduced. In this case, the inability to attract foreign profit income reduces the benefits from favourable tax planning by multinational enterprises. A reduction in the tax rate is still beneficial for countries with a highly distortionary CIT tax, but not for countries with already small tax bases or low tax rates. Therefore, the latter countries will not participate in a race to the bottom.

Even countries which benefit from a tax rate reduction will not completely abandon the tax on corporate income. At lower CIT rates, the distortions in the alternative taxes on consumption and labour exceed the distortionary effects of the corporate income tax on investment and profit shifting. We show that a further integration of European capital markets aggravates the CIT distortions, but will still not trigger an abolishment of the corporate income tax.

From an economic point of view, competition in tax rates is hardly worth pursuing at current levels of corporate income taxation, and even less so at a lower level of taxation. Policies to remedy tax competition, like setting a minimum tax rate or even harmonising the CIT rates, hardly enhance growth and welfare in the European Union: the winners just gain enough to compensate the losers.

3.2.2.4 Will corporate tax consolidation improve efficiency in the EU? – Authors: Albert van der Horst, Leon Bettendorf and Hugo Rojas-Romagosa (CPB) (Deliverable No. 26)

Introduction

Companies operating across the internal market are hampered by tax obstacles such as high compliance costs for cross-border operations, transfer pricing and the lack of cross-border loss compensation. These obstacles are inherent in the current system of separate accounting (SA), where the corporate income of foreign subsidiaries of multinational enterprises is treated separately for tax purposes.

In its 2002 Tax Communication, the European Commission proposed consolidation of the tax base as an answer to the inherent difficulties of separate accounting and the large compliance costs. The consolidated base has to be apportioned to the member states to guarantee their ability to tax corporate income.

Research task adopted

The aim of the paper is to assess numerically the economic effects of consolidation and apportionment formula (FA). Does it contribute to employment and GDP in the European Union and does it improve economic efficiency by reducing tax distortions? How are the gains and losses distributed within member states, between say domestic firms and multinationals, or between firms and households, and how are they distributed between member states?

Methodology used

Investigating these questions requires an integrated framework, allowing for numerical assessments of the economic outcomes under different FA proposals in comparison with the current SA system. We have developed a computable general equilibrium model CORTAX, which is designed to investigate these issues. The model captures the main features of corporate income taxation in 17 EU member states and in the United States. It includes the investment and labour-demand decisions of both MNEs and domestic firms. Moreover, the model allows for a welfare analysis by considering the optimal response of households to changes in taxes and factor rewards. This welfare analysis will answer questions on the efficiency of the corporate income tax system in the European Union and on the distribution of the gains and losses of consolidation.

Our paper is the first simulation study on consolidation and formula apportionment in the European Union. It is most closely related to Sørensen (2004), who applies a similar CGE model to the harmonisation of both the tax base and the tax rate in the European Union. In fact, our model builds on Sørensen's OECDTAX-model. The crucial extension in *CORTAX* is the inclusion of consolidation and formula apportionment. Sørensen points at the potential welfare gain from tax harmonisation, which we will confirm in our simulations, but does not investigate the distortions introduced by formula apportionment.

Edminston (2002) is the single application of a computable general equilibrium model to formula apportionment. He focuses on both the strategic behaviour of the fiscal authorities in the United States and on the tax planning by firms. However, the situation in the US, with state-specific formulas and relatively small tax rate differentials, differs substantially from the European environment with large tax rate differentials and presumably uniform apportionment formulae. The contribution of our paper is to investigate consolidation and formula apportionment in the European Union.

Key results and policy conclusions

The economic effects of consolidating the corporate income tax base with applying formula apportionment depend crucially on its design. The largest gains from consolidation might be expected if all enterprises, both domestic and multinational, are treated equally. Proposals for consolidation which exclude part of the firms introduce uneven competition and induce a large restructuring both within and between member states. Formula apportionment distorts the investment and labour demand behaviour of multinational enterprises, which are minimised if the apportionment formula reflects the distribution of corporate income of MNEs.

The main benefits from the abolishment of separate accounting by consolidating the tax base are the elimination of paper profit shifting, the introduction of automatic loss compensation for cross-border activities and the reduction of compliance costs. However, consolidation has its costs too, as it may create unequal opportunities for different firms. With common consolidated base taxation (CCBT), domestic firms might face a different definition of the tax base than MNEs.

Consider the introduction of a common base at the EU average to which only multinationals may apply. In countries with a broad tax base, this consolidation benefits multinationals relative to domestic firms, as the latter still have to apply to the broad domestic rules.

In the alternative proposal of home state taxation, where firms have to make their tax declaration according to the rules of their home country, domestic firms and multinational headquarters are treated equally. Unevenness is now introduced, however, between subsidiaries of foreign MNEs. Home state taxation gives preferential treatment to subsidiaries originating from member states with a narrow tax base.

The full benefits from consolidation can only be reaped if all firms participate and apply to a common tax base. If domestic firms are excluded, the EU average gains in terms of GDP and welfare from CCBT equal respectively 0.08% and 0.03% of GDP in the long run, with the most favourable apportionment formula. The gains would be much larger, with additional gains for both GDP and welfare of about 0.10%, if not only MNEs but all firms participate.

Apportioning the consolidated base to the member states leaves them the autonomy to tax corporate income at their own desired rate. However, the way in which the tax base is distributed likely distorts the investment and production decisions of multinational enterprises. The largest distortions are introduced if apportionment is based on a single production factor, like either on employment or on capital. The incentives for reallocating production are minimised if the apportionment formula resembles the distribution of corporate income of MNEs. In the simulations with CORTAX this is achieved if apportionment depends only on production shares.

The economic effects of CCBT with formula apportionment are unevenly distributed, both between and within countries. With separate accounting, low-tax countries are attractive for the location of paper profits. With formula apportionment, however, low tax countries are attractive for the location of production (and production factors): higher production in low-tax countries enlarges the apportioned share of the tax base in these jurisdictions and thus reduces the average tax payments of MNEs. This expansion of MNEs implies an increase in GDP, employment and capital in low-tax countries. In contrast, production in high-tax countries declines. This uneven distribution of gains and losses due to formula apportionment adds up to the unbalanced impact of the common consolidated base. In our basic simulation of CCBT, where apportionment is based on employment, capital and production in equal proportions, the change in welfare ranges between a reduction of 0.4% of GDP and an increase of 0.6% of GDP, whereas the change in GDP ranges between a reduction and an increase both of 0.7%.

Tax competition is intensified with common consolidated base taxation. Relatively open economies and those with low tax rates have stronger incentives to reduce their tax rate with a consolidated tax base than with separate accounting. Would formula apportionment be based on an internationally mobile production factor, like capital, tax competition might even result in a race to the bottom: for several member states it is optimal to leave their proportioned share of the com-

mon tax base untaxed. Would apportionment be based on an internationally less mobile factor, like employment, tax rates are likely to be cut, but not to the bottom.

3.3 Tax/benefit systems and potential growth (productivity) of the EU (WP 3)

3.3.1 Summary of WP 3

Introduction

If we focus on productivity dynamics, the EU countries caught up of the US between 1960 and 1995. After this period, Europe has been lagging behind the US. On the other hand, relatively to the US, and during the same period, there is a decline in the total number of hours worked in EU. This decrease is explained by: a reduction in the average number of hours worked by each employed person, a lower participation rate and higher unemployment rate. In this context, is it reasonable for the Europe to expect a catch up of the US?

What is the dynamics of this decomposition of the GDP per capita? Why does Europe remain poorer than American? At the beginning of the 1960's, the low level of GDP per capita in Europe was mainly due to a lag in productivity (65%), partially compensated by a larger effort at work in Europe (20%) (see the following Figure 2). In the 1970's, the productivity catching up continued, whereas the effort at work is the same in Europe as in the US. During the 1980's and the 1990's, the productivity catch up process seemed to be terminated, but the effort at work of the Europeans largely decreased relatively to the one of the Americans. This last fact is mainly due to a large decline in both the hours worked and the participation rate. Finally, since the end of the 90's, we observed an increase of the gap between the US and the European productivities. Hence Europeans work less and are less and less efficient than American: hence, they are poorer.

Research tasks adopted

During the past few decades, we observe in European countries high unemployment and slow-down in economic growth. Are these two phenomena related? There is no consensus regarding the sign of the correlation between growth and unemployment, either across countries or across time. Yet, theory suggests that the distortions due to fiscal instruments lead to a lower growth (endogenous growth theory) and/or to a higher unemployment (equilibrium unemployment theory).

The link between growth and unemployment can be viewed through the simultaneous link between growth, unemployment and the labour market institutions, both in the EU-15, some other key OECD countries and the NMS of the EU.

Methodological approaches used

First, we develop a Schumpeterian endogenous growth model (two sectors, a competitive final goods sector and a monopolistic innovation sector) with trade unions. This model explains the effects of labour market institutions on growth and unemployment.

We estimate empirically the model for disaggregated data which comes from the Eurostat's European Regional Database (2005). The statistical regions of Europe correspond to the second level of the Nomenclature of Units Territorial for Statistics (NUTS 2). The corresponding countries considered are: Austria, Belgium, Germany, Denmark, Spain, Finland, France, Ireland, Italy, Netherlands, Portugal, Sweden and the United Kingdom for the period 1980-1995. The originality of the approach is to take into account the large heterogeneity between regions inside a country. The specificity of each European region is measured by the growth rate of its Solow residual. This indicator can be viewed as the closest measure of the specific technology available in a specific region.

The second approach is the following. In the preceding analysis, we focus on the link between unemployment and productivity: we neglect the hours worked and the participation margins. Now, we propose to investigate the links between all labour margins and the productivity. Hence, GDP per capita (Y/P) is decomposed into four labour market components and the productivity:

$$\frac{Y}{P} = \frac{Y}{H} \cdot \left[\frac{H}{E} \cdot \frac{E}{L} \cdot \frac{L}{N} \right] \cdot \frac{N}{P}$$

where Y/H denotes productivity per hour worked, H/E hours worked per employee, E/L the employment rate, L/N the participation rate and N/P the dependency ratio.

We analyse this decomposition using a second data set, based on long time-series of the OECD countries. The countries are Belgium, Denmark, Germany, Greece, Spain, France, Ireland, Italy, the Netherlands, Austria, Portugal, Finland, Sweden, the United Kingdom, the United States, Japan, Canada, Switzerland, Norway, Australia and New Zealand. The time period is 1960-2004. The originality of the approach is to decompose the catch up of the US between the long-run productivity dynamics and the long-run adjustments of the labour markets.

The overall joint starting point in Work packages 1 and 3, and also in the whole TAXBEN project, can be illustrated with the following figure, which decomposes the gap in the income levels between the EU and the US into the five components just mentioned.

Finally, as a fourth research task, the last objective of WP 3 is to analyze the short and medium-run relationship between the employment and growth. Remember that in the long-run, our results suggest that we can have more growth in Europe with more employment. The short-run analysis is important for the political leaders. Indeed, the impact of the reforms must improve the welfare before the next election. Today, European political leaders are committed to the Lisbon process. This process has two goals: an increase in both economic growth and the employment rate. Is there a conflict between the two objectives of the Lisbon process? From the traditional theory point of view, summarized by the Okun law, there is no conflict between growth and employment in the short-run. Nevertheless, this traditional view is acceptable if the economy is hit by demand shock. However, there is now a large consensus on the large size of the supply shock in the explanation of the business cycle. Hence, a conflict between growth and employment can arise in the short run. We propose to test this assumption in this last part of the WP3. We use the approach of the SVAR methodology and simulation of an econometric model, built for the Finnish labour market.

Figure 2. Decomposition of the income gap between the EU-15 and the US
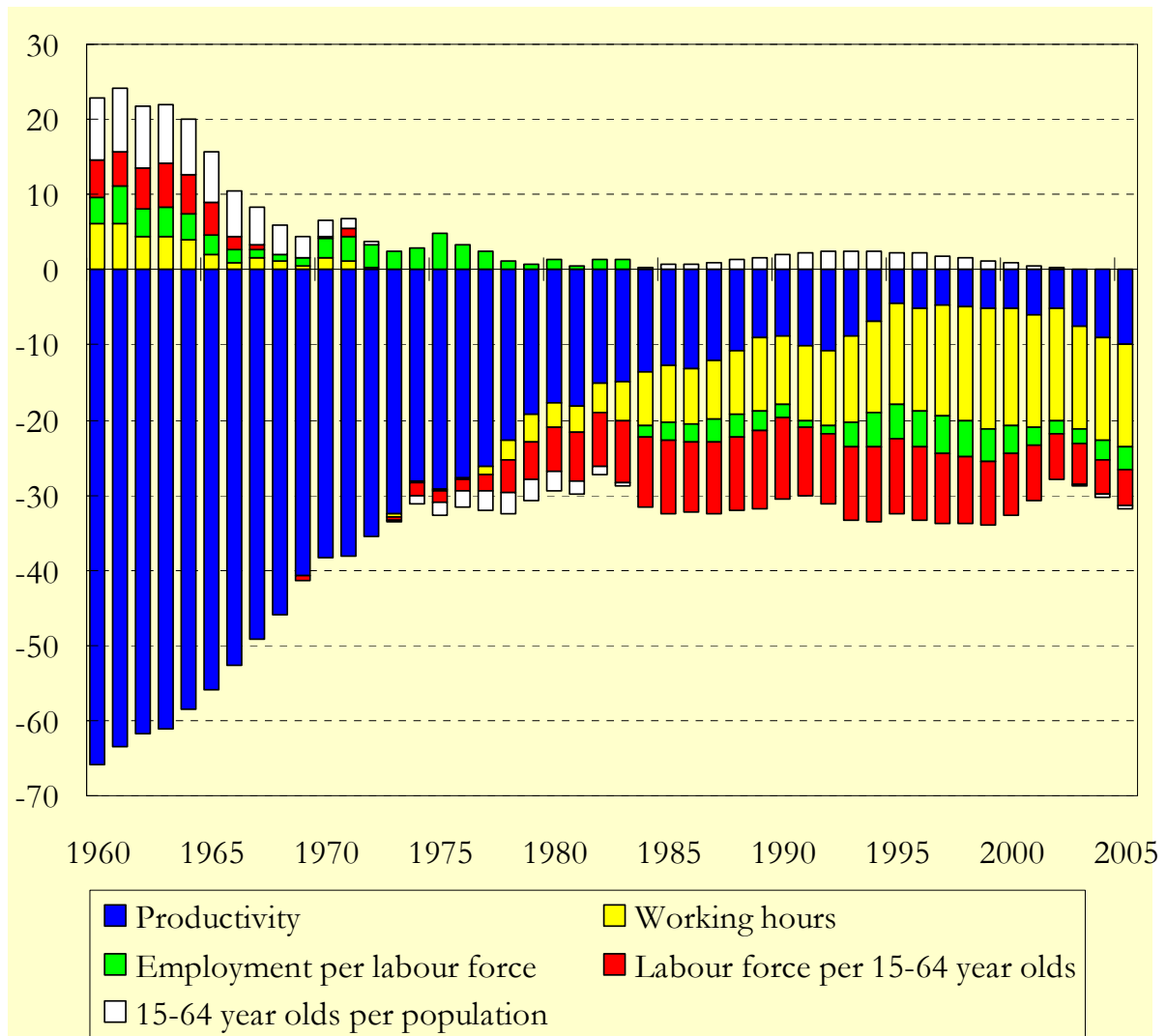
Key results and policy conclusions

Using the theoretical endogenous growth model, we show that (1) high labour cost and/or power-ful trade unions lead to higher unemployment and slowdown of the economic growth, (2) effi-cient bargaining implies more employment but less growth. The empirical results, using regional data, show that,

1) Technological progress increases the growth rate of the GDP per capita, and decreases the unemployment rate.
2) At the opposite, the tax wedge and unemployment benefit (UB) decrease the growth rate of the GDP per capita and increase the unemployment rate.
3) More cooperative bargaining process, measured by the index of the coordination of the wage bargaining, decreases both growth and unemployment.

These first results are in accordance with the theoretical investigation. Contrary to the theoretical predictions, the bargaining power, measured by the collective bargaining coverage is not statisti-

cally significant. However, this variable has the sign predicted by the theory. Finally, remark that the employment protection is not a significant variable in explaining the growth rate of GDP per capita, but decreases significantly the unemployment rate.

Using the second approach mentioned above, we first present a thorough decomposition of the income gap presented above. After these descriptive statistics, we estimate the conditional convergence of the productivity using pooled least square panel data analysis. Empirical results suggest that there is convergence. Thus countries with lower initial levels of productivity have had faster productivity growth than the countries closer to the technological frontier. Moreover, taxes and gross replacement rate slow down the convergence of productivity. But this last result is not robust. With other explanatory variables, the impact of the tax/benefit system on the productivity growth becomes insignificant.

If we turn now to the average hours worked by the working-aged population, it appears clearly that the tax rate has a negative impact. Hence the higher tax rate in Europe than in the US is the first candidate for the explanation of the low performance of Europe. But the taxes are used to finance the "welfare state". Taxes and social insurance can be correlated. Hence, other regressions show that, if the tax rate is not included in the vector of the explanatory variables, UB and Employment Protection (EP) become significant. This shows that these labour market institutions which reduce flexibility, also explain the decline in hours worked.

In the preceding empirical analysis, we focus on the old Europe. What about the NMS? We are able to reach the following conclusions.

1. First, a brief look on the data shows that these countries catch up of the old Europe. Indeed, for NMS productivity catching-up a higher initial gap implies higher speed of convergence.
2. Does the labour market institutions in the NMS allow to make easier the catching up of the Old Europe? A priori, the answer is positive because, in relation to EU-15, the NMS have lower Passive Labour Market Policy expenditures, Employment Protection and union density. But the NMS have the same levels of taxes. Nevertheless, with the same tax level as in the old Europe, the catching-up process of the NMS has slowed down.

