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Non-technical summary: The German system of social welfare is widely perceived as one major cause of high unemployment rates among the unskilled. It comprises social assistance and unemployment assistance. Both programmes provide income support predominantly for those persons who either have exhausted their unemployment benefits or who do not have enough labour market experience to receive those benefits. In the recent public debate, the system of social assistance in particular has been held responsible for creating labour market disincentives on two grounds: first, the level of social assistance is usually considered too high so as to impose sufficient incentives to take up a low-income job. Secondly, further disincentives are created by high transfer withdrawal rates involving a considerable amount of benefits lost when welfare recipients earn supplementary labour incomes. These disincentives effects have led politicians and academics to advocate programs making labour market participation attractive enough to reduce the need for welfare receipt. What is common with the majority of these proposals is that they generally suggest a reduction in effective marginal tax rates in the lower income ranges associated with a decrease in social benefits to stimulate labour supply.

The present paper uses a computable general equilibrium (CGE) model to assess the effectiveness of recent social welfare reform proposals in terms of their impact on labour supply and unemployment. We employ the CGE-model PACE-L to simulate a variety of reform proposals. This model incorporates important institutional features of the German labour market. In particular, PACE-L accounts for sectoral wage bargaining and contains a relatively detailed incorporation of the German tax-benefit system. Moreover, the model employs a discrete choice model of labour supply where individuals can choose from a finite set of hours only.

Compared to microsimulation studies, which generally take a partial equilibrium perspective, the main advantage of our approach lies in the ability to identify general equilibrium effects of reform proposals. This is important for several reasons: first, one important aspect of welfare reforms that is typically neglected by microsimulation studies is e.g. the impact on wage formation. Provided that additional labour supply reduces the equilibrium wage, this is likely to have negative feed-back effects on labour supply. Second, a general equilibrium approach enables us to take into account the consequences of welfare reforms for the demand side of the labour market. This is particularly important for an assessment of the employment effects as positive employment effects are to be expected only if additional labour supply is at least partially absorbed by labour demand.

In sum, our numerical results indicate that substantial employment effects may be expected only from major cuts in welfare payments. General equilibrium wage responses are found to be rather modest. However, as both reform proposals entail a slight decrease in unemployment, this suggests that the union wage reactions are strong enough to prevent additional labour supply translating into higher unemployment. Moreover, although the general equilibrium wage reactions can be shown to mitigate the labour supply effects, these effects appear to be rather small.

Reforming Social Welfare in Germany - An Applied General Equilibrium Analysis

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Abstract

This paper analyses the effects of a social assistance reform in Germany. In contrast to studies which are based on microsimulation methods we use a computable general equilibrium model which incorporates a discrete choice model of labour supply to simulate a variety of reform scenarios. The main contribution is that we are able to identify general equilibrium effects of a reform on wages and unemployment. The simulation results show that general equilibrium wage reactions tend to mitigate labour supply effects. Moreover, the simulations indicate that substantial employment effects are to be expected only from major cuts in welfare payments.

Keywords: social assistance, discrete labour supply model, applied general equilibrium

JEL Code: D58, J22, J51

*Corresponding author: Nicole Gürtzgen, ZEW, Labour Markets, Human Resources and Social Policy, L 7,1, D-68161 Mannheim, E-mail: Guertzgen@zew.de. We would like to thank Michael Feil and Peter Jacobebbinghaus for their helpful comments. We are particularly thankful to Peter Jacobebbinghaus for providing us with the necessary data from the ZEW's microsimulation model. The present paper has originated as part of the larger project "Reforming the Welfare State" (Reform der Sozialen Sicherung) supported by the "Gemeinschaftsinitiative Soziale Marktwirtschaft" that dealt with a fundamental reform of all parts of the German welfare system (see project report by Breyer et al. 2004).

