

Modelling of Labour Markets in the European Union

Final Report

Part I - A Survey

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Executive Summary

Good economic policy advice requires rigorous analysis of reforms. Three different evaluation methods are typically used. *Micro-econometric methods* mainly address causality questions. However, they implicitly assume the absence of general equilibrium effects, which is a limitation when reforms have economy wide repercussions. *Microsimulation models* tend to be strong in capturing household and firm heterogeneity and the detailed institutional representation of tax-benefit systems and other aspects of the public sector. While particularly detailed in the analysis of distributional consequences of public policy, these models also tend to be relatively weak in capturing behavioural effects and the associated efficiency costs of policy. *Computable General Equilibrium (CGE)* models are a valuable tool because they capture behavioral effects in general equilibrium and can quantify the aggregate and disaggregate welfare consequences of policy reform. They thus contribute to a rigorous evaluation of the efficiency and distributional concerns. Such models illustrate the interactions between different behavioral margins. They can be used to compare the direct impact of policy reforms, taking behavior as given, with the total effects on the economy including the policy induced general equilibrium adjustments. Similarly, they help to compare the direct fiscal costs of policy initiatives with the total costs when prices and supply and demand behavior has changed in reaction to public policy. They are useful in illustrating how the total policy impact of public expenditure or tax reform can sometimes substantially change, depending on how these reforms are financed to sustain budget balance. Furthermore, CGE models can provide an ex-ante analysis of ‘hypothetical’ policy scenarios which is often impossible with micro-econometric methods. Finally, intertemporal equilibrium models can reveal the timing of benefits and costs, i.e. the contrasting short- and long-run policy effects, when the economy converges to a new balanced growth path after reform. Compared to microsimulation models, CGE analysis typically captures less distributional detail because the rigorous modelling of behavioral responses makes these models rather complex.

CGE models are tightly linked to modern economic theory and therefore provide rigorous theoretical foundations for policy evaluation. Such models permit a welfare based policy evaluation which is often not possible with other evaluation approaches, and allow for a rigorous causal interpretation of numerical simulation results. However, one must keep in mind the potential sensitivities that are associated with each of the alternative evaluation approaches. We think that CGE models have three dimensions of sensitivities: i) Simulation results are sensitive to the theoretical specification of the model. One must ask whether the chosen model specification is suitable for the analysis of a given particular policy problem. ii) Results are sensitive to the chosen values of behavioral parameters. One must ask whether the chosen parameterization reflects the available empirical evidence well. Sometimes, econometric estimates on certain parameters vary quite substantially in the literature. iii) Results can also be sensitive to the chosen implementation of the policy scenario. One must ask whether the numerical policy scenario is

correctly specified to suitably capture the key economic aspects of real world policy initiatives. We are convinced that CGE analysis is a useful complement to other evaluation methods but one must also take into account the possible limitations.

The purpose of the project on *Modelling Labour Markets in the European Union* was not so much the analysis of a specific policy reform but rather to provide a versatile tool for labour market analysis in a macroeconomic context. The model was expected to be very detailed to allow Commission authorities to analyze a range of alternative policy issues. This *Final Report* of the project consists of four parts. The first part, *Modelling Labour Markets in the European Union - A Survey*, provides a compendium of models, a characterization of labour markets in the European Union, a literature survey on the impact of labour market policies, a list of possible policy scenarios, as well as a short outline of the model. The second part, *Documentation of the model*, consists of a detailed technical documentation of the labour market model. The *Country Study for Germany* includes illustrative simulations of a range of policy problems that play an important role in the German reform debate. The fourth part, *Illustrative Simulations*, provides a short analysis of selected policy scenarios for other countries.

The compendium of models in the first part reviews a range of existing macroeconomic and labour market models. We first provide an overview of general equilibrium models as applied by the European Commission or at least partly financed by the European Union. The review indicates that the model developed in this project includes a substantially richer modelling of labour market features and could thus be a useful complementary tool for policy analysis by Commission authorities. The remaining part describes labour market models used by other institutions to simulate policy reforms. Most of these models make simplifications especially regarding dynamics, foreign trade and the firm sector to reduce model complexity. On the other hand, models concentrating on these latter aspects impose important simplifying assumptions about labour market issues. In comparison, the ‘labour market model’ contains many relevant labour market features not included in most of the other available models.

The overview of labour markets in the European Union delivers a very heterogeneous picture. One can observe big differences in labour market states such as employment, participation and unemployment rates across Member States. These disparities partly reflect different labour market and fiscal institutions in the Member States. We therefore also provide an overview of these institutions.

The survey of the academic literature discusses active and passive labour market policy, employment protection legislation, life-long learning policies, contractual arrangements and complementarities between different labour market policies. The review draws the following conclusions. Theoretical arguments show that active labour market policies (ALMP) can have quite complex economic effects. On the one hand, measures such as job search assistance, sanctions or other activation measures can strengthen incentives for job search and raise the matching probability. On the other hand, ALMP can also raise the value

of unemployment. As a result, the net effect is often ambiguous. The simulations highlight the positive effects of active labour market policy on employment, but it should be targeted to specific groups.

The literature on passive labour market policy shows that higher replacement rates in the unemployment system offer more insurance to risk-averse workers but are themselves a source of unemployment. Not only do they weaken job search incentives by making unemployment less costly, high replacement incomes also get partly shifted to firms and undermine job creation incentives. Empirical findings provide convincing evidence on these effects. Therefore, most unemployment systems condition benefit receipts on some performance criteria. The economic literature also identifies positive and negative effects of employment protection legislation (EPL). In raising separation costs for firms, EPL tends to reduce the incentive to dismiss workers. On the other hand, these costs also tend to undermine the incentives for new hiring. Findings on the economic impact of employment protection legislation are therefore mixed, although there is somewhat more evidence for negative effects of EPL.

Economic theory suggests that imperfections in labour-, capital- and training markets might interact in a way that induces economic agents (employers or employees) to underinvest in training. If the social return to training is higher than the private return, or if there are other reasons for underinvestment such as financial restrictions, public intervention can be justified. Evidence on flexible contractual arrangements such as fixed-term contracts suggests that flexible employment is more sensitive to economic and cyclical factors than regular employment. However, there is evidence that temporary employment can be an important step in moving from unemployment to a regular job. The idea of ‘worksharing’ has become popular in Europe in the past, pushed by some policymakers and unions as a means to increase employment. Available evidence suggests that worksharing reduces the overall number of hours worked in the economy and thereby reduces output, but can help to raise employment. It is often argued that complementarities between different policy measures play an important role for economic outcomes. However, the economic literature on complementarities between different labour market policies is scarce. Both in theoretical and empirical work, researchers find complementarities, but they tend to be small.

The second part of the *Final Report* provides a detailed description of the labour market model. It starts with a general discussion of the model and explains the life-cycle structure of households in detail. A large part of the model description is devoted to the household sector. We distinguish between retiree and worker households, where the decision structure of workers is much more refined due to several alternative margins of labour supply. Subsequently, we describe the production side of the economy and the matching process between workers and firms, the firing and training decisions of firms, the wage-bargaining process as well as the investment decision of firms. Next, the structure of the public sector and of the social security system with a rich set of taxes, transfers and other labour market tools is introduced, and a welfare measure for the evaluation of policy scenarios is derived. Finally, the Appendix

contains the calibration of the model. The calibration has now been extended to all the countries covered in the project.

All countries (Austria, Denmark, Germany, Italy, Poland, and the United Kingdom) are modelled as an open economy with an internationally fixed real interest rate and endogenous growth of labour productivity as a result of training and education. Savings and physical as well as human capital investments follow from optimal intertemporal choice with perfect foresight. Households save to ensure smooth consumption in the face of a fluctuating life-cycle income pattern. In particular, they save to top up public pensions and sustain their consumption level during retirement. We allow for intergenerational transfers which are important in replicating consumption profiles.

The model is based on the probabilistic ageing approach introduced by Grafenhofer et al. (2007a) which allows for a period length of one year and approximates life-cycle features with a limited number of age groups to keep the dimensions of the model tractable. The model is a generalization of Gertler (1999) who was the first to introduce a simple life-cycle structure into the basic Blanchard (1985) perpetual youth model. Heijdra, Keuschnigg and Kohler (2004) introduced dynamic search unemployment in a Blanchard type model without retirement and derived some analytical results. Keuschnigg and Keuschnigg (2004) combined this with the Gertler model by introducing two age groups, workers and retirees, to analyse pension reforms. The present model considers several age groups of workers and retirees and allows for mortality in all life-cycle stages. The model includes a detailed representation of public social insurance systems in the presence of life-cycle labour supply, training, search unemployment and retirement.

The life-cycle is divided into periods of education, active work and retirement. At the beginning of the adult life-cycle, agents choose their skill group via a discrete educational decision. To attain higher human capital, individuals have to undergo education, implying a delay of entry into the labour market. During active work life, agents choose work effort or hours worked when employed (intensive labour supply), time spent on job search in case of unemployment and the participation rate or the retirement age (extensive labour supply), respectively. In addition, they invest in the maintenance and increase of their individual human capital by training. Retirement terminates the flow of wage income and, instead, entitles to pension benefits. Even if pensions and unemployment benefits are linked to previous earnings, contributions to a PAYG system are partly perceived as taxes if they earn a rate of return less than the market interest rate. These implicit taxes are part of the overall tax burden on labour and importantly determine the labour market outcome as they can be a large part of the total tax wedge.

Labour market equilibrium reflects search unemployment where the model is based on the pioneering theory reviewed by Mortensen (1986). In creating jobs, firms post an optimal number of vacancies for different age- and skill-groups. Unemployed persons choose an optimal search effort to obtain a new job. Vacancies and individuals are allocated by job matching. We use a static search model as in Boone

and Bovenberg (2002) in contrast to a dynamic model as in Pissarides (2000). The static model is simpler yet captures the essential insights of the dynamic one. Subsequently, the firm has to decide whether to keep the worker or to fire her. Employers and employees bargain over wages where the wage outcome depends on the bargaining power of workers and firms. Due to the structure of the model, we can explain age- and skill-dependent unemployment rates. Firms can increase productivity of their employees by investing in firm-sponsored training. Together with private training and education, firm-sponsored training determines the productivity of an employee.

Finally, we include in detail the budget of the social security system and the remaining public sector. The modelling of the unemployment insurance and the pension system includes an individually perceived tax benefit link. We are thus able to calculate the implicit tax component of mandatory contributions and to capture the distortions of the participation and retirement decision of prime age workers.

The model is rather elaborate and complex and is, thus, suitable for a range of alternative applications. However, given this complexity, possible adjustments and further extensions should be undertaken with due care. Nevertheless, a reflection about some amendments might be worthwhile for the future development of the labour market model. Participants of the seminar in Brussels pointed out the usefulness and strength of the model. They also mentioned possible extensions. We shortly review the most promising. First, instead of using a static variant of the standard Mortensen-Pissarides type matching theory, the model might benefit from imposing a steady state variant in each period. Hall (2005) discusses the rather quick convergence of the labour market to a steady state. Second, it was asked how the optimal number of hours is determined. Given wages, individuals decide on the optimal amount of hours worked in the model. Alternative assumptions are conceivable. For example, firms might determine the number of hours. Hours worked might also follow from simultaneous Nash-bargaining over wages *and* hours between firms and workers (efficient Nash-bargaining). This issue is discussed in Christoffel et al. (2009). Third, the current version of the model does not include a differentiation between short- and long-term unemployment. Explicitly accounting for different states of unemployment could help in analysing certain policy scenarios, but one should be cautious so as not to introduce too much heterogeneity among individuals which would be difficult to handle.

The model has been developed and calibrated for six countries, Austria, Denmark, Germany, Italy, Poland and the United Kingdom. The effect of policy reforms can therefore be analysed for the main alternative social models in Europe. An explicit extension of the model to other countries requires tedious calibration work. The third part of the *Final Report*, (*Country Study for Germany*), applies the empirically implemented dynamic general equilibrium model to quantitatively evaluate important labour market reforms. In particular, we analyse several important policy areas that relate to structural problems discussed in Germany. Given the importance of employment protection compared to other

OECD countries, it is natural to ask about its impact on output, labour markets and welfare of private households. Our first simulation scenario thus investigates the consequences of a reduction of employment protection and the introduction of other important elements of the Danish *flexicurity* system. Flexicurity rests on three pillars. First, it aims to enhance labour market flexibility by allowing firms to terminate employment more easily if a job match is no longer productive, and to release labour for more efficient uses elsewhere. Second, it provides sufficient income support for unemployed persons, especially those with low income, to alleviate the burden of unemployment. And last, it also implies a substantial spending on active labour market policies to bring the unemployed back into employment at a faster rate.

The second scenario considers alternative ways of *enhancing employment of prime age workers*, including higher spending on public childcare, an unemployment benefit reform and training subsidies to firms. A third policy area targets *skill-based growth*. Even though some effort has been made to improve the outcome and efficiency of German tertiary education, the system still seems to suffer from some weaknesses compared to other countries within the EU and OECD. To investigate the potency of *skill formation*, we evaluate the consequences of moving to a less progressive income tax system and an increase in student grants which could enhance enrolment in tertiary education. Next, the report discusses *employability of the old*. Projections of the European Commission show that Germany seems to be heavily exposed to ageing. Raising the retirement age is probably the most urgent policy step to restore the solvency of the social security system in an ageing society. We thus quantitatively investigate various alternatives to boost incentives of employees to postpone retirement. Finally, we draw attention to the labour market effects of *corporate taxation*. Germany is one of the countries with the highest effective tax rates on profits. In simulating a *corporate income tax cut*, we show that labour market performance not only depends on labour taxation and welfare policies, but also on business taxation which can also be seen as a tax on job creation. We find that the effects of a corporate tax cut might be quite substantial.

The fourth part of this *Final Report, Illustrative Simulations* provides a brief analysis of reform scenarios for the other countries covered in the project. The reform scenarios partly rely on economic policy recommendations of the European Commission and the OECD. Both institutions argue that *Denmark* should provide stronger incentives to increase labour market participation of older workers. *Italy* suffers from the poor results of the educational system. Even though children in primary school perform pretty well in international comparisons and even though expenditures for the secondary educational system are rather high, the number of graduates is among the lowest in the European Union. Several different reform scenarios have already been performed for *Austria* in the Second Interim Report as already presented at the seminar in Brussels. We focus on a cut of the corporate income tax rate in this Final Report. *Poland* provides a system of generous and rather poorly targeted disability and early retirement benefits. The effects of tightening eligibility to disability benefits are analysed in this report. For the *United Kingdom*,

both institutions recommend to continue attempts to bring more people into employment. The recent success of the New Deal for young people suggests that it could be applied more broadly.

These labour market reform scenarios are based on a list of policy scenarios that are discussed in Section 5 of the first part of the report. The list contains suggestions for labour market, tax, education and training, and pension reform scenarios that can be analyzed with the model. Tables with simulation results provide an overview about the wide range of possible indicators the model can generate. The *country study for Germany* and the *Illustrative Simulations* are not only intended to analyse the effects of reform policies for the different countries. In fact, they also provide an overview of the multitude of policy scenarios that can be addressed by the model.

Some of these policy scenarios were presented at the seminar in Brussels and a second part of remarks at the seminar was closely related to the modelling scenarios implemented in the report. The authors emphasized that one should pay attention to the *sensitivity* of simulation results, as is advised with any evaluation method. Providing a sensitivity analysis, both on the magnitude and type of the policy shocks as well as on the sensitivity of behavioral reactions to the shock, is a very useful tool not only to analyse the range of possible results but also to highlight which behavioral margins are important in determining the quantitative results. The discussion of the flexicurity scenario also showed that *specific extensions* might be useful for an elaborate investigation of some special policy reforms. Seminar participants suggested that a variant of the Acemoglu and Shimer (2000) argument might improve the understanding of a flexicurity reform package. In particular, average labour productivity should increase when less productive worker-firm pairs separate due to less stringent employment protection so as to allow the reallocation of workers to more productive jobs elsewhere. Furthermore, the *public budget* need not be balanced separately in each period but only in present value. One can thus use public debt to shift the tax burden between present and future generations which allows for additional flexibility in the design of reforms. Simulations of different policy reforms have also revealed that *complementarities* among different policies are small in the model, which is partly in line with results in the literature. Future research on the magnitude of complementarities and a reflection on how to take account of policy complementarities in the model might be useful.

Résumé

Le conseil en matière de bonne politique économique requiert une analyse approfondie des réformes. Trois méthodes d'évaluation sont habituellement utilisées. Les *méthodes micro-économétriques* concernent principalement des questions de causalité. Elles impliquent cependant l'absence d'effets d'équilibre général, ce qui constitue une limitation de l'analyse de réformes avec des répercussions à l'échelle macroéconomique et économique. Les *modèles de microsimulation* parviennent en général à bien capturer l'hétérogénéité des ménages et des entreprises ainsi que la représentation détaillée du système socio-fiscal et d'autres aspects du secteur public au niveau institutionnel. Si ces modèles sont particulièrement exhaustifs en matière d'analyse des effets de répartition de la politique publique, ils ne parviennent que relativement mal à rendre compte des effets comportementaux et des coûts d'efficacité de cette politique. Les *modèles d'équilibre général calculable (EGC)* sont un outil précieux parce qu'ils permettent de capturer les effets comportementaux en matière d'équilibre général et de quantifier les conséquences agrégées et désagrégées de réformes politiques en matière de protection sociale. Ils contribuent ainsi à une évaluation rigoureuse des questions d'efficacité et de répartition. De tels modèles rendent compte des interactions entre les différentes contraintes comportementales. Ils peuvent être utilisés pour comparer l'impact direct de réformes politiques, qui considèrent le comportement comme donné, et les effets globaux sur l'économie y compris les ajustements de l'équilibre général induites par la politique. De même, ils permettent de comparer le coût fiscal direct des initiatives politiques et leur coût global dans une situation où les prix et le comportement de l'offre et de la demande ont changé en réaction à la politique publique. Ils sont également utiles pour illustrer le fait que l'impact politique global de dépenses publiques ou d'une réforme fiscale change parfois sensiblement selon la manière dont ces réformes sont financées conformément à l'équilibre budgétaire. Par ailleurs, les modèles EGC permettent une analyse ex-ante de scénarios politiques 'hypothétiques' ce qui est généralement impossible avec les méthodes micro-économétriques. Enfin, les modèles d'équilibre intertemporels permettent de déterminer le calendrier des profits et des coûts, comme par exemple les effets contrastés à court et à long terme, dans une économie qui converge vers une nouvelle croissance équilibrée après la réforme. Par rapport aux modèles de microsimulation, l'analyse EGC saisit généralement moins de données relatives à la répartition car la modélisation minutieuse de réactions comportementales rend ces modèles plutôt complexes.

Les modèles EGC sont étroitement liés à la théorie économique moderne et disposent ainsi d'un fondement théorique approfondi propice à l'évaluation politique. Ces modèles permettent une évaluation de la politique de protection sociale, ce qui n'est généralement pas possible avec d'autres approches évaluatives, ainsi qu'une précise interprétation causale de résultats de simulation numériques. Il faut cependant être conscient des sensibilités potentielles associées à chacune des approches d'évaluation alternatives. Nous estimons que les modèles EGC ont trois dimensions de sensibilité : i) Les résultats de simulation sont

sensibles à la spécification théorique du modèle. Il est essentiel de se demander si la spécification de modèle choisie convient à l'analyse d'un problème politique donné. ii) Les résultats sont sensibles aux valeurs des paramètres comportementaux. Il est essentiel de se demander si le paramétrage choisi reflète correctement les données empiriques disponibles. Les estimations économétriques de certains paramètres qu'on trouve dans la documentation existante présentent parfois des variations relativement fortes. iii) Les résultats peuvent également être sensibles à l'implémentation du scénario politique. Il est essentiel de se demander si le scénario politique est correctement spécifié pour rendre compte de manière adéquate des aspects économiques clés d'initiatives politiques réelles. Nous sommes convaincus que l'analyse EGC constitue un excellent complément à d'autres méthodes d'évaluation. Il convient tout de même de garder ses limites potentielles à l'esprit.

L'objectif du projet sur la *modélisation des marchés de l'emploi au sein de l'Union européenne* consistait moins à analyser une réforme politique spécifique qu'à fournir un outil flexible d'analyse du marché de l'emploi dans un contexte macroéconomique. Il a été prévu que ce modèle soit très détaillé pour permettre aux autorités de la Commission d'analyser une série de questions politiques alternatives. Ce rapport final du projet comprend quatre volets : le premier volet, *Modélisation des marchés de l'emploi au sein de l'Union européenne - une vue d'ensemble*, contient une compilation de modèles, une caractérisation des marchés de l'emploi dans l'Union européenne, une analyse bibliographique de la documentation portant sur l'impact des politiques de marché de l'emploi, une liste de scénarios politiques potentiels ainsi qu'une présentation succincte du modèle. Le deuxième volet, *Documentation du modèle*, comprend une documentation technique détaillée du modèle du marché de l'emploi. *L'étude de pays consacrée à l'Allemagne* réunit des simulations illustratives d'une série de problèmes politiques qui jouent un rôle important dans le débat allemand portant sur la réforme. Le quatrième volet, *Simulations illustratives*, comprend une brève analyse de scénarios politiques choisis pour d'autres pays.

La compilation de modèles dans le premier volet passe en revue une série des modèles macroéconomiques et du marché du travail qui existent. Nous proposons d'abord un aperçu des modèles d'équilibre général appliqués par la Commission européenne ou du moins partiellement financés par l'Union européenne. Cet aperçu met en évidence le fait que le modèle développé dans le cadre de ce projet dispose d'une modélisation des caractéristiques du marché du travail beaucoup plus riche, ce qui en fait un outil complémentaire propice à l'analyse politique par les autorités de la Commission. Ensuite sont décrits des modèles du marché de l'emploi appliqués par d'autres institutions pour simuler les réformes politiques. En vue de réduire la complexité, la plupart de ces modèles recourt à des simplifications, notamment en ce qui concerne les dynamiques, le commerce extérieur et le secteur des entreprises. Les modèles focalisés sur ces aspects imposent cependant d'importantes simplifications concernant des questions du marché du travail. Notre modèle du marché de l'emploi en revanche contient nombre de caractéristiques pertinentes

en matière de marché de l'emploi qui ne sont pas prises en considération dans la plupart des autres modèles disponibles.

Une vue d'ensemble des marchés de l'emploi de l'Union européenne livre une image très hétérogène. On constate de grandes différences entre marchés de l'emploi des Etats membres, sur des critères tels que les taux d'emploi, de participation et de chômage. Ces disparités reflètent en partie les différentes institutions fiscales et du marché de l'emploi dans les Etats membres. Nous présentons donc aussi un aperçu des ces institutions.

L'analyse bibliographique de la littérature académique se consacre aux politiques actives et passives du marché du travail, à la législation en matière de protection de l'emploi, aux politiques d'éducation et de formation tout au long de la vie, aux modalités contractuelles et aux complémentarités des différentes politiques en matière de marché de l'emploi. Il en résulte les conclusions suivantes. Les débats théoriques montrent que les politiques actives du marché du travail (PAMT) peuvent avoir des effets économiques assez complexes. D'une part, des mesures telles que les services de placement, les sanctions ou d'autres stratégies d'activation peuvent renforcer l'incitation à rechercher un emploi et accroître la probabilité d'appariement. D'autre part les PAMT peuvent entraîner une augmentation de la valeur du chômage. Par conséquent, l'effet net est souvent ambigu. Les simulations mettent les effets positifs des stratégies d'activation sur l'emploi en évidence; il conviendrait cependant de cerner des groupes spécifiques.

L'analyse bibliographique de la documentation disponible sur les politiques passives du marché de travail démontre qu'un système de chômage avec des taux de remplacement élevés offre plus d'assurance aux travailleurs réfractaires au risque tout en créant du chômage. Non seulement ils fragilisent les mesures incitatives à la recherche d'emploi en rendant le chômage moins coûteux, mais les revenus élevés de remplacement sont également en partie transférés vers les entreprises et ébranlent les mesures incitatives à la création d'emploi. Les résultats empiriques démontrent ces effets de manière concluante. Par conséquent, l'éligibilité aux prestations est soumise à certains critères de performance dans la majorité des systèmes de chômage. La littérature économique identifie également les effets positifs et négatifs des dispositions législatives applicables à la protection de l'emploi. Grâce à l'augmentation des frais de licenciement des entreprises, ces dispositions ont tendance à réduire l'incitation au licenciement. Ces frais semblent toutefois en même temps réduire la propension à l'embauche. Les conclusions au regard de l'impact économique de la législation en matière de protection de l'emploi sont donc mitigées, quoique l'évidence pour les effets négatifs prévale légèrement.

La théorie économique suggère que des imperfections des marchés du travail, du capital ou de la formation puissent interagir de sorte que les agents économiques (employeurs et employés) sont menés à sous-investir dans la formation. Si le rendement social de la formation est plus élevé que le rendement privé ou s'il y a d'autres raisons pour un sous-investissement, telles que des restrictions financières,

une intervention publique paraît justifiée. Des données sur les modalités contractuelles flexibles, telles que les CDD, amènent à la conclusion que l'emploi flexible est plus sensible aux facteurs économiques et cycliques que l'emploi régulier. Il existe pourtant des données qui suggèrent que l'emploi temporaire peut constituer une étape essentielle entre le chômage et une activité régulière. Par le passé, le concept du chômage partiel, encouragé par quelques décideurs politiques et des syndicats en tant que moyen d'augmenter le taux d'emploi, a gagné du terrain en Europe. Les données disponibles suggèrent que le partage du travail réduit le nombre total d'heures travaillées à l'échelle de l'économie et ainsi également sa performance. Cette stratégie peut pourtant contribuer à augmenter le taux d'emploi. Le rôle essentiel que jouent les complémentarités entre les différentes mesures politiques pour la rentabilité économique est souvent invoqué. La littérature économique traitant des complémentarités entre les différentes politiques de marché du travail se fait cependant rare. Si des complémentarités sont mentionnées dans la documentation scientifique théorique et empirique, elles sont plutôt faibles.

Le deuxième volet du rapport final fournit une description détaillée du modèle du marché de l'emploi. Ce deuxième volet s'articule autour d'une discussion générale du modèle, suivie par une explication détaillée de la structure du cycle de vie des ménages. La description du modèle est principalement consacrée au secteur des ménages. Nous distinguons entre les ménages de retraités et les ménages de travailleurs, la structure décisionnelle des travailleurs étant beaucoup plus complexe en raison de plusieurs contraintes relatives à l'offre de travail alternatives. Ensuite nous nous penchons sur la description de la production économique, du processus d'appariement entre travailleurs et entreprises, des décisions de licenciement et de formation au sein des entreprises, du processus de négociation salariale ainsi que des décisions d'investissement en entreprise. C'est ici que la structure du secteur public et du système de sécurité sociale accompagnée d'une vaste panoplie d'impôts, de transferts et d'autres outils du marché de l'emploi est introduite et qu'une mesure de protection sociale pour l'évaluation de scénarios politiques en est dérivée. En annexe se trouve enfin l'estimation du modèle, qui a désormais été étendue à tous les pays inclus dans ce projet.

Tous les pays (l'Autriche, le Danemark, l'Allemagne, l'Italie, la Pologne et le Royaume-Uni) sont modélisés en tant qu'économie ouverte avec un taux d'intérêt réel fixé au niveau international et une croissance endogène de la productivité du travail qui résulte de la formation est de l'éducation. L'accumulation de ressources financières et les investissements de capital physique ainsi qu'humain découlent d'un choix intertemporel optimal avec prévision parfaite. Les ménages font des économies pour assurer une consommation souple au regard des fluctuations de revenu au cours du cycle de vie. Ils économisent notamment pour compléter leurs retraites publiques et pour maintenir leur niveau de consommation pendant la retraite. Les transferts intergénérationnels, qui sont essentiels pour la réplique de profils de consommations, sont pris en considération.

Le modèle s'appuie sur l'approche probabiliste du vieillissement introduite par Grafenhofer et al. (2007a) qui prévoit une périodicité annuelle et établit une approximation des caractéristiques du cycle de vie avec un nombre limité de groupes d'âge pour maintenir les dimensions du modèle maniables. Le modèle est une généralisation de Gertler (1999) qui a été le premier à introduire une simple structure du cycle de vie dans le modèle de jeunesse perpétuelle de base de Blanchard (1985). Heijdra, Keuschnigg et Kohler (2004) ont introduit le chômage frictionnel dynamique dans un modèle à la manière de Blanchard sans le facteur de la retraite et en ont dérivé quelques résultats analytiques. Keuschnigg et Keuschnigg (2004) ont opéré une synthèse entre ce dernier et le modèle de Gertler en introduisant deux groupes d'âge, les travailleurs et les retraités, afin de permettre d'analyser les réformes de retraite. Le présent modèle inclut plusieurs groupes d'âge de travailleurs et de retraités et tient compte de la mortalité à tous les stades du cycle de vie. Le modèle contient une représentation détaillée des systèmes d'assurance sociale publics en présence d'une d'œuvre au cours du cycle de vie, de la formation, du chômage frictionnel et de la retraite.

Le cycle de vie est divisé en périodes d'éducation, d'activité et de retraite. Au début du cycle de vie adulte, les agents choisissent leur groupe de compétences au biais d'une décision autonome en matière d'éducation. Afin de valoriser leur capital humain, les individus suivent une éducation, ce qui implique un retard en termes d'entrée sur le marché du travail. Au cours de la vie active, les agents décident de l'effort de travail et des heures travaillées, s'ils détiennent un emploi (offre de main d'œuvre à la marge intensive), du temps consacré à la recherche d'emploi en cas de chômage et du taux de participation ou bien de l'âge de départ à la retraite (offre de main d'œuvre à la marge extensive). En outre, ils investissent dans le maintien et l'accroissement de leur capital humain individuel au moyen de la formation. Le départ à la retraite met fin aux flux de revenus salariaux et ouvre le droit aux allocations de retraite. Même si les allocations de retraite et les indemnités de chômage sont liées aux revenus précédents, les contributions à un système de type PAYG (régime de retraites par répartition) sont partiellement perçues sous la forme d'impôts si leur taux de rendement se situe en dessous du taux d'intérêt du marché. Ces impôts implicites font partie des charges fiscales générales sur le travail et ont une influence considérable sur la performance du marché du travail comme ils peuvent constituer une large portion du coin fiscal.

L'équilibre du marché du travail reflète le chômage frictionnel, le modèle étant fondé sur la théorie pionnière revue par Mortensen (1986). En créant des emplois, les entreprises fournissent un nombre optimal de postes vacants pour différents groupes d'âge et de compétences. Les chômeurs adoptent un effort de recherche optimal pour obtenir un nouvel emploi. Les vacances et les individus sont alloués par appariement d'emploi. Nous utilisons un modèle de recherche statique à la Boone et Bovenberg (2002) au lieu d'un modèle dynamique à la Pissarides (2000). Le modèle statique est plus simple, il permet néanmoins de capturer les aspects essentiels du modèle dynamique. Ensuite, il revient à l'entreprise de

décider soit de garder le travailleur, soit de le renvoyer. Les employeurs et les employés négocient le salaire; l'issue des négociations dépend du pouvoir de négociation des travailleurs et des entreprises. La structure du modèle permet d'explicitier les taux de chômage, ventilés par groupes d'âge et de compétences. Les entreprises peuvent augmenter la productivité de leurs employés en investissant dans des formations. Les formations financées par l'entreprise ainsi que les efforts d'éducation et de formation privés déterminent la productivité d'un employé.