Empirical results in the fourth part of the WP show that a positive technology shock increases productivity but decreases employment. These results are in accordance with the new-Keynesian view: indeed, with preset prices, the demand is constrained in the short run. Hence, less hours are needed to satisfy the demand of goods if the efficiency increases. At the opposite, a demand shock has not a significant impact on the productivity, but it increases the number of hours worked. Finally, this empirical analysis also supports the view that the taxes have a negative impact on hours worked in the long run. Hence, to summarize, the empirical results show that there is conflict between the two Lisbon objectives in the short run. This occurs because an impulse in the R&D sector, increasing directly productivity, can lead to a decrease in hours worked.

The core policy conclusions of the WP are as follows. The size of the state, measured by the tax-to-GDP ratio reduces the hours worked per employee, the employment rate and the productivity growth. This leads to confirm the policy makers about the essential need to decrease taxes. But a large part of the taxes cannot be cut down because they are the counterparts of the insurance programmes (welfare state) or the R&D public sector. The costs of transition toward an economy with only individual insurance and only competitive R&D sector overstate the cost of the steady-state tax-distortions. Hence, the essential problem is the use of the taxes. Non-productive expen-

ditures of the governments should be redirected towards R&D by the public sector (more growth and more employment in the high-tech sector). The second essential problem is the profile of the taxes: a reform of the tax/benefit system should give more value to employment for the medium- and low-skilled workers (payroll tax subsidies, sanctions in the UI system). See also Work package 1.

3.3.2 Summary of the deliverables

There are altogether four working papers prepared under this WP.

3.3.2.1. Growth, unemployment and tax/benefit system in European countries: Theoretical and empirical investigations – Authors: Stephane Adjemian (Cepremap & GAINS (Université du Maine)), François Langot (PSE-Jourdan & Cepremap & GAINS) and Coralia A. Quintero Rojas (GAINS (Université du Maine)) (Deliverable No. 16 B)

Introduction

The observed high unemployment in continental Europe and the slowdown in economic growth in the last decades naturally raise the question of whether these two phenomena are related. On the empirical side, there is no consensus regarding the sign of the correlation between growth and unemployment, either across countries or across longer periods of time in the same country. The same is true on the theoretical side. Nevertheless, the endogenous growth theory and the equilibrium unemployment theory suggest that the distortions due to fiscal instruments lead to a lower growth or to a higher unemployment rate. This suggests that the link between growth and unemployment can be viewed through the simultaneous link between growth, unemployment and labour market institutions.

Research task adopted

In this contribution we construct a theoretical model to analyse the effects of labour market institutions on growth and equilibrium unemployment and estimate it using regional data on EU-15 countries.

Methodology used

The main hypotheses of our model built in the paper are the following: (i) Innovations are the engine of growth. This implies a "creative destruction" process generating jobs reallocation; (ii) Agents have the choice of being employed in production or being engaged in R&D activities; and (iii) there is no full employment because the trade union representing the workers' interests sets the wage rate above the competitive level.

Key results and policy conclusions

In the theoretical model we show that:

(i)   Powerful trade unions or higher labour costs associated with one or more of the labour-market variables (e.g., the unemployment compensation, the payroll taxes payed by employers, the taxes paid by workers or the cost of employment protection) cause more unemployment and the slowdown of the economic growth.

(ii)   A coordinated bargaining process increases employment, at the price of a lower growth rate. These theoretical predictions are consistent with our empirical analysis.

On passive labour market policies we reach the following key theoretical results. First, we analyse the consequences for growth and unemployment of (i) a more generous unemployment insurance system, (ii) higher taxes on labour incomes, and (iii) *a* higher level of employment protection.

The first result is that an increase in the unemployment compensation, or in the payroll taxes, or in the taxes paid by workers or in employment protection leads to an increase in unemployment and to a decrease in the rate of growth.

This last result is very intuitive: a higher labour cost implies a higher wage and so a decline in the labour demand. The total outcome is a contraction of the monopolistic profits with the subsequent reduction in the expected value of an innovation. This, together with the fact that higher wages make production more attractive with respect to R&D, tends to reduce the number of researchers. Thus, the growth rate falls, too. Concerning the impact on unemployment, since neither the wage rates nor the labour demands change, the only effect is a contraction of the profits. This discourages that workers engage in R&D activities, and then the growth rate falls and unemployment rises.

The impact of the unions can be analyzed in two steps. First, for an uncoordinated wage bargaining process, one can derive the implications of a higher bargaining power. Second, we can compare the outcome of an efficient bargaining process with the inefficient outcome computed above.

The second key result is that an increase in the unions' bargaining power leads to an increase in the unemployment rate and to a decrease in economic growth.

The economic intuition is the following: a bigger bargaining power implies higher wages. Then the labour demand for production declines, this contracts the monopolistic profits and so the expected value of an innovation. This discourages workers from R&D. The total outcome is more unemployment and a lower economic growth.

If in each sector the monopolistic firm and the trade union bargain over both the labour demand and the wage rate jointly, the outcome is the efficient one. The third key result is that under efficient bargaining, employment levels are higher but economic growth is also lower than under uncoordinated bargaining. However, the comparison is ambiguous for unemployment.

Because there are less researchers but more employed in production, we do not know the total effect on unemployment. The gain in employment at the same labour costs is due to the coordination in the setting of wages and the labour demand for production. Yet, the decreasing returns to research induce a contraction of the monopolistic profits while the opportunity cost of R&D is unchanged. Consequently, there are less researchers under efficient bargaining.

The empirical analysis produced the following results. The observed high unemployment in continental Europe and the slowdown in economic growth in recent decades naturally raised the question of whether these two phenomena are related. Our theoretical framework clearly shows that the labour market institutions may imply high unemployment and low growth. Equipped with these results, we then explore if the heterogeneity of growth and unemployment experiences across European countries prevails at a regional level and, if that is the case, how much of this is accounted by the labour market institutions.

The disaggregated data we use comes from the Eurostat's European Regional Database (2005). The Statistical regions of Europe correspond to the second level of the Nomenclature of Territorial Units for Statistics (NUTS 2 regions). The average size of the regions in this category is between 800 000 and 3 million. The corresponding countries to the regions considered are: Austria, Belgium, Germany, Denmark, Spain, Finland, France, Ireland, Italy, The Netherlands, Portugal, Sweden and the United Kingdom, for the period 1980-1995.

In summary, the following empirical results confirm our theoretical approach:

1. The tax wedge and unemployment benefits lower the growth rate but increases the unemployment rate,
2. The employment protection increases unemployment rates, without significant effect on the growth rate of GDP per capita,
3. The coordination of wage bargaining lowers the growth rate and the unemployment rate. More than a validation, this last result gives the sign of the link between unemployment and coordination which is ambiguous in our theoretical model.
4. The growth rate of the Total Factor Productivity (TFP) increases (decreases) the growth of the GDP per capita (the unemployment rate). In our model, a higher TFP is due to a more efficient R&D sector.

Nevertheless, the links between the bargaining power and the endogenous variables are not significant, whereas our theoretical model suggests unambiguous relationships. These results can be explained by the poor approximation of the bargaining power by our statistical measure (collective bargaining coverage).

3.3.2.2 Productivity, hours worked, and tax/benefit systems in Europe and beyond - Author: Ville Kaitila (ETLA) (Deliverable No. 16A)

Introduction

The EU-15 countries were catching up with the United States in terms of labour productivity up until 1995, but after that Europe has on average been losing ground. However, there are considerable differences between the European countries in this respect. Meanwhile, the average number of hours worked by the working-aged population was declining in the EU-15 countries relative to the USA up until the mid-1990s, but started a recovery shortly thereafter. As a result of the developments in productivity and hours worked, there has been very little change in relative GDP per capita between the EU15 and the USA after 1970. However, due to Europe's slower population growth total GDP reached a peak relative to the USA in the mid-1970s and has been falling behind thereafter.

Research task adopted

We put special emphasis on tax and benefit variables when we analyse what factors have affected the relative performance of the EU-25 and other OECD countries in 1960-2004. We decompose GDP per capita into two parts (see above on page 41): How much value added in purchasing-power terms is produced on average in one hour worked (labour productivity) and how many hours the working-aged population aged 15-64 years work on average. The latter variable merges three labour market indicators into one: the number of hours worked by each employed person, the participation rate and unemployment. However, from our point of view the important issue is the total number of hours worked. We do not discuss whether the different factors influence the supply of or the demand for labour more.

To the extent that the analysis is also based on the development preceding the early 1990s the new EU member countries that joined the Union in 2004 are not included. On the other hand, some industrialised countries outside the EU-15 are included because they can give us further insight into the factors that may affect productivity and the number of hours worked.

Methodology used

We approach the research task from several angles. On the one hand, we use panel data econometrics for 21 OECD countries in 1960-2004 to explain the growth rate of labour productivity and the number of hours worked. The data are in non-overlapping five-year averages. This should remove largely the influence of business cycles. The estimation method is pooled least squares estimations with White heteroskedasticity-consistent covariances for the cross-sections, corrected for the degrees of freedom. We use both country and time-period fixed effects. In addition to this we use cross-sections to analyse the 1995-2004 period. We concentrate on different kinds of tax and benefit variables but also take into account variables as diverse as investment into research and development or inflation. Productivity and hours worked are mostly analysed separately. However, their possible interaction is also discussed.

Key results and policy conclusions

The first key finding is that the development of productivity does not seem to be influenced by tax/benefit variables. While there surely is a problem with productivity growth in the EU-15 countries, there are some points that need to be taken into account before criticising the EU countries too harshly. First, while slower productivity growth is true on average, there are several EU-15 countries with growth rates in 1995-2004 more or less equal to that in the USA. Meanwhile, especially Spain and Italy, and to a lesser extent the Netherlands, suffered from low productivity growth during this period. In fact, the average growth rate of productivity in 1995-2000 in the EU-15, excluding Spain and Italy, was the same as in the USA. While Spain has been suffering from negative productivity growth, employment has grown very rapidly and GDP growth has equalled that in the USA. Meanwhile, Italy and to a smaller extent the Netherlands suffered from a loss of competitiveness due to a too fast rise in unit labour costs.

In the cross-section analyses for averages of 1995-2004 we concentrated on 'high-productivity countries' with productivity exceeding 70 per cent of the US level in 2004. This is because the growth strategy of the least wealthy countries can be based on very different foundations than in countries that are closer to the technological frontier. We found that there is a statistically significant positive correlation between the growth rate of productivity, on

the one hand, and higher R&D and ICT investment as a percentage of GDP, a higher share of young adults with at least upper secondary education, and lower product market regulation, on the other hand. Often this result requires that we exclude Ireland, which has had a very high productivity growth rate with little investment in ICT and R&D. No correlation was found between productivity growth, on the one hand, and the taxes-to-GDP ratio or the degree of unionisation, on the other hand.

The results from our pooled least squares regression analysis show that productivity convergence has occurred. The results also largely confirm those from the cross-section data analyses. The growth rate of labour productivity has been affected positively by higher fixed investment, lower inflation, higher R&D investment, and increased exports. In most specifications taxes and gross replacement rates had no statistically significant effect on productivity growth. We found a negative effect from taxes and a positive one from gross replacement rates when they appeared together with fixed investment or inflation. However, with this evidence we conclude that taxes and gross replacement rates are unlikely to have had an effect on productivity growth.

The second key finding is that tax/benefit variables do affect the development of the number of hours worked. The average number of hours worked by a working-aged person was the same in the EU-15 area as in the United States in 1970 but declined thereafter to just 73 per cent of the US level by 1997. After that it has recovered and increased to 79 per cent by 2004. The faster ageing of the European population increases healthcare and other costs to these societies. The costs would be easier to finance from a larger GDP, and GDP would be larger if people were to participate in production more.

In many studies, the lower number of working hours in Europe has been attributed to either higher taxes and social benefits and/or a relatively stronger influence of trade unions. Higher taxes mean that the opportunity cost of leisure time increases and it becomes less profitable to work. According to our cross-section analyses, there was a strong negative correlation in the OECD countries between the average number of hours worked by the working-aged population and the taxes-to-GDP ratio in 2000-04, although this requires the exclusion of Denmark, Finland and Sweden from the analysis. Also, looking at historical time series the rise and then stabilisation of taxes at some new higher level seems to have often resulted first in a decline in the number of hours worked and then their stabilisation at some new lower level.

We further find a negative correlation between the average number of hours worked, on the one hand, and production market regulation, gross replacement rates and the strictness of overall employment protection legislation, on the other hand. Income inequality and trade union density do not correlate with the number of hours worked, but collective bargaining coverage has a negative correlation. There is also a negative correlation between the ratio of collective bargaining coverage and trade union density, on the one hand, and the average number of hours worked, on the other hand. This ratio can be thought of as a proxy to how 'democratic' the trade unions are. If the ratio is very high, a relatively small number of trade union members, or their representatives, negotiate wages for almost every employed person. At least in principle, it is possible that this leads to a radicalisation of trade union policies.

According to our pooled least squares panel data estimations for the 1960-2004 period, the average number of hours worked by the working-aged population seems to depend negatively on the taxes-to-GDP ratio. Also, as the only independent variable, gross replacement

rates have had a negative effect, collective bargaining coverage has had a positive effect, and the ratio of collective bargaining coverage and trade union density has had a negative effect on the number of hours worked. On the other hand, trade union density and our measure of employment protection, which is different from the one used in the cross-section analysis, fail to explain the number of working hours.

It has to be noted that leisure time is valuable in itself. If we work less, however, GDP will be lower because higher productivity growth cannot compensate for lower working time anymore as has been possible in the past. And here we do find evidence that higher taxes with respect to GDP have had a negative impact on the number of hours worked. This can of course arise either through lower demand for labour or lower supply of labour, or both. Taxation, benefits and income transfers have potentially a significant impact on the labour market through incentives.

The key policy conclusion is that more emphasis should be put on education, investment and incentives to work.

3.3.2.3 Labour market institutions and productivity in the new EU member states – Authors: Sten Anspal and Andres Võrk (PRAXIS) (Deliverable No. 18)

Introduction

Prior to accession to the EU, the Central and Eastern European new member states of the EU have adopted a range of labour market institutions similar to those in the Western European countries (Riboud et al., 2002). Since the period of transition from planned to market economies, many of these institutions have been in a continuous process of reform and adaptation. In some cases, policy makers have justified the changes by the need for greater flexibility in the economy, in order to accommodate a dynamic process of growth and catching-up of Western European income levels, in relation to which the NMS countries make up only little more than a half. In our paper we consider the possible role of labour market institutions in either fostering or hindering growth and convergence to Western European income levels.

When speaking of the influence of labour market institutions on growth and output convergence, a relevant question is also whether and to what extent the institutions themselves are subject to convergence in the process of integration into the EU. There are several channels through which labour market institutions may be influenced in this process. Directives and transnational agreements may directly help to shape national institutions of social protection or employment regulation. Labour unions in the new member states collaborate with and receive assistance from their EU counterparts and EU level organizations. Another channel through which convergence might occur is imitation, whereby a country adopts institutions similar to that of a neighbouring western country.

Research task adopted

The two questions posed in our paper are, first, how the labour market institutions in the new EU member states have developed in comparison to those of the EU-15, and second, whether these developments have contributed to their productivity growth. In other words, we ask whether there is evidence of convergence in labour market institutions between the new and old member

states, and whether these institutions have had an effect on convergence in their levels of output per worker.

Methodological approach used

In outlining the trends in the development of the labour market institutions in the NMS, we try to compare these to those in the western European countries. As for the time period, we consider the period from 1995 to the latest period with data available, thus concentrating less on specifically transition-related reforms than on more recent trends in the decade prior to EU accession. Using indicators from Eurostat, OECD and other sources, we try to identify which labour market institutions converge with and which diverge from the average of the EU-15 countries. As labour market institutions, we consider taxation of labour (implicit tax rates on labour), unemployment benefits (expenditure on passive labour market policy), union density and coverage of collective bargaining, employment protection (employment protection legislation indexes), and expenditure on active labour market policies.

After giving background data on the developments of labour market institutions in the new member states, we then estimate the relationship between labour market institutions and productivity growth based on a panel of OECD countries over the period 1970-1999 (using averaged data over non-overlapping five-year periods). We also try to examine the effects of these institutions empirically in a data set for 1975-2004 that includes also the new member states. The data on labour market institutions are from the dataset by Belot and van Ours (2004), supplemented with data on the new member states as much as possible.

Key results and policy conclusions

Examining the developments of the labour market institutions in the Central and Eastern European new EU member states during the decade prior to accession, we find that the trends shared among the countries in this group are declining rates of unionization and coverage of collective bargaining. In most countries, the taxation of labour has also declined. In the majority of countries, expenditure on active labour market policies has not kept up with GDP growth. The relative decline of spending on active labour market policies (ALMP) appears especially pronounced when viewed to the background of substantially increased unemployment rates in some countries. Spending on passive measures has also been lower in most countries toward the end of the period under review in comparison with the mid-1990s.

The situation is more varied in indicators of the strictness of employment protection legislation. Regulations have been relaxed in Slovenia and Slovakia; employers' assessments of hiring and firing procedures have become more favourable also in the Baltic States. The more flexible countries, Hungary and Poland, on the other hand, have tightened their regulations somewhat with regard to temporary work.