1 Introduction

In the last decade, the German economy experienced a substantial increase in unemployment especially among low-skilled workers. Since the beginning of the 1990s, the unemployment rate in Western Germany of workers without any vocational qualification has risen to about 20 per cent while unemployment rates among workers holding a vocational degree increased only to 5 per cent (IAB 2002). The German system of social welfare is widely perceived as a major cause of this. It comprises social assistance and unemployment assistance. Both programmes are means-tested and provide income support predominantly for those persons who have either exhausted their unemployment benefits or who do not have enough labour market experience to receive those benefits. In recent public debate, the system of social assistance in particular has been held responsible for creating labour market disincentives on two grounds: first, the level of social assistance is usually considered too high so as to impose sufficient incentives to take up a low-income job. Secondly, high transfer withdrawal rates involve a considerable amount of benefits lost when welfare recipients earn supplementary labour incomes. In light of these disincentives effects, several reform proposals have been made aiming at improving incentives of low-income workers to participate in the labour market (e.g. Sinn et al. 2002, Wissenschaftlicher Beirat 2002, Breyer et al. 2004). What is common with the majority of these proposals is that they generally suggest a reduction in marginal tax rates in the lower income ranges associated with a decrease in social benefits to stimulate labour supply (for an overview see e.g. Zimmermann 2003).

To assess the effectiveness of reform proposals in terms of their impact on employment, income distribution and government expenditures, microsimulation studies have now become widely used for a quantitative analysis of tax-benefit reforms. Since these reforms are generally designed to stimulate labour supply and employment, the principal aim of microsimulation studies is to take into account behavourial effects of policy reforms when estimating their budgetary and distributional consequences. There are a number of microsimulation studies concerned with a quantitative assessment of social welfare reforms in Germany (e.g. Buslei and Steiner 1999, Kaltenborn 2000, Steiner 2000, Bonin et al. 2002, and Steiner and Jacobebbinghaus 2003). However, a common drawback of microsimulation studies is that they generally focus on labour supply effects at given wages and fail to account for general equilibrium effects of tax-benefit reforms. This may be justified as long as the number of individuals who are affected by such a reform is small. By contrast, if a policy concerns a large fraction of the relevant population, general equilibrium effects may change the results considerably. One important aspect is e.g. the general equilibrium impact of welfare reforms on wage formation. In a competitive labour market, additional labour supply may be expected to decrease the wage in equilibrium which is likely to have negative feed-back effects on labour supply. With union wage bargaining, a reduction in welfare payments may be expected to weaken the fall-back position of union workers which is also likely to translate into lower union wages. Furthermore, another relevant aspect commonly neglected by microsimulation approaches are the consequences of welfare reforms for the demand side of the labour market: identifying

the effects on labour demand is crucial for an assessment of the employment effects as positive employment effects are to be expected only if additional labour supply is at least partially absorbed by labour demand.

To overcome the problems associated with microsimulation approaches, the present paper uses a computable general equilibrium (CGE) model to assess the effectiveness of recent social welfare reform proposals in terms of their impact on labour supply and unemployment. To date, there is no work that we are aware of that attempts to quantify the employment effects of German social welfare reforms in a computable general equilibrium setting. We employ the CGE-model PACE-L, which incorporates important institutional features of the German labour market (Böhringer et al. 2002, Boeters et al. 2004). The model accounts for sectoral wage bargaining and contains a relatively detailed incorporation of the German tax-benefit system. Moreover, PACE-L employs a discrete choice model of labour supply where individuals can choose from a finite set of hours only. These kinds of models have recently become increasingly popular in modelling labour supply as they provide a more realistic description of supply choices open to individuals (see e.g. van Soest 1995, Blundell and MaCurdy 1999). Moreover, discrete choice models allow for a straightforward distinction between labour supply responses along the intensive and the extensive margin. This difference is crucial because adverse labour supply effects that are generated by the present social assistance system primarily concern the participation decision, i.e. labour supply along the extensive margin. The incorporation of different working time categories enables us to differentiate households not only in terms of skill-composition and age but also in terms of the chosen working time. The latter point is particularly important as low-income employment may not only result from low wages but also from few hours worked.

The remainder of the paper is organised as follows: Section 2 describes the key features of the present German social assistance system and presents the main characteristics of recent reform proposals. Section 3 provides a brief description of the labour market module of the CGE-model PACE-L, which turns out to be most relevant for the present analysis. Section 4 discusses the expected economic effects of the reform scenarios that are presented in Section 2, while Section 5 reports the simulation results. Finally, we offer some discussion and conclusions in Section 6.