Enfin nous intégrons en détail le budget du système de sécurité sociale et des autres domaines du secteur public. La modélisation de l'assurance chômage et du système de retraite comprend un lien à la perception individuelle de prestations et d'impôts. Cela nous permet de calculer la part des impôts implicites dans les contributions obligatoires et de capturer les déviations entraînées par les décisions de participation et de départ à la retraite des travailleurs en âge de forte activité.

Ce modèle très élaboré et complexe se prête à une série d'applications alternatives. En raison de sa complexité, les ajustements et les extensions ultérieures sont pourtant à apporter avec soin. Une réflexion sur des amendements peut néanmoins s'avérer utile en vue de l'évolution future de ce modèle. Les participants au séminaire à Bruxelles ont mis l'accent sur l'utilité et la puissance du modèle. Ils ont également signalé des extensions potentielles, dont nous rappelons ici les plus prometteuses. Premièrement, au lieu d'utiliser une variante statique de la théorie d'appariement standard dans la lignée de Mortensen-Pissarides, le modèle pourrait profiter de l'application d'une variante d'état continu pour chaque période. Hall (2005) discute la convergence assez rapide du marché de travail vers un état d'équilibre. Deuxièmement, la question de savoir comment le montant optimal d'heures est déterminé a été soulevée. Dans notre modèle, les individus décident du montant optimal d'heures de travail sur la base d'un salaire donné. Des alternatives sont envisageables. Le nombre d'heures pourrait par exemple être déterminé par les entreprises ou bien résulter de négociations simultanées sur les salaires et les heures entre les entreprises et les travailleurs (processus de négociation efficace selon Nash). Cet aspect est discuté dans Christoffel et al. (2009). Troisièmement, la version actuelle du modèle ne différencie pas entre le chômage de longue et de courte durée. Une représentation explicite de différents états de chômage pourrait permettre de mieux analyser certains scénarios politiques. Il faudra d'ailleurs veiller à ne pas introduire trop d'hétérogénéité entre les individus comme cela sera difficile à manier.

Le modèle a été développé et calibré pour six pays à savoir l'Autriche, le Danemark, l'Allemagne, l'Italie, la Pologne et le Royaume-Uni. Les incidences de réformes politiques peuvent ainsi être analysées pour les principaux modèles sociaux européens. Une extension explicite du modèle à d'autres pays requiert un travail d'estimation délicat et pointilleux. Le troisième volet du rapport final (*Etude de pays sur l'Allemagne*) appliquera le modèle d'équilibre général dynamique, qui a été implémenté empiriquement, à d'importantes réformes de marché du travail évaluées de manière quantitative. Nous analysons en

particulier plusieurs domaines politiques essentiels liés aux problèmes structurels discutés en Allemagne. Face à une protection de l'emploi bien plus contraignante que dans d'autres pays de l'OCDE, on est amené à soulever la question de son impact sur les performances, les marchés du travail et le bien-être des ménages privés. Notre premier scénario de simulation examine ainsi les conséquences d'un allègement de la protection de l'emploi et de l'introduction d'autres composants essentiels du système de *flexicurité* danois. La flexicurité repose sur trois piliers. Premièrement, elle vise à promouvoir la flexibilité du marché du travail en accordant aux entreprises une plus grande facilité de licenciement au cas où un rapprochement travailleur/entreprise ne serait plus productif pour libérer la main d'œuvre pour d'autres utilisations plus efficaces. Deuxièmement, elle propose un complément de ressources suffisant pour les personnes sans emploi, spécialement pour ceux disposant d'un revenu faible, afin d'alléger le poids du chômage. Et enfin, elle implique des dépenses majeures en matière de politiques actives du marché du travail pour faciliter la sortie du chômage et accélérer la réinsertion dans la vie active.

Le deuxième scénario présente d'autres stratégies pour *promouvoir l'emploi des travailleurs en âge de forte activité*, y compris des dépenses publiques plus élevées dans le domaine de l'assistance à l'enfance ainsi qu'une réforme des allocations chômage et des subventions de formation pour les entreprises. Un troisième domaine politique met l'accent sur la *croissance basée sur les compétences*. Bien que des efforts aient été menés afin d'améliorer les résultats et l'efficacité de l'éducation tertiaire en Allemagne, il apparaît que le système soit toujours frappé par des faiblesses par rapport aux autres pays au sein de l'UE et l'OCDE. Afin d'examiner la portée de *l'acquisition de compétences*, nous évaluons les incidences de l'introduction d'un impôt sur le revenu moins progressif et de la revalorisation des bourses pour faciliter l'accès au tertiaire. Ensuite, ce rapport aborde *l'employabilité des travailleurs âgés*. Selon les projections de la Commission européenne, l'Allemagne semble fortement exposée au vieillissement. Le relèvement de l'âge de départ à la retraite semble être l'une des mesures politiques les plus urgentes afin de restaurer la solvabilité du système de sécurité sociale dans une société vieillissante. C'est pourquoi nous examinons de manière quantitative diverses alternatives susceptibles à stimuler la motivation des employés à reculer le départ à la retraite. Pour conclure, nous mettons l'accent sur l'impact de *l'imposition des entreprises* sur le marché du travail. L'Allemagne compte parmi les pays avec les taux fiscaux effectifs sur le bénéfice les plus élevés. Par le biais d'une simulation d'une *baisse de l'imposition des entreprises* nous montrerons que la performance du marché du travail n'est pas seulement conditionnée par l'imposition du travail et les politiques de protection sociale, mais aussi par l'imposition des entreprises ; une charge fiscale qui pourrait d'ailleurs être qualifiée d'impôt sur la création d'emplois. Nos résultats suggèrent qu'une baisse de l'imposition des entreprises aurait un impact considérable.

Le quatrième volet de ce rapport final, intitulé *Simulations illustratives*, fournit une analyse succincte de scénarios de réforme pour les autres pays couverts par ce projet. Les scénarios de réforme se réfèrent

partiellement aux recommandations de politique économique de la Commission européenne et l'OCDE. Les deux institutions soutiennent que le *Danemark* devrait davantage encourager la participation des travailleurs âgés au marché du travail. *L'Italie* souffre des faibles résultats de son système éducatif. Si l'éducation primaire est relativement bien placée dans les comparaisons internationales et si les dépenses pour l'éducation secondaire se situent à un niveau assez élevé, le nombre de diplômés est parmi les plus bas dans l'Union européenne. Plusieurs scénarios de réforme établis pour *l'Autriche* ont fait l'objet du deuxième rapport intérimaire et ont été présentés lors du séminaire à Bruxelles. Dans ce rapport final nous nous concentrons sur une baisse du taux d'impôt sur les revenus des entreprises. *La Pologne* dispose d'un système d'indemnités d'invalidité et de préretraite généreux mais peu ciblé. Les effets d'une éligibilité limitée aux prestations d'invalidité sont analysés dans ce rapport. En ce qui concerne *le Royaume-Uni*, les deux institutions recommandent des efforts continus en vue d'augmenter le taux d'emploi. Les succès récents du New Deal pour les jeunes en inspirent une application plus large.

Ces scénarios de réforme du marché du travail se basent sur une liste de scénarios politiques étudiés dans le premier volet du rapport, section 5. Cette liste contient des propositions de scénarios en matière de marché du travail, d'impôts, d'éducation et de formation et de retraite que le modèle devra permettre d'analyser. Des tableaux présentant des résultats de simulation donnent un aperçu du vaste éventail d'indicateurs que le modèle est à même de générer. *L'étude de pays sur l'Allemagne* et les *simulations illustratives* ne constituent pas uniquement un cadre d'analyse des incidences des politiques de réforme dans différents pays, mais fournissent également une vue d'ensemble de la multitude de scénarios politiques que le modèle servira à traiter.

Certains de ces scénarios politiques ont été présentés dans le cadre du séminaire qui s'est tenu à Bruxelles et une deuxième série d'observations était étroitement liée aux scénarios de modélisation implémentés dans le rapport. Les auteurs ont mis tout particulièrement l'accent sur le fait que, comme pour toutes les méthodes d'évaluation, il convenait de tenir compte de la *sensibilité* des résultats de simulation. Une analyse de sensibilité sur la magnitude et le type des chocs politiques ainsi que sur les réactions comportementales au choc constitue un outil précieux, non seulement pour analyser la gamme de résultats potentiels mais aussi pour mettre en évidence quelles variables comportementales sont nécessaires à la détermination des résultats quantitatifs. Les débats sur le scénario de flexicurité ont confirmé que des *extensions spécifiques* pourraient s'avérer utiles pour un examen approfondi de certaines réformes politiques. Il a été suggéré qu'une variante de l'argument d'Acemoglu et Shimer (2000) pourrait faciliter la compréhension d'un train de réformes autour de la flexicurité. C'est notamment la productivité moyenne du travail qui devrait progresser si, grâce à une protection de l'emploi moins contraignante, des couples travailleur/entreprise peu productives pouvaient se séparer pour permettre la réallocation des travailleurs à des activités plus productives ailleurs. En outre, le *budget public* ne devra pas être équilibré individuel-

lement pour chaque période mais seulement à un instant donné. Cela permettra de transférer la charge fiscale de la génération présente à celles futures par le biais de la dette publique ce qui rend la conception de réformes plus flexible. Des simulations de réformes politiques ont révélé que les *complémentarités* entre les différentes politiques dans le modèle sont faibles, ce qui confirme partiellement les résultats de la littérature. Des recherches ultérieures sur la magnitude des complémentarités et une réflexion sur la manière dont ces complémentarités sont prises en compte dans le modèle pourraient s'avérer fructueuses.

Zusammenfassung

Gute wirtschaftspolitische Beratung benötigt eine tiefgreifende Analyse von Reformen. Typischerweise werden drei verschiedene Auswertungsmethoden verwendet. *Mikroökonomische Methoden* beschäftigen sich vorwiegend mit Fragen der Kausalität. Sie setzen allerdings implizit die Abwesenheit von allgemeinen Gleichgewichtseffekten voraus, wodurch sie nur begrenzten Erklärungswert besitzen, sobald eine Reform Auswirkungen auf die gesamte Wirtschaft hat. *Mikrosimulationsmodelle* werden üblicherweise dazu verwendet, die Heterogenität von Haushalten und Firmen abzubilden, sowie eine detaillierte Repräsentation von Steuer-Transfersystemen und anderen Aspekten des öffentlichen Sektors zu liefern. Während Modelle dieser Art sehr detailliert in der Analyse von Verteilungseffekten wirtschaftspolitischer Maßnahmen sind, können sie nur begrenzt zur Analyse von Verhaltenseffekten und Effizienzkosten eingesetzt werden. *Berechenbare allgemeine Gleichgewichtsmodelle (CGE - Computable General Equilibrium Models)* sind ein wertvolles Werkzeug, da sie Verhaltenseffekte in einem allgemeinen Gleichgewicht erfassen und die aggregierten sowie disaggregierten Auswirkungen auf die Wohlfahrt durch politische Reformen analysierbar machen. Dadurch ermöglichen sie eine rigorose Bewertung von Effizienz- und Verteilungsfragen. Weiters illustrieren Modelle dieser Art die Interaktionen zwischen verschiedenen Verhaltensspielräumen. Sie können daher dazu verwendet werden, die direkten Auswirkungen politischer Reformen, wobei das Verhalten der Agenten als fix vorausgesetzt wird, mit den Gesamteffekten auf die Wirtschaft, unter Einbeziehung der durch die Politik induzierten allgemeinen Gleichgewichtsadjustierungen, zu vergleichen. Analog können sie dazu dienen, die direkten fiskalen Kosten von Politikinitiativen mit deren Gesamtkosten zu vergleichen, wobei letztere zutage treten, sobald Angebot und Nachfrage auf das veränderte Vorgehen der Politik reagieren. Sie erweisen sich dabei insofern als nützlich, als sie aufzeigen, wie sich die Auswirkungen politischer Entscheidungen substantiell verändern können in Abhängigkeit von deren Finanzierung. Zusätzlich können CGE - Modelle eine ex-ante Analyse von 'hypothetischen' Politikenszenarien liefern, was mit mikroökonomischen Methoden oft unmöglich zu bewerkstelligen ist. Schließlich können intertemporale Modelle die Zeitpunkte von Kosten und Nutzen politischer Maßnahmen verdeutlichen, indem sie die kontrastierenden kurz- bzw. langfristigen Effekte zeigen, die entstehen können, wenn die Ökonomie in einen neuen gleichgewichtigen Wachstumspfad nach der Reform konvergiert. Verglichen mit Mikrosimulationsmodellen erfasst eine Analyse mittels allgemeiner Gleichgewichtsmodelle typischerweise weniger Details in Verteilungsfragen, da die rigorose Modellierung von Verhaltensreaktionen solche Modelle in der Regel ziemlich komplex werden lässt.

Allgemeine Gleichgewichtsmodelle sind eng mit der modernen ökonomischen Theorie verknüpft und bieten daher eine fundierte theoretische Grundlage für die Bewertung politischer Maßnahmen. Modelle dieser Art erlauben eine wohlfahrtsbasierte Politikbewertung, die oft mit anderen Bewertungsmethoden nicht erreicht werden kann, und gestatten eine kausale Interpretation der numerischen Simulationsergeb-

nisse. Man muss jedoch dabei die potentiellen Sensitivitäten, die mit verschiedenen Bewertungsmethoden verbunden sind, im Auge behalten. Unserer Meinung nach besitzen CGE - Modelle drei Dimensionen der Sensitivität: i) Simulationsergebnisse hängen von der theoretischen Spezifikation des Modells ab. Man muss sich daher fragen, ob das gewählte Modell für die Analyse einer gegebenen politischen Problemstellung passend ist. ii) Die Ergebnisse hängen stark von den gewählten Verhaltensparametern ab. Man muss sich daher fragen, ob die gewählte Parametrisierung die verfügbare empirische Beweislage gut widerspiegelt. In manchen Fällen variieren dabei die ökonometrischen Schätzungen innerhalb der Literatur beträchtlich. iii) Die Resultate können auch von der gewählten Implementierung des Politik Szenarios abhängen. Aus diesem Grund sollte man prüfen, ob das numerische Politik Szenario korrekt spezifiziert ist, um die ökonomischen Schlüsselaspekte von realen Politikinitiativen angemessen zu erfassen. Wir sind der Überzeugung, dass die allgemeine Gleichgewichtsmodellierung ein nützliches Komplement zu anderen Bewertungsmethoden darstellt, wobei man aber die möglichen Grenzen dieser Methode nicht außer Acht lassen darf.

Das Ziel des Projekts *Modellierung von Arbeitsmärkten in der Europäischen Union* war nicht so sehr die Analyse einer spezifischen politischen Reform, sondern eher die Bereitstellung eines vielseitigen Werkzeuges für Arbeitsmarktanalyse im makroökonomischen Kontext. Das Modell sollte sehr detailliert sein, um der Europäischen Kommission die Analyse einer Reihe von verschiedenen politischen Kernthemen zu ermöglichen. Dieser Endbericht des Projekts besteht aus vier Teilen. Der erste Teil, *Modellierung von Arbeitsmärkten in der Europäischen Union - ein Überblick*, bietet ein Kompendium von Modellen, eine Charakterisierung der verschiedenen Arbeitsmärkte in der Europäischen Union, einen Literaturüberblick über die Auswirkungen von Arbeitsmarktpolitik, eine Liste an möglichen Politik Szenarien, sowie eine Kurzbeschreibung des Modells an. Der zweite Teil, *Dokumentation des Modells*, enthält eine detaillierte technische Dokumentation des Arbeitsmarktmodells. Der *Länderbericht für Deutschland* beinhaltet illustrative Simulationen einer Reihe von Problemen der Politik, die eine wichtige Rolle in der deutschen Reformdebatte spielen. Der vierte Teil, *Illustrative Simulationen*, führt eine Kurzanalyse von ausgewählten Politik Szenarien für andere Länder durch.

Das Kompendium von Modellen im ersten Teil des Berichts beschreibt und bewertet eine Reihe von existierenden makroökonomischen und Arbeitsmarktmodellen. Zuerst bieten wir eine Übersicht über allgemeine Gleichgewichtsmodelle, die von der Europäischen Kommission angewendet werden oder zumindest teilweise von der Europäischen Union finanziert wurden. Dieser Überblick kommt zu dem Schluss, dass das in diesem Projekt entwickelte Modell eine ausführliche Modellierung der Charakteristiken des Arbeitsmarktes beinhaltet und daher ein nützliches ergänzendes Werkzeug für die Politikanalyse der Europäischen Kommission sein könnte. Der verbleibende Teil beschreibt Arbeitsmarktmodelle, die von anderen Institutionen zur Simulation von Politikreformen verwendet werden. Die meisten dieser Model-

le nehmen Vereinfachungen vor allem hinsichtlich der Anpassungsdynamik, des Außenhandels und des Firmensektors vor, um die Komplexität zu reduzieren. Auf der anderen Seite treffen Modelle, die sich auf oben genannte Aspekte konzentrieren, tendenziell vereinfachende Annahmen bezüglich einiger Kernproblemstellungen des Arbeitsmarktes. Im Vergleich dazu verfügt dieses ‘Arbeitsmarktmodell’ über viele relevante Charakteristiken des Arbeitsmarktes, die in den meisten der anderen Modelle nicht enthalten sind.

Ein Überblick über die Arbeitsmärkte innerhalb der Europäischen Union liefert ein sehr heterogenes Bild. Man kann dabei große Unterschiede in der Situation dieser Arbeitsmärkte bezüglich Beschäftigung, Partizipation und Beschäftigungslosenraten für die verschiedenen Mitgliedsländer feststellen. Diese Disparitäten spiegeln zum Teil unterschiedliche Arbeitsmarkt- und fiskalische Institutionen der Mitgliedsländer wider. Daher erstellen wir auch einen Überblick über diese Institutionen.

Der Abriss der Forschungsliteratur diskutiert ökonomische Wirkungen von aktiver und passiver Arbeitsmarktpolitik, Kündigungsschutzbestimmungen, Maßnahmen für lebenslanges Lernen, vertraglichen Vereinbarungen und Komplementaritäten zwischen verschiedenen politischen Maßnahmen am Arbeitsmarkt. Der Bericht zieht dabei folgende Schlussfolgerungen: theoretische Argumente zeigen, dass aktive Arbeitsmarktpolitik (active labour market policies, ALMP) sehr komplexe ökonomische Effekte haben kann. Auf der einen Seite können Maßnahmen wie die Unterstützung bei der Arbeitsplatzsuche, Sanktionen oder andere Aktivierungsmaßnahmen die Anreize für die Suche nach Arbeit verstärken und die Wahrscheinlichkeit eines sogenannten *matchings*, beziehungsweise eines erfolgreich besetzten Arbeitsplatzes, erhöhen. Auf der anderen Seite kann ALMP auch den Wert von Arbeitslosigkeit steigern. Als Ergebnis ist der Nettoeffekt oft nicht eindeutig. Simulationen zeigen den positiven Effekt von aktiver Arbeitsmarktpolitik auf die Beschäftigung auf, jedoch sollten dabei spezifische Gruppen dabei ins Auge gefasst werden.

Die Literatur über passive Arbeitsmarktpolitik deutet darauf hin, dass höhere Ersatzraten im Sozialversicherungssystem zwar mehr Versicherung für risikoaverse ArbeiterInnen anbieten, für sich selbst gesehen aber eine Quelle für Arbeitslosigkeit sind. Sie schwächen nicht nur die Anreize zur Arbeitssuche, indem sie Arbeitslosigkeit attraktiver machen, sondern hohe Einkommensersatzraten werden teilweise auch auf die Firmen übertragen und unterminieren Anreize zur Arbeitsplatzschaffung. Empirische Untersuchungen haben überzeugende Belege für diese Effekte gefunden. Daher verknüpfen die meisten Sozialversicherungssysteme ihre Zahlungen an Kriterien der Leistungserfüllung. Die ökonomische Literatur identifiziert positive und negative Effekte von Kündigungsschutzbestimmungen (employment protection legislation - EPL). Indem diese die Kündigungskosten für Firmen erhöht, reduziert er die Anreize hierfür tendenziell. Auf der anderen Seite führen zusätzlich entstehende Kosten dazu, die Anreize für Neueinstellungen zu senken. Die empirischen Befunde zu den ökonomischen Auswirkungen von EPL sind daher

ambivalent, obwohl es etwas mehr Belege für die negativen Effekte von EPL gibt.

Die ökonomische Theorie legt nahe, dass Imperfektionen auf den Arbeits-, Kapital- und Bildungsmärkten auf eine Art und Weise interagieren, die dazu führt, dass ökonomische Agenten (ArbeitgeberInnen oder ArbeitnehmerInnen) zu wenig in Training investieren. Wenn der soziale Ertrag von Bildung höher ist als der persönliche, oder wenn es andere Gründe für zu geringe Investitionen wie etwa finanzielle Restriktionen gibt, so kann eine Intervention von öffentlicher Seite gerechtfertigt werden. Daten über flexible Vertragsbedingungen wie etwa befristete Verträge zeigen uns, dass flexible Beschäftigungsformen stärker auf ökonomische und zyklische Faktoren reagieren als traditionellere Beschäftigungsformen. Es gibt jedoch auch Belege dafür, dass befristete Beschäftigung ein wichtiger Schritt aus der Arbeitslosigkeit in einen regulären Job sein kann. Die Idee des Work Sharings, wurde in der Vergangenheit, forciert durch manche politische Entscheidungsträger und Gewerkschaften, teilweise recht populär, um die Beschäftigung zu erhöhen. Vorhandene Daten deuten darauf hin, dass Work Sharing die Gesamtanzahl der Arbeitsstunden in einer Volkswirtschaft und dadurch auch den Output reduziert, aber die Beschäftigung steigern kann. Es wird oft argumentiert, dass Komplementaritäten zwischen verschiedenen politischen Maßnahmen eine wichtige Rolle für ökonomische Sachverhalte und Ergebnisse spielen. Literatur über Komplementaritäten zwischen verschiedenen Arbeitsmarktmaßnahmen ist jedoch rar. Sowohl in theoretischen als auch empirischen Arbeiten finden die Autoren Komplementaritäten, diese sind jedoch tendenziell gering.

Der zweite Teil des Endberichts liefert eine detaillierte Beschreibung des Arbeitsmarktmodells. Er beginnt mit einer allgemeinen Diskussion des Modells und erklärt die Struktur der Lebenszyklen der Haushalte im Detail. Ein großer Teil der Modellbeschreibung ist dem Haushaltssektor gewidmet. Wir unterscheiden zwischen arbeitenden Haushalten und solchen, die sich bereits in Pension befinden, wobei die Entscheidungsstruktur der Arbeitskräfte aufgrund mehrerer Arbeitsangebotsentscheidungen bei weitem ausgefeilter ist. In der Folge beschreiben wir die Produktionsseite der Wirtschaft und den Matching-Prozess zwischen ArbeitnehmerInnen und Firmen, die Kündigungs- und Trainingsentscheidungen der Firma, den Lohnverhandlungsprozess sowie die Investitionsentscheidungen der Firmen. Danach wird die Struktur des öffentlichen Sektors und das Sozialversicherungssystem mit einem reichhaltigen System an Steuern, Transfers und anderen arbeitsmarktrelevanten Aspekten vorgestellt, und weiters leiten wir ein Wohlfahrtskriterium für die Bewertung von Politikszenarien ab. Der Anhang enthält die Kalibrierung des Modells. Diese wurde mittlerweile auf alle Länder ausgedehnt, die in diesem Projekt behandelt werden.

Alle Länder (Dänemark, Deutschland, Italien, Österreich, Polen und das Vereinigte Königreich) werden als offene Volkswirtschaften mit einem international bestimmten Realzinssatz und endogenem Wachstum der Arbeitsproduktivität als Ergebnis von Training und Bildung modelliert. Investitionen in Spareinlagen, physisches oder Humankapital resultieren aus einer optimalen intertemporalen Entscheidung unter vollkommener Voraussicht. Haushalte bilden Rücklagen, um möglichst glatte Konsumpfade gegenüber

fluktuierenden Einkommensmustern über den Lebenszyklus hinweg sicherzustellen. Insbesondere sparen sie, um die öffentliche Pension aufzustocken und ihr Konsumniveau aufrecht zu erhalten. Wir erlauben dabei intergenerationale Transfers, die eine bedeutende Rolle in der Nachbildung der Konsumprofile spielen.

Das Modell basiert auf dem durch Grafenhofer et al. (2007a) eingeführten *probabilistic ageing approach*, welcher eine Periodenlänge von einem Jahr erlaubt und die Charakteristiken des Lebenszyklus mit einer beschränkten Anzahl an Altersgruppen approximiert, um die Dimensionen des Modells handhabbar zu halten. Das Modell ist eine Verallgemeinerung von Gertler (1999), welcher als Erster die Struktur eines Lebenszyklus in das zu Grunde liegende *perpetual youth model* von Blanchard (1985) integrierte. Heijdra, Keuschnigg und Kohler (2004) führten dynamische Sucharbeitslosigkeit in ein Modell desselben Typs wie jenes von Blanchard ein und leiteten daraus einige analytische Resultate ab. Keuschnigg und Keuschnigg (2004) führten diesen Ansatz mit dem Modell von Gertler zusammen, indem sie zwei Altersgruppen, Arbeitskräfte und Pensionisten, einführten, um Pensionsreformen zu analysieren. Das vorliegende Modell berücksichtigt mehrere Altersgruppen von Beschäftigten und Pensionisten und erlaubt Sterblichkeit in allen Stadien des Lebenszyklus. Weiters beinhaltet das Modell eine detaillierte Repräsentation des öffentlichen Sozialversicherungssystems in Gegenwart der vom Lebenszyklus abhängigen Faktoren Arbeitsangebot, Training, Sucharbeitslosigkeit und Pensionierung.

Der Lebenszyklus wird in Perioden von Bildung, aktiver Arbeit und Pension aufgeteilt. Am Beginn des Lebenszyklus wählen die Agenten ihre Qualifikationsgruppe über eine diskrete Bildungsentscheidung. Um höheres Humankapital zu erlangen, müssen sich Individuen einer Ausbildung unterziehen, was einen späteren Eintritt in den Arbeitsmarkt impliziert. Während ihres aktiven Arbeitslebens wählen die Agenten ihre Arbeitsanstrengung oder Arbeitsstunden bei Beschäftigung (intensives Arbeitsangebot), die für Arbeitssuche aufgewendete Zeit im Fall von Arbeitslosigkeit, beziehungsweise die Partizipationsrate oder das Pensionsantrittsalter (extensives Arbeitsangebot). Weiters investieren sie in die Aufrechterhaltung und Erweiterung ihres Humankapitals durch Training. Der Pensionsantritt beendet den Fluss an Arbeitseinkommen und berechtigt stattdessen zum Bezug eines Pensionseinkommens. Auch wenn Pensionen und Arbeitslosenunterstützungen an das vorherige Einkommen gebunden sind, werden Teile der Beiträge zu einem Umlageverfahren als Steuern aufgefasst, solange sie eine Ertragsrate unterhalb des Marktzinssatzes liefern. Diese impliziten Steuern sind Teil der gesamten steuerlichen Belastung von Arbeit und bestimmen den Zustand des Arbeitsmarktes wesentlich, indem sie einen großen Teil der gesamten Besteuerung bilden.

Ein Arbeitsmarktgleichgewicht spiegelt eine Sucharbeitslosigkeit wider, wobei das Modell hier auf der Arbeit von Mortensen (1986) basiert. Um Arbeitsplätze zu schaffen, geben Firmen eine optimale Anzahl an freien Stellen für verschiedene Alters- und Ausbildungsgruppen vor. Arbeitslose Personen wählen eine

optimale Suchanstrengung zur Erlangung eines neuen Arbeitsplatzes. Stellenangebote und Individuen werden einander durch sogenanntes *job matching* zugeordnet. Wir verwenden ein statisches Suchmodell wie in Boone und Bovenberg (2002), im Gegensatz zu einem dynamischen Modell wie in Pissarides (2000). Das statische Modell ist einfacher und erfasst dabei doch die essentiellen Einsichten des dynamischen Modells. In der Folge entscheidet die Firma, ob sie die ArbeitnehmerIn behält oder feuert. ArbeitgeberInnen und ArbeitnehmerInnen verhandeln über die Löhne, wobei der daraus resultierende Lohn von der Verhandlungsmacht der jeweiligen Partner abhängt. Aufgrund der Struktur des Modells können wir alters- und ausbildungsabhängige Arbeitslosigkeit erklären. Firmen können die Produktivität ihrer MitarbeiterInnen erhöhen, indem sie in unternehmensfinanziertes Training investieren. Gemeinsam mit privatem Training und Ausbildung bestimmt firmenfinanziertes Training die Produktivität von MitarbeiterInnen.

Schließlich inkludieren wir detailliert das Budget des Sozialversicherungssystems und des verbleibenden öffentlichen Sektors. Die Modellierung der Arbeitslosenversicherung und des Pensionssystems beinhaltet eine individuell wahrgenommene Verbindung zwischen Steuern und Transfers. Wir sind daher in der Lage, eine implizite Steuerkomponente von verpflichtenden Beiträgen zu berechnen und die Verzerrungen von Partizipations- und Pensionsantrittsentscheidungen von Arbeitskräften zu erfassen.

Das Modell ist sehr ausführlich und komplex, und eignet sich daher für eine Reihe von Anwendungen. Aufgrund dieser Komplexität sollten eventuelle Anpassungen und Erweiterungen mit Vorsicht unternommen werden. Trotz dieser Tatsache kann eine Betrachtung einiger Ergänzungen für die zukünftige Entwicklung des Modells lohnend sein. TeilnehmerInnen des Seminars in Brüssel zeigten die Nützlichkeit und Stärken des Modells auf und erwähnten einige mögliche Erweiterungen. Wir gehen kurz auf die vielversprechendsten dieser Vorschläge ein. Erstens könnte das Modell, anstatt einer statischen Variante der Standard Mortensen-Pissarides Matching-Theorie, von der Implementierung einer Steady-State-Variante für jede Periode profitieren. Hall (2005) diskutiert hierzu die rasche Konvergenz des Arbeitsmarktes zu einem Gleichgewicht. Zweitens wurde gefragt, wie die optimale Anzahl an Arbeitsstunden im Modell bestimmt werde: bei gegebenen Löhnen entscheiden die Individuen über die optimale Anzahl an gearbeiteten Stunden im Modell. Alternative Annahmen sind hierfür denkbar. Zum Beispiel könnten die Firmen die Anzahl an Arbeitsstunden bestimmen. Arbeitsstunden könnten auch aus einem simultanen *Nash-bargaining* über Löhne *und* Stunden zwischen ArbeitnehmerInnen und Firmen bestimmt werden (effizientes Nash-bargaining). Dieser Sachverhalt wird in Christoffel et al. (2009) abgehandelt. Drittens enthält die gegenwärtige Version des Modells keine Unterscheidung zwischen Kurz- und Langzeitarbeitslosigkeit. Die explizite Berücksichtigung von verschiedenen Stadien der Arbeitslosigkeit könnte bei der Analyse verschiedener Politikszenerarien hilfreich sein, aber man sollte vorsichtig vorgehen, um nicht zu viel Heterogenität unter den Individuen einzuführen, welche schwierig zu handhaben wäre.