Some of these trends have been in the same direction in the NMS and Western European countries. Trade unions have weakened in both groups of countries, although the new member states have moved more rapidly towards lower unionisation and less decentralised bargaining systems, so that there has been divergence in this regard. Taxation of labour remained mostly stable in EU-15, whereas it has fallen in most NMS countries, however the latter development has to be viewed against the background of fairly high levels of labour taxation in the CEE. There has been divergence also in spending on both active and passive labour market policies. One can perhaps speak of institutional convergence to the EU in the sense that largely similar institutions

have been adopted in the new member states, but the parameters of the systems differ in important ways.

Estimating a regression using panel data on OECD countries in the period 1970-1999 with labour market institutions as explanatory variables, the results confirm the negative effect of taxes on productivity growth. However, the variable turns insignificant when hourly productivity is used as the dependent variable, indicating that taxes may affect productivity through the effects on hours worked. In case of employment protection, union density and centralization of bargaining, the effects seem to depend on particular combinations of these institutions analysed and their interactions. For active labour market policies, positive effects on productivity growth were not found.

In a sample that also included the NMS countries, the convergence term explained most of the differences in growth rates. Labour market institutions were generally insignificant, with the exception of the negative effects of ALMP, union density and bargaining centralisation in some specifications. The results indicate that the faster productivity growth rates in the new EU member states are due more to catching up from their lower initial levels of output per worker, rather than their policy choices regarding the design of labour market institutions.

3.3.2.4 Productivity, employment and taxes – Evidence on the potential trade-offs and impacts in the EU - Authors: Kari E.O. Alho and Nuutti Nikula (ETLA) (Deliverable No. 16C)

Introduction

A quick look at the cross-section data for the EU countries in relation to the US suggests that the two goals: productivity, being the key determinant of long-term economic growth, and employment would be in sharp conflict with each other, see Kaitila (2006). If more of the EU labour force is wanted to be employed, this can only be met with a lower level of productivity, and vice versa. This is an important policy issue, and therefore information on this link, be there either a trade-off, or a mutual positive relationship, between these two key goals in the short and long run, can deliver essential insight on the internal consistency of the Lisbon reform process in the EU.

Research task adopted

The relationship between productivity and employment is a long-standing issue in macroeconomics, with a fierce discussion between the New Keynesian and Real Business Cycle Schools, focusing on the fact, whether productivity and employment are negatively or positively linked in the short run. Aside from the theoretical and empirical controversy of a proper business cycle model, there is an important policy question, just mentioned, connected to this dispute. Accordingly, our main interest here lies mostly in the question of the long-term effect of productivity gains on employment and thereby we shift the focus to consider the possible long-run structural rigidity in this connection. We also analyse the role of tax policies, which can have an essential impact, and which has so far received only limited attention in the related SVAR literature.

Methodological approach used

The basis for the SVAR analysis is a theoretical model describing technical change, average hours worked per employee, and the aggregate unemployment rate. We identify the technology shock, the demand shock and the tax shocks. Positive demand shocks lead to an expansion in employment, but have no long run effect on productivity. In the long run we also allow for the possibility of structural rigidity so that a positive technology shock may possibly lead to a cut in employment.

We also allow for the case of nominal price rigidity vs. flexibility. In the former case the wage rate is bargained and the price set before the shocks are realised and the firms supply all the output demanded. If there is a positive productivity shock, the demand for labour is reduced, as the firms can meet the output demanded by less production factors, i.e., labour, and there is a negative short-run effect on employment from a positive productivity shock. If there is price and wage flexibility in the economy output is determined by equilibrium between aggregate supply and demand. In the case of a positive technology shock this means that the real wage rate and labour demand will rise in the short run as a result of a positive technology shock. This issue of diversity of short-term effects of technology shocks can only be settled in an empirical analysis. In the long run there can be a neutrality from productivity shocks on employment, but not necessarily so if the labour market is rigid.

In the empirical part of the paper, we use two approaches. Both of them are based on a similar theoretical methodology describing the equilibrium in the labour market, but diverge in the method of empirical application. We first build a theoretical open economy model and identify in it a technology, non-technology and a tax shock and their effects. In the empirical part the first approach is to build structural VAR models and empirically find out the impacts of the structural shocks in the short and long run for all the EU-15 and some other OECD countries. Secondly, we use an aggregative econometric model built by Alho (2002) for the Finnish labour market, based on the idea of the equilibrium rate of unemployment, and simulate it under two types of productivity gains, different from their origin. This allows us to provide a complementary view on the nature of the productivity shocks and their effects. In addition, we also consider a change in the tax/benefit system.

Key results and policy conclusions

The theoretical model shows that the equilibrium unemployment rate depends negatively on labour taxes, but not on the real interest rate, as a higher rate of it only leads to a lower level of productivity and income. This means that a permanent shift in the capital income tax rate does not have an effect on employment in the long run. On the other hand, we come to the conclusion that a permanent change in labour taxes only has a long-run negative impact on employment, but not on productivity, which is determined by the capital-labour ratio.

The SVAR model analysis shows that in the short, but less so in the long run, there exists a negative trade-off between employment and productivity in most EU countries, but not in all, and unlike in the case of the US. The results of the simulations of the econometric model show that, although not in the short, but in the medium run there may be quite essential employment gains from an acceleration in productivity, although in the long run there is no connection between them.

The results show that in the short term there is indeed in the EU a trade-off between the two key economic goals of productivity rises and employment. This is less severe in the long run, although does not fully disappear, but turns over time to become statistically insignificant. In the short term, a positive non-technology shock has a positive effect on productivity.

The country-wise results clearly differ between the countries in some important respects. Quite uniformly there is a short-run trade-off between employment and productivity so that a positive productivity shock leads to an immediate reduction in employment in the EU countries. We can interpret this so that productivity gains have to a large extent been linked in the short run to simultaneous labour shedding, i.e., we have the basic case of price stickiness in the short run. In the long run, there is in some cases this kind of trade-off, but of a smaller magnitude, and not so significant in statistical terms. Neither is the effect so uniform as in the short run. So, most of the EU-15 countries do not reveal a long-run trade-off between productivity and employment, with the exception of the Netherlands and Italy. What is interesting is that, in contrast, the US economy does not reveal this kind of characteristics, as there is virtually no trade-off of this type, even in the short run, which confirms the situation of price flexibility there.

As to the effects of aggregate tax shocks, the pattern of impulse responses is less uniform between the countries than between employment and productivity, and the majority of the effects are not statistically significant. Overall, it seems that the negative impact of aggregate taxes is stronger on productivity than on hours, which is a somewhat unexpected result.

In order to analyze the effects of taxes more accurately we modified the VAR model so that it includes two different kinds of taxes; corporate taxes and employee taxes, in relation to GDP. We carried out this analysis only for the aggregate EU-15 countries. Now the labour tax shock has a statistically significant negative effect on employment, and not on productivity, which is line with the theoretical model. The corporate taxes have been fairly neutral with respect to productivity, which is also in line with reasoning above. However, they also have had a negative effect on employment, although the impulse response is not statistically significant in the long term.

We finally use the econometric model for the labour market, built and estimated for the Finnish economy by Alho (2002). The general policy conclusion of these simulations is that, irrespective of the fact that in the long run employment and productivity are not correlated, over the medium run important gains in employment can be achieved through productivity boosting measures if the real wage is capable to adjust and assist in the absorption of the shocks. In this sense, we could take a positive position to the widespread public conception among policy makers about the positive relationship between productivity and employment, as exemplified here at least to apply to the case of a single EU country.

The broad policy conclusion is that the EU countries should make their labour markets more flexible to adjust to the introduction of new technologies and adjust to the negative supply shocks smoothly.

3.4 Macroeconomics of the EU tax systems under EMU (WP 4)

3.4.1 Summary of the Work package

Introduction

Since the launch of the common currency, the Euro Area has experimented a number of un-coordinated tax reforms, mainly tax cuts on personal as well as on corporate income, changes in VAT rates, and reduced number of income tax brackets. In addition, governments have been striving to reform their benefit systems. Although tax policy has been the core business of governments for decades, the new monetary regime and the scheme chosen for economic governance in the Eurozone raise new questions:

(i) The stability and growth pact (SGP) leads to higher reliance on automatic stabilizers, as opposed to discretionary fiscal policies. If Euro Area members are to move towards flatter tax systems, what can be expected in terms of automatic stabilizers?

(ii) Monetary union changes the short-run impact of tax policies both at home and in other EMU countries. However several other evolutions, such as real integration and financial liberalization, may have also impacted on tax multipliers. What is, today, the impact of a tax cut on the domestic economy as well as on Euro Area partners? Cross-border multipliers are especially important as they define the needs for fiscal co-ordination in the Euro Area.

(iii) The very existence of the SGP changes the incentives of Euro Area members to reform tax/benefit systems. The question then is whether the SGP has been powerful to countervail political myopia and foster structural reforms, or whether it has reduced the incentive to cut taxes.

Research tasks adopted

Work package 4 addresses these three issues through five research papers, three of which are theoretical and two empirical. These papers aim at (1) studying the impact of tax progressiveness on automatic stabilizers, (2) analysing tax and spending direct and cross-border multipliers in the monetary union, and (3) evaluating the impact of the stability and growth part on the incentives of governments to reform tax/benefit systems.

Methodological approaches used

The first theoretical paper, addressing the first policy issue (1), considers the stabilizing properties of the tax systems with respect to various shocks hitting the economy. The paper uses a Mundell-Fleming type model with a supply curve and a Taylor rule. Taxation can be either regressive, proportional or progressive. Taxation and public spending can be fully indexed on prices, partially indexed or un-indexed. Three types of macroeconomic shocks are successively scrutinized: a demand shock, a tax shock and a supply shock.

The second theoretical model addressing (2) involves two identical EMU countries in a static setting. Each economy is described by an IS curve and a Phillips curve. The single central bank sets the single nominal interest rate through explicit optimization of a loss function that depends

on aggregate inflation and on the aggregate output gap of the Area. Hence, it reacts endogenously to public spending and net tax shocks which are exogenous.

In a first version of the model, the central bank does not accommodate fiscal shocks: in the case of an expansionary shock in one country, it raises the interest rate until the aggregate inflation rate and output gap of the Area are stabilized. This means that output declines in the other country, except if the shock has large supply side effects, in which case perfect stabilization by the central bank is unreachable.
In a second version of the paper, the central bank smoothens the interest rate, i.e. it is reluctant to move the interest rate too suddenly after a shock. In this case, a fiscal expansion in one country has a positive impact on the other country's output gap, except if the shock has large supply side effects.

The empirical analysis addressing issue (2) above involves two distinct methodologies leading to mostly convergent results.

In the first of these papers a two-country, dynamic stochastic general equilibrium (DSGE) model is estimated in order to evaluate the impact of a public spending shock occurring in one economy. The two countries chosen are Germany in France. Like the theoretical model described above, the setting includes a Phillips curve and an IS curve in each country, and a single Taylor rule. Fiscal policy is exogenous. The model is estimated through a Bayesian methodology (using priors from related studies) with quarterly data covering the period from 1991 to 2005.

In turn, the second empirical paper provides a factor-augmented VAR (FAVAR) analysis of fiscal multipliers and fiscal spillovers. First, domestic multipliers are analysed through the estimation of a FAVAR model of net taxes, public spending, output, inflation and interest rate for Germany, the United Kingdom and the United States, successively, based on quarterly data from 1971 to 2004. The world business cycle is controlled for by the inclusion of factors representing developments in the world economy. Fiscal shocks are identified using an identification scheme à la Blanchard and Perotti (2002) and Perotti (2005). In order to see whether fiscal multipliers have evolved over time, each model is then re-estimated on a rolling window of 17 years.

In a second step, cross-border effects of fiscal policies are analyzed by adding the GDP and real effective exchange rate of seven EU countries in the German FAVAR model. This extended model is estimated on the whole period as well as on 17-year rolling windows.

This last question above (iii) is addressed by building a model which is a dynamic, two-country model where the two periods are linked by investment. Imperfect competition and distortions materialize through mark-ups on goods markets and on the labour market, influenced by capital and income taxes. Several types of governments are successively studied: a social planner, a myopic government, and a non-elected body. The sanctions incurred by violations of the SGP are introduced in the model. Finally, four types of reforms are successively studied: a reduction in labour taxes, a reduction in the welfare state, a reform of the labour market, and a reform of product markets.

Key results and policy conclusions

The main results of the first theoretical paper are the following:

- If the economies are mainly hurt by demand shocks, then flatter tax systems tend to de-stabilize output whereas indexation of taxes on prices tend to stabilize it.
- If the economies are mainly hurt by supply shocks, then the progressiveness of taxation has little impact on output stability.

On the whole, the move towards flatter tax systems would likely lead to more unstable output in the Euro Area.

The key results of the second theoretical paper under (i) are the following. Considering that (a) the ECB does smoothen the interest rate, (b) net tax shocks do have supply-side effects, and (c) spending shocks may have a declining impact on aggregate demand due to financial liberalization, the main result of the paper is the following. Public spending expansions may produce lower, positive spillovers in the Euro Area today than they used to in the past, whereas tax cuts may now produce negative spillovers.

The first empirical paper, addressing the issue (2) above, finds that a positive spending shock in Germany has a positive Keynesian impact on German GDP and a positive but small spillover on French GDP. A positive spending shock in France has symmetrical effects. The main result of the paper is that spillovers are small due to a significant reaction of the common interest rate to spending shocks in either country.

The main result of the second empirical paper is that both domestic and cross-border effects of German tax shocks have tended to weaken over time. However they have remained positive, i.e. an expansionary shock in Germany has a positive impact on partner countries, especially neighbouring ones. The impact on the interest rate is, however, found to be weak.

The main results of the last paper, addressing the issue (3), can be summarized as follows. Political myopia has a negative impact on the willingness to reduce the labour tax, and the SGP reinforces this pattern since excessive deficits lead to sanctions. Political myopia also reduces the willingness to reduce the welfare state, but this time the SGP has a positive impact on the willingness to reform. Finally, myopia has little impact on the willingness of governments to reform labour and goods markets, and the SGP produces the missing incentive.

Given that all reforms but the reform of the goods market have negative impact on neighboring countries, the paper concludes that EU countries should continue to coordinate product market reforms but leave the reforms of the welfare state and of the labour markets to peer pressure, with the positive, SGP catalyst.

3.4.2 Summary of the deliverables

There are five working papers prepared in this Work package.

3.4.2.1 Economic shocks, progressiveness of taxation, and indexation of taxes and public expenditure in EMU, Author: Markku Kotilainen (ETLA) (Deliverable No. 11A)

Introduction: background of the paper

Progressive income taxation is common practice in the old member states of the EU. The new members have, however, challenged this practice. Lithuania, Latvia, Estonia and Slovakia currently have proportional income tax systems, and Romania also has this kind of tax system.

Proportional income taxation has microeconomic advantages, which are related to incentives to work. Also, arguments are often made that inefficiencies can arise due to differences between proportional capital income taxes and high marginal income taxes. There is some evidence of positive growth effects from proportional taxation, too. The counterarguments to proportional income taxation are usually based on income distribution. In addition to the above-mentioned viewpoints, there is a macroeconomic aspect that also deserves attention, namely how different tax systems affect stabilization of an economy facing different kinds of shocks. This is the topic of the current paper.

Research task adopted

We study the properties of different kinds of income tax systems in the context of the EMU countries. The emphasis is on progressiveness of taxation and on indexation of taxes and public expenditure.

We examine economies facing three unanticipated shocks: demand, tax and supply shocks. Demand shocks can be exogenous changes in foreign demand, consumer preferences, etc. Policy-related demand shocks are typically changes in public expenditure. Changes in taxes have both a demand and supply component. A typical supply shock is an exogenous change in productivity, oil prices, or other factor affecting producer prices. If supply shocks are temporary, automatic stabilizers to cushion the effects can easily be justified. If, however, the shocks are permanent, it can be argued that the stabilizers delay the necessary adjustment. When the (temporary) shocks originate in the market, we would like to stabilize them to some extent. In the case of policy-induced shocks, the focus is usually on the effectiveness of the policy tool in question. Automatic stabilizers reduce, in this situation, a part of the effect of the measure.

Methodological approach used

We use a Mundell-Fleming -based two-country theoretical macroeconomic model with a rather rich supply side. The bilateral exchange rate between the countries is fixed. The model tries to depict the situation in the larger EMU countries. We also use a one-country model, which is more relevant in the case of small EMU countries.

In addition to the extent of tax progressiveness, the authorities have to decide on the inflationary adjustments to be made on taxation and public expenditure. In extreme cases, inflation can be totally neglected, on the one hand, or taxes and public expenditure can be fully indexed to changes in prices, on the other.

The tax shock is a mixed shock including demand as well as supply effects (through wages and prices). All shocks are assumed to occur in country 1 ("Germany"). They have, however, effects

on country 2 ("France") through output and price spillovers as well as through changes in competitiveness. Because the model is too complicated for obtaining a priori results, we calculate the solution by using realistic estimates for the parameters. In the one-country model, however, *a priori* results are obtained.

Key results and policy conclusions

We first present the effects without any monetary policy reactions. A positive demand shock in country 1 increases the output and prices of both countries, though more so in the country where the shock originates. In the case of a tax cut, the output effect in the country where the shock originates is clearly positive, whereas in the foreign country it is relatively smaller than in the case of a demand shock because that country's competitiveness deteriorates in this case. Prices change only marginally because the effects through lower costs and through increasing economic activity work in opposite directions. A pure supply shock has, in the short run, a "beggar-thy-neighbour" nature.