2 Reforming Social Assistance in Germany

2.1 Design of the German Status-Quo-System

The present section describes the key features of the German social assistance system. Social assistance (SA) becomes relevant only if the other transfer systems (e.g. unemployment benefits, unemployment assistance) do not provide sufficient income support. In particular, eligibility for SA payments requires that income from other sources fall short of some specified basic minimum income level. As a consequence, households who receive transfer payments from other sources may also be eligible for

SA, if those transfers are smaller than the specified minimum income level. While SA recipients may keep a small amount of earned labour incomes, transfer payments from other sources are fully deducted from SA payments. According to SA legislation, persons who are able to work are obliged to take any effort to earn their support themselves. Refusing to take up work may be sanctioned by a 25 per cent cut in SA benefits - in practice, however, this legislation is far from being fully enforced (Ochel 2003).

Household type	**Average monthly SA minimum income in €[1)]**	**Disposable labour income low-skilled in €[2)]**	**Wage-assistance differential in per cent**
Single no children	581.00	1212.85	108.8
Single 1 child	920.00	1419.65	54.3
Single 2 children	1215.00	1573.65	29.5
Single > 2 children	1586.00	1727.65	8.9
Married couple no children	899.00	1398.38	55.5
Married couple 1 child	1110.00	1552.38	39.9
Married couple 2 children	1343.00	1706.38	27.1
Married couple > 2 children	1768.00	1860.38	5.2

Table 1: Wage-assistance differentials for different household types

Source: Statistisches Bundesamt (2002) and own calculations.
1) Average over all German recipient households of the respective household type.
2) The disposable labour income consists of net labour earnings and child benefits. For the details of these calculations see section 3.1.3 and the appendix.

The basic minimum income level is household-specific and depends on household size and composition. In what follows, this minimum income will be referred to as the "SA minimum income". The SA minimum income specified to cover the so-called "socio-cultural" minimum consists of a basic rate ("Regelsatz") for each household member and a supplement covering housing and heating costs. Moreover, payments for special needs may be added. The basic rate for each household member will be referred to as the "basic SA rate". For the household head, for example, this rate currently amounts to about 300 € per month. The second column of Table 1 displays average total monthly SA minimum incomes for different household types in 2001 (Statistisches Bundesamt 2002).

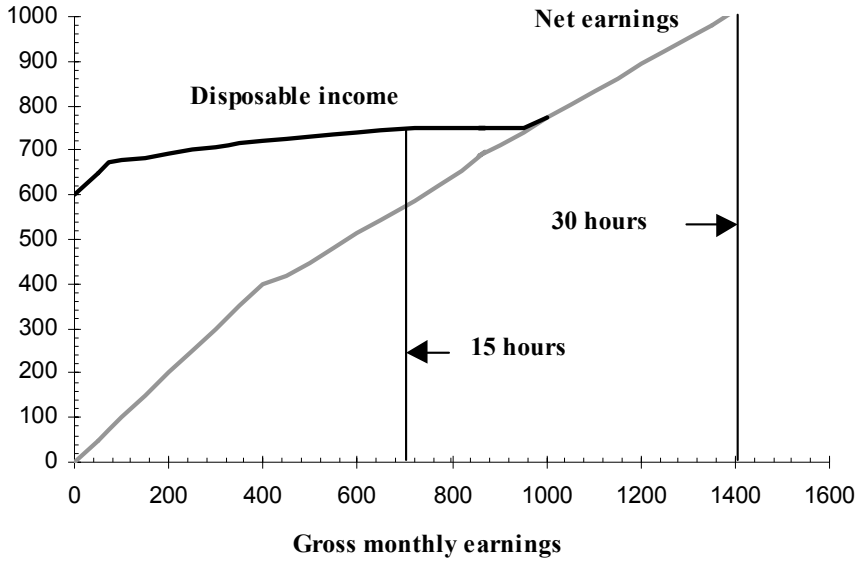
The design of the German SA system is widely criticised for creating labour supply disincentives on two grounds: first, the gap between earned labour income of low-skilled workers and SA minimum income with zero labour supply is usually considered