Das Modell wurde für sechs Länder entwickelt und kalibriert: Dänemark, Deutschland, Italien, Öster-

reich, Polen und das Vereinigte Königreich. Der Effekt von politischen Reformen kann daher für die wichtigsten alternativen sozialen Modelle in Europa analysiert werden. Eine explizite Erweiterung des Modells auf andere Länder benötigt langwierige Kalibrierungsarbeit. Der dritte Teil des Endberichts, der *Länderbericht für Deutschland*, verwendet das empirisch implementierte dynamische allgemeine Gleichgewichtsmodell, um wichtige Arbeitsmarktreformen quantitativ zu evaluieren. Insbesondere analysieren wir wichtige politische Themen in Bezug auf strukturelle Probleme Deutschlands, die momentan zur Diskussion stehen. In Anbetracht der Wichtigkeit des Kündigungsschutzes im Vergleich zu anderen OECD Ländern, scheint es natürlich, nach dessen Auswirkung auf Output, Arbeitsmarkt und Wohlfahrt von Privathaushalten zu fragen. Aus diesem Grund untersucht unser erstes Simulationsszenario die Konsequenzen einer Reduktion des Kündigungsschutzes und die Einführung anderer wichtiger Elemente des dänischen *Flexicurity* Systems. Flexicurity beruht auf drei Säulen. Erstens zielt es auf die Verbesserung der Arbeitsmarktflexibilität ab, indem es Firmen eine Beendigung des Beschäftigungsverhältnisses erleichtert, sobald ein bestehendes Arbeitsverhältnis nicht mehr ausreichend produktiv ist, und daher die Arbeitskraft für eine effizientere Verwendung an anderer Stelle freigibt. Zweitens bietet es ein hinreichendes Einkommen für arbeitslose Personen, besonders für jene mit niedrigem Einkommen, um die Last der Arbeitslosigkeit zu verringern. Schließlich impliziert es auch substantielle Ausgaben für active labour market policies, um die Arbeitslosen schneller wieder in die Beschäftigung zurückzubringen.

Das zweite Szenario betrachtet alternative Möglichkeiten für eine *Erhöhung der Beschäftigungszahlen von Arbeitskräften*, inklusive höherer Ausgaben für öffentliche Kinderbetreuung, eine Reform der Arbeitslosenunterstützung und Trainingszuschüsse für Firmen. Ein drittes Gebiet politischer Maßnahmen ist *bildungsbasiertes Wachstum*. Obwohl einige Anstrengungen unternommen wurden, um die Abschlusszahlen und die Effizienz des deutschen tertiären Bildungssystems zu verbessern, scheint das System weiterhin unter einigen Schwächen im Vergleich zu anderen Ländern in der EU und der OECD zu leiden. Um die Wirksamkeit von *Qualifikationsakkumulation* zu untersuchen, evaluieren wir die Konsequenzen eines Übergangs zu einem weniger progressiven Steuersystem und einer Erhöhung der Studienbeihilfe (BAföG), was die Immatrikulationszahlen im tertiären Bildungsweg erheblich steigern könnte. Als nächstes diskutiert der Bericht die *Beschäftigungsfähigkeit der Älteren*. Vorhersagen der Europäischen Kommission zeigen, dass Deutschland einer starken Alterung der Bevölkerung ausgesetzt sein wird. Die Steigerung des Pensionsantrittsalters ist wahrscheinlich der dringlichste politische Schritt, um die Zahlungsfähigkeit des Sozialversicherungssystems in einer alternden Gesellschaft zu sichern. Wir untersuchen daher in quantitativer Hinsicht verschiedene Alternativen, um die Anreize für Arbeitskräfte, ihren Pensionsantritt aufzuschieben, zu verstärken. Letztlich lenken wir die Aufmerksamkeit auf die Arbeitsmarkteffekte von *Unternehmensbesteuerung*. Deutschland ist eines der Länder mit dem höchsten effektiven Steuersatz auf Unternehmensgewinne. Durch die Simulation einer *Reduktion der Körperschaftsteuer* zeigen wir, dass die Performance des Arbeitsmarktes nicht nur von den Steuern auf Arbeit, beziehungsweise vom Wohlfahrts-

staat abhängt, sondern auch von der Besteuerung von Unternehmen, welche auch als eine Besteuerung der Schaffung von Arbeitsplätzen gesehen werden kann. Wir stellen fest, dass die Effekte einer Senkung der Körperschaftssteuer beträchtlich sein können.

Der vierte Teil dieses Berichts, *Illustrative Simulationen*, beinhaltet eine kurze Analyse der Reformszenarien für die anderen Länder, die in diesem Projekt behandelt werden. Die Reformen stützen sich teilweise auf wirtschaftspolitische Empfehlungen der Europäischen Kommission und der OECD. Beide Institutionen argumentieren, dass *Dänemark* stärkere Anreize setzen sollte, um die Partizipation älterer Arbeitskräfte am Arbeitsmarkt zu erhöhen. *Italien* leidet unter der schwachen Leistungsfähigkeit seines Bildungssystems. Obwohl Kinder in der Grundschule bei internationalen Vergleichen ziemlich gute Resultate erzielen und die Ausgaben für die Sekundarschulbildung eher hoch sind, ist die Anzahl der Abschlüsse unter den niedrigsten in der Europäischen Union. Einige verschiedene Reformszenarien wurden für *Österreich* im zweiten Zwischenbericht bereits durchgeführt. Wir konzentrieren uns in diesem Endbericht nun auf eine Reduktion der Körperschaftssteuer. *Polen* bietet ein System von großzügigen und nicht ausreichend zielorientierten Invaliditäts- und Frühpensionsbeihilfen. Die Effekte einer Verschärfung der Anspruchsberechtigung für Invaliditätsrenten werden in diesem Bericht analysiert. Für das *Vereinigte Königreich* empfehlen beide Institutionen, die Versuche fortzusetzen, mehr Menschen in die Beschäftigung zu bringen. Der kürzliche Erfolg des ‘New Deal’ für junge Menschen vermittelt, dass dieser auf einer breiteren Basis angewendet werden könnte.

Diese Arbeitsmarktreformszenarien basieren auf einer Liste von Politikszenerarien, die in Abschnitt 5 des ersten Teils dieses Berichts diskutiert werden. Diese Liste enthält Vorschläge für Arbeitsmarkt-, Steuer-, Bildungs- und Trainings-, sowie Pensionsreformszenarien, die auszugswise mithilfe des Modells analysiert werden können. Tabellen mit Simulationsergebnissen bieten einen Überblick über die große Bandbreite von möglichen Indikatoren, die das Modell generieren kann. Der *Länderbericht für Deutschland* und die *Illustrativen Simulationen* sind nicht nur dazu gedacht, die Effekte von Reformmaßnahmen für die verschiedenen Länder zu analysieren. Tatsächlich bieten sie auch einen Überblick über die Vielzahl an Politikszenerarien, die mit dem Modell erfasst werden können.

Manche dieser Szenarien wurden bei dem Seminar in Brüssel präsentiert, und ein zweiter Teil der Hinweise bei dem Seminar war eng verbunden mit den Modellierungsszenarien, die in diesem Bericht implementiert wurden. Die Autoren betonten, dass man besondere Aufmerksamkeit auf die *Sensitivität* der Simulationsergebnisse legen sollte, wie für alle Evaluationsmethoden empfohlen wird. Die Durchführung einer Sensitivitätsanalyse, sowohl betreffend den Umfang und den Typ des Politikshocks, als auch die Sensitivität der Verhaltensreaktionen auf den Schock, ist ein wertvolles Werkzeug, nicht nur um die Bandbreite an möglichen Ergebnissen zu analysieren, sondern auch um hervorzuheben, welche Verhaltensspielräume wichtig für die quantitativen Resultate sind. Die Diskussion des Flexicurity Szenarios

zeigte auch, dass *spezielle Erweiterungen* nützlich für die ausführliche Untersuchung einiger spezieller politischer Reformen sein könnten. TeilnehmerInnen des Seminars deuteten darauf hin, dass eine Variante des Acemoglu und Shimer (2000) Arguments das Verständnis eines Flexicurity-Reformpakets verbessern könnte. Insbesondere könnte die durchschnittliche Arbeitsproduktivität steigen, sobald weniger produktive ArbeitnehmerInnen-Unternehmens Paarungen aufgrund von geringerem Kündigungsschutz getrennt werden, und somit die Reallokation von ArbeitnehmerInnen zu produktiveren Arbeitsplätzen an anderer Stelle ermöglicht wird. Weiter muss das Budget der *öffentlichen Hand* nicht in jeder Periode ausgeglichen werden, sondern nur die intertemporale Budgetbeschränkung erfüllt werden. Man kann daher die Staatsschuld dazu verwenden, die Steuerlast zwischen heutigen und zukünftigen Generationen zu verschieben, was weitere Flexibilität in der Gestaltung der Reformen erlauben würde. Simulationen verschiedener politischer Reformen zeigten auch, dass *Komplementaritäten* zwischen verschiedenen Maßnahmen im Modell gering sind, was teilweise in Übereinstimmung mit der Literatur ist. Zukünftige Untersuchungen der Größe dieser Komplementaritäten und eine Betrachtung darüber, wie man diese Komplementaritäten in das Modell miteinbeziehen kann, könnten sich als nützlich erweisen.

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1 Introduction

The following text contains the first part of the Final Report of the project *Modelling Labour Markets in the European Union*. The aim of this project is to provide DG EMPL of the European Commission with a labour market model to evaluate labour market reforms in different countries of the European Union (EU). This Final Report consists of four parts. The first part contains a compendium of existing models, information on the labour market in the countries of the EU and a literature survey as well as a short outline of the model. The second part, *Documentation of the model*, contains a detailed description of the model. The third part gives a *Country Study for Germany* and the fourth part provides *Illustrative Simulations* for the other countries.

The model helps to analyse different reform scenarios with respect to their impact on the labour market as well as on the firm- and household side of the economies of different countries with varying initial situations. The *European Employment Strategy* (EES) covers a comprehensive bundle of actions to increase the employment rate and productivity in the EU and is one key element of the Social Agenda (2005-2010). The goal of the Social Agenda is to promote more and better jobs and to offer equal opportunities for all. The separate programmes are integrated into the framework programme PROGRESS. Objectives of the EES are the increase of the overall employment rate, of the share of population with at least upper secondary education, of participation in lifelong learning and of the share of long-term unemployed persons participating in training, retraining or work practice programmes. By the year 2010, the overall employment rate in the EU should be increased to 70 percent, that of females to 60 percent, and that of older (55-64 year old) workers to 50 percent. Currently, the achievement of these objectives seems to be unrealistic given the worldwide economic downturn, which is not expected to stabilize before 2010.

This first part of the Final Report is structured as follows. The following section 2 gives an overview about existing macroeconomic and labour market models. Section 3 gives a brief overview of the labour market situation in the EU. The first subsection illustrates participation rates, unemployment rates, and employment rates. Furthermore, the educational structure of the population, the attendance of lifelong learning programmes and labour productivities are discussed. In the second subsection, we focus on institutional details of the labour market, such as taxes and social security contributions on labour income, figures on active and passive labour market policies, employment protection legislation, and minimum wages.

Section 4 provides a literature survey. We mainly focus on articles on active and passive labour market policies and on employment protection legislation. These three components largely determine the degree of flexicurity. Furthermore, we discuss lifelong learning issues, contractual arrangements and

complementarities between labour market policies. The literature survey includes empirical findings and theoretical arguments. Section 5 provides a list of possible policy scenarios that can be addressed in the model. In Section 6, we proceed by giving a short outline of the model. A detailed technical documentation of the model is attached in a separate document. The Appendix includes tables with information on labour markets and institutional details in the EU.

2 Compendium of (Labour Market) Models

This part of the report reviews some of the existing macroeconomic and labour market models. We first provide an overview of general equilibrium models as applied by the European Commission or at least partly financed by the European Union. The other part deals with labour market models that are discussed in the economic literature. One has to be aware of the fact, that this review can only be based on existing, cited model documentations. Thus, if there have been extensions since the time those documentations have been written, they are not included in this summary. Furthermore, published model descriptions are often rather simplified. The main intention of the authors becomes clear, but many details of the models are not included in those descriptions.

The review shows that the model developed in this project includes a substantially richer modelling of labour market features than the models of the European Union and could thus be a useful complementary tool for policy analysis by Commission authorities. On the other hand, most models dealing with the labour market in particular, simplify the model on other issues such as dynamics, foreign trade or the firm sector. Our labour market model intends to have a very detailed representation of labour markets and the household side with a sufficient detail on the firm sector.

2.1 Models of (Financed by) the European Commission

We shortly review three of the models that are part of the MODELS (MOdel Development for the Evaluation of Lisbon Strategies) project co-funded by the European Commission, namely the WORLDSCAN model, the GEM-E3 model and the MIRAGE model. Additionally, we summarize important features of the QUEST III model. The most important distinguishing feature between these models and our labour market model is the different purpose they are used for. All of those models we discuss here have a much simpler labour market structure, whereas they put their focus on other important economic points such as trade, sectoral decomposition, interaction with environment, etc. Therefore, the labour market model that is developed during this project will to a large extent provide additional value-added for the European Commission.

The GEM-E3 (General Equilibrium Model for Energy-Economy-Environment interactions) has been developed as a multinational collaboration project, partly funded by the fifth Framework programme.¹ It is an applied general equilibrium model that provides effects on the macro-economy and its interaction with the energy system and the environment representing several world regions and 15 European countries. The analysis of different energy-related environmental policies such as taxes or regulations, the evaluation of programmes that aim at enabling new and sustainable economic growth and the consideration of market

¹A detailed description of the model can be found in the Model Manual of the E³M-Lab.

interactions across Europe are of interest in that model. Profit maximizing firms produce output using labour, capital, energy and materials as inputs. The households maximize utility by choosing labour supply, the consumption level and the optimal consumption bundle that is comprised of foreign and domestic tradeables and non-tradeables from different industrial sectors. Due to the rather detailed production side and environmental and energy issues, the model includes a rather simple labour market and household sector. In each country, households consist of a representative consumer. In the base model, it is assumed that fully flexible wages clear the labour market and that ensures full employment. However, in another version, wage rigidity can be assumed.

The WorldScan (Lejour et al. (2006)) model was developed in the nineties by the Central Planning Bureau. Over the past years, the model has been used to assess the impact of e.g. EU-accession, R&D, ageing and climate change. It is a multi-region and multi-sector model, regions are connected by bilateral trade flows. Capital is assumed to be fully mobile, whereas labour is assumed to be immobile across regions. In the standard model, households supply low- and high-skilled labour exogenously. Unemployment is also projected exogenously. The model is thus well suited to analyse international or sectoral developments, but to a smaller extent labour market policies, although the model has recently been extended to include endogenous intensive and extensive labour supply.² MIRAGE (Modelling International Relationships in Applied General Equilibrium)³ is also a model that is devoted to international trade policy analysis, whereas the labour market is modelled rather simple.

DG ECFIN (the Directorate General Economic and Financial Affairs) of the European Commission (see e.g. Roeger et al. (2008)) uses the QUEST III model for the simulation of structural reforms in the European Union. Their base-model links two open economies, namely the European Union and the United States. Again, QUEST is more detailed on the production sector and foreign trade, whereas the labour market is kept simpler than in our model. The economy basically consists of households, final and intermediary goods producing firms, a research industry, a monetary, and a fiscal authority. Both final and intermediary goods producers act in a monopolistic competitive environment. Final goods producers use labour of three different skill levels and a composite of foreign and domestic intermediary goods. Producers of intermediary goods rent capital from households and use patents. The model employs the Jones (1995) semi-endogenous growth framework to explicitly model the underlying development of R&D. Households optimally choose consumption, labour supply and various different forms of assets. On the labour market, it is assumed, that households supply differentiated labour services to unions which act as wage setters in a monopolistic competitive environment. Trade unions can therefore charge a mark-up over the reservation wage of the households. From the models employed by the European Communities, the QUEST model is probably the model 'closest' to the current labour market model.

²See Canton (2009).

³For a description see Decreux and Vallin (2007).

Nevertheless, on the one hand, QUEST puts more emphasis on the production sector and foreign trade. On the other hand, the labour market is modelled more explicitly in our model as it differentiates effort, search intensity, participation and retirement decision. In addition, we model human capital formation via discrete educational choice and lifelong learning. We also include a detailed modelling of welfare state institutions including, among other things, a pension system with tax benefit link and retirement (dis-)incentives.

2.2 Labour Market Models

There are many labour market models in the economic literature. Concerning the structure and the focus of these models, they are of course more closely related to our labour market model than the models operated by the European Communities. Compared to the models presented in subsection 2.1, the models discussed in this subsection, cut back significantly on some aspects (e.g. no detailed firm and foreign trade representation). Most of them assume small open or closed economies and do not disaggregate with respect to industrial sectors. It is often assumed that goods market are perfectly competitive. On the other hand, those models particularly emphasize features that are important in determining labour market and educational outcomes.

In our view, a labour market model should include several elements and behavioural margins in order to meaningfully account for labour market and welfare state policies. Many models, especially for the United States, assume perfect labour markets and are not able to account for a change in unemployment rates. This is certainly not a suitable assumption for European welfare states with often high unemployment rates. A labour market model referring to European countries should account for labour market frictions and unemployment.

Labour demand of firms is influenced by job creation and job separation decisions. It is important to include both components because they can be affected differently by labour market policies. Employment protection, for example, is commonly said to decrease labour demand by lowering job creation and to increase labour demand by lowering job separation. Households can react to changes in the labour market along several margins. They can change the number of hours worked if employed, the intensity for job search if unemployed, or they can decide to be inactive by early retirement or non-participation. As for firms, labour market policies can influence these decisions quantitatively and even qualitatively in a different way. Thus, a meaningful and comprehensive labour market model should consider all these elements.

Lifelong learning policies are becoming increasingly important due to the potential benefits and challenges of globalisation, demographic change and technological progress. The human capital stock of an

individual is crucially determined by the educational decision at the beginning of her lifetime and by subsequent training decisions of individuals and firms.

Savings and consumption by households and capital accumulation by firms should result from intertemporal optimisation in a comprehensive labour market model. Furthermore, it is important to model the public sector in sufficient detail so that incentive effects of the institutional system are replicated adequately.

Altig and Carlstrom (1999) study the quantitative impact of marginal tax rates on the distribution of income using a computable general equilibrium model for the United States. They find that the change in steady-state inequality generated by the tax shift from 1984 to 1989 is about half as large as the actual change found in the data. The analysis builds on an Auerbach-Kotlikoff (1987) type overlapping generations model extended to allow for multiple types of life-cycle agents who are distinguished by age, labour productivity and preferences for leaving bequests. Individuals choose consumption, leisure and intergenerational transfers to maximize utility. Output is produced by competitive firms using a constant-returns-to-scale production function that, contrary to our model, does not allow for capital-skill-complementarity. Just as most other models for the United States, they assume that the labour market clears so that there is no unemployment and there is also only one margin along which households can adjust labour supply. Altig et al. (2001) analyse the welfare and macroeconomic effects of five 'fundamental' alternatives to the U.S. federal income tax system. The main difference to the model of Altig and Carlstrom is a much more detailed representation of the fiscal system.

Heckman et al. (1998a and 1998b) analyse the effect of two tax reforms and the reasons for raising wage inequality in a CGE model with endogenous human capital formation. They extend an Auerbach-Kotlikoff model by i) introducing skill formation and considering both schooling choices and investment in on-the-job-training and ii) allowing for heterogeneity in ability, endowments and skills. Compared to our model, the human capital formation part is more advanced. However, they assume competitive labour markets and therefore cannot capture the effects of labour market frictions on the incentives for education and lifelong learning. In addition, they totally abstract from labour supply decisions. In contrast to Altig et al., but in line with our model, they assume that labour inputs of different educational levels are not perfectly substitutable among each other in the production function.

Blundell et al. (2003) do a comparative static analysis of wage subsidies in the United Kingdom. They develop an Auerbach-Kotlikoff type general equilibrium model with endogenous savings, skills and human capital decisions, endogenous labour supply and idiosyncratic shocks on productivity and the cost of education. As in our model, the authors assume a small open economy environment with full capital mobility and perfect competition on the goods market. In contrast to some other models, labour supply is a discrete participation decision. Individuals optimally decide on their labour market state,

which can either be employed, in education or inactive. If inactive, an individual receives payments. The labour market is competitive such that there are no labour market imperfections. In their model, individuals can accumulate skills if they are in education. If they are employed, they acquire skills by the learning-by-doing approach. Therefore working and accumulating skills are non-rivalrous activities.

Oskamp and Snower (2007) study the interactions between employment and training policies, in particular between hiring and training subsidies. The authors find that, for reasonable parameter values, the complementarities between those two policies are small. They build a model that has a particular focus on the labour market, thus keeping other parts of the model simple. For example, there is no capital in the model, the production function is linear in labour input, and the government only pays those two subsidies, collects a pay-roll tax and pays unemployment benefits. The authors include random operation costs for a match, that may also be interpreted as productivity shocks. In contrast to many other models, the authors do not use the search and matching framework of the Mortensen-Pissarides type. Instead, they implement hiring decisions in such a way that the matching technology is not policy-invariant. In their model, they distinguish short- and long-term unemployed. The wages of the three different skill levels are the outcome of a Nash bargain between the median employee of each skill level and the firm.

Ludwig et al. (2007) build an Auerbach-Kotlikoff model to investigate the role of endogenous human capital formation for the economic consequences of demographic change. They find that additional human capital formation can help to mitigate the adverse effects of ageing in their closed economy model. There is perfect competition in the goods market and market clearing on the labour market so that there is no unemployment. Households decide on the optimal level of consumption, labour supply and time investment in the formation of human capital. The costs of human capital formation are opportunity costs of foregone labour income so that earnings and learning are rivalrous. The educational technology used is adopted from Bouzazah et al. (2002). In their model, there are different skill groups, but the authors assume that labour inputs of these different skill levels are perfect substitutes in the production process.

The MIMIC (Micro and Macro model to analyze the Institutional Context) model (Bovenberg et al. (1998) for a detailed model description, Bovenberg et al. (2000), de Mooij (2006) and Jongen et al. (2000)) is an applied general equilibrium (AGE) model developed at the Central Planning Bureau (CPB) in The Hague and has been designed to study structural labour market implications of changes in the tax and social security system. The behavioural equations of firms and households are derived from profit and utility maximisation under constraints. The model distinguishes 40 household types, inter alia with respect to single persons and couples, the presence of children in the household, and the educational level of the primary and the secondary earner. On the labour market, MIMIC combines a union bargaining framework with a skill-specific model for job search and matching. Wages per productivity unit contain

a mark-up over the outside option of workers, determined by bargaining between unions and employers' federation. In the scaled down version of the model that is described in Jongen et al. (2000), there is no capital and the production function is linear in the labour input. However, in their full version, capital is also included in the production function. There are different firms, employing one of the three different skill types and it is assumed that goods produced by the different skill types are imperfect substitutes to each other in the utility function of the household. This is different to our model, where capital and labour input of different skill groups are used in a comprehensive production function (which captures capital-skill complementarity) that produces one good. Demand of foreign and domestic consumers depends on the terms of trade and on the preferences over domestic and foreign production.

We are confident that our model provides additional insights compared to those models. The models of Heckman et al., Blundell et al. and Ludwig et al. focus on the accumulation of human capital. However, they cut back significantly on other aspects. All of them assume market clearing on the labour market. Furthermore, there is only one labour supply margin (which is the participation decision in Blundell et al. and number of hours worked in the other models). Altig et al. (1999 and 2001) also assume competitive labour markets and only one labour supply margin. Oskamp and Snower investigate several different hiring decisions of firms in a model with unemployment. However, there is no endogenous labour supply decision of households, no capital accumulation of firms and, as far as we can see from the documentation, many transition rates between labour market states and skill levels are exogenously given. The MIMIC model seems to be well suited to study the impact of labour market policies. Their micro-data approach allows for a detailed disaggregation of household types. In addition, the model has some features, such as e.g. monopolistic competition on the goods market or a disaggregation into six production sectors. We don't believe that these features are crucial for our labour market model and therefore put more emphasis on labour market issues. As far as we can see, there is only a comparative static, no dynamic version of the MIMIC model. We believe that the transition path of reforms to a new steady state should also be taken into account when analysing reforms. Due to the structure of the model, it does not really allow to cover life-cycle issues such as life-cycle unemployment or life-cycle income profiles. Concerning retirement insurance, our model allows to cover issues that deal with tax-benefit links, retirement incentives, etc. that become more and more important, inter alia with respect to labour market outcomes, due to demographic ageing. It seems like the MIMIC model is not capable of doing this. Thus, though the MIMIC model is a very detailed model, our model can provide plenty of additional insights concerning labour market policies. Summing up, the overview shows that there is no model which is able to capture all desirable aspects of the economy. Each model is designed to answer particular questions. In a nutshell, we believe that our model is very well suited to analyse issues concerning labour market and welfare state policies.

3 Labour Markets in the EU

This part of the report is intended to give a short description of labour markets in the Member States. It is based on data available in 2008. Due to the financial and economic crisis, the labour market situation has already changed and will probably even more do so in the next months. In general, the labour market situation in the different countries of the EU is very heterogeneous. There are countries with high participation and low unemployment rates as well as countries with low participation and high unemployment rates. There are also big differences among the social security systems, with countries with generous replacement rates in the unemployment and pension systems and countries with low rates. Development over time also differs between countries. The EES has to deal with all these differences in the Member States. A strategy that performs well in one country may not have strong positive effects in another Member State.

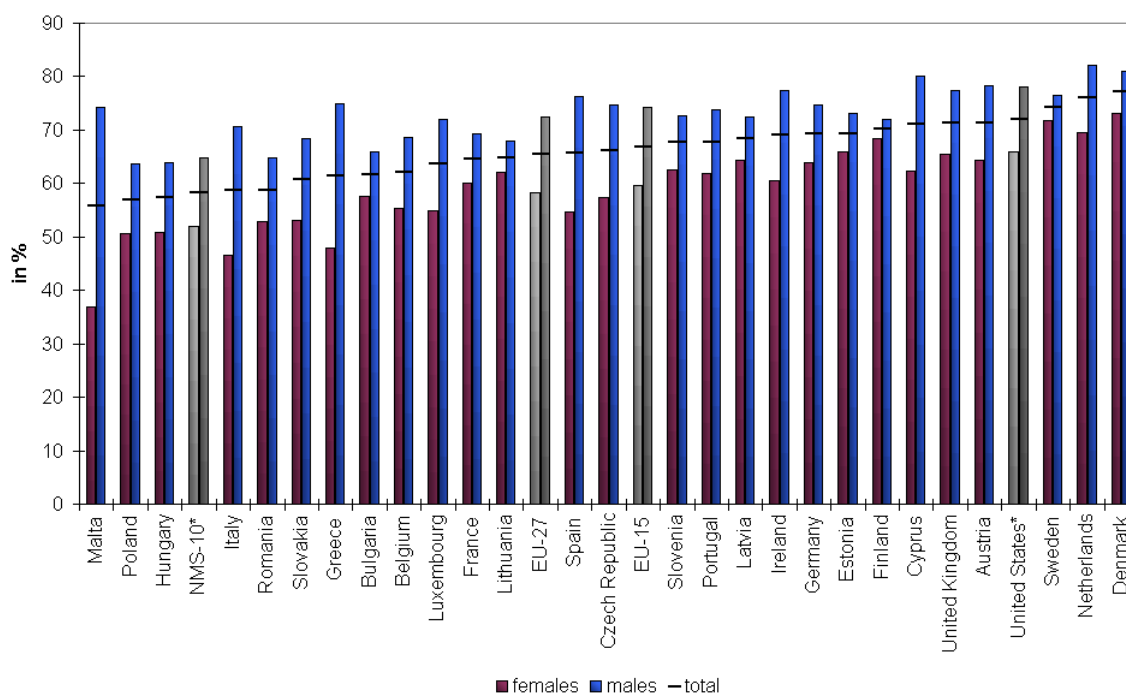
In this section we provide a short overview of important differences in the Member States of the EU. In the first subsection we provide data on labour market outcomes and in the second we give a short overview of institutional details such as replacement rates in the public unemployment system.

3.1 Labour Market Situation in the EU

One important criterion of the EES is the employment rate, and one of the main goals of the EES is an increase in this rate. The employment rate (65.4 percent) is 4.6 percentage points lower than targeted and employment of females (58.3 percent) is 1.7 percentage points lower than targeted. Employment rates for females and males as well as the total rate for persons aged 15 to 64 are presented in Figure 1. Employment of older workers (44.7 percent) is 5.3 percentage points lower than the EES's target. The average numbers of the EU-15 countries in all these categories are higher, but they also do not fulfil the proposed goal. Data for the EU and the Member States can be found in Table 1 and Table 2. In the year 2007 only six EU countries fulfil all three criteria: Cyprus, Denmark, Finland, the Netherlands, Sweden, and the United Kingdom. Two out of three criteria are fulfilled by a seven countries, whereas twelve countries achieve none of these target values. The data for the US show a total employment rate of 71.9 percent in the year 2006. The gap between the employment rates of females and males is similar to the one in the EU with 12 percentage points.

Figure 2 shows changes of the employment rate of the EU-27, EU-15, New Member States-10 (NMS-10) and the United States. One can see that the employment rate in the EU-15 countries increased considerably, from 60 percent in 1995 to almost 67 percent in the year 2007. In the NMS-10 countries, one finds a different picture. Since the year 2000, the employment rate has not changed significantly. It decreased until 2004 and increased afterwards. Nevertheless, employment is much lower in the NMS-10

Figure 1: Employment Rates by Gender (age 15-64) in the European Union and the United States in the Year 2007



*2006 data

Source: Eurostat, structural indicators.

than in the EU-15. In the U.S., the employment rate has not changed significantly. Similarly to the NMS-10, it decreased in the years 2000 to 2003 and remained fairly stable afterwards, but on a higher level than in the European Union. Closing the gap to the United States is one of the main goals.

The breakdown with respect to age also shows enormous differences. In general employment rates of younger and older persons are significantly lower than those of persons in middle age. In the NMS-10 countries, employment of older persons is more than ten percentage points lower than in the EU-15 countries. Eight of the Member States show values below 40 percent. Countries with high employment rates of older workers are Sweden with 70 percent and Denmark and Estonia with around 60 percent.