When studying Taylor-type monetary policy rules, we notice that in the case of a demand shock, following a price or output target tends to stabilise both union-wide output and prices. In the case of a tax shock, strict adherence to a price target does not tend to stabilise output, because prices change only marginally. In the case of a positive supply shock prices decline in both countries, whereas union-wide output remains rather stable due to opposing effects in the two countries. Following the price target would thus destabilise the output.

When studying the effects of progressive taxation in the one-country model we notice that progressive taxation tends to stabilise output in the cases of demand and tax shocks. In the case of a supply shock, progressiveness tends to stabilise output if taxes are fully indexed. If they are not, the outcome depends on the relative magnitudes of the parameters of the model. In particular, the smaller is the demand effect of taxes, the more likely it is that progressiveness will tend to stabilise output even with low indexation of taxes.

Progressive taxation stabilises prices definitely only in the case of a tax shock. In the case of a demand shock, progressiveness tends to stabilise prices when the supply effect is weak, and in the case of a supply shock when the demand effect is weak.

In the two-country case we use the model version without monetary policy reactions. The motivation for this is that we want to keep the effects of the tax parameters transparent. Monetary policy often takes time, and we do not know the policy rule very well. Because the monetary policy of the central bank is based on discrete decisions, the reaction can also vary over time. We research two cases: 1) a case where the reaction of wages, and, accordingly, of prices to taxes is rather small, and 2) a case where wages and prices respond strongly to changes in taxes. The first assumption can be motivated by the short-run nature of the model (wages are sticky due to contracts often for one or two years) and by the assumption that employees put weight on the public expenditure financed by taxes. The second scenario is relevant in countries whose citizens strongly dislike taxes and where wages are determined flexibly on short notice.

When prices react strongly to changes in taxes, the output stabilisation property of increasing progressiveness holds in both countries in the case of a demand shock. But now the deviation of prices in both countries tends to increase. This is because increasing taxes tend to raise prices. Here we have a clear case for restrictive monetary policy. In the case of a tax shock, increasing progressiveness tends to stabilize the output of both countries by dampening part of the shock's

effect. When prices react strongly and quickly to changes in taxation, higher progressiveness tends to dampen the original decline in taxes, and accordingly the decline in prices in country 1. In country 2, taxes increase more with progressive taxation and the decline in prices in this country is also smaller. In the case of a supply shock, output and prices are, again, not very sensitive to progressiveness. Output in both countries tends to deviate slightly less with higher progressiveness. Also prices in country 1 deviate slightly less with progressive taxation. Prices in country 2, however, deviate somewhat more. When taxes are less than fully indexed, the effects of progressiveness on output deviations are about the same as in the case of a weaker supply reaction to taxes. Prices become, however, more sensitive to progressiveness. Price deviations are enhanced when progressiveness increases.

About the role of progressiveness in economic stabilisation, following various shocks, in the two-country model, it can be concluded that progressive taxation tends to increase the stability of output in both countries in the face of a demand shock. Progressiveness stabilises prices if wages and prices react only modestly to changes in taxes, but destabilizes them when these reactions are strong. In the case of a tax shock progressive taxation tends to stabilise the output and prices of both countries in both cases. From a policy point of view, progressive taxation partly offsets the output effects of a tax cut. In the case of a supply shock output and prices are not very sensitive to progressiveness. This result is consistent with studies using the INTERLINK, QUEST, NiGEM and FRB/US models (where, however, the full operation of all types of automatic stabilisers is assumed). Sensitivity increases when taxes are less than fully indexed to prices. In this case output deviations are slightly greater than with proportional taxation in the country where the shock originates, but slightly smaller in the other country.

We can roughly summarise the results obtained in the one- and two-country models by saying that progressive taxation tends to stabilise output or has a neutral effect in most cases. The effects on price stabilisation are, however, more controversial, since they can be stabilising, rather neutral or destabilising depending on the case at hand.

In the case of a positive demand shock occurring in one country, the deviation of output and prices in both countries increases when indexation of taxes or public expenditure increases. This is because deflating the effect of rising prices tends to enhance the real effect. In the case of a tax shock, the price effect is so small, due to the conflicting demand and supply effects of taxes, that indexation does not matter much. In the case of a supply shock, taking into account the effect of declining prices in one country tends to lead to heavier taxation that, in turn, is likely to stabilise the output of that country. The effect is similar in the other country until some medium degree of indexation. The effects of tax indexation on prices are small. Increasing indexation of public expenditure, however, tends to destabilise prices.

3.4.2.2 Short-term fiscal spillovers in a monetary union – Author: Agnès Bénassy-Quéré (CEPII) (Deliverable No. 11 B)

Introduction

One popular view concerning macroeconomic policy in the European Monetary Union is that the ECB should deal with aggregate shocks whereas national governments should concentrate on

idiosyncratic shocks. Still, this simple division of labour encounters several difficulties. First, the ECB will react to aggregate shocks only to the extent that this does not contradict the objective of keeping inflation close to 2%. Second, monetary policy is not a perfect substitute for fiscal policy. Third, a fiscal impulse in one country may impact on output and prices in another country, due to higher imports (trade channel), lower price competitiveness (relative price channel) or to a rise in the common interest rate (interest-rate channel). Whatever their net sign, the very existence of a fiscal spillover asks for some form of coordination among member states. Last, but not least, the effectiveness of fiscal policy is a much debated issue. This raises the question of the needs for coordinating tax and benefit reforms in the Eurozone, in relation with business cycles.

Research task adopted

This paper intends to analyse the sign of short-term fiscal spillovers in a monetary union depending on (i) the way fiscal policy is implemented (expenditures versus taxes), (ii) the strength of the supply-side channel of tax policies, and (iii) the extent of central bank accommodation. The recent evolution of prices in the Eurozone has been shown very sensitive to tax policies in the large economies of the area, which have not been the result of fiscal cooperation. Simultaneously, the ECB has proved relatively flexible concerning short-run movements of aggregate inflation, especially for one-off variations due to oil hikes or tax shocks. Hence, it is necessary to reconsider fiscal spillovers within such context where a tax increase in one country 1 may impact positively on country 2 just because price competitiveness is improved in country 2 due to higher prices in country 1 while the central bank reacts smoothly to higher inflation.

Methodology used

A simple, two-country, static model is developed. It relies on two IS curves, two Phillips curves and an optimization behaviour by the central bank. Fiscal policy consists in either a spending shock, which impacts on demand, or a tax shock, which impacts on both demand and prices. Fiscal shocks are assumed to be exogenously implemented in country 1, and their effect on output gaps and prices in both countries is analyzed.

Key results and policy conclusions

It is shown that both a spending expansion and a tax cut produce positive spillovers on foreign output provided that the central bank accommodates the shock, except if tax cuts have large supply-side effects. In this case, the foreign country does not benefit from a fall in the interest rate (because of interest rate smoothing), whereas it suffers from loss in price-competitiveness.

If the central bank does not accommodate the shock, the spillovers of a fiscal expansion are generally negative: the common interest rate rises until aggregate demand is perfectly stabilized, which entails an output loss in the foreign country. However fiscal spillovers can be positive in the case of a tax cut because induced disinflation reduces or even reverses the reaction of the central bank.

Due to financial liberalization, it is possible that demand side channels of fiscal policy have become less powerful compared to supply side channels, because of higher ability of households to disconnect consumption from current disposable income. This has important implication for fiscal spillovers. For a spending expansion, the spillover effect is likely to become less positive. In turn, the rising importance of supply side effects relative to demand side effects is likely to turn

positive spillovers into negative ones following a tax cut, at least if the central bank obeys an interest-smoothing behaviour.

3.4.2.3 Changing patterns of domestic and cross-border fiscal policy multipliers in Europe and the US – Authors: Agnès Bénassy-Quéré and Jacopo Cimadomo (CEPII) (Deliverable No. 24)

Introduction

The way fiscal policy has impacts on domestic and foreign economies depends on several factors. In particular, the presence of excess capacity, accommodating monetary policy, distortionary taxation and liquidity constrained consumers play a prominent role in affecting how fiscal policies affect the economic activity in the home country. The impact on foreign output depends crucially on the importance of trade links, on real exchange rates and, in a monetary union, on the sensitiveness of private investment and consumption to the interest rate. The last 30 years have witnessed frequent changes in the economic environment. For instance, in most OECD countries, the monetary policy stance became less accommodating in the 1980s compared to the 1970s, and more accommodating again in the late 1990s and early 2000s. Moreover, financial markets have been heavily deregulated. Hence, fiscal policy might have lost (or gained) power as a stimulating tool in the hands of policymakers.

Research task adopted

This study attempts to shed more light on the time evolution of domestic and cross-border tax and spending multipliers. We analyze the domestic impact of fiscal shocks in Germany, the UK and the US and cross-border fiscal spillovers from Germany to the seven largest European economies.

Methodology used

The paper combines a "factor-augmented" vector autoregression (FAVAR) approach with the identification strategy proposed by Blanchard and Perotti (2002), and Perotti (2005), to provide new evidence on the domestic impact of fiscal policy in three OECD countries: Germany, the UK and the US. In the two former cases, three "global common factors" representing worldwide comovement in business cycles, credit conditions and fiscal policies are included in a baseline VAR model to control for a possible bias in multipliers estimation due to the fact that worldwide phenomena may affect fluctuations of domestic output, especially in relatively small countries, rather then domestic fiscal shocks. We then extend our workhorse FAVAR model to study fiscal spillovers from the largest Euro area economy - Germany - to five neighbouring countries France, Italy, the Netherlands, Belgium and Austria) and to two more remote countries (Spain and the UK). After analyzing a period ranging between 1971 and 2004, we perform recursive estimations and shocks identification of single-country and two-country models based on rolling windows of data to assess if and how spending and tax multipliers have changed in the last thirty-four years.

Key results and policy conclusions

It is found that tax shocks are generally more effective in spurring domestic output than government spending shocks. This might be due to the fact that tax policies may rise potential growth in the long run, especially when distortionary taxes are removed thus increasing economic efficiency and competitiveness. Government spending shocks, on the contrary, are more likely to crowd out the private sector. When the estimation is performed recursively over samples of 17 years of data, it emerges that GDP multipliers drop drastically from early 1990s on, especially in Germany (tax shocks) and in the US (both tax and government spending shocks). Moreover, the conduct of fiscal policy seems to have become less erratic, as documented by a lower variance of fiscal shocks over time, and this might contribute to explain why business cycles have shown less volatility in the countries under examination.

Expansionary fiscal policies in Germany do not generally have beggar-thy-neighbour effects on other European countries. In particular, when shorter sub samples are analyzed, our results suggest that tax multipliers have been positive but vanishing for neighbouring countries (France, Italy, the Netherlands, Belgium and Austria), weak and mostly not significant for more remote ones (the UK and Spain). Cross-border government spending multipliers are found to be monotonically weak for all the subsamples considered. However, foreign output seems to react positively in the short run and when the 1970s are dropped, but just for the Netherlands, Belgium and Austria.

Overall these findings suggest that fiscal "surprises", in the form of unexpected reductions in taxation and expansions in government consumption and investment, have become progressively less successful in stimulating the economic activity at the domestic level, indicating that, in the framework of the European Monetary Union, policymakers can only marginally rely on this discretionary instrument as a substitute for national monetary policy. Furthermore, the positive sign of cross-border multipliers suggests that the interest rate channel of transmission of fiscal policy is offset by the trade one.

3.4.2.4 Assessing Spillover Effects from Fiscal Policy in Europe: A DSGE approach - Author: Charlotte Möser (CEPS) (Deliverable No. 25)

Introduction

The introduction of the Euro in 1999 has led to a debate about new challenges for monetary and fiscal policy in Europe. In a currency union, countries share a common central bank, which is responding to union-wide developments. As a consequence, macroeconomic policy at the national level is shifted towards fiscal policy. Whether countries belonging to the euro area should coordinate their fiscal policies depends among other things on the existence of spillover effects from fiscal policy. Spillover effects of fiscal policy can occur via the common interest rate in an integrated capital market and through international trade. In the latter case, fiscal expansions lead to increased economic activity which in turn may also increase imports from trading partners. Spillover effects arising through the interest rate channel are, however, more problematic. An expansionary fiscal policy in few countries may put upward pressure on domestic inflation, forcing the ECB to raise interest rates and thereby affecting all countries in the euro area.

Research task adopted

The paper aims to provide evidence on spillover effects based on a structural modelling framework that can be applied for policy analysis. To this end, we develop and estimate a Dynamic Stochastic General Equilibrium (DSGE) model to analyse the sign and size of spillover effects of fiscal policy both within and between countries. To keep the analysis tractable, we set up a two-country model and estimate it with French and German time series data. We therefore employ a theoretical and an empirical approach at the same time, which is a novelty in the literature on fiscal spillover effects. We understand our approach as a starting point for a comprehensive analysis of spillover effects of fiscal policy in a multi-country DSGE framework covering the whole Euro area.

In contrast to our approach, most of the literature analysing fiscal spillover effects uses empirical Vector Autoregressive (VAR) models. A potential caveat – which we address by developing a structural model – is that VAR models are based on a non-structural modelling framework, which is not applicable for policy experiments and forecasting exercises.

Methodological approach used

We suggest a micro theoretically founded model consisting of two countries of equal size constituting a currency union. In our model, monetary policy is conducted by a common central bank, which sets the interest rate for the union. Fiscal policy is implemented at the country level through government spending financed by lump-sum taxes. The model includes nominal rigidities and both country-specific and union-wide shocks.

We estimate the model with Bayesian inference techniques using French and German time series data. Estimating instead of calibrating the model allows us to make direct use of time series data. The Bayesian estimation method also allows us to formalise the use of prior information obtained from earlier studies. Including prior information improves the estimation of parameters of a DSGE model when data have a short sample period, as is the case for the euro area. In presenting our results, we discuss the parameter estimates and the transmission of a fiscal policy shock through impulse response functions.

Our modelling approach belongs to a new research agenda which has been adopted by various policy institutions in the recent years. In this research program, so-called Dynamic Stochastic General Equilibrium (DSGE) models building on explicit micro foundations with optimising agents are developed to conduct policy analysis and forecasting experiments. While the focus of this literature has been on the analysis of monetary policy, there have been contributions recently discussing the role of fiscal policy in models similar to the present one. Micro founded expectation-based DSGE models provide a framework that is more suited for the analysis of macroeconomic policies, because DSGE models are able to deliver a structural interpretation of the obtained results. In addition, major advances in estimation methodology in recent years allow the estimation of DSGE models that are able to compete with time series models, such as Vector Autoregressive (VAR) models.

Key results and policy conclusions

Our results show that a positive shock to government spending increases economic activity in France and Germany. Examining the propagation of government spending shocks across borders, we find the effect on economic activity to be very small. Moreover, the sign of transmission is

ambiguous: while a government spending shock in Germany is found to raise output in France, a shock to government spending in France results in a negative response of output in Germany. However, the effect arising from the interest rate channel is clearly negative; a fiscal expansion in France and in Germany results in a union-wide interest rate increase. The results suggest that the spillover effects arising from the trade channel are negligible, whereas the effect arising from the interest rate channel is clearly negative. In summary, expansionary fiscal policy triggers a tight monetary policy response and is thereby spreading over the whole Euro Area. Policymakers should therefore strictly support the case for consequent adherence to the rules of fiscal discipline laid down in the Maastricht Criteria.

3.4.2.5 Structural reforms in the EU and the political myopia in economic policies – Author: Kari E.O. Alho (ETLA) (Deliverable No. 21)

Introduction

Structural reforms of the EU have been a long-standing issue in European policy-making and on the agenda of the European and world-wide economic research community. Recently, there have been three main lines of research in this field. First, it has been studied what the current situation in the EU is with respect to the reforms and what the consequences of them and their spillovers are within the Union, second, whether reforms, being beneficial in principle for the EU economies as such, are viable in the political and social environment, and third, how the reforms are indirectly affected by EU policies, notably by the coordination in economic policies implied by the monetary union and the Stability and Growth Pact (SGP) with limits on the budget balance.

Research task adopted

The links between the SGP and economic reforms have been analysed by Beetsma and Debrun (2004) using a two-period political-economic model. In this paper we use a somewhat similar approach as Beetsma and Debrun, but seek to discuss economic reforms in a more explicit way, both their benefits and costs, and evaluate these by building a small model with monopolistic goods and labour markets and distinguish the tax/benefit system. The key factor, the effect of which is influenced by political myopia, and which creates intertemporal spillovers, is the investment behaviour of firms, which can be here affected positively by reform policies. We consider the political bias in economic policies and the fact, whether it can be corrected with a SGP. We omit here the short-run demand and inflationary effects of policies, in order to keep the analysis as manageable, but extend the time span to the medium run with supply side dominance.

Methodological approaches used

We build a two-period model with imperfections in the goods and labour markets, aimed at medium-run analysis of policies and, consequently, concentrate on the supply side of the economy. The consumers allocate consumption over two periods with the aim to smoothen consumption. The monopoly trade union sets its wage so that the after-tax real wage is based on the mark up over the social benefit. The government budget allocation is on social transfers and public consumption, and collects taxes from labour income, and uses borrowing.

Similarly as in Beetsma and Debrun (2004) in the beginning of period 2 there is an election and the present government has the probability p of winning it and running a second term. We as-

sume that the outcome of the election only depends on the present after-tax real labour income of the median voter and assume that he or she is an employed person. We define that the government may be of four possible types, of variable degree of myopia and far-sightedness in policies.

The government faces the options to carry out economic reforms:

(i)   through cutting taxes, only taxes on labour being considered here,
(ii) curtailing the welfare system by lowering b,
(iii) by driving the mark up in the labour market down and reforming it from monopolistic to more competitive, and
(iv) reforming the product market as more competitive by driving the mark up m there down.