too small to encourage labour market participation. The wage-assistance differential, which measures by which amount disposable labour income exceeds the SA minimum income in percentage terms, provides an illustrative measure to assess the quantitative extent of this disincentive effect. The last column of Table 1 displays wage-assistance differentials for different household types. The calculations are performed on the basis of a full-time job of 38 hours per week. For couples, only either one of the partners is assumed to work while the spouse receives no labour or transfer income. The wage-assistance differentials reported in Table 1 reveal that the gap between disposable labour income and SA income ranges from 5.2 to about 55 per cent, except for singles without children, who exhibit a wage-assistance differential of more than 100 per cent. Moreover, the differential generally decreases with the number of children. Single parents and couples with more than two children exhibit a differential of less than 10 per cent. This is primarily caused by the fact that average basic SA rates for children exceed child benefits that are available for those individuals not entitled to SA payments. The figures reported in Table 1 therefore suggest that the present SA level appears to create considerable labour supply disincentives, particularly for low-income workers with children.

A guaranteed minimum income need not necessarily lead to a labour supply of zero hours if SA recipients are allowed to keep a substantial amount of additional labour earnings. The second important feature of the present SA system therefore concerns transfer withdrawal in case of supplementary labour earnings. At present, net earnings up to 25 per cent of the basic SA rate are not withdrawn. Over net earnings exceeding this amount, SA is withdrawn with a marginal transfer withdrawal rate of 85 per cent, where the marginal transfer withdrawal rate measures the amount of benefit lost when net earnings increase at the margin. The maximum net income allowance which is not deducted from SA payments currently amounts to half of the basic SA rate of the respective SA recipient. Figure 1 depicts the relationship between gross earnings and disposable income for a single person without children[1]. Assuming for simplicity an average SA minimum income of 600 € per month, a zero labour supply translates into a disposable income of 600 €. With a basic SA rate of 300 €, net earnings up to 75 € are not withdrawn. Over additional earnings beyond 75 € up to 575 € (corresponding to gross income amounts of 75 € and about 720 €), SA is phased out at a marginal rate of 85 per cent. Net earnings exceeding 575 € are subject to a transfer withdrawal rate of 100 per cent, since at 575 € the maximum allowance amounting to half of the basic SA rate (150 €) is reached. Eligibility for SA ranges up to net earnings of 750 €, which correspond to gross earnings of about 950 €. Figure 1 therefore illustrates that over a gross income range between 75 € and 950 €, SA recipients face substantial transfer withdrawal rates which are likely to discourage labour market participation.

[1]The calculation of net earnings and disposable income is described in more detail in Section 3.1.3 and in the appendix.

Fig. 1: Income function of a single without children in status-quo



Note: 15 and 30 hours refer to a weekly labour supply of a worker with a gross hourly wage of 10.8 €. For the details of the calculations of disposable income and net earnings see Section 3.1.3 and the appendix.

Finally, to assess the quantitative relevance in terms of the number of persons being affected by the disincentive effects of the present SA system, it is illustrative to calculate the number of SA recipients who are able to work. At the end of 2001, there were 2.7 million SA recipients. The so called "net employment potential" is obtained by subtracting the number of persons older than 60 and younger than 18 years of age, ill and unemployable individuals, persons with family responsibilities and those already employed or in training. According to this calculation, the employment potential of SA recipients amounted to about 1 million persons in 2001 (Statistisches Bundesamt 2002).

2.2 Reform Scenarios

The disincentive problems associated with the present system of SA have led to several reform proposals aiming at increasing labour market participation of low-income workers. What is common to the majority of the proposals is that they suggest a reduction in effective marginal tax rates at the bottom of the income distribution. The effective marginal tax rate measures the overall marginal tax resulting from income taxes, social security contributions as well as transfer withdrawal. These reductions may either be achieved by wage subsidies similar to the US-American EITC

(Earned Income Tax Credit) as proposed by Sinn et al. (2002), or by a reduction in the marginal transfer withdrawal rate as put forward by the Scientific Council of the Federal Economics Ministry (Wissenschaftlicher Beirat 2002) or by Breyer et al. (2004). The main problem with a reduction in the effective marginal tax rate within low income ranges is that it must lead to a substantial increase in effective marginal tax rates for higher income levels. Otherwise a reduction is likely to lead to a considerable increase in the number of persons being entitled to wage subsidies or SA payments and, as a consequence, to a substantial expansion of government expenditures. To limit fiscal costs associated with a reform of the German SA system, most of the reform proposals therefore suggest a simultaneous reduction in the SA minimum level for those persons who are able to work. To avoid a cut in SA payments for those persons who are able to work but do not find a job in the regular labour market, proposals suggesting a substantial reduction in SA minimum income levels generally include some form of communal work programs (Sinn et al. 2002, Ochel 2003, Breyer et al. 2004). These programs are typically designed to guarantee a minimum income amounting to the former SA level.