Analogous to employment rates, the participation rate in the year 2007 also varies significantly across the countries of the EU, from a low of 59.5 percent in Malta to a high of 80.2 percent in Denmark. In the EU-15 countries participation is higher than in the NMS-10. The average across the EU-15 countries is 71.9 percent, whereas the average in the NMS is 65.4 percent. Thus the difference corresponds to 6.5 percentage points. The same picture also holds for the participation rates of the subgroups female and

Figure 2: Dynamic of the Employment rate EU-27, EU-15, NMS-10 and the United States



*2006 data

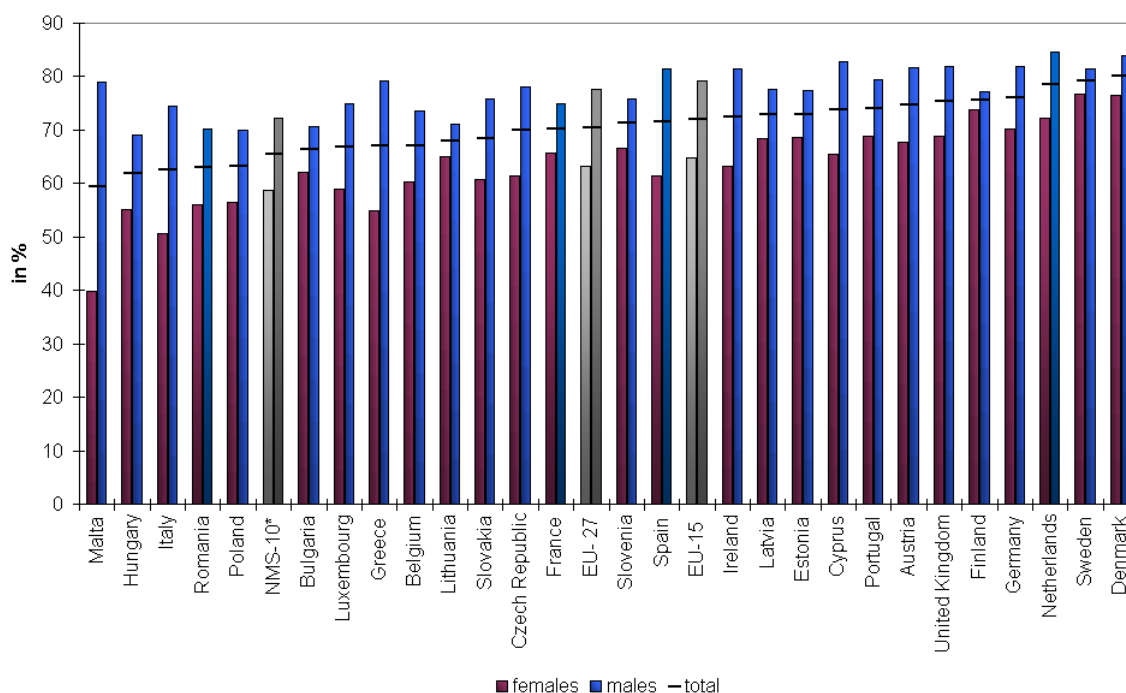
Source: Eurostat, structural indicators.

male.

Figure 3 shows the participation rates of females and males and the average for the different countries. It can be seen that there are countries where the difference of the gender specific participation rate is rather low, and countries where it is incredibly high. Countries with small differentials are the Scandinavian and Baltic countries with less than 5 percentage points. The difference is especially high in Malta with nearly 40 percentage points, but also many other countries in the south of Europe have a very high disparity of more than 20 percentage points. Although participation rates for female are lower in the NMS, the difference between female and male is a little bit less (13.4 percentage points compared to 14.5 points for the EU-15). The numbers for the different countries for 2007 can be found in Table 3 in the Appendix in section 7.

The breakdown of the participation rate with respect to age shows large differences especially for young persons (between 15 and 24 years) and for older workers (between 55 and 64 years). Very high participation rates of young people can be observed in Denmark and the Netherlands and very low rates, below 30 percent, in Lithuania, Hungary, Luxembourg, and Bulgaria. In principle, it is not clear in

Figure 3: Labour Market Participation Rates by Gender (age 15-64) in the European Union in the Year 2007



Source: Eurostat, detailed annual survey results.

advance whether high participation rates of this group are preferable. High participation also means that fewer people are participating in schooling. If a large share of youth are acquiring very high education, participation rates should be low.

The same does not hold for older workers. From the perspective of demographic changes a high participation rate would be preferable. There is a large number of countries with participation rates below 40 percent, including Austria, Belgium, France, Italy and Poland. There are only four countries with participation rates above 60 percent: Sweden (72.8 percent), Denmark (60.8 percent), Estonia (62.2 percent), and Latvia (60.3 percent). All other countries have participation rates of this age group between 40 percent and 60 percent. Increasing these rates is one of the most important tasks, even more pronounced in the NMS.

The dynamic development of participation of workers aged between 15 and 64 in recent years for the EU-15, the EU-27, and the NMS-10 is shown in Figure 4. Whereas the participation rate increased steadily in the EU-15 over the last 12 years, it decreased for the NMS-10. Since the year 2000, despite the higher GDP growth rates in the NMS-10, the difference between the *old* and *new* Member States

increased.

Figure 4: Dynamic of the Participation Rate EU-27, EU-15, and NMS-10



*2006 data

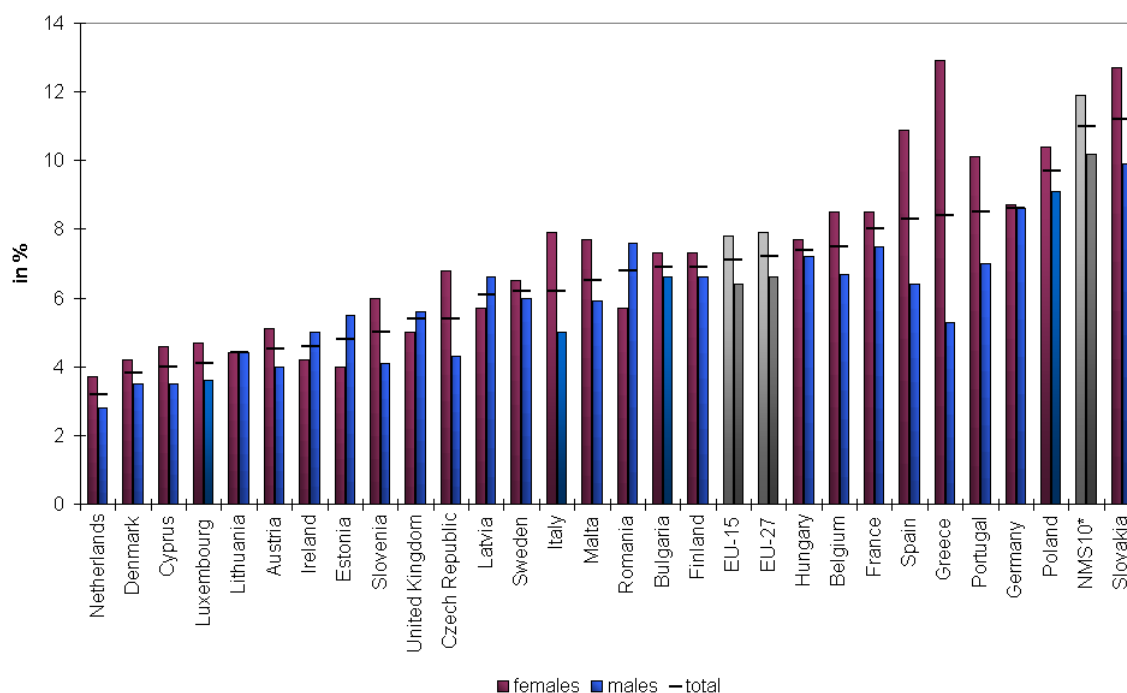
Source: Eurostat, detailed annual survey results.

For the EU-15 this higher activity can be mainly attributed to higher participation of females, with an increase of 4.9 percentage points since the year 2000 and 8 percentage points since 1995. For males the corresponding values are 1.1 and 1.6 percentage points. In the NMS-10 the decline since the year 2000 is more pronounced for females, with -1.6 percentage points, than for males, with -0.8 points. Furthermore the increase in the EU-15 is more pronounced for older workers with an increase of 8.7 percentage points since the year 2000 (10.3 percentage points since 1995). But the activity rates are also significantly higher for the group of 25 to 54 years old cohorts (2.5 percentage points since 2000 and 4.2 points since 1995). For young cohorts the change is rather small. In the NMS-10 there has been an especially strong decrease of participation of young cohorts with 5.6 percentage points since the year 2000. For the other groups the rate is rather stable or even increases (older workers 4.9 percentage points).

Another important criterion which characterizes the labour market is the unemployment rate. Like the employment and participation rate, the unemployment rate also differs significantly among the Member States of the EU. In the year 2007, the unemployment rate for the EU-27 was 7.2 percent, where for the

EU-15 the unemployment rate was 7.1 percent and for the NMS-10 it was 11 percent (2006). Data for the different countries and the development over time can be found in Figure 5, Figure 6, and Table 4. Compared to the year 2000, the unemployment rate in the EU decreased by 2.2 percentage points, where the decrease for the NMS-10 was considerably larger with 2.8 percentage points (2000-2006) compared to the EU-15 with a decline of 1.4 percentage points.

Figure 5: Unemployment Rates by Gender (age 15-64) in the European Union in the Year 2007



*2006 data

Source: Eurostat, detailed annual survey results.

The difference becomes more pronounced if one looks at individual countries. In the year 2007, there were a few countries with unemployment rates below 5 percent: Austria, Cyprus, Denmark, Ireland, Luxembourg, Estonia, Lithuania and the Netherlands. On the other hand there were two countries with unemployment rates of more than 9 percent, Poland and Slovakia. The unemployment rate reacts strongly to the economic situation. For example, in Lithuania the unemployment rate decreased from 17.1 percent in the year 2001 to 4.4 percent in 2007. The unemployment rate is especially important for social reasons. Unemployment leads to a decline in the purchasing power due to lower unemployment income compared to employed persons, to a loss of human capital, and also to discouragement effects of long-term unemployed persons. Furthermore, assuming a fixed participation rate, the public sector

Figure 6: Dynamic of the Unemployment Rate EU-15, EU-27, and NMS-10



*2006 data

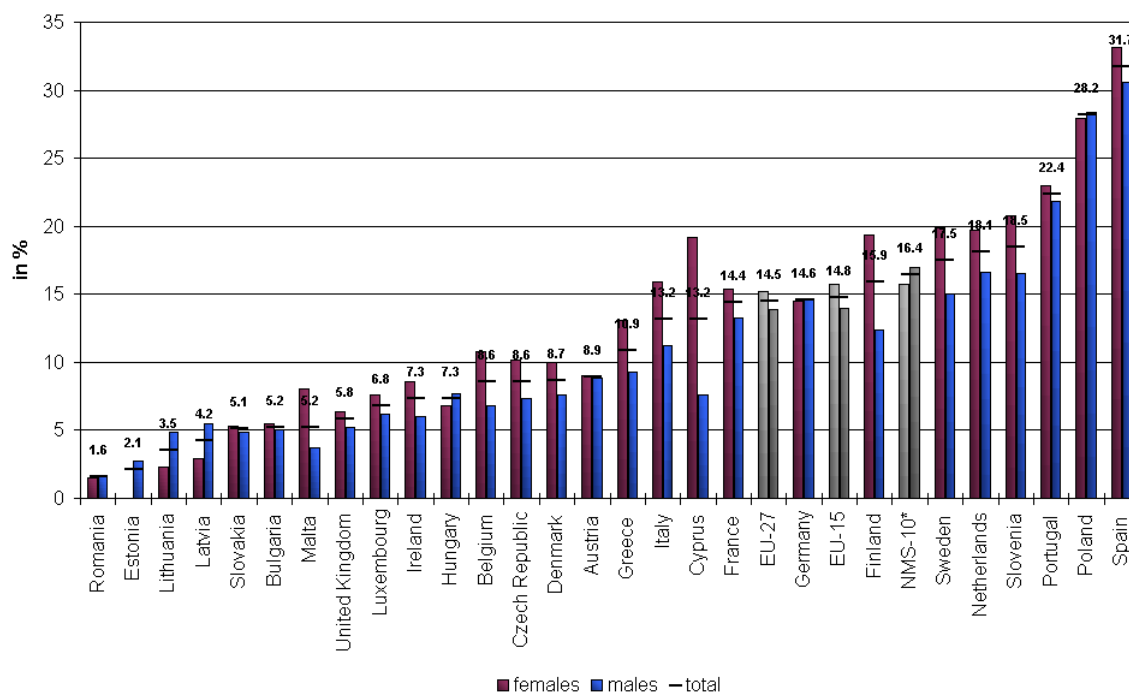
Source: Eurostat, detailed annual survey results.

benefits from a lower unemployment rate because of higher tax and contribution revenues and lower unemployment spendings.

In this context a look at the share of temporary employees as a percentage of the total number of employees is also interesting. Presenting data for 2007, Figure 7 shows that in Estonia, Latvia, Lithuania and Romania the proportion of temporary employees is below 5 percent. But there are also many countries with a high proportion like Poland or Spain with more than 25 percent of temporary employees. However the differences between the EU-15, EU-27 and NMS-10 averages seem to be low (between 14.5 and 16.4 percent). Most of the countries have a higher share of female temporary employees than male, but in some New Member States and Germany the opposite is observable. Furthermore, a trend to an increasing level of temporary employees within the EU can be observed in the last years.

Another important aspect of the labour market is the level of education of the population. Higher education implies higher productivity, higher participation rates and lower unemployment rates. The shares of low- (ISCED 0-2), medium- (ISCED 3-4), and high-skilled persons (ISCED 5-6) of the active population for the EU and the individual Member States can be found in Figure 8 and Table 6. The

Figure 7: Share of Temporary Employees by Gender, 2007



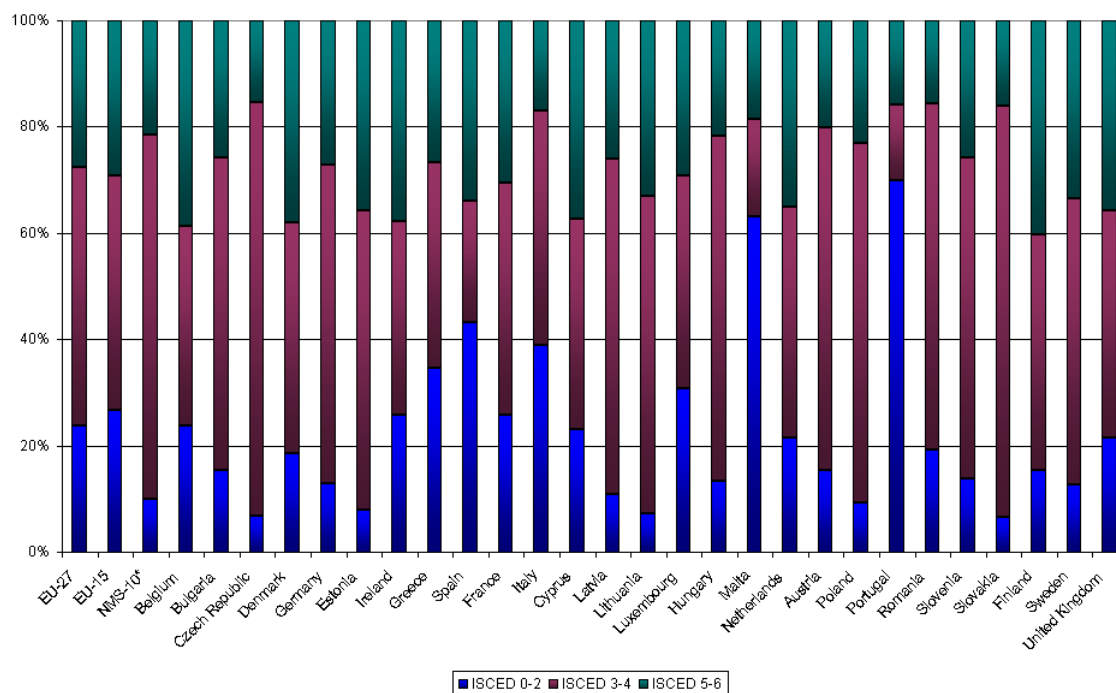
*values for 2006.

Source: Eurostat.

Table shows that nearly half of these persons are medium-skilled and the rest are divided equally between low- and high-skilled. The NMS-10 countries have a much lower share of low-skilled persons, but also a lower share of high-skilled compared to the EU average. For males the share of low-skilled persons is a little bit higher compared to females and the share of high-skilled is lower. The picture of a higher share of high-skilled females in the active population can be observed in nearly every country of the EU, with the exception of the Czech Republic, Germany, the Netherlands, and Austria. Concerning the higher share of low-skilled males, the picture is much more mixed among countries. In nine countries females have a higher share of low-skilled, in the other countries it is the other way round.

Figure 9 gives an overview of the labour productivity per hour worked in the Member States and the US relative to the EU-15 average. As expected the EU-27 level is much lower than the EU-15 level. The New Member States have a lower productivity level in comparison to the EU-15 average. Luxembourg has the highest productivity level within the EU, which is more than 1.7 times higher than the EU-15 average, an exception of the Member States. The labour productivity level in the US is also considerably higher than the EU-15 average.

Figure 8: Share of Low-, Medium-, and High-Skilled Persons of the Active Population in the European Union in the Year 2007(4th Quarter)

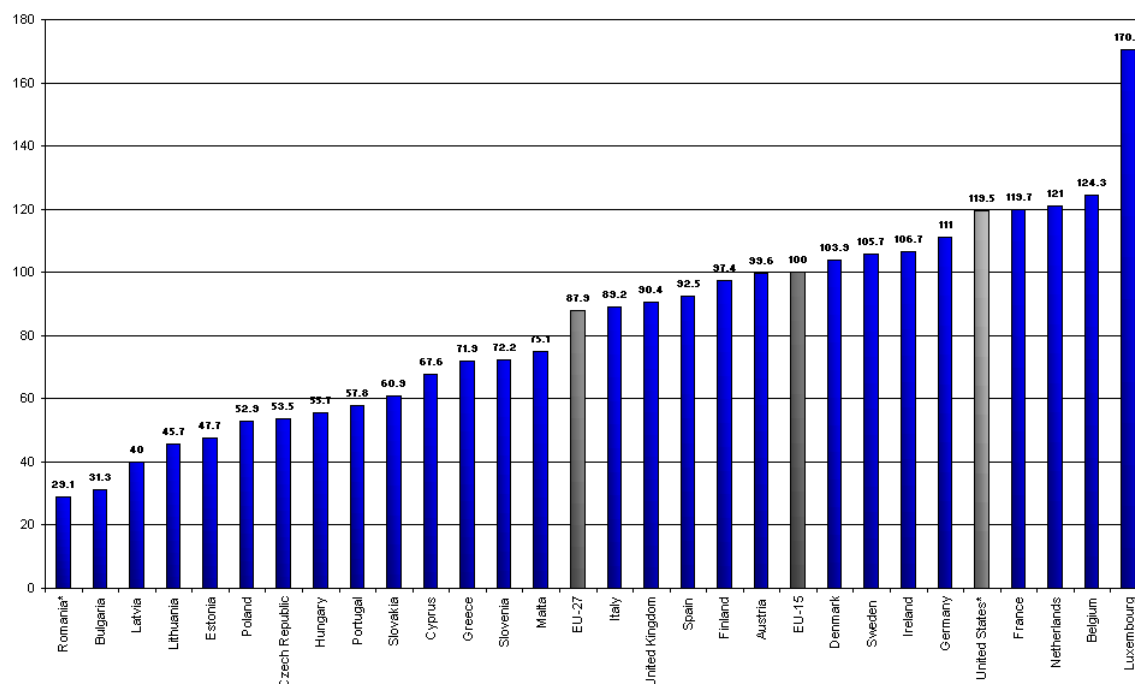


*2006 data

Source: Eurostat, detailed annual survey results.

Lifelong learning is an important determinant of increasing productivity in the EU. Lifelong learning helps not only to maintain the human capital to counteract depreciation of human capital over time but also to extend the existing human capital stock. Human capital is an important aspect of the quality of location. Figure 10 and Table 7 give an overview of participation in lifelong learning activities in the years 2006 and 2007 divided by age and sex. The participation rate in lifelong learning varies significantly, from around 30 percent in Denmark and Sweden to a low of a little bit more than 1 percent in Bulgaria and Romania. The data also show that with the exception of Bulgaria, Germany, Greece, and Malta, participation is higher for females than for males. Furthermore, in line with human capital theory, participation in lifelong learning decreases with age. It is highest for the 25 to 34 old population and declines with age in every country.

Figure 9: Labour Productivity per Hour Worked - in PPS, per Hour Worked, relative to EU-15 (EU-15=100) in 2006



*values for 2005.

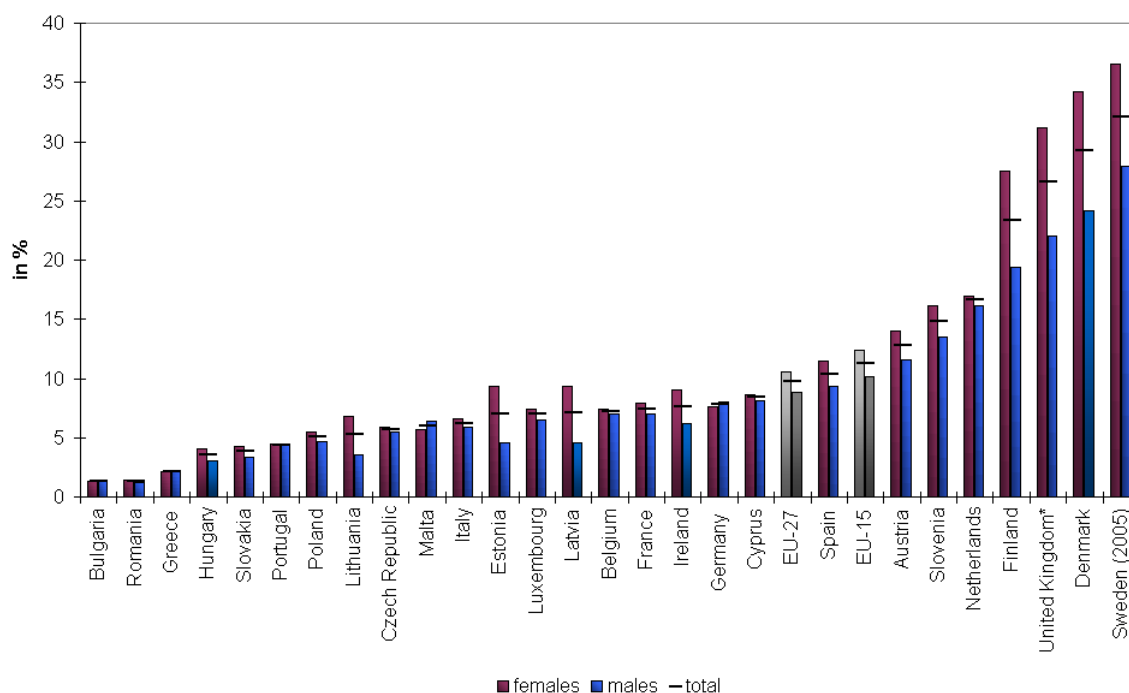
Source: Eurostat.

3.2 Labour Market Institutions in the EU

As described in section 3.1 labour market performance such as participation, unemployment, education, and lifelong learning differs significantly across countries. An important explanation for differences seems to be different labour market institutions. For example, Nickell et al. (2005) investigate how much of changing unemployment patterns can be attributed to changes in the institutions alone. They find that time varying institutions provide a satisfactory explanation of unemployment shifts in the long-run in OECD countries. About 55 percent of the 6.8 percentage point increase in unemployment from 1960 to 1995 is caused by these shifts, much of the remainder being due to lower growth rates. Of that number, 39 percent can be attributed to changes in the benefit system, 26 percent to increased labour taxes, 19 percent to shifts in the union variables, and 16 percent to changes in employment protection legislation.

In dynamic panel estimates, the European Commission (2004) attempts to detect the determinants of the increase in the employment rates in the second half of the 1990s. The authors find that the degree of openness of a country (measured by the flows of goods and services intermediated by foreign

Figure 10: Participation of the Adult Population Aged 25-64 in Lifelong Learning Activities in the year 2007



*2006 data

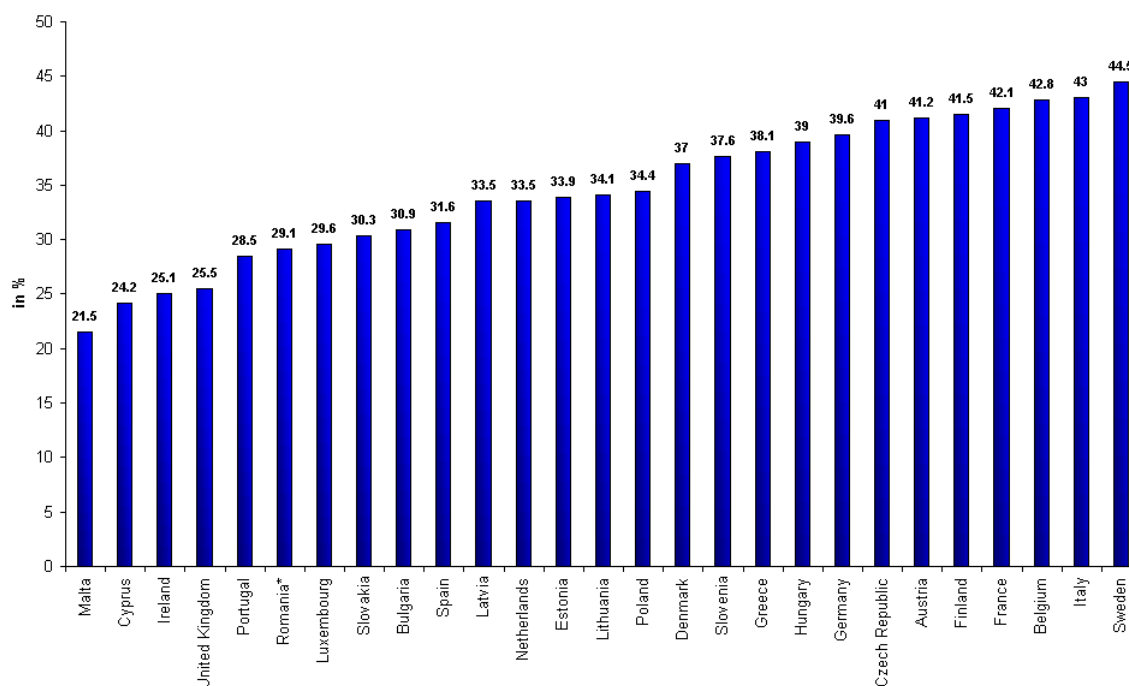
Source: Eurostat, detailed annual survey results.

markets; increase from 88 to 110 percent of GDP from 1997 to 2000) and the increase in the share of part-time employment (increase by 3.5 percentage points in the share of part-time employment) are major determinants of the increase, accounting for 60 and 20-30 percent respectively. Furthermore, the increase in spending on ALMPs seems to be responsible for 10-20 percent of the increase in the employment rate observed between 1997 and 2002. Once the interaction of ALMPs with other institutions is allowed for, all categories of ALMP expenditures have positive effects on the employment rate, whereby public employment services and youth measures have stronger effects than direct job creation or training. The decrease in the EU-15 average tax wedge by around 1 percentage point is said to be responsible for less than 10 percent of the increase. The authors also investigate the effect of the wage bargaining process in a country on the employment rate. They find that in countries where bargaining occurs on the intermediate level, the employment performance tends to be less influenced by changes in the tax wedge and the replacement rate level. Expenditures on ALMPs raise the employment rate only in systems where wage bargaining takes place at the intermediate or centralized level.

Blanchard (2006) also stresses the importance of institutions for labour market outcomes. He argues for a broader application of the flexicurity concept. To his mind it is important to protect workers, not jobs, by providing a generous level of unemployment insurance, but conditional on their willingness to train for and accept jobs whenever there is one available. Furthermore he argues for employment protection in the form of financial costs to firms to make them internalize the social costs of unemployment, rather than other often-used forms such as high administrative costs. Given the apparent high impact of institutions, it is important to take a brief look at them in the different countries.

Taxes on labour vary quite pronounced across the different Member States. Figure 11 gives an overview of the ratio of taxes and social security contributions on employed labour income. Malta has the lowest ratio within the EU with 21.5 percent. There are seven countries (Czech Republic, Austria, Finland, France, Belgium, Italy, and Sweden) with a share of more than 40 percent. The highest value can be found in Sweden (44.5 percent).

Figure 11: Ratio of Taxes and Social Security Contributions on Employed Labour Income in 2006



*values for 2005.

Source: Eurostat, detailed annual survey results.

The structure of public expenditures as a percent of GDP for labour market policy in the year 2006 is described in Table 8. The most important expense items in most of the countries in the EU are the

ones for passive labour market, i.e. out-of-work income maintenance. On average, more than 1.1 percent of GDP is assigned to passive labour market policies (out-of-work income maintenance and support). However, the variance is quite large, from more than 2 percent of GDP in Germany to less than 0.1 percent in Estonia. The Netherlands is especially interesting. They spend around 1.5 percent of GDP for income maintenance but have one of the lowest unemployment rates in the Union. More information may be provided by the replacement rates. Labour market services play an important role in most of the EU-15 countries, but are of much less importance in the New Member States, as well as in Greece, Italy and Spain. Expenditures for training are also much more important for the older Member States than for the new ones. Employment incentives are particularly important in Denmark and Sweden, but play a minor role in many other countries. The integration of disabled persons is also only of special importance in a few countries, such as Denmark, the Netherlands, and Sweden. Expenditures for early retirement measures are especially significant in Austria, Denmark, Finland, and Poland. However, participation of older workers in these countries differs a great deal. Whereas in Poland and Austria the participation rate of this age group is significantly lower than in the whole EU, it is much higher in Denmark and Finland.

Net replacement rates of the public unemployment system offer further information about passive labour market policies, because these data 'correct' for the level of unemployment in the economy. Net replacement rates with and without social assistance for different persons are presented in Table 9. One has to keep in mind that the calculation of replacement rates is difficult, as they usually depend on many individual features such as income level before unemployment. Nevertheless they give information about the general generosity of the system. The net replacement rate can be seen as incentive for unemployed persons to search for a new job. *Ceteris paribus*, the higher the replacement rate the lower the incentive should be. However, often there are additional *gains* of unemployment which are not reflected in this replacement rate, such as the imputation of unemployment payments for the public pension system. Replacement rates vary not only with respect to the country but also with household status. Replacement rates are often much higher if there are children in the household. For example, the replacement rate for a lone parent with two children in Poland is more than twice as high as for a single person. Unemployment payments are also often combined with social assistance payments, which increases the replacement rate considerably, as in the Netherlands, Sweden, and Germany. According to the OECD, the lowest replacement rate is offered by the Italian unemployment system with net replacement rates of 6 percent or 7 percent. The highest replacement rates are provided in Denmark, Finland, France, and Austria with values between 50 percent and more than 80 percent if social assistance is accounted for. These different rates have an important impact on labour market outcomes. However, one has to be cautious, because there may be other social programmes in the countries whose impact is not reflected in these numbers.

From an efficiency point of view the impact of net pension replacement rates on the participation decision of older workers is also important. Higher replacement rates with low deductions in the case of early retirement can lead to a lower average retirement age. Table 10 shows net replacement rates. Gross replacement rates differ from net replacement rates considerably. This is the result of different fiscal treatment of labour and pension income. For the decision of households the net replacement rate is much more important. One has to keep in mind that pension payments are often accompanied by payments or in-kind transfers of other social programmes, especially for low-income retirees. The Table shows replacement rates for persons with different individual earnings categorized by a multiple of average earnings of a worker. The last column shows the replacement rate of a worker with median income. There are countries with replacement rates above 100 percent, especially for low income workers. Interestingly, replacement rates in Greece are above 100 percent for all types of workers considered, which may lead to enormous disincentive effects on the labour market if early retirement is possible. In many countries replacement rates decrease with the level of income. This is especially pronounced in the United Kingdom and Ireland, where the net replacement rates decline from about 65 percent to 24 percent with the income level. This effect is induced by partly providing some kind of basic public pensions.