Taxes on the capital income are kept fixed. We use a numerical calibration and solution of the policy optimum in the model as a function of the probability p. In addition, we present econometric evidence based on Alho (2002).

Key results and policy conclusions

Our general conclusion is that the structural reforms are negatively affected by myopia in economic policies. So, taxes are higher and the welfare state larger under myopia than in the social optimum. However, the case for product market reform is quite strong, irrespective of the political setup. On the other hand, it may easily be that political considerations block reforming the labour market. Our econometric evidence confirms these findings. The Stability Pact limits and hinders the magnitude of a tax reform, but is conducive to a reform of the welfare state and the labour and product markets. But with the degree of tightness of the actual pact, these effects are not likely to be big.

We reach the following four key results on policy. The optimal tax policy depends negatively on far-sightedness. This implies that the social optimum tax rate, with p being unity, is lower than that chosen by a myopic government and that the international non-elected body emphasises a tax reform more than the national decision makers. It also holds that the optimal tax depends negatively on the stringency of the SGP. The intuition is that the SGP makes borrowing more costly, and therefore calls for higher current taxes. It turns out that this impact of the SGP may in principle be quite large, but is not, however, very big, if we concentrate on the size of the sanctions stipulated in the SGP.

It also holds for the optimal welfare benefit that the more far-sighted the government is, the lower the level of social spending. This implies that the social optimum welfare benefit, with p being unity, is lower than that chosen by a myopic government and that the international non-elected body emphasises a reform in the welfare state similarly more than the national decision makers. The optimal social benefit level depends negatively on the stringency of the SGP, because a lowering of the benefit level leads to a saving in government finances.

As the replacement ratio is here fixed there does not exist a uniformly "best" (inner point optimum) wage level, as is plausible. In empirical terms, we are inclined to think that this threshold value is quite low, so that the case in reality for a labour market reform is not very strong. It is also interesting that the effects of the economic factors on the required reaction in the political market to lead to a status quo do not depend much on the existing political myopia in economic policies.

A lowering of the mark-up factor in the goods market is unambiguously beneficial both for private income, and thereby on consumption, and for finances of the public sector. The gain of the reform in the goods market is magnified by the larger capital stock in the second period. It seems that in general we can find the following dividing line. The national decision-makers are the least to carry out a reform, which the public would favour, and the international bodies are in general on the right cause, as they keep on calling for reforming the economy. However, their argument may be even stronger than the social optimum.

The role of the Stability and Growth Pact of the EU is not very big, if we take into account the stringency with respect to sanctions of the actual Pact. Its impact is negative in the case of tax reform but positive in terms of other economic reforms. Thus, we could qualify the result of a negative impact of the Pact on reform activity, reached by Beetsma and Debrun (2004), to apply only to tax policy, but in the case of reforming the welfare state, the labour and the product market the case is the reverse. This is due to fact that these latter reforms lead to an improvement in government finances and thereby to a lower effective cost of borrowing.

The numerical values reached in the solutions are, of course, only indicative. Of the various reforms considered in the paper, it turned out that reforming the goods market would in economic terms and politically have the strongest case, and not much at all be hampered by considerations of myopia. It also seems to be the case that in reality reforms in the EU have been clearly more predominant in the goods than in the labour market.

This medium-run emphasis is likely to lead to the situation that the reforms of the tax system and the welfare state are of the beggar-thy-neighbour type, because they can give rise to inward FDI in the reforming country at the cost of the neighbouring EU countries. Therefore, there is not so much scope for active coordination, because the scope of these reforms already in a single EU country is limited and biased towards the status quo. The situation in the goods market is, however, reverse, and thereby there is a justification for coordination of product market policies in the EU.

We show that, in general, the political bias in economic policies can have quite a substantial effect. We show that a key factor would be to reduce the extent of myopia in the political process, and that international organisations, like the OECD, and the peer review by the EU Commission and member states, may do a good job in this respect.

3.5 Climate change policies and taxation - Abating global warming, emissions trade and the need for European coordination (WP 5)

3.5.1 Summary of WP 5

Introduction

The major EU policy challenge in the field of global warming is how to get global greenhouse gas emission abatement activities afloat that would offer a chance of meeting the EU objective to

limit during this century the rise in temperature to 2^0 Celsius compared to pre-industrial levels. Here, both the timing of abatement efforts and the road to be travelled towards the establishment of a global abatement coalition are major and critical policy features.

The instalment of cap-and-trade schemes is one of the major policy solutions to the abatement problem. Yet, other policy measures are taken simultaneously. This raises important policy questions with respect to the interactions between the different instruments deployed. Examples of these are the fostering of R&D on cleaner energy technologies, the subsidization of renewable energy and energy taxation.

Research tasks adopted

In view of the policy challenges and questions in the field of climate change and taxation the following research questions have been addressed, in six research papers.

In the field of post-2012 climate policy development:

(i)   assessments have been made of the timing of global abatement efforts that would be optimal in view of the EU temperature-objective and of the additional costs of late action,

(ii)   the road towards a global coalition has been explored as well – in two separate papers. The first paper assesses – under various permit allocation rules – the impacts of broadening the abatement coalition from the platform of G8 to a relatively small group of countries that really matter (called L20) because they are leading in terms of GDP *and* population *and* emissions. The second paper explores the impacts of an extension of the Californian initiative to the whole of the US.

In the field of policy instrument interactions, two questions have been addressed:

(iii)   in a theoretical paper using an endogenous growth model the impacts of an emissions cap on induced R&D are assessed with numerical model calculations,

(iv)   the interactions of the EU Emissions Trading Scheme (EU-ETS) with energy taxes have been explored as well – in two separate papers. The first paper analyses, in a partial equilibrium framework, the impacts of introducing a unilateral carbon tax within the EU-ETS. The second one assesses the impacts of energy tax reforms with the EU-ETS in place within the context of a general equilibrium model. In particular, this paper assesses the benefits of converting existing energy taxes to carbon taxes relative to cap-and-trade, the overall abatement efficiency of the EU system (delineation of the regulated sector) given existing taxes, and the benefits of revenue recycling if permits are auctioned.

Methodologies used

Within WP 5 a variety of methodologies has been deployed. These range from numerical calculations with concise theoretical models and detailed partial equilibrium models for EU-27 to applied general equilibrium models of a dynamic nature with global coverage. The paper on the optimal timing of global emission abatement efforts conducts various counterfactual policy scenarios using two different applied general equilibrium models. One of these, PACE-IAM, is

of an aggregate nature, yet dynamic in a forward-looking sense and capable of generating an integrated assessment of the temperature increase that will go with accumulated greenhouse gas emissions. The other, WorldScan, is recursively dynamic, yet much more disaggregated, and used to show the impacts of the emission profiles generated by the other model in much more detail. PACE-IAM is also used to assess the impacts of a broadening of the abatement coalition to the group of countries that really matter. WorldScan is also used to assess the interactions between the EU-ETS and energy taxation.

Key results and policy conclusions

Because delayed action may induce large excess-cost of transitional climate policies the burden sharing debate may become substantially more critical over time due to "foregone action".

The simulations concerning coalitions of leading countries suggest that leaders prefer leadership under an egalitarian allocation rule. For ability-to-pay and polluter-pays rules leadership is costly to the leaders but these costs can be lowered if unilateral action is limited to a transitional phase.

The impact analysis of an extension of the Californian initiative to the whole of the US shows that the US would tend to gain from free permit trading with the EU.

In the endogenous technology case R&D in less-polluting energy technologies is fostered by high permit prices.

Introduction of a unilateral carbon tax within the EU-ETS will not affect EU emissions, always raises abatement costs (in general especially in the country that introduces the tax) and cannot be justified from the point of climate change policy. The implication of the analysis is that existing energy taxes for installations covered by the EU-ETS are better removed from the point of view of abatement efficiency. This finding is also confirmed by the following experiment in a general equilibrium context: when permits are auctioned, using the permit revenue to slash existing energy taxes within the sectors covered by the EU-ETS is welfare improving (over and above revenue recycling in a lump-sum fashion). Moreover, the conversion of existing energy taxes to uniform carbon taxes is a powerful instrument both in terms of emissions reduction and economic welfare relative to cap-and-trade. However, the position of the new member states deserves special attention when energy taxes would be rearranged in this way. Given existing energy taxes, the inefficiencies involved in delineating the regulated sector turn out to be relatively minor. Revenue recycling is beneficial, relative to recycling in a lump-sum fashion. Hence, from this point of view, the auctioning of permits is to be preferred to grandfathering.

3.5.2 Summary of the deliverables

There are altogether six working papers prepared in this Work package.

3.5.2.1 Post-2012 climate policies: A simulation study with WorldScan - Authors: Stefan Boeters and Gerard Verweij (CPB) (Deliverable No. 23B)

Introduction

After the decision of the United States and Australia not to ratify the Kyoto Protocol, the process of an internationally coordinated climate policy seems to be deeply stuck. The Kyoto Protocol commits a group of industrialised countries - the Annex-B countries - to reduce their emissions of greenhouse gases in 2008-2012 by approximately 5% below their 1990 level. This is a small step towards a stabilisation of the concentration of greenhouse gases in the atmosphere. A focal point in the discussion about climate change is a limit on the rise in global temperature of 2°C, which is commonly seen as a 'safe' temperature level limiting the possible catastrophic consequences of more severe changes. With such a target in mind, stricter emission ceilings for individual countries and an extension of the group of contributing countries are indispensable, which makes the non-participation of the United States even more worrisome.

Research task adopted

In this situation, climate policy research can contribute by pointing out possible further steps and analysing their consequences. The discussion can be stimulated by contrasting possible paths of the future development, and singling out those that have the highest probability of gaining broad support. In this paper, we want to contribute to this discussion by sketching a climate policy scenario for the period 2012-2020, building on the CPB-RIVM study of Bollen et al. (2005). We take the already existing climate change policies as a starting point and extend them where we consider this as politically feasible. There are three important building blocks of our post-2012 scenario: The Annex-B countries, excluding the United States, form an abatement coalition in the form of a cap-and-trade system. The United States commits to moderate emission targets, but does not partake in the trading system. Non Annex-B regions contribute in the form of a system of Clean Development Mechanism (CDM) projects.

Methodology used

WorldScan (Lejour et al., 2006) is a multi-sector, multi-region Applied General Equilibrium (AGE) 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, greenhouse gas limitations, etc. The model is calibrated on input-output tables and trade data from the GTAP6 database (Dimaranan and McDougall, 2005). The base year for the model is 2001. The model version used in this study distinguishes 13 sectors and 19 regions.

The impacts of policy interference are measured with respect to a baseline, which is a reference scenario usually termed business-as-usual (BaU), where no policy changes apply. In order to simulate the economic and environmental implications of our post-2012 scenario, information on the future BaU development of the global economy is required. The BaU projections forced upon the models determine how policy interference, such as carbon emission constraints under post-2012 climate policies, will bind the respective economies in the future. The compilation of the BaU projections is a key challenge for long-term climate policy analysis. For our simulations, we

adopt the WEC/IIASA Scenario B "Middle Course" as our reference case. Scenario B is based on a cautious approach to technological change and energy availability as well as modest economic growth.

**Key results and policy conclusions**

The baseline emissions are relatively stable for the Annex-B regions and rise steadily with 2.7% per year for the non Annex-B regions. Non-Annex-B countries like China and India will therefore become large emitters in the next decades.

In the non-Annex-B regions, the post-2012 scenario only generates a modest reduction of the CO_2 emissions: -1 % in 2020. There is a small reduction, although the commitment of these countries is not stricter than the benchmark emissions, because CDM is taking place. However, the volume of CDM is small compared with the total emissions in the non-Annex-B area. Furthermore, some leakage of CO_2 emitting activities to the Rest of the World takes place; here the emissions increase by 1% in 2020.

For the Annex-B regions, there is a more substantial reduction in CO_2 emissions compared with the baseline: −24% for the USA and −16% for the rest of the Annex-B in 2020. Differences in CO_2 reduction between regions exist according to their emissions target and level of permit trade.

Three markets for emission permits exist: the internal market of the United States, the common Annex-B market and the regional markets for CDM credits. Figure 3 shows the pattern of prices that lead to market clearing for these different types of permits. The emission price in 2020 for the United States is the highest: 32 € / tCO_2. The rest of the Annex-B has a lower emissions price: 18 € / tCO_2.. This higher price in the United States can be explained when we have a second look at the formation of the emission targets. If expressed as relative reduction compared to the 1990 emissions, it seems that the reduction target in the US is considerably less strict than in the rest of the Annex-B countries (no change vs. −26%). However, if this is translated into changes compared to the baseline emissions, the order is reversed. The US then end up with a stricter target (−24% vs. −20%), which results from the steeper increase in baseline emissions in the US. In addition, the US does not participate in CDM, so that the difference in domestic emission reductions is even enlarged to −24% vs. −16%. This translates into the permit price difference of 14 € / tCO_2. Joining the Annex-B permit market would thus be beneficial for the United States by lowering its emissions price.

For the Annex-B group Figure 3 shows a positive permit price already in the Kyoto period (2008-2010). The price remains below 3 € / tCO_2, however.

Figure 3.   Carbon emission price in € / t CO₂

Emission price
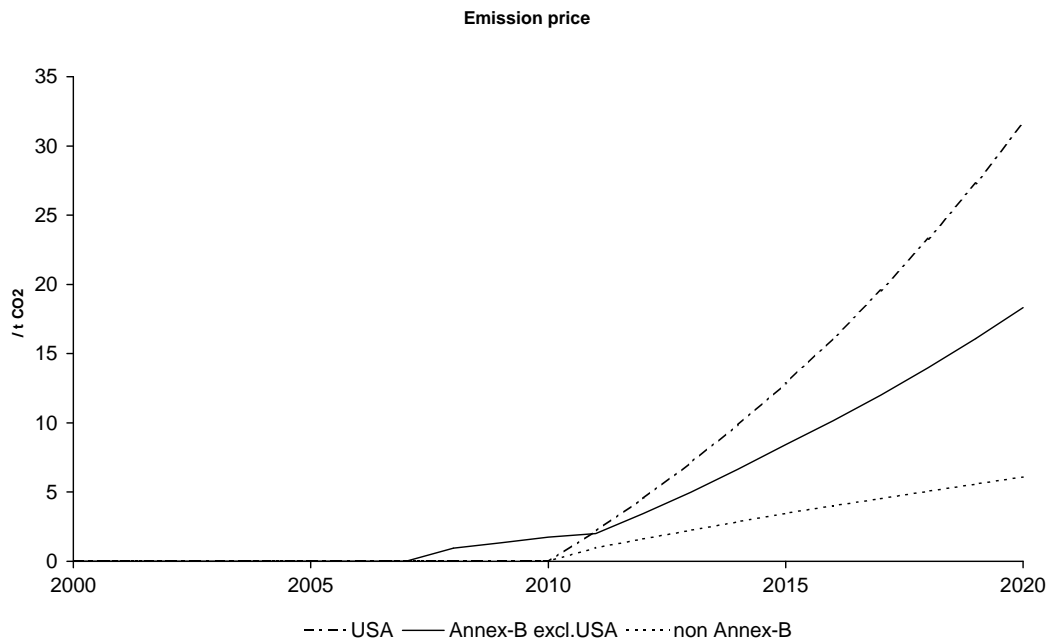
3.5.2.2 Post-2012 Climate policies: From G8 to L20 – Authors: Christoph Böhringer (ZEW and University of Heidelberg) and Ulf Moslener (ZEW) (Deliverable 23A)

Introduction

Since spring 2005 the Kyoto Protocol – the first international agreement on climate protection – is in force. It contains legally binding emission targets for industrialized countries to be achieved during the commitment period 2008-2012. While proponents of the Protocol celebrate it as a breakthrough in international climate policy, opponents criticize that its approach, namely negotiating targets and timetables for emission reductions within a comprehensive UNFCCC process, is seriously flawed and ultimately doomed to fail. In the debate on climate policy architectures beyond 2012 there is concern about the effectiveness of the inclusive negotiation procedure associated with a 160-nation bureaucracy – underlying the negotiations towards the Kyoto Protocol. The (anticipated) minor environmental effectiveness of the Protocol seems to back this perception: Acknowledging the vast heterogeneity of the 160 nations' political priorities the veto power by every single nation compromises any ambitious common reduction target. A substantial leverage on negotiation outcomes may be achieved by working with a small number of countries representing the major emitters as well as economic and political powers. Such a group (perhaps along the lines of the Leaders 20 Summit – L20 – suggested by Canadian Prime Minister Paul Martin) may move forward with stringent unilateral emission reduction commitments, while the rest of the world does not necessarily have to be part of any legally binding international agreement.

Research task adopted

We compare the economic impacts of this leadership against a global commitment which keeps with the same world-wide emission budget. We investigate the incentives for leadership by a limited number of countries under alternative allocation rules for the global carbon emissions budget.

Methodology used

We describe the trade-off between limited and global coverage from an L20-leaders perspective: Given some world-wide emission limit over the next decades, the pay-off to include other countries in a potentially cumbersome UN debate on global burden sharing declines with the degree to which participation of countries outside L20 reduces compliance cost of the leaders.

As a cost-effectiveness framework for numerical analysis we use an intertemporal multi-sector, multi-region computable general equilibrium (CGE) model of global trade and energy use (PACE-IAM). Beyond the consistent representation of market interactions as well as income and expenditure flows, the dynamic model setting accommodates an assessment of the adjustment path of economies to exogenous policy constraints over time.