To capture the main features of the reform proposals put forward in the recent political discussion, we simulate on the one hand a substantial reduction in the SA minimum income level associated with a considerable reduction in the transfer withdrawal rate. As a variant, we simulate a moderate reduction in SA combined with a less pronounced decrease in the marginal transfer withdrawal rate. Contrary to the reform proposals put forward in the recent discussion, we do not account for any communal work programs for those employable SA recipients who do not find a job in the regular labour market[2]. The following sections describe the reform scenarios in more detail.

2.2.1 Scenario 1

The first reform scenario suggests a substantial reduction in the SA level for those welfare recipients who are able to work. More specifically, the scenario involves a complete cut in the basic SA rate for those recipients belonging to the net employment potential. More detailed definition criteria of employability will be given in Section 3.1.1. Simultaneously, the transfer withdrawal rate is cut to zero up to the net earnings amount that is necessary to reach the status-quo SA level. I.e., a single person without children, for example, may earn 300 € net labour income that is not withdrawn. Net earnings in excess of this amount are subject to a transfer withdrawal rate of 50 per cent up to the breakeven income where net income corresponds exactly to disposable income. For a single person without children, eligibility for SA therefore extends up to net earnings of 900 €. The transfer withdrawal rate for non-employable single individuals remains the same as in the status-quo system,

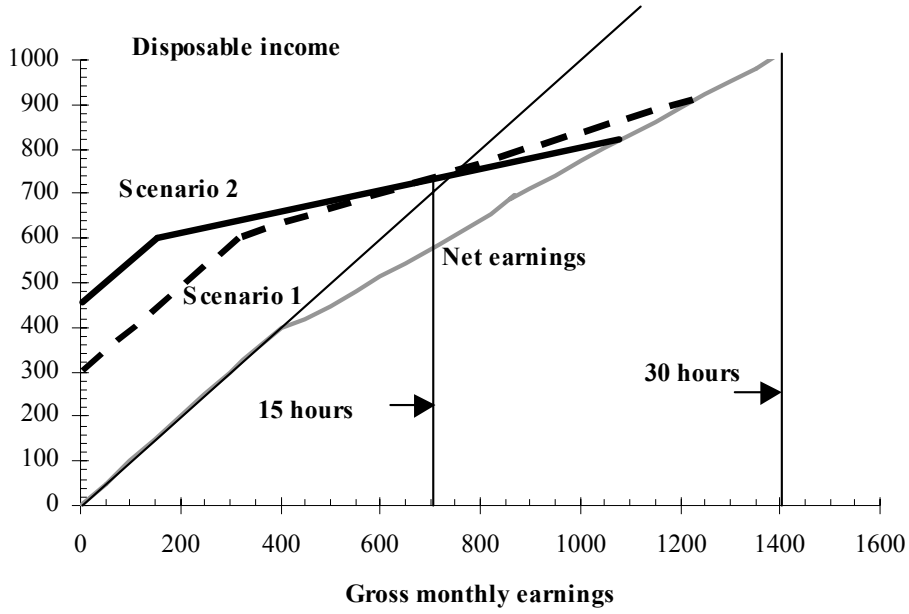
[2]We justify this by assuming that the availability of public work jobs has no major impact on the labour supply decision, which we are mainly interested in. Apparently, the neglect of public work-programs which guarantee the former SA level for those individuals willing to work leads to an overestimation of negative distributional effects.

whereas employable partners of non-employable persons in couple households face a lower transfer withdrawal rate.