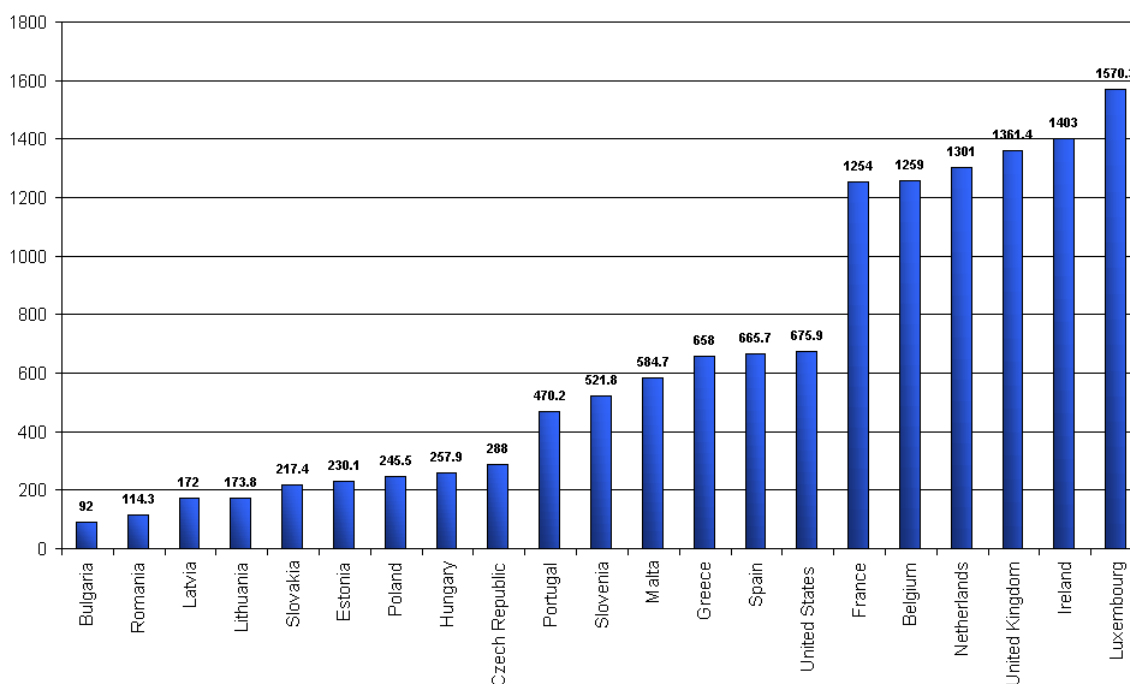
In January 2007, 20 of the 27 Member States of the EU had national legislation that set statutory minimum wages, i.e. minimum wages set by national legislation and applicable to the majority of full-time salaried workers.⁴ Only Denmark, Germany, Italy, Cyprus, Austria, Finland, and Sweden had no statutory minimum wage legislation. Figure 12 illustrates minimum wage levels in these countries. Minimum wages refer to monthly gross wages in euro, i.e. before deduction of taxes and social security contributions. In cases where the minimum wage rate is set to an hourly, daily, or weekly rate, a conversion to a monthly rate has been made.⁵ Concerning the level of minimum wages, countries can be divided into three groups. The lowest levels can be found in some of the New Member States, with a range of between 92 euro in Bulgaria and 288 euro in the Czech Republic. The group of medium minimum wages mainly consists of southern Member States, where monthly gross minimum wage rates lie between 470 euro in Portugal and 666 euro in Spain. In comparison, the US can also be added to this group with a minimum wage level of 676 euro. Countries with rather high minimum wages (from 1,254 euro per month in France to 1,570 euro in Luxembourg) can be found in western Member States. Eurostat (2007b) also presents minimum wage levels in Purchasing Power Standards. They show that the ranking shown in Figure 12 remains virtually unchanged. However, the differences in levels become markedly smaller when accounting for purchasing power in the different countries or if one depicts the minimum wage as a share of the average gross wage in the different countries. In 2005, this share ranges from 33 to 52 percent so

⁴See also Eurostat (2007a).

⁵In countries where the minimum wage is paid more than 12 times a year (e.g. in Spain, Greece and Portugal, where it is paid 14 times), the numbers also take into account these additional payments.

that the difference is much smaller than the difference among absolute minimum wage levels.

Figure 12: Minimum Wages in Certain Member States and the United States, January 2007 (in Euro)



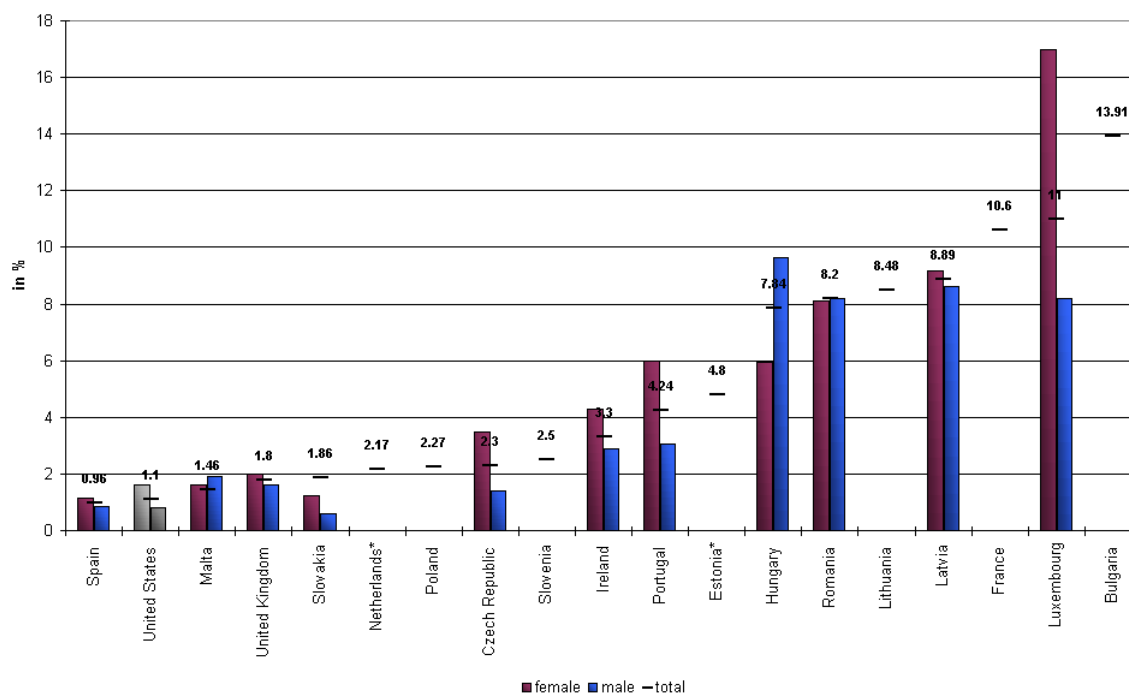
Source: Eurostat.

Apart from the absolute and the relative level, the share of employees receiving the minimum wage determines the impact of minimum wage legislation. Figure 13 illustrates the share of full-time employees earning the minimum wage in certain Member States in 2006. One can clearly see that the shares differ significantly. The total share ranges from 1 percent in Spain to 13.9 percent in Bulgaria. In addition, except in Malta, Hungary and Romania, the percentage of workers receiving the minimum wage is higher for females than for males. In the US a proportion of 1.1 percent of full-time employees earning the minimum wage can be observed.

An often mentioned feature of the European labour market is the high degree of employment protection in the Member States. This may prevent firms from hiring workers. In the scientific community there is no clear agreement on the effect of employment protection on the labour market.⁶ The OECD provides an index of employment protection for the OECD countries. An overview of this index is provided in Table 11. The higher the value of the index, the stricter employment protection is. The overall strictness varies widely among countries. Specific requirements for collective dismissals are not of major impact

⁶For a discussion see Chapter 4.3.

Figure 13: Proportion of Full-Time Employees Earning the Minimum Wage by Gender in certain Member States and the United States, 2006 (in percent)



*values for 2005.

Source: Eurostat.

on the index. Regulation of temporary employment, however, seems to be a key element of country differences. France, Greece, and Spain offer very strict job security, but protection of regular employment is not higher than in many other countries. The index suggests that strict regulation for temporary contracts goes hand in hand with strict regulation of permanent contracts.⁷ From the late 1990s to 2003 there seem to be only minor changes in the overall index. Relatively more important changes can be found in Greece, Italy, and Slovakia. In all three cases the decrease can be attributed nearly exclusively to temporary employment protection. The least regulated countries among those observed are Ireland and the UK. In Denmark the data also provide evidence of the flexicurity policy, with relatively low employment protection and high replacement rates in the unemployment and pension system.

Institutions play a role in the labour market outcome. However, there are interactions between them which may dampen or boost the effect and lead to different outcomes. A general equilibrium model can help to highlight the impact of a certain mix of labour market relevant public institutions.

⁷See OECD(2004), p.71.

4 Literature Survey

Labour market policies are public interventions in the labour market that are targeted at certain groups in the labour market. In contrast, general employment policies, by definition, are not targeted at any particular groups. Thus certain policies, such as measures that lower labour costs through a decrease in income tax rates or social security contribution rates, fall into the category of general employment policies. Labour market policies can be further divided into active and passive labour market policies (ALMP and PLMP). The former aim to raise the probability of employment or to improve income prospects for certain groups that find it difficult to obtain employment. A further aim of ALMP is to increase the quality and productivity of jobs and thus to strengthen social cohesion. The purpose of PLMPs is to provide income support to unemployed people or early retirees and they do not attempt directly to improve the labour market prospects of these groups. It is sometimes mentioned that employment protection legislation (EPL) is a reason why unemployment plays a more dominant role in Europe than in the US (see e.g. OECD (1994)). For this reason the impact of employment protection is also analysed. Section 4.1 includes empirical findings and theoretical arguments of the impact of ALMP, section 4.2 gives an overview of empirical findings of the impact of PLMP, and section 4.3 contains empirical findings and theoretical arguments of the impact of employment protection. Another issue in getting ‘more and better jobs’ is the need for education and lifelong learning in order to build and adapt qualifications throughout a working life, which is a crucial factor to improve the labour market situation and shortly reviewed in section 4.4. Section 4.5 summarizes some discussion about contractual arrangements such as flexible and fixed-term contracts and working time legislation. It is often argued that such measures could help to get more people into employment. The issue of possible interactions and complementarities between different policies is important for their impact on the economy. Empirical and theoretical literature is summarized in section 4.6.

4.1 Active Labour Market Policy

4.1.1 Empirical Findings

There is a vast body of empirical literature which analyses the outcomes of ALMPs.⁸ In general, these studies can be divided in two different types. The first type evaluates the outcome of programme participation on individuals’ employment probability and income (microeconomic evaluation). They estimate the difference between the outcome from participation and the outcome participants would have achieved if they had not participated in the programme (the so-called counterfactual). Most of these studies estimate the impact of participation in the programme on unemployment and employment as the main

⁸This short review of empirical literature is partly based on a work of the European Commission (2006).

outcome variable, whereas the impact on earnings is of less interest. The second type attempts to measure net effects of programmes on aggregate labour market outcomes. These studies also try to estimate deadweight, substitution and displacement effects. However, most recent empirical evidence still comes from microeconomic fields, so these effects are mainly neglected.

According to the European Commission, ‘a favourable micro-econometric evaluation of a programme is a necessary, though not a sufficient condition to demonstrate its value’ (European Commission (2006), p. 134). Calmfors (1994) argues that the following indirect effects should also be considered in a comprehensive analysis: displacement effects (i.e. subsidised activities may displace non-subsidised activities in the economy), deadweight effects (jobs would have been created anyway), creaming (only the most employable persons among the unemployed benefit from the programme), substitution effects (individuals from the target group may displace non-subsidised individuals), and taxation (distortion caused by financing the expenditures). However, Martin and Grubb (2001) argue that displacement and substitution effects might be of less relevance in the long run. Only in the short run might total employment be rigid, so that displacement plays an important role. Over the years, aggregate employment does adjust to changes in labour supply. Therefore, if ALMPs increase effective labour supply, their displacement effects will fade away in the medium and long term.

Martin and Grubb (2001) mention several caveats of (micro-)econometric evaluation that should be taken into account when drawing conclusions from this literature. Some of them are:

- The development of an ‘evaluation culture’ for labour market policies in many European countries is currently lagging behind the United States. However, the situation is rapidly improving here.
- There is almost never a stable set of active programmes to evaluate, which complicates an analysis of programmes.
- There is little evidence of the long-run effects of ALMPs, as most evaluations only provide outcomes for not more than two years after the individual has participated in the programme.
- There is also only little evidence on potential social benefits of ALMPs, such as lower crime or better health.
- Many programmes which have been evaluated recently are small-scale programmes. Thus it is uncertain how effective they would be if they were extended, as general equilibrium effects could kick in more heavily.
- Many evaluations are undertaken by public sector agencies, which gives rise to concerns about the independence of findings.

- Even if these evaluations can give insight into the question ‘What works and for whom?’, they mostly cannot give hints on related questions, such as ‘Why do some programmes work for some groups and not for others?’, or ‘Under what circumstances do these programmes work?’.

Most studies report their evaluation results according to different types of ALMP measures. It has to be pointed out that negative or only small effects of ALMPs might be biased by a negative locking-in effect due to reduced availability or job search efforts by participants. Public training programmes are intended to improve the employability and/or earnings of the target groups. By raising productivity, they should also improve the quality of the match, securing more stable relationships. Several authors, e.g. Cahuc and Zylberberg (2004, chapter 11), stress the argument that both employees and employers tend to underinvest in general training compared to the socially optimal level because of market failures (such as e.g. imperfections of credit markets or frictions in matching). Thus, public intervention is also justified to correct for this incompleteness.

Training policy exerts an influence on the workers’ job search activity and thus on the expected duration of unemployment via three different channels (Andersen and Svarer (2006)). First, the *threat effect* arises when workers reach the date when they have to participate in an activation programme. This effect implies that some workers decide to leave unemployment and thus intensify their job search activity before they have the obligation to attend a programme. As a result, the probability of re-employment is increased for these workers near the date of programme participation. According to Black, Smith, Berger, and Noel (2003) for the US and Rosholm and Svarer (2004) for Denmark, the threat effect is large and significant. Second, as a drawback of activation programmes, there is a so-called *locking-in effect* due to those unemployed workers who would quickly find a new job. These workers lower their job search activity during the time of program participation, which reduces the probability of re-employment for these workers in the activation programmes. Most studies empirically confirm that the locking-in effect is significant. Third, there is a *post-programme effect* that refers to the increased re-employment probability of those workers who completed an activation programme (Andersen and Svarer (2006)).

However, according to Martin and Grubb, different evaluations of public training programmes in various OECD countries suggest low or even negative rates of return for participants in terms of their effect on employment and earnings. Most consistently positive results were found for adult females. It should be mentioned that ‘any overall assessment of the effectiveness of training programmes tends to be negatively biased, because it usually disregards the long run effects’ (European Commission (2006), p. 138).⁹

Direct job creation in the public sector is usually targeted at long-term unemployed or young people

⁹For each of the different programme types listed, Martin and Grubb provide hints on the design of the different programmes in order to enhance their effectiveness.

that face severe problems of integration in the regular market. The majority of evaluation studies of this programme type show that direct job creation has not been very successful in raising post-programme employment probability in the labour market. Calmfors et al. (2002, p. 35) provide evidence that job creation programmes are more efficient the closer they are to a regular employment scheme. However, adjusting job-creation programmes closely to regular employment might cause displacement effects in terms of crowding out people from regular employment. Perhaps caused by these negative evaluation results, there has been a marked trend away from this kind of intervention in many OECD countries.

One of the disappointing conclusions that can be drawn from the evaluation literature is that most of the studies show that special measures targeted at disadvantaged youths are not effective (see e.g. Heckman et al. (1999) for the US and Europe and Larsson (2000) for Sweden). However, some European studies such as Denny et al. (2000) on 'market-oriented programmes' for youths in Ireland and van Reenan (2001) for the U.K. New Deal for Young People report positive outcomes.

Employment subsidies comprise both wage subsidies to private employers and start-up loans to individuals to allow them to become self-employed. The effect of employment subsidies is strongly dependent on the incidence of the subsidy. Under certain circumstances (such as risk neutrality, unemployment benefits perfectly linked to wages and subsidies being proportional to the wage), in a theoretical matching model, the wage bargaining process may yield the result that the employee receives the entire subsidy initially paid to the employer.¹⁰ Several studies in OECD countries have found that employment subsidies have a greater impact than public training programmes or direct job creation. At the same time, most evaluations which focus on firm behaviour show that these subsidies have both large deadweight and substitution effects. Martin and Grubb cite studies for Australia, Belgium, Ireland, and the Netherlands that suggest that the combined deadweight and substitution effects amount to around 90 per cent. This implies that for every 100 jobs subsidised only ten were net gains in employment.¹¹

Kluge and Schmidt (2002) investigate European evaluation studies covering programmes conducted during the time period 1983-1999, mostly during the 1990s. One of their main results emphasizes that training programmes seem likely to improve the labour market prospects of unemployed workers. Direct job creation in the public sector seems to be of little success, whereas subsidies in the private sector show at least some positive effects. Job search assistance programmes, which are in general the least expensive measures, seem to have positive results in Europe and the US.

Kluge (2007) provides a meta-analysis on 137 observations from 95 different programme evaluation studies in 19 countries. For each study considered in this meta-analysis, the outcome of interest is an

¹⁰Under the same conditions, labour income taxes are fully paid by the employee.

¹¹Evidence suggests that the size of net gains may increase to 20-30 percent or more if the subsidy is targeted tightly to particular groups and there is close monitoring of employer behaviour in order to curb abuse. However, the higher the controls, the less willing are firms to participate in such programmes, so that there will be a trade-off.

indicator for whether the programme was found to have positive, no, or negative effects. The independent variables of the estimates are grouped into the categories

- type of programme,
- study design,
- institutional context, and
- economic background in the country at that time.

In their estimates, they compare the outcome of different types of ALMPs with the outcome of training. Training programmes are found to have a modest likelihood of recording a positive impact on post-programme employment rates. Relative to these programmes, private sector incentive programmes and Services and Sanctions¹² have a positive impact. They are 40-50 percent more likely to have a positive impact than training programmes. By way of contrast, direct job creation programmes in the public sector are 30-40 percent less likely to show a positive outcome. Programmes targeted at young workers fare significantly worse (the probability of a positive outcome is 40-60 percent lower) than programmes targeted at adult workers. They further find that, once the type of programme is taken into account, there is little systematic relationship between programme effectiveness and various other factors. These other factors include the time period of implementation of the programme, the macroeconomic environment, and a variety of indicators for institutional features of the labour market. The degree of dismissal protection is the only institutional factor that appears to have an important systematic effect on effectiveness, but even this effect is small relative to the effect of the programme type.

Lechner et al. (2004) argue that the small impact of public sector sponsored training programmes reported in the empirical literature can be explained by the short duration of these programmes (e.g. one month) and the short observation periods. They use German data to evaluate different forms of training programmes and observe the participants over a seven year period. In general, training programmes in Germany in the 1990s have a much longer duration than in other countries. The results for the various programmes differ substantially. Retraining with a typical duration of more than 20 months increases the employment probability in the seventh year after programme start by 10-15 percentage points. Short and long training programmes (5 and 9-12 months duration) increase the probability by 5-9 percentage points. Effects of practice firms programmes appear to be small. Taking into account the locking-in effect the net outcome aggregated over a seven year period gives the following ranking. Shorter programmes show the best performance. The gain after seven years would be eight months of additional employment,

¹²A category comprising all measures aimed at increasing job search efficiency, such as counselling and monitoring, job search assistance, and corresponding sanctions in case of non-compliance.

about half for longer programmes and insignificant for retraining programmes. Additionally, no positive effects could be detected for practice firms.

The second type of evaluation of ALMPs is based on macroeconomic outcomes. Since the second half of the 1990s, there has been an increasing number of macro-econometric evaluation studies that investigate the effect of various independent variables, such as ALMP measures, institutional design, or cyclical conditions, on labour market outcomes. The major advantage of this type is that it can give a comprehensive view of general equilibrium effects of ALMPs. However, there are also some major drawbacks to this method. First, there is still only a small, though rising, number of studies. Second, available studies are based on few observations. Third, due to the design of these studies, heterogeneous labour market programmes often have to be pooled together into more broadly defined categories. Furthermore, issues of multicollinearity and simultaneity bias often arise.

Elmeskov et al. (1998) use annual data over the period from 1983-95 from 19 OECD countries. The independent variable to capture ALMPs is public spending on ALMPs per unemployed person, relative to output per capita. They find a negative, but only marginally significant, impact of ALMP on the unemployment rate. Scarpetta (1996) showed that the presence of Sweden is significant for the estimate results. Excluding Sweden from the pool of countries, as it is an outlier in terms of intensity of spending, leads to a significant increase in the magnitude and statistical significance of the coefficient of ALMP.

Nickell and Layard (1999) use two 6-year averages from 1983-94 from 20 OECD countries. The independent variable of interest is spending on ALMP per unemployed person as a percentage of GDP per labour force participant. They find a negative impact of ALMP spending on the unemployment rate (with a stronger impact than that found by Elmeskov et al.) but no significant impact on the employment rate.

Boone and van Ours (2004) use annual data over the period 1985-99 from 19 OECD countries to investigate the effect of different types of ALMPs. They find that expenditures on labour market training have the largest positive impact on labour market outcomes, whereas expenditures on public employment services appear to be able to reduce the unemployment rate but do not affect the employment rate. Expenditures on employment incentives seem to be ineffective for both improving the unemployment and the employment rates. An illustration based on one of their estimates finds that an increase of training expenditures from 0.2 percent to 0.25 percent of GDP reduces the unemployment rate from a base value of 8 percent to 7.7 percent in the short-run and to 7.6 percent in the long-run. Bassanini and Duval (2006) investigate the impact of policies and institutions on employment and unemployment of 21 OECD countries over the period 1982-2003. In line with Boone and van Ours, labour market training is the only ALMP category with robust impact on unemployment across several estimation methods. They find that an increase of ALMP spending on training programmes per unemployed as a percentage of GDP per

capita by 4 percentage points would reduce unemployment by between 0.2 and 0.6 percentage points.

In a nutshell, the results of micro- and macro-econometric evaluation are somewhat conflicting. Whereas training programmes appear to be rather ineffective in micro-evaluations (Kluve (2007)), they are the only category of ALMP that seems to have a significant positive impact on aggregate labour market outcomes in macro-evaluations. Boone and van Ours (2004) developed a general equilibrium model that is capable of solving this puzzle. They separately model different categories of ALMPs. In their model, for example, training raises the quality and average duration of a job match, thus reducing outflows into unemployment and the unemployment rate. This effect can potentially explain the positive impact of training in macro-evaluations that might not be reflected in micro-evaluations due to the short observation period.

4.1.2 Theoretical Arguments

In the following papers the authors mainly deal with the economic impact of employment and training subsidies. Van der Linden (2005) shows in a model the impact of increased effectiveness of and access to counselling programmes.

Mortensen and Pissarides (2001) derive the effects of wage, employment, and hiring subsidies on job creation, job destruction, employment, and wages using an extended Mortensen-Pissarides matching model. A wage subsidy is modelled as a permanent decrease in a proportional labour tax imposed on the employer, an employment subsidy as a permanent lump-sum payment to the firm and a hiring subsidy as a one-off payment to the firm. Permanent in this sense means that payment occurs in every period as long as the match between employer and employee exists. In their setting each employer-employee match is exposed to a productivity shock, where it is assumed that shocks are correlated by a Markov process with persistence. Renegotiation of wages is possible. A special feature of the persistence of the shock is that it may be preferable for a firm to fire an employee and to hire a new one after a negative shock has arrived, even if the value of the existing match is higher than the firing costs. Firing costs enter into the wage bargaining setting only if a match already existed in the last period (see Mortensen and Pissarides (1999)). They distinguish between low- and high-skilled employees who are assigned different productivities. A crucial assumption for their results is the partial independence of the outside option of an employee of the wage and productivity, which reflects home production output, which is the same for all. In this setting they analyse the economic impact of an employment subsidy, a wage subsidy and a hiring subsidy.

They show that the employment subsidy dominates the wage subsidy because it is cheaper given the same labour market outcome.¹³ In their computational experiments an employment subsidy of 20

¹³It is assumed that the costs of labour market policy are financed by a consumption tax, which does not influence labour

percent for high-skilled workers has only a small effect on output and the unemployment rate of this group; however, wages go up significantly. If this instrument is applied to low-skilled employees, this would result in a strong decrease in the unemployment rate of low-skilled persons (in the 'US' and 'EU' case from 9.0 percent to 6.7 percent and 16.2 percent to 7.6 percent respectively for a subsidy of 20 percent of wages) and an increase in output. In this model a hiring subsidy has a strong negative effect on the economy in most cases. There are two counteracting effects. On the one hand, a hiring subsidy increases vacancies in the firms, leading to higher job creation. On the other hand, more jobs are destroyed because it is cheaper for firms to search for more productive workers. They show that a hiring subsidy leads to a strong increase in unemployment for high-skilled workers for the 'US' and 'EU' scenario, but also for low-skilled workers in the 'US'. Only for low-skilled workers in the 'EU' does unemployment decrease moderately, but nevertheless output would also decrease. The destruction effect is therefore stronger than the effect of increased hiring. They also show that an employment subsidy for low-skilled workers combined with an additional wage tax for high-skilled workers could lead to a considerable decrease in unemployment for low-skilled workers with a moderate increase for high-skilled workers and additional output in the economy. However, this result crucially depends on the assumption that a considerable share of the outside option is homework production and is the same for low- and high-skilled persons.

Brown et al. (2007) obtain a partially converse result. They explore the effectiveness of alternative employment subsidies and compare these policies with respect to the so-called *approximately welfare efficient* (AWE) criteria. A policy is AWE if it improves aggregate employment and welfare, does not increase earnings inequality, and is self-financing. The following policies are analysed:

- wage subsidies targeted at workers with low abilities
- hiring vouchers targeted at long-term unemployed workers
- hiring vouchers targeted at workers with low abilities
- hiring vouchers targeted at long-term unemployed workers with low abilities

The authors find that, of the above mentioned criteria, the self-financing constraint is reached first for all policies. Therefore they decided to see how employment and welfare are affected by the reform under the single constraint of being self-financed.

Their model contains three ability classes and five labour market states: insiders (long-term employed), short-term unemployed, long-term unemployed, primary (previously short-term unemployed) and secondary (previously long-term unemployed) entrants in employment. The transitions among the market states are given by a Markov process derived from microeconomic foundations (Markov model of market outcomes in their model).

the labour market). Individuals changing from unemployment to employment have lower productivity than insiders. After one period of employment their skills appreciate to the same level. Firms face a random cost factor, where distribution is skill-dependent. Given the cost factor the firm decides upon firing. Wages are determined by wage bargaining of the median insider for each skill group. The labour force of each skill group is exogenously given and fixed. To analyse the impact of the different policies the model is calibrated to German data.

The authors argue that wage subsidies for a specific skill group imply a fairly large deadweight effect, i.e. that 13.6 percent of the workforce would receive a wage subsidy, although these persons would be employed anyhow. Wage bargaining also leads to a wage effect, i.e. that part of the subsidy goes to the worker and does not increase hiring incentives. The self-financing capability also depends on the replacement rate effect of workers and the transition effect. The replacement rate effect states that for low-skilled persons, the replacement rate in case of unemployment is higher than for other groups. Assuming the voucher is proportional to the wage, the deadweight costs are therefore smaller for low-skilled persons if they find a job. The transition effect states that the low hiring probability, especially of long-term unemployed persons, is exchanged for higher retention probabilities.

Simulations show that low wage subsidies are not self-financing due to the deadweight and wage effect and are therefore not AWE. Ranking different forms of vouchers leads to the result that hiring subsidies for the long-term unemployed are more effective than hiring vouchers for low-income/skilled workers. The same ranking holds for employment subsidies. Their model results suggest that an additional expenditure of 50 euro per worker could decrease unemployment by nearly 10 percent if hiring vouchers are used for long-term unemployed persons, by 6.6 percent if the money is used for hiring vouchers for persons with low skills and by 0.4 percent if they are used for a low wage subsidy.

Kolm and Tonin (2006) also look at employment subsidies, namely the *Earned Income Tax Credit* (EITC), especially important in the US and the UK. They use a Mortensen and Pissarides type model with wage-bargaining and a matching function, which is extended by search intensity. They also account for a participation decision of workers. Assuming that the in-work benefit is a lump-sum payment to workers if they are employed, their model leads to the following results. An in-work benefit will reduce wages¹⁴ and increase labour market tightness as well as search effort. The equilibrium unemployment rate falls, participation and employment increases. The in-work benefit leads to wage moderation of workers to reduce time in unemployment, which is also reflected in the increase in search intensity of unemployed persons. These two effects make it much more attractive for firms to offer additional vacancies. In their model, employment increases mainly through the impact of job creation and not only through better incentives for workers to search for a job. The authors also conclude that their results are robust to

¹⁴Wage is take-home pay without EITC.

various extensions such as endogenous determination of hours of work and wage indexation of in-work benefits. Additionally, their results also hold if in-work benefits are financed by a proportional income tax on wages, as long as a higher tax rate implies higher fiscal revenues, i.e. there is no Laffer-curve effect of the income tax.

The paper of Van der Linden (2005) focuses on the labour market impact of counselling programmes. To analyse the effect the author uses a model with risk-averse individuals, endogenous job-search effort and participation, and bargained wages by incumbent employees. Workers are heterogeneous with respect to skill and utility when inactive. It is shown that equilibrium effects depend heavily on the type and the range of endogenous behavioural adjustments and the labour market institutions (especially wage formation).

The model deals with publicly-provided short-duration active programmes organized for the unemployed, with the aim of improving matching effectiveness. Each firm uses one and only one type of skill, so there is segmentation in the labour market. Each firm is composed of filled and vacant jobs. Furthermore, a two-tiered unemployment benefit system is introduced with high replacement rates for short-term unemployed and lower unemployment or assistance benefits for long-term unemployed. There are three possible states for unemployed persons, high benefits, low benefits and participation in a counselling programme. The matching function depends on the effectiveness-adjusted number of job seekers and the number of vacancies; search intensity is endogenous. Matches are destroyed with an exogenously given probability. Furthermore, it is assumed that there are two different exogenous matching effectiveness parameters for matching of employees and employers, where it is assumed that the matching parameter for persons participating in counselling programmes is higher than for other unemployed persons. There is also an exogenous probability that a person participating in a counselling programme drops out.