To determine the key players (Leaders) on the field of international climate policy there are several criteria. Three fairly self-evident and rather prominent criteria are a country's (i) CO_2 emissions, (ii) GDP, and (iii) population. These criteria also serve as a basis for central equity rules referred to in the policy debate. Among the most commonly quoted equity rules, the sovereignty and the polluter pays (ppa) principle are based on (historical or projected) emissions. The egalitarian principle (ega) calls for identical per capita emissions, thereby emphasizing the role of population. Finally, the ability-to-pay (atp) rule is based on the economic wealth of a country which is in general linked to GDP. The countries identified as potential members of a Leaders-group consist of four industrialized regions (EUR-30, USA, Japan, and Russia) and five non-industrialized regions (Brazil, Mexico, China, India and Indonesia).

Key results and policy conclusions

Our simulations suggest that leaders prefer leadership under an egalitarian allocation rule (ega). For ability-to-pay (atp) and polluter-pays rules (ppa) leadership is costly to the leaders but these costs can be lowered if unilateral action is limited to a transitional phase. Figure 4 displays welfare implications in percent of the different regimes for both the leaders moving forward with ambitious climate policy targets and the rest of the world (ROW).

Figure 4. Welfare implications of a group of leaders moving forward with CO₂ abatement commitments. (L20: Leadership for ever; L20 Trans: Leadership restricted to transitional phase; Global: Global coverage of reduction commitments.)
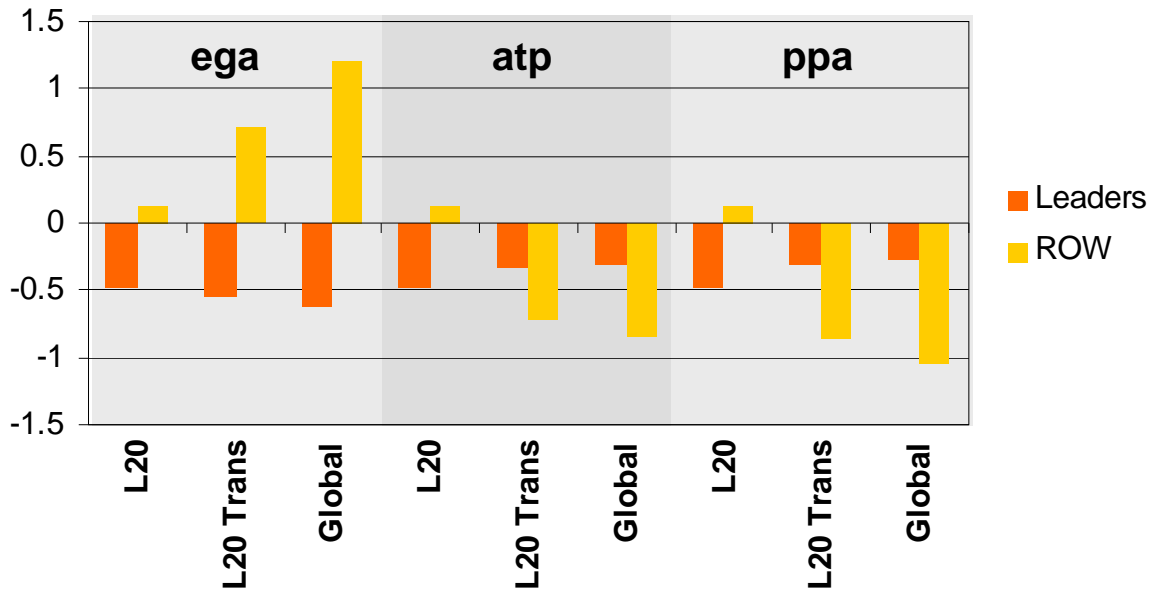
We have identified a non negligible trade-off between limited and global coverage from an L20 perspective if leadership is assumed to last for ever. If, however, leadership is restricted to a transitional phase – until 2030 – the welfare implications might be reduced substantially. The main driver for the welfare implications turns out to be the income transfer via the carbon endowments. While for an egalitarian allocation rule leaders would prefer an L20 scenario to global coverage for all other analyzed allocation rules make the potential leaders better off if global coverage of reduction commitment is assumed. Additional work on the issue of burden sharing debate among the (relatively inhomogeneous) group of leaders would be one interesting area of further research.

Our findings suggest that leadership might be preferred in case of the egalitarian rule, but costly under polluter-pays or ability-to-pay regimes. The cost burden of the leaders might be substantially smaller if leadership is restricted to a transitional phase.

3.5.2.3 Efficient and transitional climate policies - A combined analysis using PACE and WorldScan - Authors: Christoph Böhringer (ZEW and University of Heidelberg), Stefan Boeters (CPB), and Ulf Moslener (ZEW) (Deliverable 14)

Introduction

The analysis of long-term scenarios of climate policy poses ambitious requirements for the scope of the economic models used. On the one hand, they must cover a long time span, and there must

be a dynamic coupling of all periods to account for the forward-looking adjustment of economic agents to future policies. On the other hand, regional and sectoral detail is necessary to capture the distributional consequences of such policies, both between and within countries. These differential consequences determine the incentives for countries and for particular groups within countries to participate in a coordinated international approach to emission reduction.

Research task adopted

The required detail in several dimensions goes beyond what is currently handled in standard CGE models. In this study, we therefore combine information from two models, PACE-IAM and WorldScan, to get a comprehensive picture of future options of climate policy.

The strength of PACE-IAM is its intertemporal optimization set-up, which allows us to construct a full time-path of optimal reduction targets. As a tool specifically tuned for this task, PACE-IAM uses a relatively coarse disaggregation with respect to regions, time periods and sectors. This is the place where the second model, WorldScan, comes in. It is set up as a dynamic recursive model, so that the economic equilibrium in each period can be calculated independently of later periods. This makes a more detailed coverage of regions and sectors possible. As the single periods can be individually tuned, the match with the exogenous baseline scenario is closer in WorldScan as well.

We illustrate the complementarities of the two models in an investigation of different optimal and conditionally optimal policies. As a background, we start with a policy that establishes global where-and-when efficiency for a given temperature target over the entire period until 2100, derived by PACE-IAM. The consequences of this policy are then broken down by region and sector on a year-by-year basis using WorldScan. This overall efficient policy is finally compared with different conditional scenarios that follow a politically feasible path until 2030, and are then complemented by an efficient path until the end of the period of interest. We assess the efficiency loss that these concessions to political feasibility generate.

Methodological approach used

In order to investigate the long-term effects and efficiency costs of transitional climate policies we make use of both the integrated assessment model PACE-IAM and WorldScan. PACE-IAM combines economic aspects of climate change with scientific knowledge of the dynamics of climate change. WorldScan complements this with a model setup that adds regional, sectoral and temporal detail, while lacking the climate and intertemporal optimization aspects.

PACE-IAM links a dynamic macroeconomic model with a simple geophysical module of climate change. The latter corresponds to the climate component of the RICE-99 model. The macroeconomic module is formulated as an intertemporal multi-sector, multi-region computable general equilibrium model of global trade and energy use. PACE-IAM in its current version does not attempt to translate global warming into market impacts and non-market impacts. The model is, however, well suited to derive cost-efficient climate policies given long-term temperature or concentration targets and to compare the efficiency costs of alternative policy scenarios. As is customary in applied general equilibrium analysis, base-year quantities and prices - together with exogenous elasticities - determine the parameters of functional forms that describe technological options in production and consumer preferences in consumption. For the base-year calibration, PACE-IAM builds on the most recent GTAP 6 database.

WorldScan shares many general features of CGE models with PACE-IAM. The differences are in the dynamic set-up of the model and in the aggregation structure. In its temporal structure, WorldScan is dynamic-recursive. This does not allow for intertemporal optimization, which is why the time profile of optimal emissions is taken over from PACE-IAM. On the other hand, the independence of the periods and the yearly structure allow for a more precise calibration to the exogenous time path of GDP and energy use. With respect to regional and sectoral disaggregation, WorldScan accommodates considerably more detail than PACE-IAM. The world is broken down into 21 regions. In each of the regions, we distinguish 31 production sectors.

Key results and policy conclusions

Figure 5 depicts the carbon emission trajectories across the different scenarios. Under global efficiency considerations for a long-term temperature target of 2°C, substantial emission cutbacks vis-à-vis the BaU are already required in the transition phase between 2010 and 2030 accounting for long-term climate dynamics. In our assessment of efficiency costs for transitional climate strategies, we consider pragmatic formulations of climate policies up to the year 2030. To provide a meaningful cross-comparison of different policy scenarios up to 2030, we impose that the "residual" policy between 2030 and 2100 will use an efficient intertemporal strategy that meets the same exogenous long-term temperature target (+2°C) as the "Efficient" scenario. "BaU_2030" reflects a situation without effective abatement policies until 2030; afterwards an efficient climate policy applies to meet the temperature target in 2100. "Kyoto" requires industrialized countries (as listed in Annex B of the Kyoto Protocol) to maintain their Kyoto targets from 2010 onwards, whereas no explicit emission constraints apply to developing countries. "Kyoto_Plus" assumes that industrialized countries stick to the Kyoto targets until 2020 and then decrease these emission limits by 1% per year between 2020 and 2030.

Table 1 summarizes gross adjustment costs at the world level: Adjustment costs are measured as Hicksian equivalent variation in lifetime income.

Table 1. Adjustment costs (% change in Hicksian equivalent variation)

	BaU	BaU_2030	Efficient	Kyoto	Kyoto_Plus
World	0.0	-0.89	-0.66	-0.78	-0.77

WorldScan is used to break down the results of the "Efficient" scenario into regional and sectoral effects.

Figure 5. Global carbon emissions (Gt of C)
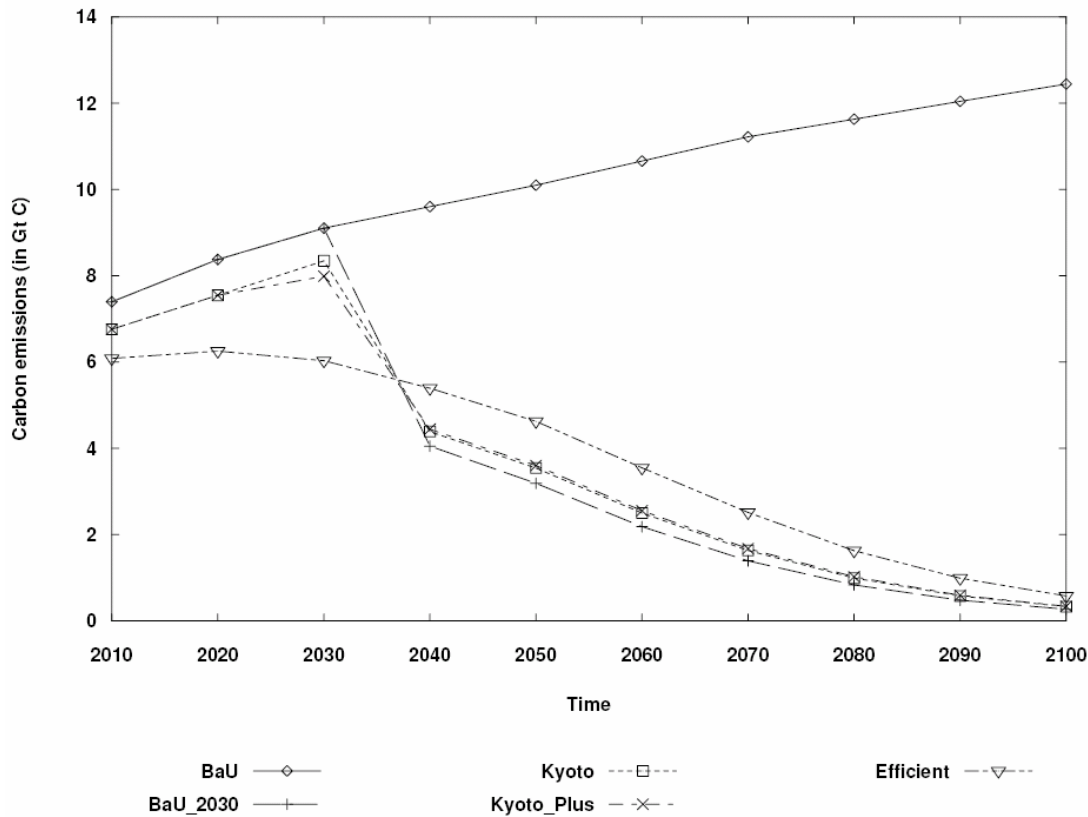
The efficient carbon reduction scenario is characterized by a relatively mild emission cutback in the beginning and, by contrast, a steep decline towards the end of the simulation period. The emission price is steadily rising, reaching levels in the second half of the century that suggest an almost complete switch to some backstop technology. The relative emission reduction level differs between countries, developing countries reducing considerably more than industrialized countries.

With respect to the composite scenarios that take political feasibility into account, we can observe the following general pattern: Low emission targets until 2030 (especially in the "business-as-usual until 2030" scenario) must be compensated by higher reduction achievements towards the end of the period. This leads to an emission price profile that is even is more steeply increasing than in the efficient scenario. The overall welfare loss is roughly driven by the looseness of the abatement targets in the initial period. The more the path deviates from the efficient one until 2030, the higher the welfare costs to be borne later.

3.5.2.4 Efficiency losses from overlapping economic instruments in European carbon emissions regulation − Authors: Christoph Böhringer (ZEW and University of Heidelberg), Henrike Koschel (ZEW), Ulf Moslener (ZEW) (Deliverable No. 20A)

Introduction

To reduce their carbon dioxide emissions, in addition to the CO_2 Emissions Trading Scheme (ETS), EU member states must apply complementary regulatory measures in those sectors that are not covered by the EU ETS. This segmented carbon regulation runs the risk of producing substantial excess cost since marginal abatement costs are not equalized across emission sources which would lead to inefficiencies. In many member countries the allocation to energy-intensive industries has been perceived rather generous at the expense of sectors outside the EU ETS. The burden has been shifted from energy-intensive industries with rather low marginal abatement costs to sectors with potentially high abatement costs.

In several EU countries, industrial installations which have to hold emission permits are also affected by national energy tax regimes. In contrast to the EU emissions trading directive that clearly prescribes which installations are affected by the emissions trading scheme, the EU energy tax directive allows the member states great latitude as to whether EU ETS sectors are taxed or not. Even though from a purely theoretical point the use of a mix of policies in order to pursue a single policy objective is not useful, it is in the nature of policy design within a federal system such as the EU that instruments introduced on a European level are complemented by instruments of the member states.

From a more subtle theoretical point, there are several reasons why a mix of policy instruments might even be preferable to a single instrument. Differentiated instruments can be justified if there are multiple policy objectives, such as social or technology-related criteria. Second-best regimes, which are characterized by initial market distortions or imperfections provide a general argument for differentiated regulation. Such regimes include situations with uncertainty, external knowledge spillovers, initial tax distortions, market power, or transaction costs. In climate policy design, sector-specific differences in transaction costs have, e.g., been used as an argument for applying different climate policy instruments to different economic sectors.

Research task adopted

We analyse the potential efficiency losses arising from the co-existence of emission taxes and emissions trading. The following analysis abstracts to a large extent from market distortions and focuses on the static efficiency implications of additional emission taxes imposed on energy-intensive sectors that are in addition subject to the EU ETS. We show that in this case overlapping regulation may induce substantial excess costs: Firms under the EU ETS which – at the same time – are confronted with additional domestic energy or carbon taxes will abate inefficiently much while other firms within the EU ETS will benefit from lower international emission permit prices. In essence, unilateral emission taxes within the EU ETS are ecologically ineffective and subsidize net permit buyers.

Methodology used

We illustrate the effects of possible overlaps of existing CO_2 emissions regulations with the EU ETS using a simple emission market model. Each member state is characterized by an (aggregate) marginal abatement cost function of the sectors that are subject to the EU ETS, including the power sector, oil refining, several energy-intensive industries, and by an (aggregate) marginal abatement cost function for the rest of the economy (covering all sectors outside the scope of the EU ETS including private households, transport, trade). The ETS sectors in each member state receive an emission budget according to the National Allocation Plans and can trade the permits thereafter. In contrast, the rest of the economy does not participate in trade. The member states, however, are required to take complementary action. We assume that the emission reductions in the rest of the economy are prescribed by the National Allocation Plans and implemented cost efficiently by carbon taxes.

Key results and policy conclusions

The EU ETS implements any given EU-wide target for the ETS sectors at minimum costs – independent of whether the country-specific National Allocation Plan implies an over-allocation or not. An additional tax within the trading scheme cannot change the distribution between the ETS and non-ETS sectors ex post. Due to the segmentation of the economy into ETS and non-ETS sectors, however, taxes do not act as an instrument to implement a second-best solution: A unilateral emission tax drives apart the marginal abatement costs within the ETS sectors of the different regions and leads to efficiency losses. It increases the EU overall implementation costs of the emissions target and has no ecological effect. Furthermore, it is costly for the (taxing) member state.

There is an exception to this. The taxing country may gain at the expense of overall cost effectiveness only if rather restrictive conditions are met: the country has a large share in the permit market, features comparatively flat marginal abatement costs in the sectors subject to emissions trading, and is at the same time a net permit importer. In this case, the reduced domestic permit demand may lower the EU-wide market price for permits and thereby cause an extra reduction of the country's expenditures for permit imports. Therefore, energy or carbon taxes within the part of the EU economy that is regulated by the emissions trading system should be handled with great care and justified by other reasons than implementing the commitments under the Burden Sharing Agreement in a cost-efficient manner.