2.2.2 Scenario 2

The second reform scenario suggests only a 50 per cent cut in the basic SA rate for those SA recipients who are able to work. The transfer withdrawal rate is again cut to zero up to the net earnings amount that is necessary to reach the status-quo SA level. For a single person without children this implies that he or she may earn 150 € net labour income that is not withdrawn. Net earnings exceeding this amount are subject to a transfer withdrawal rate of 70 per cent up to the breakeven income where net income corresponds exactly to disposable income. Due to the more generous SA level as compared to Scenario 1, a higher marginal transfer withdrawal rate is necessary in Scenario 2 to restrict the income range where persons are entitled to SA payments. For a single person without children, eligibility for SA now extends up to a net income amount of about 800 €. Figure 2 illustrates the relationship between disposable income and gross labour income for the two reform scenarios for a single person without children.

Fig. 2: Income function of a single without children in Scenarios 1 and 2



Note: 15 and 30 hours refer to a weekly labour supply of a worker with a gross hourly wage of 10.8 €. For the details of the calculations of disposable income and net earnings see Section 3.1.3 and the appendix.

3 Description of the CGE-Model

To simulate the reform scenarios that have been presented above, we use the CGE-model PACE-L, which incorporates important institutional characteristics of the German labour market. The following sections present a description of the labour market module of PACE-L which models wage determination and labour supply. A more extensive model description and a summary of the data sources used for calibration can be found in Böhringer et al. (2002) and Boeters et al. (2004).

3.1 Labour supply

3.1.1 The labour supply model

The aim of this section is to present the labour supply module of PACE-L. When analysing the effects of tax-benefit reforms it is desirable to distinguish the effects for individuals belonging to different household types. The reason is that individual labour supply elasticities and the relevant budget constraints depend strongly on the household type an individual belongs to. Couples and singles, for example, are subject to different budget constraints due to marital income tax splitting. Another source of household-specific budget constraints are SA payments that depend on household size and composition as described in Section 2. To account for these heterogeneities, the present model distinguishes 27 household types according to their age and skill composition and to the household members' flexibility of labour supply. There is one representative household type containing household members with inflexible labour supply[3]. The remaining 26 household types represent those households whose adult members' labour supply may be thought of as completely flexible. They are divided into 10 single households and 16 couple households. More detailed defining criteria are given in Table A1 in the appendix. Except for single parents with more than one child and married women with more than one child, adult members of these households are taken to be the relevant population being subject to changes in the SA system as presented in Section 2. Single parents and married women with more than one child are excluded since they are defined as not being able to work due to child care responsibilities.

To determine hours of labour supplied, we employ a discrete choice model of labour supply, i.e. each individual (single or adult member of a couple household) can choose from a finite set of hours only. The adoption of this kind of model is appropriate for several reasons: first, it provides a more realistic description of supply choices open to individuals since the frequently invoked assumption that individuals can freely choose the quantity of hours worked appears to be at odds with empirical evidence suggesting that hours worked are rather concentrated at different discrete

[3]Those are defined as persons whose labour supply may be regarded as non-responsive to tax-benefit policies. More specifically, this household type is meant to include at least one adult person younger than 20 and older than 65 years, civil servants, retired and self-employed persons, individuals being still in education or training, persons being in parental leave and individuals not residing in private households.

points. Second, discrete choice models allow for a straightforward distinction between labour supply responses along the intensive and the extensive margin. Third, discrete choice models facilitate the incorporation of a complex tax-benefit structure since the budget constraint has to be determined for a finite set of hours only. According to the empirically observed concentration of hours worked reported by Buslei and Steiner (1999) for Germany, the present model distinguishes three working time categories for married men and five options for married women and singles. The first of these options is always a labour supply of zero hours. Table A2 in the appendix displays the remaining working hours categories for all individuals.