The author shows how a change of the participation rate in counselling programmes, of the drop-out rate and matching effectiveness influences the labour market. The author distinguishes between direct and indirect effects. The direct effects, holding labour market tightness fixed, are positive for an increase in the matching effectiveness and a decrease in the drop-out rate. A higher participation in counselling programmes has positive direct effects only in cases where the matching effectiveness of persons in counselling programmes is sufficiently higher than of unemployed and long-term unemployed persons. Indirect effects are also important. An increase in programme participation and in the matching effectiveness and a decrease in the drop-out rate leads to an increase in wages and therefore to a decrease in labour market tightness. This induces a negative adjustment in equilibrium search, especially for groups not participating in the counselling programme. In sum, the effect on labour market tightness in this model is clearly negative, while the effect on employment is unclear. The numerical analysis in this paper illustrates that the effectiveness of labour market policies changes as more decisions (search or

participation) are endogenized. The impact changes from positive to negative as additional margins are taken into account. The role of search effort seems to be the key decision for the impact, which in turn depends upon parameters of wage bargaining.

Cardullu and van der Linden (2006) extend the model of van der Linden (2005) by the introduction of interaction between low- and high-skilled workers in the production function. In this model total output is a convex combination of the production of low and high-skilled workers. The two main differences to the paper of van der Linden are that the elasticity of substitution between different types of labour is less than infinitely and that the marginal value of labour varies with the number of workers in both sectors. In contrast to the previous paper, an increase in participation in counselling programmes does not only have an ambiguous effect on employment but in general also on labour market tightness. Additionally, they show how the interaction of different kinds of workers in the production function changes the results of Mortensen and Pissarides. Assuming an employment subsidy of 300 euro per month, they find that presuming a fixed marginal value of labour overestimates the level of employment of low-skilled workers by about 5 percent and underestimates it for high-skilled workers by 0.7 percent. The higher the elasticity of substitution between the skill groups, the less the difference becomes.

Albrecht et al. (2005) analyse the impact of a Swedish adult training programme, called *Adult Education Initiative* or *Knowledge Lift*. In the first part of the paper they estimate the impact of this programme on income and employment using micro-data. They do not find any effect on average income and find an employment effect only for young males. For females there is no significant effect at all. This is in contrast to other studies which state that if there is an effect, then it is larger for females. Arguments for this result are that the sample size may be too small, the concentration on the post-programme year is too close, and there may be a gain in work experience in the control group, which does not arise in the treatment group.

In the second part of the paper they use an equilibrium labour market model to analyse theoretically the impact of the *Knowledge Lift*. They assume that the exogenously given skill distribution changes by participating this programme. Jobs are described by their minimum skill requirement y and each member of a skill group produces either an output y or nothing if the skill requirement is not sufficient. Unemployed persons and vacancies are matched by a matching function, and the firm has to pay a fixed cost and the wage to the employee, depending on the skill type. The separation rate is exogenously given. Furthermore, medium-skilled persons can be matched with medium- and low-skilled jobs, whereas low-skilled workers can only be matched with low-skilled vacancies. The impact of the *Knowledge Lift* is an increase in the share of medium-skilled workers. Simulating this educational programme leads to the following result in their model. In equilibrium, the increase in the medium-skilled share leads to a strong increase in wages for treated workers and to a moderate decrease in non-treated workers.

Employment probability increases significantly for treated groups and decreases for persons who continue to be low-skilled. Their model can explain the empirically observed increase of employment in young males; however it is not able to reproduce the other empirical results.

Boone and van Ours (2004) jointly analyse the effect of training, subsidized employment, and public employment services in a model. Training is modelled as a subsidy to training costs of unemployed workers, employment services as a subsidy to search costs, and subsidized employment as a subsidy for the value of the match of low productive jobs. A central aspect in their model is the quality of a job. An unemployed person has to decide upon the search and the training intensity. Both intensities provide disutility for the worker, but with different intensity. They assume two different categories of workers, low- and high-skilled. The rate of separation is given exogenously and is higher for low-skilled employees. There is an exogenous probability that someone working in a low productivity job ends up in a high productivity job by learning by doing. Furthermore, the authors assume that there are fixed costs of being in an active labour market programme (stigma or disutility of being monitored). The subsidies decrease disutility of search or training effort. The participation rate depends on the situation of the labour market and the distribution of outside opportunities defined by a distribution function. The firm posts vacancies, and if there is a matching it obtains low- or high-skilled workers with a given probability. The job subsidy in the context of ALMP is modelled as a lump-sum payment to low-productivity jobs. Wages are determined by Nash-bargaining.

In their model an increase of the subsidy to search decreases search costs and induces further search effort, but it also raises the value of being unemployed, which decreases search intensity (locking-in effect). The latter effect reduces the incentive to escape unemployment through search or training. The results regarding search intensity are therefore ambiguous. The same holds for a training subsidy. The decrease in the costs leads directly to an increase in the incentive for additional training and also search by the higher probability of finding a high-skilled job. However, also in this case the value of unemployment increases, which in turn reduces the incentive to find a job. An increase in the job subsidy stimulates search but reduces training intensity by the implied decrease in the wage differential between low- and high-skilled jobs. This decreases the probability of finding a high-wage job and therefore reduces search. For all three forms of ALMP the effect on the job finding rate is theoretically ambiguous in their model. In the next step the authors fix the job finding rate and show the impact on training effort, which then determines the unemployment rate. An increase in the search subsidy increases the value of being unemployed, which leads to an incentive to lower the training effort, because a job with a higher separation rate is less a problem. Public employment services would therefore increase unemployment. An increase in the stigma effect works in the other direction. The job subsidy would also decrease training effort, which also leads to a higher unemployment rate. The training subsidy would directly increase training effort, but also

increases the value of being unemployed, leading to a decline of training effort. The authors show that training effort is unambiguously increased and unemployment goes down if the future is discounted.

4.2 Passive Labour Market Policy

Together with a description of employment protection legislation and ALMP, an evaluation of unemployment benefit systems is important to determine the effects of flexicurity in a country. Basically, more generosity in unemployment insurance (such as higher unemployment benefits or a longer benefit duration) has several economic impacts. First, it increases the value of being unemployed and thus reduces an unemployed person's search effort. Thus it decreases the exit rate from unemployment into employment (*disincentive effect*). Second, it makes it more attractive to increase search effort and to accept jobs for those unemployed workers currently non-eligible for unemployment benefits or near benefit-exhaustion in order to become qualified for benefits in the future (Hamermesh (1980), *entitlement effect*). Furthermore, it also increases the reservation wage of employees, thereby putting upward pressure on wage claims and reducing labour demand.

Empirical evidence for unemployment benefits can be derived from cross-country panel regression models. With only a few exceptions, these regressions show that generous unemployment benefits tend to raise the equilibrium unemployment rate. The base-case estimates of Bassanini and Duval (2006) imply that a 10 percentage point reduction in the gross replacement rate would reduce the equilibrium unemployment rate by 1.2 percentage points on average in the OECD countries. Further evidence is available, for instance, in Nickell and Layard (1999), Scarpetta (1996) and Elmeskov et al. (1998). Nickell et al. (2005) state that on average a 1.11 percentage point rise in the equilibrium unemployment rate exists for every 10 percentage point rise in the benefit replacement ratio.

Layard, Nickell and Jackman (1991) review several empirical studies. They conclude that the elasticity of unemployment duration with respect to the level of unemployment benefits depends on the specific design of the labour market, but generally lies between 0.2 and 0.9. In a survey of econometric studies using micro-data, Krueger and Meyer (2002) argue that the elasticity of unemployment duration with respect to the benefit generosity is around 1, above the value of 0.2 to 0.9 from Layard et al. A number of micro-studies for Europe (see Grubb (2005), Holmlund (1998)) have similar results.

Boone and van Ours (2000) design a search model in order to analyse the effects of a benefit reduction on the unemployment rate. They calibrate it with a replacement rate of 0.7, a matching elasticity of 0.5 and an unemployment rate of 8.7 percent. They conclude that lowering the replacement rate by 10 percent increases the search effort and thus decreases the unemployment rate to 7.3 percent. These numbers imply higher unemployment elasticity of around 1.6.

However, the evidence on the effect of unemployment benefits on employment is less robust. Nickell and Layard (1999) find little impact on the employment rate. They argue that high benefits may lead to higher unemployment and higher participation, as a more generous unemployment system makes labour participation more attractive. This is somewhat contradicted by Bassanini and Duval. As already stated, their base-case estimate implies that a 10 percentage point decrease in the replacement rate results in a 1.2 percentage point decrease in the unemployment rate. The effect on the employment rate is even more pronounced (increasing by 1.7 percentage points for prime-age males and 3.2 percentage points for prime-age females).

There is also evidence that a longer benefit duration is associated with longer spells and, *ceteris paribus*, a higher rate of unemployment. Concerning the effect of maximum benefit duration on the duration of unemployment, Meyer (1990) and Katz and Meyer (1990) suggest a duration elasticity of about 0.5. In a different approach, Meyer (1992) estimates that the duration elasticity is smaller and lies between 0.24 and 0.42. Card and Levine (2000) carry out a quasi-experiment and find an effect of 0.08 weeks per additional week of maximum benefit duration, which implies an elasticity of 0.1. By analysing the Regional Extended Benefits Program (REBP) in Austria, Lalive and Zweimüller (2004) find that an additional week of spell duration increases the duration of unemployment by 0.055-0.189 weeks. Exit rates from unemployment to employment increase as workers approach the date of benefit exhaustion, see e.g. Winter-Ebmer (1999) or Lalive and Zweimüller (2005). Card et al. (2007) analyse the ‘spike’ in unemployment exit rates around benefit exhaustion. This spike in exit rates has become a leading example of distortionary effects of unemployment insurance and social insurance programs (see e.g., Feldstein 2005). However, using Austrian data, they conclude that a large fraction of the exit rate of unemployment at the expiration of benefits simply leave the unemployment registry. Once the period of eligibility for benefits is exhausted, the incentive to register as unemployed declines significantly.

On the other hand, unemployment benefits may allow unemployed persons to find a more productive match, thereby enhancing job stability. In a well-known paper, Acemoglu and Shimer (2000) show that economies with moderate unemployment benefits can have higher output and welfare than those without unemployment insurance. Unemployment insurance allows people to look for more productive, but riskier jobs.

Most unemployment insurance systems in OECD countries condition benefit payments on some performance criteria, such as e.g. *active job search*, often monitored by public employment services (PES). Fredriksson and Holmlund (2001) and Boone et al. (2001) provide theoretical support for this. Using models where job search behaviour is not perfectly observable, they show that a monitoring and sanctioning system designed to encourage search effort yields an overall welfare improvement set against the costs of doing so. Boone, Sadrieh, and van Ours (2004) conduct a quasi-experiment to investigate the

behavioural response of unemployed to sanctions. They find that sanctions induce higher effort. Lalive, van Ours, and Zweimüller (2002) investigate two types of sanctions ('warning' and reduction of benefits), using data from Switzerland. They find that these sanctions increase search effort of those sanctioned (due to loss of benefits), but also (because of monitoring) of those who are not sanctioned.

Blanchard and Wolfers (2000) argue that cross-country explanations of unemployment rates based on institutions run into major empirical problems. Many of those institutions were already present in times when unemployment was low. Thus, they argue, while labour market institutions might potentially be able to explain cross country differences today, they are not able to explain the general rise in unemployment over time. Ljungqvist and Sargent (1998) provide the following explanation. In 'Europe', benefits are high with a long duration of eligibility, whereas the 'US' has modest levels and a fixed duration. If there are only low turbulences, there are smaller skill losses among unemployed and the difference in the unemployment rates between 'Europe' and the 'US' is minimal, because the probability of an unemployed 'European' finding a job with wages above the benefit level are high. However, if turbulence is higher, skill losses among the unemployed are higher. As a consequence, the high benefits in 'Europe' bite and unemployment is higher than in the 'US'. Therefore these two systems react very differently.

4.3 Employment Protection Legislation

The aim of employment protection legislation is to ameliorate working conditions and welfare of workers. The literature identifies positive and negative influences of employment protection on the economy. From an economic point of view EPL generates additional dismissal costs for firms. This reduces the incentive to dismiss workers in times of a downturn and increases job stability. On the other hand it leads to disincentives to hire workers in upturns.¹⁵ This should lead to lower outflows of employment but also to lower outflows from unemployment. For this reason employment is higher in troughs and lower in peaks. The effect on average employment is therefore ambiguous. Furthermore, higher job stability increases the incentive of workers to invest in human capital in the form of firm-specific skills. A further argument is that firing costs can reduce the moral hazard problem in the public unemployment system, to prevent too-ready lay-offs. One way to deal with this issue is the introduction of experience rating in the public unemployment system.

Over the past 15 years there has been a convergence of EPL in OECD-countries. This occurred in many cases by expanding the possibility to engage in temporary contracts. An impressive example for the substitution of permanent contracts with temporary contracts is Spain. In 1984, there was an extensive liberalisation of temporary contracts, which led to a dramatic increase in the share of this

¹⁵See also OECD (2004), p. 63.

type of contract. From 1984 to 1991, the share of fixed-term, or temporary, contracts increased from 11 percent to 30 percent.¹⁶ Both firing rates and the flow from unemployment to employment increased significantly.

4.3.1 Empirical Findings

It is often argued that EPL is a reason why unemployment plays a more dominant role in Europe than in the US (see e.g. OECD (1994)). Lay-off costs make it more costly for firms to lay off workers. For this reason hiring declines. The empirical evidence with respect to the impact of employment protection on unemployment is somewhat mixed. However, EPL may also influence the participation rate among the population, which in turn influences the unemployment rate.

Lazear (1990) investigated the effect of severance payments on employment, unemployment and participation rates and the average number of hours worked. He used data on 22 developed countries covering 29 years. Severance payments were defined as the number of months of salary given to workers upon dismissal after ten years of service. This variable must be seen as a proxy for the severance payments system. He found a negative impact of severance rules on employment and participation rates as well as on the number of hours worked and a positive correlation with the unemployment rate. He concluded that for the US a three-month increase in severance pay would increase the unemployment rate by 0.3 percentage points.

Scarpetta (1996) and Elmeskov et al. (1998) also found a positive impact of employment protection on the unemployment rate. Scarpetta used an average of the two OECD rankings discussed in section 3.2 for regular and fixed term contracts as an approximation for EPL. EPL seems to have a stronger impact on youth and long-term unemployment than on overall unemployment. Elmeskov et al. pooled data of 19 countries over the period 1983-95 and used the structural unemployment rate as the dependent variable. As a measure for EPL they used the same indices as Scarpetta. They find that EPL has a stronger effect in countries with an intermediary level of centralization of wage-bargaining.

Belot and van Ours (2004) built their own index for employment protection which measures strictness with respect to open-ended contracts, fixed-term contracts and temporary work agencies. They estimated the impact on unemployment rates as well as on non-employment rates. They found a stronger positive effect on unemployment than on non-employment. Given that their index ranges between 0 and 1, their estimate implies that differences in unemployment rates caused by EPL could be at most 4 percentage points. They also tested for the interaction of EPL and the degree of centralization of wage bargaining. In this specification the direct effect of EPL is no longer significant, and the interaction term only in

¹⁶See Alvarez and Veracierto (2006), p. 2.

the case of fully decentralized bargaining. Their estimate also shows that non-employment is negatively influenced by EPL; however, the coefficient is insignificant. They argue that non-employment rates have a larger voluntary component which is less sensitive to institutions.

The paper of Nickell (1998) gives a somewhat different picture. He found a strong impact of the replacement rate, the benefit duration and the union density upon the logarithm of the unemployment rate, but no significant impact of employment protection. EPL seems to decrease unemployment in the short term but increase it in the long term.

Belot et al. (2007) assume a non-linear relationship between GDP growth per capita and EPL, and obtain a positive linear term and a negative quadratic term in their estimate, indicating an inverse U-shaped relationship and an optimum level of protection. They estimate that the optimal level of EPL for open-ended contracts would correspond to the levels of the UK, Italy, and Ireland at the end of the 1990s, while the overall protection should be higher and correspond to the level of Sweden, Italy, and Germany.

A standard definition of job flow measures is from Davis and Haltiwanger (1992). Job creation is the sum of employment gains over all *growing* firms, job destruction is the sum of all employment losses in *contracting* firms and job reallocation is the sum of these two variables. Gomez-Salvador et al. (2004) find an elasticity of job creation, job destruction and job reallocation w.r.t. to EPL of -0.2, -0.1 and -0.3. Wolfers (2005) argues that EPL plays a major role for seasonal adjustment and gets an elasticity of job reallocation w.r.t. EPL of -0.45. Ljungqvist (2002) shows that the overall effect on employment is more likely to be negative when firing costs push up wages and investigates this case in several different models.

Deelen et al. (2006) give a good literature survey on EPL. They distinguish simulation studies and empirical studies. In their 'meta study' of simulation studies, they find an elasticity of unemployment w.r.t. to the EPL indicator of 0.04 and an elasticity of employment of -0.01. In these different studies, the impact of EPL is ambiguous, as is in line with the theory. The few studies that investigate severance payments, suggest that they give more favourable results of EPL on employment than firing costs as workers might be more willing to compensate the firms by means of a wage cut. When looking at empirical studies, they point out drawbacks of cross-country studies. They give an average elasticity of unemployment w.r.t. the OECD EPL indicator of 0.13 and of employment of -0.06. Furthermore, studies that find a disadvantageous impact of EPL on unemployment and employment are more numerous than studies that find the opposite.

4.3.2 Theoretical Arguments

The results of theoretical models with respect to lay-off costs are very diverse. Bentolila and Bertola (1990) use a *partial* equilibrium analysis in the presence of linear hiring and firing costs. In their model they take explicit account of dynamics and uncertainty. Whenever a firm wants to fire a worker it has to pay firing costs, whenever it wants to hire workers it has to pay hiring costs. In their model firing costs neither have an impact on wages, i.e. there is nothing like wage bargaining, nor does the hiring decision have an impact on available labour supply; labour market tightness does not change. The impact of firing costs on lay-off is much more pronounced than on the hiring decision of firms, because firing costs are discounted. Furthermore, firing costs lead to an increase in job tenure and therefore to an additional discounting of firing costs. For these reasons firing costs have a strong impact on firing but a weak impact on hiring. They found a negative correlation between EPL and the unemployment rate.

Early general equilibrium models¹⁷ suggest a negative impact of EPL on employment.¹⁸ More recent studies show a positive impact of lay-off costs on employment, as in Alvarez and Veracierto (2001) and Mortensen and Pissarides (1999). Ljungqvist (2001) tries to shed some light on the reasons for these different results. To perform this task he distinguishes among the types of models used:

- search models (Alvarez and Veracierto)
- matching models (Burda, Saint-Paul, Mortensen and Pissarides)
- employment lotteries (Hopenhayn and Rogerson)

In search models the unemployed worker chooses the search intensity $s \geq 0$ at increasing disutility $\gamma(s)$ of searching. The search intensity determines the matching probability, with search effort as the only argument of the matching function. The government imposes a tax $\tau \geq 0$ for each destroyed job, which is redistributed lump-sum to the households. Matching models determine the successful matches by a linearly homogeneous matching function $M(u, v)$, where u measures unemployment and v the number of vacancies. The match surplus is split between employer and employee through Nash-bargaining. With $F(p)$ and $W(p)$ being the firm's and the worker's expected discounted value with productivity p , the two alternative specifications of Nash-bargaining are mainly used:

- $(W(p) - Z_u)^\delta F(p)^{1-\delta}$
- $(W(p) - Z_u)^\delta (F(p) + \tau)^{1-\delta}$,

¹⁷For example Burda (1992), Hopenhayn and Rogerson (1993) and Saint-Paul (1995).

¹⁸See Ljungqvist (1999), p. 2.

where Z_u is the outside option of the worker (discounted value of unemployment). In the first specification the share of surplus between employer and employee is constant, whereas in the second specification the decrease in the outside option of the firm, $-\tau$, changes the worker's relative share of the match surplus. Another specification is proposed by Mortensen and Pissarides (1999), introducing a two-tier contract, where firing costs do not appear in the Nash-bargaining in the first period, but from the second year on. They argue that there is no employment relationship if employer and employee disagree in the first period and therefore no reason for firing costs. However, Ljungqvist (2001) shows that this corresponds to the first specification above, except for the individual wage profile.

In models with employment lotteries, preferences of the households are linear separable further on, but there is curvature on the consumption term, i.e. preferences are

$$E_0 \sum_{t=0}^{\infty} \beta^t [u(c_t) - v(l_t)], \quad (1)$$

where $v(l_t)$ is disutility of labour. In these models it is assumed that individual households have access to markets to insure against the idiosyncratic risk associated with employment lotteries. In this case the economy behaves as if there were a representative agent and no risk on the household side.

Simulations show that for a large perturbation in parameter values the employment effects are very different in these types of models. Whereas in the search model and the matching model with constant shares in the surplus division, employment rises with the level of firing taxes, in the lottery model and the matching model with increasing shares of the employees, employment decreases. The net effect on employment in the search model depends on two counteracting effects. Assuming that workers do accept cuts in wages induced by lay-off costs and the lower average productivity in the economy, jobs are filled and tenure is longer. However, lower wages lead to a decline of the search intensity. The effect on employment is positive as long as the tenure effect is stronger than the search effect.

In a matching model the story is a different. Firms have two ways to cover their vacancy costs, either by longer average job tenure leading to a decrease in the unemployment rate or by a higher unemployment rate, which increases the probability that a vacancy is filled. If the length of job tenure is exogenously given, as in Burda (1992), then unemployment will go up. If the match surplus of the worker is additionally increased by the second specification of the wage-bargaining, then it becomes even more difficult for firms to retain the vacancy costs and unemployment will be more likely to increase.

In models with employment lotteries the result depends on the strength of the substitution effect versus income effect. The result of decreasing employment is driven by the substitution effect towards leisure. One has to keep in mind that the income effect is eliminated in the simulations by redistributing the lay-off tax in form of a lump-sum transfer to the households.

The results indicate that the impact of employment protection on employment or unemployment depends heavily on the type of model used, but will also depend on the way of redistributing the firing tax (lump-sum or severance payment to the laid-off worker). It may also depend on how the lay-off tax is derived. There may be an influence on the outcome based on whether firing costs depend on the wage (e.g. severance payments proportionally to wages) or not, especially in the case of wage-bargaining.

Fang and Rogerson (2007) try to explain differences in hours worked and participation in Europe and the US. For example, hours worked per person in Europe are roughly one third less than in the US; employment is also significantly lower. A large part of the difference is due to differences in statutory holidays and vacation for full-time workers. To derive results along the intensive (hours) and the extensive (employment) margin the authors use a Pissarides matching model, where firms offer vacancies. One explanation for the differences along the two margins mentioned is employment protection. To simulate differences in EPL a cost factor ϕ for lay-offs and idiosyncratic shocks is introduced in the model. Whenever a shock hits a firm, which happens with probability λ , it incurs a cost ϕ in terms of output and the match is dissolved. The authors show that an increase in ϕ with a rebate of these costs to the households leads to an increase in the hours worked per person, but a decrease in employment. In case of no rebate, i.e. the firing costs are a resource cost to the economy, the effect on hours is positive, while the effect on employment is ambiguous. In their setting the authors were not able to explain the different pattern of hours worked in the US and Europe.

The paper by Blanchard and Tirole (2008) shows very interesting implications concerning the joint design of unemployment insurance and employment protection. In a very stylized model they analyse first best policies with respect to a benchmark model and alternative specifications. In their setting households are risk-averse, firms are risk-neutral. This implies that individuals in the benchmark case want to insure fully against unemployment risk. Productivity shocks occur after hiring. In the benchmark model the wage is set before the revelation of the productivity shock, which afterwards is also known only by firms but not by workers. In the benchmark case the first best policy can be achieved by compensating laid-off unemployed workers with firing taxes and providing no unemployment insurance. This result changes under certain conditions. If it is assumed that the productivity of a match of firm and worker is also revealed to the worker and not only to the employer, then the implementation of the first best solution requires firing taxes and unemployment payments. In this case employment is lower than in the benchmark model, because part of the rent of the firm is assigned to the workers. So the average productivity of a job in the economy has to increase, implying that fewer workers will find jobs.

The incentive to invest in firm-specific skills is often mentioned as an argument in favour of EPL. Suedekum and Ruedemann (2003) use a simple two-period model to show the effect of severance payments on firm-specific human capital formation. The only decision of the firm is whether to maintain production

in the second period or not, while the wage and the mark-up are exogenously given. The worker has to decide upon the level of firm-specific investment, which is lost once there is a lay-off. The costs of financing firm-specific human capital formation are borne by the worker, who therefore has no incentive to quit the job. The authors show that the decision about the level of firm-specific skills depends upon the size of the counteracting *incentive-* and *lethargy effect*. The incentive effect implies that higher job protection increases the incentive to invest in firm-specific skills because the probability of realizing the rents is higher. The lethargy effect states that the higher outside option coming from severance payments makes a lay-off less a problem. In their model the net effect depends on the level of mark-up of the firm. If the market power is high, then payrolls of the employees do not change very much and the lethargy effect is higher. In their setting a low mark-up level is needed to induce workers to invest in firm-specific skills.

Belot et al. (2007) use a model to discuss the trade-off with respect to firm-specific human capital formation associated with EPL, also taking into account the effect of minimum wages. They show that EPL stimulates training and increases welfare. The direct costs of separation, however, have a negative effect on welfare. There is firm-specific training e by the employee, where the effort choice is not contractible and the associated convex costs are borne by the worker. Training raises the productivity x of a match. After the effort decision has taken place an industry shock i is revealed. If the productivity of the match is too low the match is dissolved. In this case the employer has to bear the firing costs. The firing costs c_f consist of severance payments ϕc_f and administration costs $(1 - \phi) c_f$, which are pure waste. The output y of a match is given by:

$$y = x + e + i. \quad (2)$$

If output, given the wage, is too low, the match is dissolved and the worker receives the outside option b (e.g. unemployment payments) and severance payments. The authors assume that wages consist of a base wage w , like a minimum wage, and a so-called bonus ω , which is not allowed to be negative and is provided to the worker.

The Nash-bargaining problem is:

$$\max_{\omega \geq 0} [w + \omega - (b + \phi c_f)]^\beta [y - (w + \omega) + c_f]^{1-\beta}, \quad (3)$$

where β is the bargaining power of the worker. The firm's outside option is given by the total firing costs. If the minimum wage w equals the outside option, $w = b + \phi c_f$, then Nash-bargaining¹⁹ and bargaining over ω alone lead to the same overall wage. If the minimum wage is higher, then there are shocks i for which the Nash-bargained wage is lower. For this reason additional separations occur if the minimum

¹⁹Nash-bargaining means bargaining over $w + \omega$.

wage is higher than the outside option. In their model severance payments affect separation only in the presence of wage rigidities, i.e. $w > b + \phi c_f$. In the other case only the pure waste component of the firing costs protect low productive-jobs.

A higher effort has two beneficial effects in their model. Higher effort leads to a lower firing probability and raises the wage paid. They show that in the setup without rigidities severance payments have no influence on the effort choice of the worker. The reason for this result is that the separation decision is independent of these payments. Only the pure waste component influences the effort decision. When there is a minimum wage, separation is less likely with higher severance payments, which increases the incentive for the worker to increase the effort. However, higher severance payments provide the worker a higher outside option which in turn decreases the incentive to avoid dismissal by decreasing effort (lethargy effect). Therefore there are two counteracting effects on the decision. An increase in the overall firing costs in the presence of wage rigidities has an additional effect. A decrease in dismissals leads to cases where higher effort does not increase the wage, i.e. the firm pays the minimum wage, which in turn decreases the incentive to invest in e .

Optimizing social value shows that there is a hold-up problem. The assumption that the worker effort costs e cannot be contracted leads to an underinvestment in effort as long as the bargaining power of the worker is smaller than one. Firing costs could improve the effort and lead to a higher overall welfare in the economy, so the firing costs should be positive but finite. Furthermore, the authors argue that job security should be higher for more-productive workers. They also show that taxes work in the opposite direction to firing costs: they decrease the value of continuation relative to separation, and discourage effort.

Booth and Zoega (2003) take a different view on the effect of EPL on human capital. They investigate the effect of EPL, modelled as statutory redundancy payment, on employees' training paid by firms. The impact is analysed in an indirect way. They use a two-period model and assume that training has occurred in advance. Employees quit a job with an exogenously given probability and employers decide upon lay-offs, in which case they have to pay redundancy payments. They show that the quit rate of the employees leads to a discount factor of the firms which is higher than the socially optimal one. In case of a recession, firms will lay off more workers than would be optimal from a social perspective, because lay-offs are combined with a loss of firm-specific human capital. Optimally, the redundancy payment should be set to internalize the higher discount factor of the firms and to induce them to choose the socially optimal level of employment.

There is also an impact of job security on the type of human capital investment. Wasmer (2002), for example, argues that higher job security leads to an increase in firm-specific human capital investment, whereas lower security leads to an increase in general human capital investment, so the mix of skills will be

influenced by job tenure. Stähler (2006) uses a CGE-model to analyse the effect of EPL on the schooling decision. He distinguishes two levels, low- and high-skilled workers. At time of birth the individuals have to decide whether to start with low- or high-skills, and the decision depends on the discounted value of work income during the lifetime and individual costs, uniformly distributed. Firing costs are fixed legal costs and independent of the type of educational level. They show that the human capital decision depends mainly on labour market tightness, i.e. the probability of finding a job. The probability of finding a job decreases with EPL. Whether more or fewer individuals obtain a high skill depends on the relative change of labour market tightness for the two skill groups. The bargaining power of workers is also important, e.g. more people become educated if it is higher. Stähler simulates an increase in EPL, calibrating the model to an initial state with no EPL. In all his scenarios EPL leads to an increase in the educational level in the economy. However, one has to mention that firing costs are assumed to be the same for both skill groups and represent wasted resources. In case of severance payments, additional wage effects come into play and results may differ.

4.4 Lifelong Learning

Economic theory suggests that imperfections in labour-, capital- and training markets might interact in a way that induces economic agents (employers or employees) to underinvest in training. If the social return to training is higher than the private return, or if there are other reasons for underinvestment such as financial restrictions, public intervention can be justified. The effects of lifelong learning policies are often analysed empirically or in general equilibrium models. Leuven and Oosterbeek (2004) estimate the effect of changes in the Dutch regulation concerning the incentives for work-related training. In particular, they focus on a policy that allows to deduct firms an additional amount of their training costs if workers are older than 40. They find that the training rate of workers somewhat older than 40 is about 15 to 20 percent higher than the rate of workers slightly younger than 40. However, they find that this effect is mainly due to a postponement of training and that the measure is not stimulating training as a whole. Moreover, they do not find a significant effect of training participation on wages. This can be explained by the fact that the firm pays the full direct costs for a large majority of training measures in their data set and that the firm will only be willing to pay if it can grab a share of the returns of training.

Bassanini (2004) uses data from the European Community Household Panel to assess the effects of training and adult education on individual labour market performance. He finds that training has a clear impact on wages only for young and highly educated employees. However, it has a stronger impact on employment security (as perceived by the workers) for older and low-educated workers.