3.5.2.5 The EU-ETS and existing energy taxes - Author: Paul J.J. Veenendaal (CPB) (Deliverable No. 20B)

Introduction

Under the Kyoto Protocol, the European Union has committed itself to reduce greenhouse gas emissions over the period 2008-2012 by 8 per cent below 1990 levels. One of the major tools that have been put in place to achieve this commitment is the EU Emissions Trading Scheme (EU-ETS). This cap-and-trade system is currently in its first, 2005-2007, start-up phase. It puts a cap on CO_2 emissions from large combustion installations with a capacity exceeding 20 MW. Together these installations account for nearly half of EU-25 fossil fuel CO_2 emissions. Emission permits are allocated to firms by national governments (subject to approval by the European

Commission) and are freely tradeable. Most of the permits have been grandfathered but the directive allows for permit auctions as well, albeit subject to a maximum of ten per cent in the second phase that coincides with the Kyoto period 2008-2012. The EU-ETS establishes a uniform emissions price for all installations that it covers throughout the member states. Hence, in principle emissions abatement will be efficient and undertaken at the lowest possible costs. However, existing energy taxes may jeopardize this conclusion if they are applied non-uniformly to the installations covered by EU-ETS.

Research task adopted

The aim of the paper is to analyse the interactions between the EU-ETS and EU energy taxation and to assess the importance of these interactions. We distinguish three relationships between cap-and-trade systems and taxation.

First, the cap would alternatively materialize if CO_2 emissions would be taxed at exactly the level of the permit price. Hence, the claim that a cap-and-trade system is cost-effective presumes that energy use is not taxed in additional non-uniform ways. Energy taxes are abundantly present, however, especially in the member states of EU-15, and widely varying by energy carrier, by user and by member state, the relative height of energy taxes bearing no relation whatsoever to CO_2 emissions. Hence, the cost-effectiveness of an additional cap-and-trade system is not guaranteed.

Second, though the coverage of EU-ETS (large combustion installations) may be extended in its second phase, there is no doubt that the cap will continue to be imposed on only part of the economy (henceforth: the regulated sectors). As by the EU Burden Sharing Arrangement each member state has taken on a cap on total emissions, permit allocation to the regulated sectors implicitly puts a complementary, national cap on emissions from the other (hereinafter: nonregulated) sectors. In general, marginal abatement costs of the regulated sectors under the EU-wide cap will differ from the marginal costs incurred by the nonregulated sectors while the latter also will differ among member states due to the Burden Sharing Arrangement. Compliance costs of the nonregulated sectors depend directly on the amount of permits allocated to the regulated sectors. The separation of emissions reduction within EU-25 in many different compartments thus raises questions concerning the efficiency of the overall abatement effort. Over- or underallocation of permits to the regulated sectors and extension of the sectoral coverage of the EU-ETS may have important impacts on marginal abatement costs in the nonregulated sectors. Moreover, diverging levels of existing energy taxes may drive abatement costs even further apart.

The third connection between cap-and-trade and taxation is rather more direct. When emission permits are auctioned, the auction receipts can be recycled back into the economy. Though the possibilities to do so are numerous, the economic literature suggests that using these receipts to slash existing tax distortions improves economic welfare more than a lump-sum transfer to the economic agents. According to the weak double dividend hypothesis, revenue recycling through cuts in distortionary taxes improves economic welfare relative to recycling through lump-sum payments. The strong double dividend hypothesis suggests that substitution of an environmental tax for a distortionary tax will improve economic welfare. Hence, the introduction of an environmental tax would not only enhance environmental quality but also non-environmental welfare (double dividend). Obviously, verification of the double dividend hypotheses requires model simulations in a particular empirical setting.

Methodology used

In this paper we use a recursively dynamic global applied general equilibrium model, WorldScan, as a tool to analyse and assess the importance of the interactions of EU cap-and-trade systems and EU energy taxes. One should bear in mind that the outcomes from the model are of a long term nature and do not reflect the costs of structural adjustments. As a baseline we adopt the WEC/IIASA 'Middle Course' scenario B. This scenario is characterized by a cautious approach to technological change and energy availability as well as modest economic growth. It does not include climate change policies or carbon taxation.

Key results and policy conclusions

The possible interaction between existing taxes and cap-and-trade systems raises the question how tax harmonisation in terms of carbon taxation would fare as a device to curb CO_2 emissions vis-à-vis cap-and trade. For the assessment we first install a full cap-and-and-trade system in the EU, that caps EU fossil CO_2 emissions of all sectors and households. Subsequently we convert existing energy taxes to carbon taxes in four different ways: separately by member state and for consumers and producers, separately by member state for all agents, EU-wide, yet separately for producers and consumers, and EU-wide for all agents. In all these cases we maintain energy tax revenues at baseline levels as a percentage of GPD. It then turns out at the conversion of existing energy taxes to more uniform carbon taxes would outperform the cap-and-trade system for the next decade in terms of emissions reduction. Second, the conversion would in addition, in general, outperform the cap-and-trade system also in terms of (smaller) welfare losses. Moreover, when the energy taxes would be converted to a uniform carbon tax for all agents, strong double dividends would arise at the levels of EU-15 and EU-25. EU-wide harmonization would, however, have adverse impacts on economic welfare in the new member states as it would raise the energy tax burden in these countries over and above baseline levels. Finally, the conversion would strongly discourage the use of coal and natural gas and promote the use of petroleum, relative to the baseline.

Though tax harmonization thus seems to be a strong alternative to cap-and-trade, the political viability of a tax harmonisation strategy may not be large. The distributional impacts on welfare in the new member states and on employment in the coal industry may be politically sensitive, tax harmonization is a difficult process and the fostered use of petroleum seems to be at odds with energy conservation and energy security concerns. Hence, the main lesson is that existing energy taxes are very distortive, and, by the same token, rearranging them may provide potentially very powerful instruments within the context of climate change policies.

As the EU-ETS covers only part of the economy, other policy measures must ensure that the nonregulated sector reduces emissions as well. This raises the question to what extent overall abatement efficiency in the EU is sensitive to extension of the EU-ETS to all other production sectors with the exception of the transport sector. Given existing energy taxes, the general conclusion is that extension would not increase economic welfare. Extension of the EU-ETS with other production sectors will lower the permit price and raise the carbon tax for the nonregulated sectors.

The reasons are twofold. First, more reduction opportunities become now available in the regulated sector while fewer options are left in the nonregulated sector. Second, existing energy taxes are now even more concentrated in the nonregulated sector. This implies that the carbon tax must rise considerably to have an impact on emissions because abatement is the result of

relative price changes. Hence the carbon tax must be relatively high when pre-existing taxes are high and carbon taxation becomes more costly. Hence, the overall welfare impacts of extending the EU-ETS are slightly negative. This assessment does not take into account possible differences in administrative costs. These costs may be lower for an extended system. If permits can be efficiently auctioned (and the cumbersome grandfathering process skipped), it may be less costly to include a large number of firms in the EU-ETS than monitoring them separately to check compliance with a large variety of other policy measures.

The analysis shows – again – that existing energy taxes interact in important ways with cap-and-trade systems. The higher these taxes are, the higher the costs will be of further emission reductions. As existing taxes are skewly distributed over sectors and households and quite divergent over member states, is seems sensible to limit the EU-wide cap-and-trade system to those sectors that are taxed rather mildly. This limited coverage characterizes the EU-ETS in its current form. Extension of the EU-ETS with other sectors that are also mildly taxed may not enhance overall economic welfare. This welfare assessment does not, however, take into account possible differences in administrative costs.

When permits are auctioned, recycling permit revenue in such a way that existing tax distortions are reduced, generally increases welfare over and above revenue recycling in a lump-sum fashion. Two cases are considered. First, we use the permit revenue to reduce taxes on labour. As these are borne by employers in WorldScan, reducing taxes on labour will lower producer prices, raise the real net wage and foster labour supply. Second, we use permit revenue to reduce both taxes on electricity and existing energy taxation for the regulated sector. Given the cap both the decreased taxation of energy carriers in the regulated sector and the increased demand for electricity will raise the price of permits. The rise, when large enough, might foster the adoption of cleaner technologies, e.g. in power generation.

The general conclusion that can be drawn from these revenue recycling policies is that they yield a double dividend. The impacts of reduced labour taxation appear to be most beneficial. The welfare impacts of reduced taxation of energy use by the regulated sector are relatively minor, but not negligible, especially not in the new member states.

3.5.2.6 Climate policies and economic growth – Author: Kari E.O. Alho (ETLA) (Deliverable No. 13)

Introduction

Climate policies can have important economic effects, while they endeavour to reach a path of lower emissions. Of course, giving up climate policies also has important effects as compared to the present situation. It is often heard from the environmentalists that strict climate policies give rise to such high incentives to research and development of less polluting technology so that the burden of environmental policies turn to a surplus.

The paper simply takes as a starting point that due to environmental concerns, a country or a region of countries sign a Climate Agreement which cuts their emissions stemming from the use of one essential factor of production, energy. The aim in the paper is to make a simple analysis of the effects of climate policies on the growth rate of the economy, using numerical calibrations.

Research task adopted

We start from the basic case of no international factor mobility and then enlarge it to allow for factor mobility, where domestic factors of production can relocate abroad as a result of the reduced real reward caused by the scarcity of the energy factor. The main part of the paper is devoted to the case of endogenous growth where the rate of innovation in the energy sector is endogenous, and can react to the climate policies. We want to study, how essential is endogenous technical change and R&D into clean energy from the point of view of overall economic growth. Our approach is to give more numerical substance to this field of study on endogenous growth and energy policies and to explicitly consider the case of the open economy.

Methodological approach used

Throughout the paper we take an aggregative view on a single economy, which is so small that its policies with regard to the environment and use of energy do not have any effects on the world financial and energy market. GDP is produced by domestic resources and energy. The use of the latter is limited by international climate policies.

In the first part of the paper we simply plug this constraint into an aggregative production function under both fixed domestic resources and when there is so-called carbon leakage, caused by a lower reward for domestic resources as a result of less energy available.

The main part of the paper studies the case of endogenous economic growth so that the technical change in the less polluting technical change is endogenous, i.e. the relation between emissions and energy input in production depends on economic incentives. We first analyse optimal economic growth in a command type open economy and thereafter formulate the case of a market economy and consider environmental policies to reach the social optimum in R&D in energy technology.

Key results and policy conclusions

From the basic calculations in the first part of the paper under exogenous technology we see that the Kyoto target of limiting emissions (0.25% p.a., altogether 6.3% over 30 years) reduces the level of output by 0.6-0.7% in the end point steady state, and that the adverse effect grows almost linearly with the ambition of the climate target so that a reduction of emissions by 30% would roughly cut 3.5% of the long-run level of real GDP.

Under mobile factors, however, we reach the conclusion that the reduction in domestic output would be around 2 per cent from reductions being of a "double-Kyoto" size, while with fixed factors it is less, 1.3 per cent. The price of energy, i.e., the domestic tax on energy will behave, in contrast, in such a way that its rise is the less, the higher is the carbon leakage. This is based on the fact that as output is reduced the need to cut emissions will dwindle as well.

The results of the paper illuminate, how much the energy constraint bites of economic growth. Under endogenous growth we are able to illustrate how the position adopted by the environmentalists that strict environmental policies lead to a boost in the economy, holds qualitatively, but is in quantitative terms only a minor remedy. On the other hand, the international price of the tradable emission permit has a significant impact on R&D activity to introduce more energy-saving technology. We also derive the optimal subsidy rate for R&D and find it to be quite large in size, but diminishing over time, as the cost of new technological inventions decreases over time.

The environmentalists often claim that strict environmental regulation creates incentives for R&D which outweighs the adverse effect of these environmental policies. This claim does not hold empirically here. It is true that under climate policies a somewhat larger R&D activity is carried out in the optimal growth path under climate policies than under no climate policy, but this difference is very marginal. For instance, after 30 years the share of total labour devoted to R&D in the energy technology is only 0.07 percentage points higher under the scenario of climate policy than under the baseline, so that the two R&D allocation paths are almost identical. There are two basic reasons for this. The share of energy in output is not so vital, and the energy constraint considered here is not so binding after all.

According to the results, the international price of the tradable permit has, however, quite substantial effects. Under a low price of tradable permit, the purchases of them are, of course, higher, and accordingly, domestic production is clearly higher. Under both cases, the path of purchases of pollution rights is declining, because the domestic build up of energy technology is a substitute for imported permits. The incentive to carry out own R&D in clean energy technology is clearly smaller under a low value of the pollution right.

From the results we see, first, that the optimal rate of subsidy is quite high indeed, on the order of 90 per cent of the wage cost of R&D activity. Secondly, the subsidy is higher in the beginning than later on, as the cost of new technology is lowered. We also infer that the need to subsidise R&D is the lower, the higher the price on the tradable emission permit. This reflects the fact that a tighter market for pollution rights in itself leads to a more profitable R&D activity and thereby higher allocation of resources to R&D and, consequently, to a smaller need for government intervention in promoting R&D activity.

4. CONCLUSIONS AND POLICY IMPLICATIONS

The orientation of the project was, in accordance with the research task specified in the concerned SSP priority, to produce policy-relevant research relevant at the EU level and the level of the member countries. The following key results on policy conclusions were found out. These were elaborated in more detail in respective parts of Section 3.

WP 1 (Employment)

1. The computable general equilibrium models built in the project imply that wage formation is essential in determining the outcome of the tax/benefit policies and their overall effectiveness. The apparent effectiveness of certain policies reached under fixed wages may be quite misleading, because the ensuing reaction of wages may neutralise much of the positive policy effects. However, there are also policy measures whose positive effects are strengthened by the reaction of wage formation. The former include measures affecting labour demand, like reducing the indirect labour costs of firms. The effects of such measures, which reduce wage claims, like benefit reductions, are, however, magnified under bargaining, while with fixed wages their positive effects are only marginal.

2. Wage-wage competition between the trade unions may make under decentralised bargaining futile the efforts to lower non-wage labour costs of the low-skilled workers. However, under nation-wide incomes policy this policy restores its effectiveness.

3. CGE model analysis of different wage formations for the Estonian and Finnish economies (market determined wages and bargained wages, respectively) implies that there is a need for different labour market and tax/benefit policies in different EU member states. Comparing the policy scenarios for Estonia implies that market determined wages outperform bargained wages, the latter representing more EU-like wage formation, so that the NMS should not be recommended to adopt EU-15 institutions in their labour markets.

4. The labour supply of low-skilled in the NMS is for all cases of wage formation most effectively increased by lowering the marginal income tax rate. Combining this in turn with strategies improving employment in general, e.g. lowering employers' social security contributions, could potentially improve the labour market position of those with lower skills.

5. Statistical analysis reveals that the quantitative impact of tax/benefit systems on employment in the new member states is more vigorous than in the EU-15.

6. The French system of minimum wage and payroll tax reductions for the low-wage earners is near the social welfare optimum, if endogenous productivity related to on-the-job training is taken into account.

7. The UK unemployment benefit system with a fixed benefit is preferable in terms of the employment to the French and continental one, with benefits linked to past income.

WP 2 (Tax competition and corporate taxes)

8. CGE model analysis reveals that even a unilateral reduction of the corporate income tax rate is not beneficial for all the EU countries if they have to finance the tax reduction by an increase in the tax rates on labour or consumption. The reduction in the corporate tax rate attracts foreign direct investment and foreign profits. However, the increase in the taxes on labour or consumption dampens the impact on employment, GDP and welfare, and might even offset it.

9. Econometric analysis of FDI gives the outcome that social competition has a more powerful effect on FDI than tax competition. This conclusion is based on the observation that FDI depends more on differences in employment protection and union bargaining coverage than on differences in statutory or effective corporate tax rates.

10. The largest gains from consolidating the corporate income tax base (CCTB) might be expected if all enterprises, both domestic and multinational, are treated equally. Proposals for consolidation which exclude part of the firms, like domestic firms, introduces uneven competition. This might induce a large restructuring both within and between EU member states.

11. CGE model analysis implies that the full benefits from tax base consolidation can only be reaped if all firms participate and apply to a common tax base. If domestic firms are excluded, the EU-average gains in terms of GDP and welfare from CCBT equal respectively 0.08% and 0.03% of GDP in the long run, with the most favourable apportionment formula. The gains would be much larger, with additional gains for both GDP and welfare of about 0.10%, if not only MNEs, but all firms participate.

12. Formula apportionment distorts the investment and labour demand behaviour of multinational enterprises. The incentives for reallocating production or the production factors are minimised if apportionment depends on the share of production by multinationals in each EU member country. The largest distortions are introduced if apportionment is based on a single production factor, like either on employment or on capital.

13. A common consolidated tax base to which only multinationals may apply creates GDP and welfare gains in EU member states with a broad tax base, but harms countries with narrow bases.

14. The economic and welfare effects of CCBT are unevenly distributed. Simulation of the CCBT, where apportionment is based on employment, capital and production in equal proportions, gives the result that the change in welfare ranges between a reduction of 0.4% of GDP and an increase of 0.6% of GDP, whereas the change in GDP ranges between a reduction and an increase both of 0.7%.

WP 3 (Productivity and catching up)

15. According to pooled panel data estimations and cross-country comparisons of the OECD countries, the growth rate of labour productivity has been affected positively by higher fixed investment, lower inflation, higher R&D investment, and ICT investment as a percentage of GDP, a higher share of young adults with at least upper secondary education, and lower product market regulation, and increased exports. In most specifications taxes and gross replacement rates had no statistically significant effect on the productivity growth rates. We found a negative effect from taxes and a positive one from gross replacement rates when they appeared together with fixed investment or inflation. However, with this evidence we conclude that taxes and gross replacement rates are unlikely to have had an effect on productivity growth.