Similar to Graafland et al. (2001, pp. 71-86), differences in labour supply behaviour are modelled by introducing heterogeneous preferences for desired hours of work. Preferences of each household are characterised by a utility function that consists of two additive parts. The first one is a CES part, which depends on leisure and consumption, as in the standard neoclassical labour supply model. The second part is linear in the absolute difference between actual and autonomously preferred working time. Through the parameter of autonomously desired working time, we generate heterogeneity within household types. Algebraically, the utility for single i of household type j supplying labour in hours category k is given by

$$U_{j,i}(h_{j,k}) = \left[\alpha_j^L (T - h_{j,k})^{\frac{\sigma_j - 1}{\sigma_j}} + (1 - \alpha_j^L) C_j(h_{j,k})^{\frac{\sigma_j - 1}{\sigma_j}}\right]^{\frac{\sigma_j}{\sigma_j - 1}} - \beta_j(\left|h_{j,k} - \bar{h}_{j,i}\right|), \quad (1)$$

where α_j: share parameter, T: time endowment, $h_{j,k}$: working time in hours category k, C_j: expected consumption corresponding to hours category k. σ_j would correspond to the standard elasticity of substitution if the additive term were zero. β_j measures the disutility derived from a deviation of actual hours worked, $h_{j,k}$, from autonomously desired hours of work, $\bar{h}_{j,i}$. The assumption that $\bar{h}$ is heterogeneous among individuals belonging to a particular household type j enables us to generate differences in individual working hours that are actually supplied.

As regards the labour supply of couples, we assume that couples derive the following joint utility from hours combinations $(h^f_{j,k}, h^m_{j,l})$, where the individual spouses are indexed by i and g and the superscripts f and m refer to women and men, respectively:

$$\begin{aligned} U_{j,i,g}(h^f_{j,k}, h^m_{j,l}) \;=\; & \left[\alpha_j^L \left(L_j(h^f_{j,k}, h^m_{j,l})\right)^{\frac{\sigma_j - 1}{\sigma_j}} + (1 - \alpha_j^L) \left(C_j(h^f_{j,k}, h^m_{j,l})\right)^{\frac{\sigma_j - 1}{\sigma_j}}\right]^{\frac{\sigma_j}{\sigma_{j-1}}} \\ & - \beta_j^f(\left|h^f_{j,k} - \bar{h}^f_{j,i}\right|) - \beta_j^m(\left|h^m_{j,l} - \bar{h}^m_{j,g}\right|), \end{aligned} \quad (2)$$

$L_j(h^f_{j,k}, h^m_{j,l})$ denotes joint leisure of the couple and is defined as

$$L_j(h^f_{j,k}, h^m_{j,l}) = \left(\alpha_j^f (T - h^f_{j,k}) + (1 - \alpha_j^f)(T - h^m_{j,l})\right), \quad (3)$$

with α_j^f representing a weighting parameter for female leisure. $C_j(h_{j,k}^f, h_{j,l}^m)$ denotes joint consumption which is derived from the total disposable household income. To begin with, we describe the labour supply choice for singles according to eq. (1): first we calculate the expected consumption level, $C_j(h_{j,k})$, which equals the expected disposable income in working time category k under the German tax and transfer system[4]. Disposable income has to be calculated as an expected value since we consider three possible labour market states: employment, involuntary unemployment with unemployment benefits and involuntary unemployment with SA. Thus, the values of $C_j(h_{j,k})$ are calculated as weighted averages of the disposable income in the three labour market states, with the weights being the respective probabilities. These calculations will be described in more detail in Section 3.1.3. Having calculated $C_j(h_{j,k})$, we are able to determine the CES utility part, U_j^{CES}, for each hours of work option, which is independent of the idiosyncratic parameter $\bar{h}_{j,i}$. For given values of U_j^{CES} we can determine critical values of $\bar{h}_{j,i}$ for individuals who are just indifferent between two adjacent working time classes. These critical values separate those individuals who work in the lower hours of work category from those who work in the upper category. We denote the critical value of $\bar{h}$ where an individual in household type j is just indifferent between hours of work category k and $k+1$ by $\bar{h}_{j,k,k+1}$ and calculate it as

$$\bar{h}_{j,k,k+1} = \frac{h_{j,k} + h_{j,k+1}}{2} + \frac{U_j^{CES}(h_{j,k}) - U_j^{CES}(h_{j,k+1})}{2\beta_j}. \tag{4}$$

From eq. (4) it can be seen that the critical value of $\bar{h}$ is determined by the length of the interval between two categories and the difference between the CES utility levels corresponding to the adjacent working time categories. A change in the tax and transfer system will change disposable income and consumption corresponding to different working time categories. This bears on the CES utilities and thus the relative attractiveness of the different working time options. The critical values of $\bar{h}$ adjust, and, depending on the distribution of the $\bar{h}_{j,i}$ within the household types, so do the frequencies of the different working time categories. From equation (4) it can also be recognised that, as β approaches infinity, changes in disposable incomes have no impact on $\bar{h}_{j,k,k+1}$, as the disutility associated with a difference between actual and autonomously preferred working time outweighs any utility gain derived from higher disposable income levels.