In general, the main inputs in production of human capital are time, i.e. lost wage income, and direct costs. Higher income taxation reduces the net wage, which on the one hand reduces the return

of education but on the other hand also reduces the opportunity costs (foregone labour income while accumulating human capital) of human capital investment. Under a proportional income tax the return and the costs are taxed by the same factor. This argumentation would imply, that a proportional income taxation does not have an influence on human capital formation. However, Trostel (1993) argues that this is not the entire story. First, a change of the income tax rate leaves costs for other input in the production function unchanged implying an effect of income taxation on human capital formation. Second, higher tax rates reduce the net wage, implying labour supply effects, which alters the return to education and human capital investment. Thus, a proportional tax cut should influence the decision to acquire human capital. The effect of changes in the progressivity of the income tax system will be even more pronounced.

Heckman, Lochner and Taber (1999) develop an OLG general equilibrium model with endogenous human capital decision with respect to education and on-the-job training for the United States. They evaluate the effect of tax reforms and tuition subsidies on the economy in general and human capital formation in particular. They show that a revenue-neutral \$500 increase in tuition subsidies financed by a proportional income tax increases college attendance by 5.3 percent in the partial equilibrium but by only 0.5 percent in the general equilibrium. The decline of the effect is mainly caused by the decrease of wages for high-skilled as more individuals attend college.²⁰ The large difference of the effects also holds for the analysed tax reforms. Based on micro data, Taber (2002) estimates a dynamic general equilibrium model of human capital formation for the United States. He simulates the effects of a switch from the current progressive income taxation scheme to a flat income tax resp. a flat consumption tax scheme. He finds that in both reforms the long-run college enrolment increases by approximately 2 percent.

Dellas (1997) stresses the impact of unemployment benefits for skill acquisition. He argues, that, if low-skilled are the main beneficiaries of unemployment payments, higher unemployment benefits reduce educational incentives to accumulate human capital as the income differential between low- and high-skilled decreases. Thus, this leads to an increase of aggregate labour supply of low-skilled. In addition to the direct disincentive effect of high unemployment payments, the unemployment rate of low-skilled individuals may even more increase.

4.5 Contractual Arrangements

4.5.1 Fixed-Term Contracts

An important issue relating to fixed-term contracts and temporary employment is whether this leads to more employment. Spain is particularly interesting for empirical analysis of contractual arrangements

²⁰In our model, such a general equilibrium effect on human capital formation will not only be the result of lower wages, but also of higher unemployment and lower participation rates.

given their high unemployment rates and employment protection in the 80's and a series of reforms introduced afterwards. Using a panel of 3.400 Spanish manufacturing firms for the period 1985-2001, Benito and Hernando (2008) examine the effect of fixed-term contracts, financial factors (such as e.g. cash-flow or liquidity) and a policy reform that lowered payroll taxes and dismissal costs on labour demand. The authors find that, compared to permanent contracts, temporary employment shows (i) a greater sensitivity to financial factors, (ii) a greater cyclical sensitivity, (iii) a larger average wage elasticity and (iv) less inertia.

Estimations provided by the European Commission (2003) state that wages of workers with fixed-term contracts are lower in all European countries analysed. Two papers cited in European Commission (2004), Hagen (2003) and Ichino et al. (2004), use a 'programme evaluation' approach to investigate the effects of temporary contracts on future employment prospects. According to these two studies, temporary contracts are an effective springboard towards permanent employment and do not seem to be a trap of endless precariousness. Reinowski and Sauermaun (2008) study the influence of fixed-term contracts on work-related training for low-skilled workers. One can argue, that shorter duration of a worker-firm pair in fixed-term contracts reduces incentives to invest in firm-specific human capital.²¹ However, assuming an imperfect labour market, there are some reasons why the contrary may hold. These are 'screening', 'signalling' and wages below labour productivity. These counteracting forces imply that the effect of fixed-term contracts on human capital formation is ambiguous. Based on Micro Census data for Germany for the year 2004, the authors find no negative effect on training of holding a fixed-term contract. On the other hand, the European Commission (2004) finds evidence that workers with temporary contracts tend to receive less on-the-job training than workers in permanent contracts.

Nunziata and Staffolani (2007) investigate the effect of different employment regulations (firing and hiring costs and a constraint on temporary contracts) on permanent, temporary and overall employment. In their model, firms can either offer temporary contracts, where they bear hiring but no firing costs or permanent contracts in which case they have to pay firing costs. The consequences of an increase of firing costs on different types of employment depends on restrictions for the share of temporary contracts. If there are no restrictions, higher firing costs reduce (resp. increase) permanent (resp. temporary) employment in good states.²² In this case, total employment is higher in bad states and lower in good states (under a certain condition). If there is a restriction on the share of temporary contracts, an increase in firing costs reduces permanent and temporary and therefore total employment in good states and increases them in bad states. In the empirical part of their paper, they find that temporary (resp. permanent) employment is positively (resp. negatively) correlated with permanent employment protection. Stricter employment protection is negatively correlated with permanent employment. Finally, they find that the

²¹ Additionally, it also decreases incentives for the *firms* to invest in general human capital of their employees.

²² And vice versa in bad states.

temporary employment rate has a larger variance over the cycle than permanent employment.

4.5.2 Working Hours

The idea of 'worksharing' has become popular in Europe in the 80s, pushed by some policymakers and unions. Under the condition that the total number of hours demanded by firms does not respond to a reduction of the number of hours worked per worker, this policy would reduce unemployment²³. Empirical and theoretical evidence on this idea is mixed.

Steiner and Peters (2000) estimate the effects of the reduction in weekly normal hours in West Germany, based on industry panel data. In their estimation, they distinguish low- medium- and high-skilled workers and show that labour demand elasticities with respect to wage costs are significantly different between these three groups. Elasticities for low-skilled are more negative, whereas the authors do not find a significant wage elasticity for labour demand for high-skilled workers. For given wages, the authors also do not find a direct effect of the reduction of weekly normal hours on total number of hours worked. However, they argue that the reduction of working hours is likely to increase wage costs as unions and workers will try to prevent weekly earnings to be reduced proportionally to the reduction in working hours. Therefore, effects on total number of hours worked of the reduction of normal working hours become negative. Due to the different demand elasticities, this effect is more pronounced for low-skilled workers. The authors argue that the reduction of normal working hours is therefore no adequate policy to reduce unemployment.

Kapteyn et al. (2000) review theoretical arguments and empirical evidence on the effects of a change of normal working hours. Empirical studies on the reduction of normal working hours are often based on household panel data, sometimes on macroeconomic data. Concerning the effect of the reduction on actual hours worked, evidence cited in Kapteyn et al. strongly suggests a direct relation. Hunt (1996) for Germany, de Regt (1998) for the Netherlands, Hart and Sharot (1978) for the UK and Kalwij and Gregory (1999) for Britain find elasticities of actual hours with respect to normal working hours of between 0.85 and 1.²⁴ There is, however, much more controversy on the issue of the effect on hourly wages. Using microdata for West Germany, Hunt (1996) finds that the fall in earnings due to the reduction of hours worked was nearly fully compensated for by a rise of wages. On the basis of a macro time series model, Franz and Smolny (1994), however, find that in certain industries wages rose but by and large, workers were only partly compensated for the shorter working time. Using Norwegian manufacturing data, Nymoen (1989) finds a strong short-term effect on wages, but this effect disappears in the long-run.

²³This idea is sometimes also propagated in favour of early retirement policies.

²⁴If output and total number of hours worked were fixed, this would imply a pronounced increase of employment.

Finally, Dur (1997) finds an elasticity of hourly wages with respect to working time of about 0.45 for the Netherlands.

Kapteyn et al. (2000) argue that fixed costs of hiring, costs of training employees, inflexible arrangements and slow administrative procedures hinder positive employment effects. These rigidities make it unattractive for the employer to hire additional employees, even if the current staff works fewer hours per week. Fixed costs of hiring new workers are one of the reasons why firms may prefer to have a smaller staff working longer on average.

Another important issue is the heterogeneity of workers. If skills of workers decline during periods of unemployment, unemployed returning to a job may be less productive than employed workers. If firms would like to respond to a decrease of working time per worker by hiring new employees, this issue of lower productivity might also reduce the unemployment effect. A related point was made by Freeman (1997) in the case that unskilled and skilled labour are complements in production and that most of the unemployed are unskilled. A reduction of working time of skilled labour might then lead to a decrease of skilled labour input what in turn implies lower demand for unskilled labour.

Marimon and Zilibotti (2000) study the effects of reducing working hours in a general equilibrium model with matching frictions. In their model, employers and employees bargain not only over wages, but also over the number of hours worked. They show that the effects of the reform depend heavily on the specification of the model, i.e. the production function and the relative level of the bargaining power to the elasticity parameter of the matching function.²⁵ In the benchmark model, in which decreasing returns to scale of the production function are assumed²⁶, a reduction of working time increases employment but reduces profits. The impact on total welfare depends on the relative level of the bargaining power and the elasticity of the matching function. However, in the case where capital adjusts to the new policy, the effect on employment gets negative.

4.6 Complementarities

Economic literature on complementarities between different labour market policies appears to be rather scarce. Researchers mostly find complementarities both in theoretical and empirical work but these complementarities are often not very strong.

Orszag and Snower (1999) argue, that economic complementarities are important determinants of labour market outcomes. They claim that Europe's cardinal policy mistake in the past has been to focus on a too narrow set of policy reforms and to implement them sequentially rather than in conjunction.

²⁵The importance of these two parameters is also reflected in the Hosios condition.

²⁶Or a constant returns to scale production function where capital can not adjust to the policy intervention.

They state that increasing incentives of unemployed to search for a job will only make sense if firms have incentives to hire them. In a dynamic efficiency-wage model with an endogenous labour decision of employed and search decision of unemployed and endogenous hiring and firing, they assess the size of complementarities by the ‘cross elasticity of unemployment with respect to unemployment benefits and taxes’. This cross elasticity reflects the percentage change of the responsiveness of the unemployment rate to unemployment benefits resulting from a percentage change of the labour tax rate. They find that the cross elasticity for different tax and replacement rates is always positive and that it increases with tax rates.

Joseph et al. (2003) analyse the role of labour market institutions on unemployment and on the cyclical properties of job flows in an intertemporal general equilibrium model with search unemployment and endogenous hiring and firing. In particular they extend a Mortensen-Pissarides model and study the impact of unemployment benefits, a firing tax and minimum wages on the economy. In this model, an increase of the firing tax increases the unemployment rate if the minimum wage is high, whereas it decreases unemployment if the minimum wage is low. The idea is that higher firing taxes increase the unemployment duration and thereby reduce the wage in the Nash-bargaining environment. If wages are flexible (resp. rigid), this effect is sufficient to decrease (resp. increase) equilibrium unemployment.

Bassanini and Duval (2006) analyse the impact of policies and institutions on employment and unemployment in 21 OECD countries, using data from 1982-2003. Based on their main estimates, they simulate policy reforms and find significant interactions. They combine two of the reforms (such as reducing the average unemployment replacement rate, reducing the tax wedge, or reducing product market regulation) and show the additional reduction of the unemployment rate that would be obtained in excess of the sum of the reduction implied by each reform in isolation. Whereas each of the reform would reduce the unemployment rate by one percentage point, packages of always two reforms would imply a reduction of between 2.25 and 2.37 percentage points. In other words, policy complementarities are estimated to improve the unemployment effect of the investigated reform packages by 12 to 19 percent. Based on these estimates, the OECD (2006) argues that the impact of a given reform appears to be greater in a more employment-friendly overall policy and institutional framework.

Boone and van Ours (2004) analyse interactions between different labour market institutions. They do not find a significant interaction of expenditures for public employment services and subsidized jobs but they find a significant coefficient for the interaction term between labour market training and unemployment benefits. Their results imply that the unemployment reducing effect of training is higher if unemployment benefits are higher.

5 List of Policy Scenarios

In this section, we develop possible areas for policy analysis that are interesting in general. Some of these policy reforms have already been analysed for Austria in the Second Interim Report or are presented in the *Country Study for Germany* or the *Illustrative Simulations*. In general, we want to organize our quantitative analysis in four broad policy areas: (i) labour market policy, (ii) tax policy, (iii) education and training, and (iv) pension reform.

5.1 Labour Market Policy

One can address labour market policy affecting the following margins: participation (from social assistance to labour market participation, i.e. actively starting job search), job search and matching, wage bargaining, and firing.

- **Employment protection:** There are three alternatives for protecting employed workers, (i) firing taxes (from firms to government), (ii) severance pay (from firms to workers), and (iii) administrative firing costs (deadweight loss imposed on firms). Given endogenous hiring and firing decisions of the firms, increasing employment protection will i) induce firms to fire less workers, but ii) can also reduce hiring incentives and job creation by firms.
- **Monitoring job search and financial incentives:** monitoring job search can have two consequences. When a person receiving unemployment benefits is caught shirking, he might face financial sanctions such as a cut in benefits, or a fixed disutility cost from not searching (mandatory workfare program, required learning, reporting etc.) which we can capture as a reduction in the value of home production in the state of unemployment. Of course, this is not a free lunch but requires public spending on case workers, social detectives etc. Financial sanctions and imposed disutility from monitoring boost incentives to search for a job and, by reducing the workers' reservation wage, will also reduce wages, thereby increasing labour demand.
- **Investment in matching institutions:** Some initiatives of ALMP aim to improve market transparency and raise the transition rates. These reforms can be modelled as a public investment into the efficiency of the matching process between firms and households looking for a job (raising total factor productivity of the matching function). One should again consider the costs of financing these reforms.
- **Decrease of the unemployment replacement rate:** A cut of the replacement rate decreases the reservation wage of a worker. This will increase incentives to search for a job and will have

effects on the wage bargaining, thus increasing labour demand. However, one should also consider distributional effects of such a reform.

- **Unemployment insurance savings accounts (UISA):** A rationale for these accounts can be found in Feldstein (2005) and Boss et al. (2007). Such accounts provide self-insurance over the life-cycle and boost incentives for job search. The incentive effects are reduced to the extent that such accounts are negative upon retirement. Recent severance pay reform in Austria is an introduction of UISA in disguise since the severance pay upon firing is not immediately paid to workers but put in their individual retirement account to gross up the future pension.²⁷ UISA would go further by adding unemployment insurance contributions to the account while subtracting any consumed unemployment insurance benefits. As is discussed by Boss et al. (2008), UISA can either be capital funded or implemented in PAYG system.
- **Child care provisions:** Provision of child care institutions can either reduce effort or pecuniary costs for child care, thus facilitating participation in the labour market and increasing number of hours worked. Graafland (2000) develops a model with a very detailed model of childcare. This is beyond the scope of our model. However, some of his simulations deal with a decrease of childcare costs which stimulates labour supply and is also reflected in the wage bargaining.
- **Minimum wages:** This is not easy to handle in the model. One might think of exogenously setting higher wages of some groups or of increasing the bargaining power of workers for some groups, which also increases their wages. One can also address this by raising the value of home production which strengthens the reservation wage and pushes up wages (however, the welfare consequences are not identical to minimum wages).

5.2 Tax Policy

We provide a detailed modelling of the tax and social security system and can therefore provide several different reform scenarios.

- **Tax treatment of contributions and benefits:** Most countries have now in fact chosen to give social security a consumption tax treatment, i.e. contributions are tax deductible from the income tax while benefits are fully subject to tax. This is in contrast to the tax treatment of other types of financial savings where new savings are not deductible while dissaving is tax-free. To highlight the value of the current system of consumption tax treatment of social security, one can simulate

²⁷Withdrawal from this retirement account is possible under certain conditions, see Hofer (2007).

the consequences of moving to a system where contributions (new savings) are tax deductible, and benefits (dissaving) are taxed.

- **Wage (employment) subsidies and income tax credits:** This is currently discussed e.g. in Germany, mainly for the low-skilled ‘working poor’ to make them more employable for firms. Again, the wage bargaining process and the way of financing the reform will influence the impact of the reform. Introducing a negative income tax or reducing social security contributions would have similar consequences in our model.
- **Wage vs. value added taxation:** Wage and value added taxes are largely thought to be equivalent in terms of hours worked, but these taxes differ fundamentally when it comes to discrete labour supply incentives. The wage tax taxes active wage earnings more heavily than replacement income (pensions, unemployment benefits, social assistance), while the value added tax taxes both wages and replacement income similarly. Hence, the VAT discourages extensive labour supply margins much less severely compared to wage taxation. Shifting the tax burden from wage to value added taxes should thus significantly increase labour force participation, reduce unemployment and induce postponed retirement. However, the distributional consequences of the VAT are worse since it reduces replacement incomes in real terms.

5.3 Education and Training

The model captures two main margins of aggregate skill formation, discrete education to attain certain skill classes (low, medium, high), and life-long learning (either individual or provided by the firm) within each skill class. The return to education is a higher present value of life-time earnings. Private costs include the opportunity cost of individuals’ time input (foregone earnings). The government provides public educational infrastructure including the salaries of teachers etc. We model here only education after the compulsory schooling which qualifies only for the low skilled jobs. The following scenarios are suggested for policy analysis. Before going into specific policy scenarios, it should be mentioned that other policy scenarios like the ones discussed before are also importantly determining training incentives. For example, policies stimulating labour supply, participation and employment raise the potential for individuals and firms to successfully exploit their training investments, or policies to raise the retirement age prolong the period to recoup educational costs and should stimulate training and education.

- **Training subsidies or tax credits:** Typically, private expenses for life-long learning are less than fully tax deductible if at all. But full tax deductibility would be required for wage taxation to be neutral towards skill formation. Training subsidies might encourage life-long learning quite similarly

for all income groups whereas tax credits might have no direct effect on low income individuals who pay no income tax. The analysis can show to which extent these measures are useful to stimulate private investments in human capital formation and to create more and better jobs.

- **Stipends:** The largest private educational cost at the beginning of one's adult life are foregone earnings during the education period. One can investigate by how much direct stipends can stimulate the enrolment rates in professional schools and institutions of higher education (medium- and high-skilled).
- **Public investment in educational institutions:** In addition to individual effort, school equipment, class size, student teacher ratios and teacher qualifications and salaries are part of a high quality *public infrastructure* for higher education. One can investigate how an increase in public educational spending on such infrastructure can make private educational efforts more productive and boost private enrolment for medium and high skilled education.
- **Firm sponsored training:** Firms invest in specific skills to raise the productivity of its workforce and to tailor worker skills to the specific job tasks required in the company. For any given training effort of workers, resulting in general skills θ , firm sponsored training adds to this to raise the worker's productivity in the firm. If there is underinvestment (as the literature seems to emphasize), then this would be a reason for the government to subsidize firm sponsored training, in addition to making it fully tax deductible from the corporate tax.

5.4 Pension Reform

Pension reform is a prime policy challenge in most European welfare state with predominantly unfunded PAYG pension systems. Ageing and generous social policy initiatives have led to unbalanced systems that are often subsidized out of general government revenue. One can consider parametric pension reform in the pension system. The following reforms are frequently suggested and are, in a number of countries, in the stage of being implemented:

- **Balancing the system:** An intergenerationally balanced approach should include a combination of benefit cuts, contribution increases and postponed retirement, to eliminate the PAYG deficits and evenly distribute the adjustment burden of demographic transition between old and young generations.
- **Strengthening the tax benefit link:** pension contributions are fully perceived as a tax when pensions are unrelated to past earnings. This implicit contribution tax can add substantially to the pre-existing labour tax burden and thereby discourage labour supply. The tax component of

contributions can be reduced if pension size is made dependent on one's own wage earnings as it is in Bismarkian pension systems.²⁸ However, the tax benefit link is weakened due to *minimum pensions* (given the distributional goal of avoiding old age poverty), and *flat pensions* unrelated to past earnings in some occupational groups.

- **Reforming the contribution base:** many countries have introduced individual accounts in a notionally defined contribution system to systematically establish a tax benefit link. One can consider several elements: (i) prolong the pension assessment base to life-long earnings, (ii) pay a notional interest equal to the growth rate of the wage earning which is the implicit rate of return on PAYG contributions, and (iii) reduce various types of replacement incomes (e.g. unemployment benefits) to count as insurance periods (allowing periods of unemployment to count towards pensions stands in contrast to unemployment insurance savings accounts (UISAs), which are suggested by Boss et al. (2007) to strengthen employment incentives).
- **Retirement incentives:** the retirement margin is probably one of the most important discrete labour supply margins in an ageing society. The Gruber/Wise worldwide research program²⁹ has shown that effective tax rates on continued work and labour market participation of older workers are very high, in many cases more than 60 percent. We simulate the consequences of introducing pension supplements and discounts for later and earlier retirement, resp., to encourage old age labour market participation and continued work.
- **Pathways to early retirement:** in many countries, individuals are often able to choose alternative routes to early retirement such as claiming disability pensions. To close these pathways to early retirement, many countries tighten eligibility rules which can be modelled as a reduced probability to receive benefits. The rapid growth of disability pensions is an important problem in many countries.

5.5 Comprehensive Policy Reform Package

The list of possible simulations is intended to provide examples of concrete reform scenarios that can be simulated with the Labour Market Model. Part III and Part IV of the Final Report already provide 'illustrative simulations of policy measures'. This is done by means of an elaborate country study for Germany and illustrative simulations for the other countries.

The European Commission stresses flexicurity as one crucial component of the European Growth and Jobs Strategy, which aims to enhance employment and create more and better jobs in Europe. Thus, a

²⁸See e.g. Disney (2004).

²⁹See for example Gruber and Wise (1999, 2004, 2005),

simulation of a comprehensive reform package with the Labour Market Model could include an analysis of flexicurity policies. The Commission and the Member States have reached a consensus that flexicurity policies can be designed and implemented across four policy components (European Commission (2007)): (i) flexible and reliable contractual arrangements, (ii) comprehensive lifelong learning strategies, (iii) effective active labour market policies, and (iv) modern social security systems. Policy measures along these components and a comprehensive ‘flexicurity’ reform package is analysed with the model in the ‘Country Study for Germany’. For the other countries, we looked at some important issues and problems of a country and investigate single reform proposals.

6 Outline of the Model

In this section the basic structure of the model is presented in a non-technical way. A detailed model description can be found in the separate document with the title *Documentation of the model*. The model developed initially for the Austrian economy for the Second Interim Report and finalized for Germany for the Draft Final Report has now been extended to the remaining countries, i.e. Denmark, United Kingdom, Italy, and Poland. The finalization of the calibration of the model required further effort into getting some remaining data for the rest of the countries. As our model requires a breakdown of household data according to both different age groups and educational levels, getting some of the data is very tedious. Often these data are not available from official statistics. We extended the earlier version of the model to allow for an endogenous decision of firms for firm-sponsored training. Moreover, we devoted more time to get parameters based on key behavioural elasticities reflecting the consensus of recent econometric research. This model is the basis for analysis of labour market reforms. The *Country Study for Germany* and the *Illustrative Simulations* provide illustrative simulations with the model.

The basis of the model is an Overlapping Generations (OLG) model in the spirit of Samuelson (1958) and Diamond (1965). Their model is analytically very tractable but less useful for empirical analysis since the demographic structure is very simple and the length of a period is too long. One approach which avoids this problem is to rely on models with a very large number of generations in the style of Auerbach and Kotlikoff (1987). However, the large number of different age groups in this kind of model implies that the number of dimensions of the model increases rapidly, which means that the numerical solution of the model is computationally expensive. This problem is particularly severe when using a model with considerable amounts of heterogeneity (three skill groups and several different labour market states) and with extensive institutional details. This would make a model of the Auerbach-Kotlikoff-type intractable and suggests the use of a different structure. Therefore, we rely on a type of OLG-models inspired by the *perpetual youth* model of Blanchard (1985). The Blanchard model was adapted by Gertler (1999) to allow for two age groups (i.e. workers and retirees) and thereby for age-specific behaviour. This model was also used by Morrow and Roeger (2004) to analyse the economic impact of the demographic change in the EU. Our model is based on the demographic structure as in Grafenhofer et al. (2007), who extended the Gertler model by allowing for more age groups, so that there are several active and retired groups instead of only one of each. This allows for life-cycle profiles of labour productivity, income and unemployment rates in sufficient detail. The other models mentioned can also be replicated as special cases of the probabilistic ageing model. There are several labour supply margins the households decide upon, as well as an extensive and intensive human capital decision, and an intertemporal consumption and savings decision.

The model focuses on a detailed analysis of the labour market. The production side consists of

representative firms and there is perfect competition in the goods market. Firms produce goods by means of the production factors capital and labour, where the labour force is divided into three different skill groups. This division of the labour force allows the model to highlight substitutions and complementarities within the different groups and between labour and capital. Firms optimally determine the level of capital stock according to the q-theory of Hayashi (1982) and employment by choosing the level of vacancies for the different skill groups and an optimal firing rate. Furthermore, firms decide on the optimal amount of firm-sponsored training, which is determined by the increase of labour productivity and the costs associated with training. Together with private training and education, firm-sponsored training determines the productivity of an employee. Investment is associated with installation costs: see Barro and Sala-i-Martin (1995).

The population is distinguished with respect to age and education. Some age groups are already retired while members of younger groups decide whether to participate or not. The members of the group of older workers therefore endogenously choose an optimal retirement age, so that a share of this group is still working while the other part is already retired. In addition, the population will be divided according to educational characteristics. At the beginning of their lifetime, individuals endogenously decide upon their human capital formation. We distinguish three different skill groups, low- (ISCED 0-2), medium- (ISCED 3-4), and high-skilled (ISCED 5-6). As the acquisition of education requires time, more highly educated individuals enter the labour force at a higher age. A different instrument to acquire human capital is lifelong learning. Investment of this type increases the productivity of labour. We introduce a stock of human capital for the households for each age and skill group. Investment in lifelong learning increases the stock of human capital, however it also depreciates in each period.

The labour market status of an individual can either be employed, unemployed, not participating or retired. Household income consists of either net labour income or unemployment or pension benefits, transfers from the government, and capital income. Aggregation uses the concept of income-pooling elaborated by Andolfatto (1996). As pension income is smaller than labour income, younger generations privately save in order to sustain consumption and living standards in old age. Individuals maximize their lifetime utility by endogenously choosing the number of hours worked if employed, the search effort for a job if unemployed, the participation decision, the retirement age, the choice of educational investment at the beginning of their lifetime (age 15), the effort invested in lifelong learning and an optimal intertemporal allocation of consumption. Several factors have an influence on each of these decisions.

The model contains search unemployment as pioneered by Mortensen (1986). Firms post an optimal number of vacancies and unemployed persons choose an optimal search effort. Vacancies and individuals are allocated by job matching. We use a static search model as in Boone and Bovenberg (2002) in contrast to a dynamic model as in Pissarides (2000). The static model is simpler yet captures the

essential insights of the dynamic model. Subsequently, firms endogenously choose an optimal share of the work force they want to keep within the firm. This share is determined by labour productivity, wage costs and employment protection legislation. Due to the structure of the model, we can explain age- and skill-dependent unemployment rates. Employers and employees bargain over wages, which then reflect the bargaining power of workers and firms. In the simplest Nash-bargaining setting, they take into account labour productivity and the outside option of the employee, which mainly depends on the unemployment replacement rate. In addition, institutional settings, e.g. the tax and benefit system (much as in Fisher and Keuschnigg (2007), who characterize the effective tax rates of social security contributions that distort labour market behaviour of prime-age workers and endogenous retirement of older workers) are taken into account. Compared to the First Interim Report, the model has been extended for employment protection.

Returns to education are not only influenced by skill-dependent wage differentials but also by endogenously determined employment prospects and institutional arrangements such as social protection and progressive income taxation. The co-existence of endogenously determined human capital formation and a search model with labour market frictions is therefore an important feature of the model. Individuals consider employment prospects for their human capital accumulation decisions (schooling as extensive decision and lifelong learning as intensive decision), so that changing employment prospects caused by policy changes influence the human capital stock.

The model also captures a detailed description of the public sector and institutional settings. The budget of the public sector is divided into a budget for social insurance (that includes unemployment insurance and pension insurance) and a *general* budget. Expenditures for social insurance are financed by social security contributions of employers and employees and transfers from the general budget. This structure is different for each country. Revenues of the general budget comprise all main taxes, such as personal income tax, corporate income tax, consumption and excise taxes, capital and capital gains taxes. Tax revenues finance public expenditures, which include public consumption, transfers to the social insurance systems and to households, subsidies to firms and debt servicing.

All included countries are modelled as small open economies in the sense that the interest rate is exogenously given by the world interest rate. We believe that this is a suitable assumption since capital markets are already quite integrated and monetary policy is not decided by individual countries. This is different from other papers with multi-country models such as Börsch-Supan et al. (2006). However, in such models, the labour market and institutional details are modelled in a much simpler way. We believe that there is a trade-off in order to keep the model tractable and thus also refrain from multi-country modelling.

Simulation results include macro-economic effects of reforms, such as the impact on GDP, investment,

consumption, number of hours worked, unemployment and employment rates, wages and average productivity. Household-specific variables can be presented in an aggregate manner for the whole economy, but also separately for each of the groups or partly aggregated (i.e. age-, or education-specific). The model can analyse inter- as well as intragenerational and intertemporal effects of reforms. This analysis can include the *static* as well as the *dynamic* perspective.

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7 Appendix

In this section one finds tables with information on labour markets and institutional details in the EU. Tables 1 to 7 provide informations on the labour market situation and Tables 8 to 11 informations on institutional details in the countries of the European Union.