16. On the other hand, the taxes-to-GDP ratio has had a significant negative effect on the number of hours worked by the working-aged population. We find further a negative correlation between the average number of hours worked, on the one hand, and production market regulation, and gross replacement rates, on the other hand. Income inequality and trade union density do not correlate with the number of hours worked, but collective bargaining coverage has a negative correlation. There is also a negative correlation between the ratio of collective bargaining coverage and trade union density, on the one hand, and the average number of hours worked, on the other hand.

17. Theoretical analysis shows that powerful trade unions or higher labour costs associated with increases in, e.g., the unemployment compensation, the payroll taxes paid by employers, the taxes paid by workers or the cost of employment protection, cause more unemployment and a slowdown of economic growth. A coordinated bargaining process increases employment at the price of a lower growth rate.

18. These theoretical predictions are consistent with the empirical analysis on convergence using data on regions in the EU-15. The tax wedge and unemployment benefits are found to lower the growth rate and increase the unemployment rate. Employment protection increases unemployment rates, without a significant effect on the growth rate of GDP per capita. The coordination of the wage bargaining lowers the growth rate and the unemployment rate. The growth rate of the

Total Factor Productivity (TFP) increases the growth of the GDP per capita but decreases the unemployment rate.

19. Econometric evidence shows that the faster productivity growth rates in the new EU member states are due more to catching up from their lower initial levels of output per worker, rather than their policy choices regarding the design of labour market institutions.

20. Theoretical modelling of an open economy shows that the equilibrium unemployment rate depends negatively on labour taxes, but not on the capital income tax, as a higher rate of it only leads to a lower level of productivity and income. On the other hand, a permanent change in labour taxes only has a long-run negative impact on employment, but not on productivity.

21. Vector autoregressive model (VAR) analysis for the EU-15 shows that labour taxes have a marked and statistically significant negative effect on employment, while the effects of the corporate taxes are more neutral with respect to productivity and employment. The results also show that in the short term there is in the EU a trade-off between the two key economic goals of productivity rises and employment. This is less severe in the long run, although does not fully disappear, but turns over time to become statistically insignificant, in contrast to the US where price flexibility is the case. This calls for more flexibility in the EU labour markets in order to smoothly adjust to technological changes and possible negative supply shocks. Simulation of an econometric model for the Finnish labour market shows that, although not in the short, but in the medium run there may be quite essential employment gains from an acceleration in productivity, although in the long run there is no connection between them.

WP 4 (Macroeconomics of tax systems)

22. The theoretical modelling of the Monetary Union shows that if the economies are mainly hurt by demand shocks, then flatter tax systems tend to destabilize output whereas indexation of taxes on prices tend to stabilize it. If the economies are mainly hurt by supply shocks, then the progressiveness of taxation has little impact on output stability. On the whole, the move towards flatter tax systems would likely lead to more unstable output in the Euro Area.

23. Considering that (i) the ECB does smoothen the interest rate, (ii) net tax shocks do have supply-side effects, and (iii) spending shocks may have a declining impact on aggregate demand due to financial liberalization, it is found out that public spending expansions may produce lower positive spillovers in the Euro Area today than they used to in the past, whereas tax cuts may now produce negative spillovers.

24. Estimation of a Dynamic Stochastic General Equilibrium model shows that a positive spending shock in Germany has a positive, Keynesian impact on German GDP and a positive but small spillover on French GDP. A positive spending shock in France has symmetrical effects. Spillovers between the EMU countries are small due to a significant reaction of the common interest rate to spending shocks in either country.

25. VAR analysis of the EU countries shows that both domestic and cross-border effects of German tax shocks have tended to weaken over time. However they have remained positive, i.e. an expansionary shock in Germany has a positive impact on partner countries, especially neighbouring ones. The impact on the interest rate is, however, found to be weak. It is also found empirically that tax shocks are generally more effective in spurring domestic output than government

spending shocks in the Euro Area. This might be due to the fact that tax policies may rise potential growth in the long run, especially when distortionary taxes are removed thus increasing economic efficiency and competitiveness. When the VAR estimation is performed recursively over samples of 17 years of data, it emerges that GDP multipliers drop drastically from early 1990s onwards, especially in Germany (tax shocks) and in the US (both tax and government spending shocks). Moreover, the conduct of fiscal policy seems to have become less erratic, as documented by a lower variance of fiscal shocks over time. Fiscal "surprises", in the form of unexpected reductions in taxation and expansions in government consumption and investment, have become progressively less successful in stimulating the economic activity at the domestic level, indicating that, in the framework of the EMU, policymakers can only marginally rely on this discretionary instrument as a substitute for national monetary policy.

26. Political myopia has a negative impact on the willingness to reduce the labour tax, and the Stability and Growth Pact (SGP) reinforces this pattern since excessive deficits lead to sanctions. Political myopia also reduces the willingness to reduce the welfare state, but this time the SGP has a positive impact on the willingness to reform. Myopia has little impact on the willingness of governments to reform labour and goods markets, and the SGP produces the missing incentive. Given that all reforms but the reform of the goods market have a negative impact on neighbouring countries, EU countries should continue to coordinate product market reforms but leave the reforms of the welfare state and of the labour markets to peer pressure, with the positive SGP catalyst.

WP 5 (Climate change and energy taxation)

27. An extension of the Californian initiative of curbing emissions to the whole of the US would yield it a positive gain from free permit trading with the EU.

28. Considering the policy goal to limit the rise in temperature to 2°C up to 2100 shows that delayed action may induce large excess cost of transitional climate policies and suggest that the burden sharing debate may become substantially more critical over time due to "foregone action".

29. There is a non-negligible trade-off between limited and global coverage from a perspective of the leadership of the 20 core countries in global climate policies if the leadership is assumed to last for ever. If, however, leadership is restricted to a transitional phase – until 2030 – the welfare implications might be reduced substantially.

30. Using two large-scale models of the global economy in combination shows that in an optimal emission policy over the next 100 years developing countries reduce considerably more their emissions than industrialized countries. This result is mainly driven by the share of coal in the baseline fuel use mix. The reduction in production differs between sectors, with a similar pattern in all regions. Plausibly, the fossil fuel sectors are most affected, whereas the non-energy sectors hardly decline at all.

31. A unilateral energy tax will not affect EU-wide emissions and always raises abatement costs, in general especially in the country that introduces the tax, and cannot be justified from the point of climate change policy. The implication of the analysis is that existing energy taxes for installations covered by the EU emission trading system are better removed from the point of view of abatement efficiency.

32. The conversion of existing energy taxes to uniform carbon taxes is a powerful instrument both in terms of emissions reduction and economic welfare relative to cap-and-trade. The position of the new member states deserves special attention when energy taxes would be rearranged. Existing energy taxes are very distortionary and, by the same token, rearranging them may provide potentially very powerful instruments within the context of climate change policies.

33. Revenue recycling is beneficial, relative to recycling in a lump-sum fashion. There is accordingly a double dividend in climate policies.

34. In the endogenous technology case R&D in less-polluting energy technologies is fostered by high permit prices, but it anyway requires a large initial subsidy for technology. Carbon leakage may entail a substantial extra cost to the EU in terms of economic growth.

5. DISSEMINATION OF THE RESULTS

The strategy for dissemination adopted in the project consists of the following items.

1. Creation and up-date of the project's website at http://www.taxben.org, where all the deliverables and the key presentations in the project seminars have been uploaded. In addition the research documents have been available on the web sites of the respective partner institutes.

2. Arrangement of a policy-oriented Final Conference on November 27, 2006 at CEPS, Brussels with around 100 participants. The presentations by the Work package leaders of the TAXBEN project were commented an discussed by, i.a., key EU officials in the field.

3. Organising other seminars with presence of the key representatives of the European Commission as follows:

Seminar on WP 2 (Tax competition) in Prague, on December 17-18, 2004. The seminar was also devoted to policy issues. There was a view of taxation in the EU-15 and in new member states. Then, the pros and cons of the EU proposal concerning the harmonisation and consolidation of tax bases were discussed. The workshop ended with a roundtable on tax coordination.

Kick-off meeting of the project in Brussels, on January 21, 2005

Seminar on WP 1 (employment) in Tallinn, on June 29, 2005

The first full project workshop in Helsinki, on September 9, 2005

Seminar on WP 4 (macroeconomics of tax systems) in Paris, on January 19, 2006

Seminar on WP 3 (EU convergence) in Paris, on January 20, 2006

The second full project workshop in The Hague, on June 15-16, 2006

The seminar on WP 5 (climate change and energy taxation) in Brussels, on October 9, 2006.

4. Related publications and articles. In addition to the deliverables (see Annex 1), the following other publications have been produced by the project team.

Based in part on the results reached in WP 1 and WP 3, the team at ETLA has also been published the following research report, Alho, K., Kaitila, V. and Kotilainen, M.: Employment and Productivity − An Assessment of the Effects of Economic and Labour Market Policies (in Finnish), Finnish Ministry of Labour, Employment Studies, No. 317, 2006.

A report presented to the Estonian Ministry of Social Affairs, Võrk, A., Paulus, A. "Eesti sotsiaaltoetuste ja maksude mõju inimeste tööjõupakkumise stiimulitele" (Analysis of labour supply incentives in the Estonian tax-benefit system), by PRAXIS, 2006. Available at http://www.praxis.ee/data/VorkPaulus_PRAXIS_Stiimuliteanalyys.pdf). It included the presentation of the preliminary results of Deliverable 7A.

L.J.H. Bettendorf, J. Gorter and A. van der Horst have published the report, Who benefits from tax competition in the European Union?, as CPB Document 125, 2006.

L.J.H. Bettendorf and A. van der Horst have written the report, Documentation of CORTAX, as CPB Memorandum 161, 2006.

Deliverable No. 11B, Short-run fiscal spillovers in a monetary union, by Agnès Bénassy-Quéré has been presented in Focus, *CEPII Newsletter* n°31, 4th quarter 2006, available at www.cepii.fr

Deliverable 24, Changing Patterns of Domestic and Cross-Border Fiscal Policy Multipliers in Europe and the US, by Agnès Bénassy-Quéré and Jacopo Cimadomo, has also been presented in Focus, *CEPII Newsletter* n°31, 4th quarter 2006, available at www.cepii.fr

Kari E.O. Alho and Ville Kaitila have written two articles on the preliminary results of the project in the "Prima" magazine of the Confederation of Finnish Employers (numbers 4 and 7/2005).

5. Other conference and seminar presentations

The results of the project have been presented by Kari E.O. Alho from ETLA in a conference organised by the Finnish Ministry for Labour in September 2005 and in a seminar of Finnish economists working in the employer organisations in October 2005, in Helsinki. Results of the deliverable 4 have also been presented by him in seminars at ETLA in May 2006 and in November 2006.

The work by PRAXIS has been presented in the public lecture, Võrk, A. "Töötamise stiimulid Eesti maksu- ja sotsiaaltoetuste süsteemis" (Incentives to work in the Estonian tax-benefit system), at the Estonian Ministry of Finance, 13.09.2005. The lecture had a reference to the TAX-BEN project and the presentation of the preliminary results of Deliverable 7A, available at http://www..praxis.ee/data/PRAXIStaxben_employment.pdf.

Albert van der Horst from CPB has given the presentation, Corporate income taxation in Europe, in the Dutch Ministry of Finance, on May 23, 2006, in The Hague. He has also given the presentation, Corporate income taxation in Europe, in the Conference on Subsidiarity in Europe, on November 9, 2006, Brussels.

There has been a presentation by Gorter, J. from CPB, Mondialisering en vennootschapsbelasting (Globalisation and the corporate income tax), on September 28, 2006, University of Groningen.

Stefan Boeters from CPB has presented his work, Autonomous energy efficiency increases and marginal abatement costs in long-term energy-economy scenarios, which elaborates on some methodological aspects of WP 5, at the Workshop on Economic Policy Modelling, Oslo, 22-24 January 2007.

Deliverable 24, Changing Patterns of Domestic and Cross-Border Fiscal Policy Multipliers in Europe and the US, by Agnès Bénassy-Quéré and Jacopo Cimadomo, also available at www.cepii.fr, has been presented in a seminar at ECARES – Free University of Brussels, Brussels, February 2006; in a seminar at Center for European Integration Studies (ZEI), Bonn, June 2006; and in the Annual conference of the French Economic Association, Paris, September 2006.

In addition, Agnès Bénassy-Quéré has been using the various outcomes of TAXBEN (not only those of CEPII) in her speeches at the French Ministry of Finance, in the media and elsewhere.

6. After completion of the project, it is the aim to further disseminate the project's results in various Working paper series, if not yet published in this form, and in journal articles. All of the deliverables will also to be published as ENEPRI working papers at the web site www.enepri.org of the network organised by CEPS.

In particular, so far, the following submissions have been made:

Adjemian, S., Langot, F. and Quintero Rojas, C. A. (2006): Growth, Unemployment and Tax/Benefit System in European Countries: Theoretical and Empirical Investigations, CEPRE-MAP, Deliverable No. 16B, to *Journal of Evolutianory Economics*.

Chéron, A., Hairault, J.-O. and Langot, F. (2005): A Quantitative Evaluation of Payroll Tax Subsidies: a Structural Approach, A Reform of the French Tax/Benefit System, CEPREMAP, Deliverable No. 6A, to *Journal of Public Economics*.

Chéron, A., Hairault, J.-O. and Langot, F. (2006): Labor Market Institutions and Unemployment in France vs. in the UK: A Wage Posting Investigation, CEPREMAP, Deliverable No. 6B, to *Labour Economics.*

Stefan Boeters: Autonomous energy efficiency increases and marginal abatement costs in long-term energy-economy scenarios (elaborates on some methodological aspects of WP 5), to be submitted to *Energy Journal*.

Agnès Bénassy-Quéré: Short-run fiscal spillovers in a monetary union (Deliverable No 11B), to *Journal of Policy Modelling.*

Vincent Delbecque and Amina Lahrèche-Révil: Do EU member states compete on social systems? (Deliverable No. 9B), submitted to the *Spring Meeting for Young Economists* (SMYE) in Hamburg in May 2007 and to the *Annual Conference of the Research in International Economics and Finance* (RIEF) network in Rome, June 2007.

6. ACKNOWLEDMENTS AND REFERENCES

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7. ANNEXES

Annex 1. Output of the project

Adjemian, S., Langot, F. and Quintero Rojas, C. A. (2006): Growth, Unemployment and Tax/Benefit System in European Countries: Theoretical and Empirical Investigations, CEPREMAP, Deliverable No. 16B, Downloadable at http://www.taxben.org

Alho, K.E.O. (2006): Labour Market Institutions and the Effectiveness of Tax and Benefit Policies in Enhancing Enployment: A General Equilibrium Analysis, Discussion Paper No. 1008, ETLA, Deliverable No. 4, Downloadable at http://www.taxben.org

Alho, K.E.O. (2006): Climate Policies and Economic Growth, Discussion Papers No. 1024, ETLA, Deliverable No. 13, Downloadable at http://www.taxben.org

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Anspal, S. and Võrk, A. (2006): Labour Market Institutions and Productivity in the new EU Member States, Working Paper, PRAXIS, Deliverable No. 18, Downloadable at http://www.taxben.org

Bénassy-Quéré, A. (2006): Short-term fiscal spillovers in a monetary union, Working Paper No. 2006-12, CEPII, Deliverable No. 11B, Downloadable at http://www.taxben.org

Bénassy-Quéré, A. and Cimadomo, J. (2006): Changing Patterns of Domestic and Cross-Border Fiscal Policy Multipliers in Europe and the US, Working Paper No. 2006-24, CEPII, Deliverable No. 4, Downloadable at http://www.taxben.org

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Annex 2. Status of the agreed deliverables

All the agreed deliverables have been completed. The list of the original deliverables is the following. The additions and modifications made during the project have been reported above.

Deliverables list			
Del. no. [1]	**Deliverable name**	**WP no.**	**Status**
1	Project presentation	1-6	Completed
2	Final plan for using and disseminating knowledge	1-6	Completed
3	Workshop on employment and tax/benefit systems	1	Held
4	Working paper: Reforms in tax/benefit systems and EU labour markets	1	Completed
5	First project workshop	6	Held
6	Working paper: European labour market performances	1	Completed
7	Working paper: Tax/benefit systems and employment in the accession countries	1	Completed
8	Workshop on tax competition in the EU	2	Held
9	Working paper: The tax/benefit systems in the EU under tax competition	2	Completed

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[1] Deliverable numbers in order of delivery dates: D1 – Dn

10	Workshop on macroeconomic modelling of tax policies	4	Held
11	Working paper: Macroeconomics of the EU tax systems under EMU: theory	4	Completed
12	Workshop on climate change policies and taxation in the EU	5	Held
13	Working paper: Potential growth of the EU and climate policies	5	Completed
14	Working paper: Optimal timing of GHG emissions reductions	5	Completed
15	Workshop on productivity growth and tax/benefit systems	3	Held
16	Working paper: EU catching up and reforms in tax/benefit systems	3	Completed
17	Deleted as NIER has departed from the Consortium		Deleted
18	Working paper Labour market institutions and convergence in the accession countries	3	Completed
19	Working paper: Welfare effects of various forms of tax harmonisation	2	Completed

20	Working paper: Taxes and tradable permits in the EU to curb CO_2 emissions	5	Completed
21	Working paper: Structural reforms in the tax systems and their coordination in EMU	4	Completed
22	Second project workshop	6	Held
23	Working paper: Post-Kyoto policy options	5	Completed
24	Working paper: Results of the macroeconomic model on tax policies in the EU	4	Completed
25	Working paper: Survey of existing macroeconomic model results concerning spillovers	4	Completed
26	Working paper: Tax reform in EU countries	2	Completed
27	Final report of the project	1-5	Completed
28	Final conference on the results of the project	1-5	Held