Table 1: Employment Rates of Adult Population Aged 15-64 in the EU and the US 1992 - 2007 (in Percent)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
EU (27 countries)						60.7	61.2	61.8	62.2	62.5	62.3	62.6	62.9	63.5	64.5	65.4
EU (15 countries)	61.2	60.1	59.8	60.1	60.3	60.7	61.4	62.5	63.4	64.0	64.2	64.4	64.8	65.4	66.2	66.9
NMS10 ¹									57.4	56.7	56.0	56.0	55.9	56.9	58.3	
Belgium	56.3	55.8	55.7	56.1	56.2	56.8	57.4	59.3	60.5	59.9	59.9	59.6	60.3	61.1	61.0	62.0
Bulgaria									50.4	49.7	50.6	52.5	54.2	55.8	58.6	61.7
Czech Republic							67.3	65.6	65.0	65.0	65.4	64.7	64.2	64.8	65.3	66.1
Denmark	73.7	72.1	72.3	73.4	73.8	74.9	75.1	76.0	76.3	76.2	75.9	75.1	75.7	75.9	77.4	77.1
Germany	66.4	65.1	64.7	64.6	64.1	63.7	63.9	65.2	65.6	65.8	65.4	65.0	65.0	66.0	67.5	69.4
Estonia							64.6	61.5	60.4	61.0	62.0	62.9	63.0	64.4	68.1	69.4
Ireland	51.2	51.7	53.0	54.4	55.4	57.6	60.6	63.3	65.2	65.8	65.5	65.5	66.3	67.6	68.6	69.1
Greece	53.7	53.7	54.2	54.7	55.0	55.1	56.0	55.9	56.5	56.3	57.5	58.7	59.4	60.1	61.0	61.4
Spain	49.0	46.6	46.1	46.9	47.9	49.5	51.3	53.8	56.3	57.8	58.5	59.8	61.1	63.3	64.8	65.6
France	59.9	59.3	59.1	59.5	59.5	59.6	60.2	60.9	62.1	62.8	63.0	64.0	63.7	63.9	63.8	64.6
Italy		52.3	51.4	51.0	51.2	51.3	51.9	52.7	53.7	54.8	55.5	56.1	57.6	57.6	58.4	58.7
Cyprus									65.7	67.8	68.6	69.2	68.9	68.5	69.6	71.0
Latvia							59.9	58.8	57.5	58.6	60.4	61.8	62.3	63.3	66.3	68.3
Lithuania							62.3	61.7	59.1	57.5	59.9	61.1	61.2	62.6	63.6	64.9
Luxembourg	61.4	60.8	59.9	58.7	59.2	59.9	60.5	61.7	62.7	63.1	63.4	62.2	62.5	63.6	63.6	63.6
Hungary					52.1	52.4	53.7	55.6	56.3	56.2	56.2	57.0	56.8	56.9	57.3	57.3
Netherlands	64.0	63.6	64.0	64.7	66.3	68.5	70.2	71.7	72.9	74.1	74.4	73.6	73.1	73.2	74.3	76.0
Austria			68.5	68.8	67.8	67.8	67.9	68.6	68.5	68.5	68.7	68.9	67.8	68.6	70.2	71.4
Poland							58.9	59.0	57.6	53.4	51.5	51.2	51.7	52.8	54.5	57.0
Portugal	66.6	65.1	64.1	63.7	64.1	65.7	66.8	67.4	68.4	69.0	68.8	68.1	67.8	67.5	67.9	67.8
Romania						65.4	64.2	63.2	63.0	62.4	57.6	57.6	57.7	57.6	58.8	58.8
Slovenia					61.6	62.6	62.9	62.2	62.8	63.8	63.4	62.6	65.3	66.0	66.6	67.8
Slovakia							60.6	58.1	56.8	56.8	56.8	57.7	57.0	57.7	59.4	60.7
Finland	65.1	61.0	60.3	61.6	62.4	63.3	64.6	66.4	67.2	68.1	68.1	67.7	67.6	68.4	69.3	70.3
Sweden	75.9	71.3	70.2	70.9	70.3	69.5	70.3	71.7	73.0	74.0	73.6	72.9	72.1	72.5	73.1	74.2
United Kingdom	67.9	67.4	67.9	68.5	69.0	69.9	70.5	71.0	71.2	71.4	71.3	71.5	71.6	71.7	71.5	71.3
United States	70.8	71.2	72.0	72.5	72.8	73.5	73.8	73.9	74.0	73.1	71.9	71.2	71.2	71.5	71.9	71.9

¹ New Member States (10 countries): 2006 data, Source: Eurostat, structural indicators.

Table 2: Employment Rates of Adult Population Aged 15-64 in the European Union - 2007 (in Percent)

	Overall	Females	Males	15-24 years	25-54 years	55-64 years
European Union (27 countries)	65.4	58.3	72.5	37.2	79.1	44.7
European Union (15 countries)	66.9	59.7	74.2	40.8	79.7	46.6
New Member States (10 countries)*	58.3	51.9	64.8	25.4	75.4	34.7
Belgium	62.0	55.3	68.7	27.5	79.7	34.4
Bulgaria	61.7	57.6	66.0	24.5	79.4	42.6
Czech Republic	66.1	57.3	74.8	28.5	83.5	46.0
Denmark	77.1	73.2	81.0	65.3	86.3	58.6
Germany	69.4	64.0	74.7	45.3	80.9	51.5
Estonia	69.4	65.9	73.2	34.5	84.8	60.0
Ireland	69.1	60.6	77.4	49.9	78.7	53.8
Greece	61.4	47.9	74.9	24.0	75.6	42.4
Spain	65.6	54.7	76.2	39.1	76.8	44.6
France	64.6	60.0	69.3	31.5	82.1	38.3
Italy	58.7	46.6	70.7	24.7	73.5	33.8
Cyprus	71.0	62.4	80.0	37.4	83.8	55.9
Latvia	68.3	64.4	72.5	38.4	82.3	57.7
Lithuania	64.9	62.2	67.9	25.2	82.5	53.4
Luxembourg	64.2	56.1	72.3	22.5	81.9	32.0
Hungary	57.3	50.9	64.0	21.0	74.6	33.1
Malta	55.7	36.9	74.2	46.0	65.7	28.3
Netherlands	76.0	69.6	82.2	68.4	85.4	50.9
Austria	71.4	64.4	78.4	55.5	84.0	38.6
Poland	57.0	50.6	63.6	25.8	74.9	29.7
Portugal	67.8	61.9	73.8	34.9	81.0	50.9
Romania	58.8	52.8	64.8	24.4	74.6	41.4
Slovenia	67.8	62.6	72.7	37.6	85.3	33.5
Slovakia	60.7	53.0	68.4	27.6	78.0	35.6
Finland	70.3	68.5	72.1	44.6	83.4	55.0
Sweden	74.2	71.8	76.5	42.2	86.1	70.0
United Kingdom	71.3	65.5	77.3	52.1	81.3	57.4

*2006 data, Source: Eurostat, detailed annual survey results.

Table 3: Participation Rates of Adult Population Aged 15-64 in the European Union - 2007 (in Percent)

	Overall	Females	Males	15-24 years	25-54 years	55-64 years
European Union (27 countries)	70.4	63.3	77.6	43.8	84.4	47.2
European Union (15 countries)	71.9	64.7	79.2	47.7	84.9	49.1
New Member States (10 countries)*	65.4	58.8	72.2	33.5	83.5	37.2
Belgium	67.1	60.4	73.6	33.9	85.3	35.9
Bulgaria	66.3	62.1	70.6	28.9	84.5	45.7
Czech Republic	69.9	61.5	78.1	31.9	87.8	48.2
Denmark	80.2	76.4	83.9	70.9	89.0	60.8
Germany*	76.1	70.4	81.7	51.3	87.8	58.1
Estonia	72.9	68.7	77.5	38.3	88.5	62.2
Ireland	72.2	63.1	81.2	53.1	82.2	55.5
Greece	67.0	54.9	79.1	31.1	81.9	43.9
Spain	71.3	61.0	81.3	47.8	82.8	46.1
France	70.1	65.5	74.9	39.6	88.2	39.4
Italy	62.5	50.7	74.4	30.9	77.6	34.6
Cyprus	73.9	65.4	82.9	41.7	86.7	57.7
Latvia	72.8	68.3	77.6	43.0	87.2	60.3
Lithuania	67.9	65.0	71.0	27.4	86.0	55.6
Luxembourg	66.9	58.9	75.0	26.5	84.7	32.7
Hungary	61.9	55.1	69.0	25.6	80.0	34.5
Malta	59.5	39.9	78.9	53.1	69.0	29.4
Netherlands	77.9	71.7	84.1	71.1	87.3	52.4
Austria	74.7	67.8	81.7	60.8	87.4	39.8
Poland	63.2	56.5	70.0	33.0	81.7	31.8
Portugal	74.1	68.8	79.4	41.9	87.8	54.4
Romania	63.0	56.0	70.1	30.5	79.0	42.4
Slovenia	71.3	66.6	75.8	41.8	89.3	34.6
Slovakia	68.3	60.8	75.9	34.6	86.9	38.8
Finland	75.5	73.7	77.2	53.2	88.0	58.7
Sweden	79.1	76.8	81.4	52.2	90.0	72.8
United Kingdom	75.0	68.6	81.6	59.2	84.5	59.3

2006 data, *including ex-GDR from 1991, Source: Eurostat, detailed annual survey results.

Table 4: Unemployment Rates of Adult Population Aged 15-64 in the European Union - 1990 - 2007 (in Percent)

	1990	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
EU (27 countries)							9.4	8.7	9.0	9.1	9.3	9.0	8.4	7.2
EU (15 countries)		10.8	11.0	10.8	10.3	9.5	8.5	7.4	7.7	8.1	8.3	8.2	7.9	7.1
NMS10 ¹							13.8	14.7	15.0	14.5	14.5	13.6	11.0	
Belgium	7.3	9.4	9.5	9.0	9.4	8.7	6.6	6.2	6.9	7.7	7.4	8.5	8.3	7.5
Bulgaria							16.4	20.0	18.3	13.9	12.2	10.2	9.0	6.9
Czech Republic				4.3	5.9	8.5	8.8	8.0	7.1	7.6	8.3	8.0	7.2	5.4
Denmark	8.5	7.0	6.9	5.4	5.1	5.2	4.5	4.2	4.3	5.5	5.3	4.9	4.0	3.8
Germany*	4.9	8.2	8.9	9.9	9.9	8.9	8.0	7.8	8.6	9.9	10.8	11.2	10.4	8.7
Estonia				10.5	9.7	11.7	13.4	12.6	9.6	11.0	10.4	8.1	6.0	4.8
Ireland	14.4	12.2	11.9	10.4	7.8	5.9	4.4	3.7	4.3	4.6	4.6	4.3	4.4	4.6
Greece	7.2	9.3	9.9	9.8	11.1	12.1	11.5	10.6	10.1	9.5	10.4	10.0	9.0	8.4
Spain	16.4	22.8	22.3	20.8	18.8	15.6	13.9	10.4	11.3	11.3	11.1	9.2	8.6	8.3
France	9.4	11.9	12.4	12.6	12.1	12.0	10.3	8.6	8.7	8.6	9.2	8.9	9.5	8.1
Italy	9.9	11.8	12.0	12.1	12.3	11.8	11.0	9.7	9.3	9.0	8.0	7.8	6.9	6.2
Cyprus							5.1	4.0	3.4	4.2	4.4	5.4	4.7	4.0
Latvia					14.7	14.0	14.5	13.4	13.4	10.7	10.1	9.0	7.0	6.1
Lithuania					13.9	13.6	16.3	17.1	13.2	13.0	11.4	8.4	5.7	4.4
Luxembourg	1.6	2.9	3.3	2.5	2.8	2.4	2.4	1.8	2.6	3.7	5.1	4.5	4.7	4.1
Hungary			10.0	9.0	8.9	7.0	6.6	5.7	5.6	5.8	5.9	7.2	7.5	7.4
Malta							6.4	7.2	7	7.5	7.4	7.4	7.3	6.5
Netherlands	7.7	7.2	6.5	5.6	4.4	3.6	2.7	2.1	2.6	3.6	4.7	4.8	4.5	3.6
Austria		4.4	5.3	5.2	5.5	4.7	4.7	4.0	4.9	4.8	5.3	5.2	4.8	4.5
Poland				11.2	10.2	12.6	16.6	18.7	20.2	19.7	19.4	18.0	14.0	9.7
Portugal	4.8	7.4	7.7	6.9	4.9	4.8	4.0	4.1	4.8	6.5	6.7	8.1	8.1	8.5
Romania				6.0	6.2	6.9	7.7	7.3	8.8	7.4	8.1	7.5	7.6	6.8
Slovenia			6.9	6.8	7.6	7.5	7.1	5.8	6.1	6.6	6.1	6.7	6.1	5.0
Slovakia					12.2	16.0	19.1	19.4	18.7	17.2	18.6	16.3	13.4	11.2
Finland		17.2	15.7	15.1	13.3	11.8	11.2	10.4	10.5	10.5	10.4	9.7	9.0	6.9
Sweden		9.0	9.7	10.5	9.1	7.7	5.5	4.8	5.0	5.6	6.8	7.9	7.1	6.2
United Kingdom	7.0	8.8	8.3	7.1	6.3	6.1	5.6	4.7	5.1	4.8	4.6	4.6	5.4	5.2

¹ New Member States (10 countries), *including ex-GDR from 1991, Source: Eurostat, detailed annual survey results.

Table 5: Unemployment Rates of Adult Population in the EU and the US - 1990 - 2007 (in Percent as a Share of the Total Active Population)

	1990	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
EU (27 countries)							8.7	8.5	8.9	9.0	9.0	8.9	8.2	7.1
EU (15 countries)		10.0	10.1	9.8	9.3	8.6	7.7	7.2	7.6	7.9	8.1	8.1	7.7	7.0
NMS10 ¹							11.7	12.2	12.6	12.2	12.3	11.6	9.3	
Belgium	6.6	9.7	9.5	9.2	9.3	8.5	6.9	6.6	7.5	8.2	8.4	8.5	8.3	7.5
Bulgaria							16.4	19.5	18.2	13.7	12.1	10.1	9.0	6.9
Czech Republic					6.4	8.6	8.7	8.0	7.3	7.8	8.3	7.9	7.2	5.3
Denmark	7.2	6.7	6.3	5.2	4.9	5.2	4.3	4.5	4.6	5.4	5.5	4.8	3.9	3.8
Germany*		8.0	8.7	9.4	9.1	8.2	7.5	7.6	8.4	9.3	9.8	10.7	9.8	8.4
Estonia				9.6	9.2	11.3	12.8	12.4	10.3	10.0	9.7	7.9	5.9	4.7
Ireland	13.4	12.3	11.7	9.9	7.5	5.7	4.3	4.0	4.5	4.7	4.5	4.4	4.5	4.7
Greece	6.4	9.2	9.6	9.8	10.8	12.0	11.2	10.7	10.3	9.7	10.5	9.9	8.9	8.3
Spain	13.0	18.4	17.8	16.7	15.0	12.5	11.1	10.3	11.1	11.1	10.6	9.2	8.5	8.3
France	8.4	11.0	11.5	11.5	11.0	10.4	9.0	8.3	8.6	9.0	9.3	9.2	9.2	8.3
Italy	8.9	11.2	11.2	11.3	11.4	11.0	10.1	9.1	8.6	8.5	8.1	7.7	6.8	6.1
Cyprus							4.9	3.8	3.6	4.1	4.7	5.3	4.6	3.9
Latvia					14.3	14.0	13.7	12.9	12.2	10.5	10.4	8.9	6.8	6.0
Lithuania					13.2	13.7	16.4	16.5	13.5	12.5	11.4	8.3	5.6	4.3
Luxembourg	1.7	2.9	2.9	2.7	2.7	2.4	2.3	2.0	2.7	3.7	5.1	4.5	4.7	4.1
Hungary			9.6	9.0	8.4	6.9	6.4	5.7	5.8	5.9	6.1	7.2	7.5	7.4
Netherlands	5.8	6.6	6.0	4.9	3.8	3.2	2.8	2.2	2.8	3.7	4.6	4.7	3.9	3.2
Austria		3.9	4.3	4.4	4.5	3.9	3.6	3.6	4.2	4.3	4.8	5.2	4.8	4.4
Poland				10.9	10.2	13.4	16.2	18.3	20.0	19.7	19.0	17.8	13.9	9.6
Portugal	4.8	7.1	7.2	6.7	4.9	4.4	3.9	4.0	5.0	6.3	6.7	7.6	7.7	8.0
Romania						7.1	7.3	6.8	8.6	7.0	8.1	7.2	7.3	6.4
Slovenia			6.9	6.9	7.4	7.3	6.7	6.2	6.3	6.7	6.3	6.5	6.0	4.9
Slovakia					12.6	16.4	18.8	19.3	18.7	17.6	18.2	16.3	13.4	11.1
Finland	3.2	15.4	14.6	12.7	11.4	10.2	9.8	9.1	9.1	9.0	8.8	8.4	7.7	6.9
Sweden	1.7	8.8	9.6	9.9	8.2	6.7	5.6	4.9	4.9	5.6	6.3	7.4	7.0	6.2
United Kingdom	6.9	8.5	7.9	6.8	6.1	6.0	5.5	5.0	5.1	4.9	4.7	4.8	5.3	5.3
United States	5.5	5.6	5.4	4.9	4.5	4.2	4.0	4.8	5.8	6.0	5.5	5.1	4.6	4.6

¹ New Member States (10 countries), *including ex-GDR from 1991, Source: Eurostat, structural indicators

Table 6: Highest Level of Education Attained of Active Population - 2007(4th Quarter) (Shares in Percent)

	Overall			Females			Males		
	ISCED 0-2	ISCED 3-4	ISCED 5-6	ISCED 0-2	ISCED 3-4	ISCED 5-6	ISCED 0-2	ISCED 3-4	ISCED 5-6
EU (27 countries)	23.7	48.8	27.5	22.1	48.0	29.9	25.0	49.5	25.5
EU (15 countries)	26.7	44.2	29.1	24.7	44.2	31.1	28.3	44.2	27.5
NMS10*	9.9	68.7	21.5	9.7	64.8	25.5	10.0	71.9	18.1
Belgium	23.7	37.6	38.7	20.7	35.6	43.8	26.2	39.3	34.5
Bulgaria	15.3	58.8	25.8	14.3	53.9	31.9	16.3	63.3	20.4
Czech Republic	6.8	77.9	15.3	9.4	75.9	14.7	4.8	79.4	15.7
Denmark	18.5	43.5	38.0	17.4	40.8	41.8	19.6	45.9	34.5
Germany ¹	12.9	60.0	27.1	14.2	61.7	24.1	11.8	58.6	29.6
Estonia	8.0	56.4	35.6	6.4	49.9	43.7	9.4	62.8	27.8
Ireland	25.7	36.4	37.8	18.6	36.2	45.2	31.1	36.6	32.3
Greece	34.5	38.9	26.6	28.3	41.2	30.5	38.8	37.3	23.9
Spain	43.2	22.9	34.0	37.6	23.9	38.5	47.3	22.1	30.6
France	25.7	43.8	30.5	25.6	41.1	33.2	25.8	46.2	28.0
Italy	39.0	44.0	17.1	30.9	47.5	21.6	44.6	41.5	13.9
Cyprus	23.0	39.6	37.4	20.8	37.5	41.7	24.8	41.2	34.0
Latvia	10.9	63.2	25.9	7.2	61.1	31.7	14.5	65.3	20.3
Lithuania	7.2	59.8	32.9	5.2	56.0	38.8	9.2	63.7	27.0
Luxembourg	30.7	40.0	29.3	31.4	38.1	30.5	30.2	41.6	28.2
Hungary	13.4	64.9	21.7	14.8	60.2	25.0	12.3	68.9	18.8
Malta	63.0	18.5	18.5	54.8	19.9	25.3	66.6	18.0	15.4
Netherlands	21.4	43.6	35.0	20.9	44.4	34.7	21.9	43.0	35.1
Austria	15.4	64.4	20.2	20.1	62.2	17.7	11.5	66.2	22.3
Poland	9.3	67.7	23.0	8.4	62.6	29.0	10.1	71.9	18.0
Portugal	69.8	14.4	15.8	64.9	15.2	19.9	74.2	13.6	12.2
Romania	19.3	65.2	15.5	21.2	61.9	16.9	17.8	67.8	14.3
Slovenia	13.7	60.5	25.8	14.0	54.2	31.7	13.5	65.8	20.7
Slovakia	6.6	77.2	16.2	8.1	74.2	17.7	5.4	79.7	14.9
Finland	15.4	44.4	40.2	13.1	41.1	45.9	17.5	47.5	34.9
Sweden	12.7	53.8	33.5	10.0	50.4	39.6	15.1	56.9	28.0
United Kingdom	21.5	42.8	35.7	23.1	39.4	37.5	20.1	45.8	34.1

*New Member States (10 countries); 2006 data, ¹including ex-GDR from 1991, Source: Eurostat, detailed annual survey results.

Table 7: Participation of the Adult Population Aged 25-64 in Lifelong Learning Activities - 2006/2007 (in Percent)

	2007			2006						
	Overall	Female	Male	Overall	Female	Male	25-34 years	35-44 years	45-54 years	55-64 years
European Union (27 countries)	9.7	10.6	8.8	9.6	10.4	8.8	15.5	9.7	7.6	4.6
European Union (15 countries)	11.3	12.4	10.2	11.1	12.1	10.2	17.7	11.1	9.2	5.6
Belgium	7.2	7.4	7.0	7.5	7.6	7.4	11.8	8.0	6.4	3.5
Bulgaria	1.3	1.3	1.4	1.3	1.3	1.3	4.0	0.8	-	-
Czech Republic	5.7	5.9	5.5	5.6	5.9	5.4	9.2	6.2	4.2	2.0
Denmark	29.2	34.2	24.2	29.2	33.8	24.6	39.2	29.3	26.5	21.8
Germany	7.8	7.6	8.0	7.5	7.3	7.8	16.7	6.6	5.0	2.5
Estonia	7.0	9.3	4.6	6.5	8.6	4.2	12.2	7.4	-	-
Ireland	7.6	9.0	6.2	7.5	8.9	6.1	10.6	7.4	6.1	3.7
Greece	2.1	2.1	2.2	1.9	1.8	2.0	5.1	1.4	0.4	-
Spain	10.4	11.5	9.3	10.4	11.5	9.3	16.6	9.9	7.4	4.6
France	7.4	7.9	7.0	7.5	7.8	7.2	12.5	7.8	6.3	2.7
Italy	6.2	6.6	5.9	6.1	6.5	5.7	12.5	5.3	4.2	1.8
Cyprus	8.4	8.6	8.1	7.1	7.8	6.5	11.7	7.2	5.3	2.7
Latvia	7.1	9.3	4.6	6.9	9.3	4.1	11.2	8.1	5.3	1.8
Lithuania	5.3	6.8	3.6	4.9	6.6	2.9	11.4	3.7	2.3	-
Luxembourg	7.0	7.4	6.5	8.2	8.7	7.6	13.9	8.7	5.9	3.2
Hungary	3.6	4.1	3.0	3.8	4.4	3.1	8.9	3.6	1.4	0.3
Malta	6.0	5.7	6.4	5.5	5.6	5.5	9.1	6.6	3.9	-
Netherlands	16.6	17.0	16.1	15.6	15.9	15.3	25.1	16.8	12.9	7.1
Austria	12.8	14.0	11.6	13.1	14.0	12.2	20.3	13.4	11.2	6.5
Poland	5.1	5.5	4.7	4.7	5.1	4.3	10.6	4.2	2.0	0.8
Portugal	4.4	4.5	4.4	3.8	4.0	3.7	8.6	3.3	1.6	0.7
Romania	1.3	1.4	1.2	1.3	1.3	1.3	3.7	0.8	0.3	-
Slovenia	14.8	16.1	13.5	15.0	16.3	13.8	27.0	16.2	9.9	5.4
Slovakia	3.9	4.3	3.4	4.3	4.6	4.0	7.3	4.2	2.7	1.8
Finland	23.4	27.5	19.4	23.1	27.0	19.3	33.8	24.9	21.5	13.5
Sweden (2005)				32.1	36.5	27.9	36.8	32.9	31.2	26.7
United Kingdom				26.6	31.2	22.0	32.0	28.1	25.3	18.6

Source: Eurostat, detailed annual survey results.

Table 8: Public Expenditures on Labour Market Policies - 2006 (in Percent of GDP)

	Labour market services	Training	Job rotation and job sharing	Employment incentives	Supported employment and rehabilitation	Direct job creation	Start-up incentives	Out-of-work income maintenance and support	Early retirement
EU (27 countries)	0.216	0.21	0.003	0.124	0.062	0.072	0.039	1.111	0.085
EU (15 countries)	0.224	0.22	0.004	0.129	0.062	0.075	0.041	1.169	0.078
Belgium	0.204	0.2	-	0.208	0.123	0.352	0.003	1.399	0.415
Bulgaria	0.06	0.045	-	0.045	0.008	0.286	0.005	0.182	-
Czech Republic	0.129	0.011	-	0.03	0.053	0.028	0.004	0.232	-
Denmark*	0.155	.509	-	0.446	0.478	0.478	0	0.1833	0.681
Germany	0.266	0.338	0	0.058	0.008	0.088	0.119	2.04	0.055
Estonia	0.023	0.043	-	0.004	0	-	0.003	0.075	-
Ireland	0.242	0.21	-	0.033	0.009	0.208	-	0.798	0.065
Greece*	0.011	0.036	-	0.019	-	-	0.001	n.a.	n.a.
Spain	0.095	0.145	0.007	0.316	0.021	0.061	0.079	1.395	0.038
France	0.243	0.289	-	0.123	0.067	0.194	0.01	1.348	0.046
Italy	0.032	0.215	0.003	0.179	-	0.009	0.041	0.686	0.107
Cyprus	n.a.	0.008	-	0.04	n.a.	-	0.012	0.659	-
Latvia	0.072	0.103	-	0.049	0.006	0.013	-	0.301	-
Lithuania	0.089	0.071	0	0.057	0.003	0.047	0	0.12	0.005
Luxembourg	0.055	0.122	-	0.201	0.009	0.06	0	0.419	0.174
Hungary	0.091	0.061	-	0.082	-	0.047	0.003	0.35	0.007
Malta	n.a.	n.a.	-	n.a.	-	0.004	n.a.	-	-
Netherlands	0.47	0.13	-	0.128	0.488	-	-	1.465	-
Austria	0.175	0.4	0	0.055	0.036	0.044	0.005	1.141	0.252
Poland	0.094	0.101	n.a.	0.048	0.156	0.016	0.037	0.26	0.451
Portugal	0.128	0.251	0	0.132	0.037	0.029	0.002	1.119	0.146
Romania	0.042	0.017	-	0.054	-	0.034	0.001	0.277	-
Slovenia	0.095	0.058	-	0.028	-	0.074	0.019	0.39	-
Slovakia	0.173	0.01	-	0.023	0.012	0.054	0.044	0.121	0.218
Finland	0.13	0.374	0.052	0.096	0.096	0.085	0.018	1.286	0.403
Sweden	0.187	0.33	0.063	0.514	0.196	-	0.03	0.958	-
United Kingdom	0.368	0.02	-	0.011	0.011	0.004	-	0.187	-

*2005 data, Source: Eurostat.

Table 9: Net Unemployment Replacement Rates over 60 Months of Unemployment (Averaged over 5 Years) - 2005 (in Percent)¹

	Without social assistance						With social assistance					
	No children			2 children			No children			2 children		
	Single ²	Married couple ³	LP ⁴	Married couple	LP ⁴	Married couple	Overall ⁵	Single	Married couple	LP	Married couple	Overall ⁵
Austria	51	53	65	67	65	67	59	52	59	66	72	62
Belgium	59	59	67	63	67	63	62	59	59	67	63	62
Czech Republic	11	13	30	26	30	26	20	39	61	62	70	58
Denmark	61	62	76	72	76	72	68	74	74	84	83	79
Finland	52	61	73	69	73	69	64	58	73	73	84	72
France	51	52	62	61	62	61	57	51	57	65	69	61
Germany	24	25	42	41	42	41	33	48	56	71	73	62
Greece	14	15	20	20	20	20	17	14	15	20	20	17
Hungary	9	10	31	29	31	29	20	26	43	44	56	42
Ireland ⁶	37	59	60	65	60	65	55	62	82	63	83	73
Italy	6	6	7	7	7	7	7	6	6	7	7	7
Luxembourg	17	17	31	30	31	30	24	58	73	68	81	70
Netherlands	38	38	42	42	42	42	40	64	73	70	75	71
Poland	35	35	81	39	81	39	47	41	50	83	63	59
Portugal	40	40	49	47	49	47	44	49	58	65	74	61
Slovak Republic	6	6	13	12	13	12	9	26	38	41	46	38
Spain	36	35	39	39	39	39	37	45	46	53	52	49
Sweden	15	15	46	39	46	39	29	61	73	64	82	70
United Kingdom	50	58	66	72	66	72	61	50	59	66	73	62
United States	6	6	5	5	5	5	6	14	19	41	46	30

1. Unweighted averages, for earnings levels of 67% and 100% of average worker.

2. Single person, 3. One-earner married couple, 4. Lone parent, 5. Overall average

6. Average worker value not available. Calculations are based on average productive worker.

Source: OECD, Tax-Benefit Models. www.oecd.org/els/social/workincentives

Table 10: Net Pension Replacement Rates by Earnings - 2004 (in Percent)

	Individual earnings, multiple of mean							Median
	0.5	0.75	1	1.5	2			
Belgium	77.3	65.5	63.0	51.1	40.7		64.4	
Czech Republic	98.8	75.6	64.4	49.3	40.2		70.3	
Denmark	132.7	101.6	86.7	77.0	72.2		94.1	
Germany	53.4	56.6	58.0	59.2	44.4		57.3	
Ireland	65.8	49.3	38.5	29.3	23.5		44.4	
Greece	113.6	111.7	110.1	110.3	107.0		111.1	
Spain	82.0	83.9	84.5	85.2	72.4		84.2	
France	78.4	64.9	63.1	58.0	55.4		62.8	
Italy ¹	81.8 (63.6)	78.2 (64.4)	77.9 (63.4)	78.1 (63.7)	79.3 (63.5)		77.9 (63.8)	
Luxembourg	107.6	99.8	96.2	92.9	91.0		98.0	
Hungary	94.7	95.1	102.2	98.5	98.5		96.5	
Netherlands	97.0	103.8	96.8	96.3	94.8		105.3	
Austria	90.4	90.6	90.9	89.2	66.4		90.6	
Poland ¹	74.5 (57.5)	74.8 (55.3)	74.9(55.2)	75 (55.0)	77.1 (56.4)		74.8 (55.3)	
Portugal	81.6	66.0	69.2	72.2	73.7		67.4	
Slovakia	66.4	70.6	72.9	75.4	76.7		71.9	
Finland	77.4	68.4	68.8	70.3	70.5		68.0	
Sweden	81.4	69.2	64.0	71.9	73.9		66.2	
United Kingdom	66.1	49.2	41.1	30.6	24.0		45.4	
United States	67.4	58.0	52.4	47.9	43.2		55.3	

Results are based on a single, full-career worker drawing the pension from the normal eligibility age.

¹ In brackets values for females, where they are different from males.

Source: OECD (2007).

Table 11: OECD Employment Protection Index - Late 1990s, 2003

OECD Employment Protection Index	Regular Employment		Temporary Employment		Collective Dismissals		Overall EPL (Version 2)	
	Late 1990s	2003	Late 1990s	2003	Late 1990s	2003	Late 1990s	2003
Belgium	1.7	1.7	2.6	2.6	4.1	4.1	2.5	2.5
Czech Republic	3.3	3.3	0.5	0.5	2.1	2.1	1.9	1.9
Denmark	1.5	1.5	1.4	1.4	3.9	3.9	1.8	1.8
Germany	2.7	2.7	2.3	1.8	3.5	3.8	2.6	2.5
Ireland	1.6	1.6	0.3	0.6	2.4	2.4	1.2	1.3
Greece	2.3	2.4	4.8	3.3	3.3	3.3	3.5	2.9
Spain	2.6	2.6	3.3	3.5	3.1	3.1	3.0	3.1
France	2.3	2.5	3.6	3.6	2.1	2.1	2.8	2.9
Italy	1.8	1.8	3.6	2.1	4.9	4.9	3.1	2.4
Hungary	1.9	1.9	0.6	1.1	2.9	2.9	1.5	1.7
Netherlands	3.1	3.1	1.2	1.2	3.0	3.0	2.3	2.3
Austria	2.9	2.4	1.5	1.5	3.3	3.3	2.4	2.2
Poland	2.2	2.2	0.8	1.3	4.1	4.1	1.9	2.1
Portugal	4.3	4.3	3.0	2.8	3.6	3.6	3.7	3.5
Slovakia	3.6	3.5	1.1	0.4	3.3	2.5	2.5	2.0
Finland	2.3	2.2	1.9	1.9	2.6	2.6	2.2	2.1
Sweden	2.9	2.9	1.6	1.6	4.5	4.5	2.6	2.6
United Kingdom	0.9	1.1	0.3	0.4	2.9	2.9	1.0	1.1
United States	0.2	0.2	0.3	0.3	2.9	2.9	0.7	0.7

Source: OECD (2004), p. 117.

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