For couple households, working time is determined in an analogous manner. As the labour supply choice of men is open to three working time options and the choice of women is open to five categories, couples may choose among 15 different combinations of female and male working hours $(h_{j,k}^f, h_{j,l}^m)$. However, as the simultaneous maximisation of female and male working hours would result in discontinuous reactions of the households, we make the simplifying assumption that each partner chooses his or her optimal working time under the assumption that disposable income and joint leisure corresponding to a particular category of hours of work supplied equal

[4] Although consumption must be thought of as an expected value, we suppress expectation operators for the sake of expositional convenience.

their expected values given the conditional benchmark probabilities of hours of work categories of the respective partner. Thus, the simultaneous maximisation problem reduces to two distinct maximisation problems similar to the single case. The relevant utility function for a wife i of household type j, for example, becomes

$$\begin{aligned} U_{j,i}(h^f_{j,k}) &= \left[\alpha^L_j \left(\widehat{L}_j(h^f_{j,k})\right)^{\frac{\sigma_j-1}{\sigma_j}} + (1-\alpha^L_j)\left(\widehat{C}_j(h^f_{j,k})\right)^{\frac{\sigma_j-1}{\sigma_j}}\right]^{\frac{\sigma_j}{\sigma_j-1}} \\ &\quad -\beta^f_j(\left|h^f_{j,k} - \bar{h}^f_{j,i}\right|) - \beta^m_j(\left|\widehat{h}^m_j - \bar{h}^m_{j,g}\right|), \end{aligned} \tag{5}$$

where $\widehat{L}_j(h^f_{j,k})$, $\widehat{C}_j(h^f_{j,k})$ and $\widehat{h}^m_j$ are the expected values of joint leisure, consumption and hours of work given the benchmark probabilities of hours of work categories open to the wife's spouse. The calculation of those expected values will be explained in more detail in Section 3.1.3.

3.1.2 Calibration of the labour supply module

The model described in Section 3.1.1 is calibrated to reflect empirical labour supply elasticities so as to produce empirically relevant policy simulations. To calibrate the model, we use output from the ZEW's microsimulation model (Buslei and Steiner 1999, Steiner and Jacobebbinghaus 2003) to generate elasticities that are suited to serve as a benchmark for the labour supply module. The microsimulation model uses data from the German Socio-Economic Panel (SOEP) and estimates probabilities of choosing different hours of work categories by a multinomial logit model. The estimations are based on a subsample covering those households whose adult members' labour supply may be thought of as completely flexible. This sample represents about 15.4 million households and 24 million individuals. We gain four sets of parameters from this model: (1) the overall distribution of household types, (2) the classification of hours of work as given in Table A2, (3) the empirical distribution of household labour supply across these hours of work categories for each of the 26 household types and finally (4) the simulated partial own-price elasticities of labour supply in a given working time category with respect to the gross wage in this category. These elasticities are documented in Table A3 in the appendix. They are to be read as follows: given that the gross wage for the first positive time category for men (38 hours per week) rises by ten per cent, the probability for married men in "CLL0K" couples to supply 38-hours-per-week labour will rise by 1.51 percentage points.

In order to account for the empirical distribution of labour supply into different labour supply categories, we assume that the autonomous working time preference parameter $\bar{h}$ is distributed over the interval [0,70] in a stepwise uniform distribution[5]. The steps in the density functions are assumed to coincide with the benchmark critical values of $\bar{h}$, which delimit the individuals who fall into the different working hours categories. Expressed differently, we assume that the preference parameters of

[5]The interval is based on the assumption of a maximum time endowment of 70 hours.

all individuals working $h_{j,k}$ hours are uniformly distributed between the benchmark values of $\bar{h}_{j,k-1,k}$ and $\bar{h}_{j,k,k+1}$. Given the value of the density over this interval, we are then able to determine the share of persons choosing a particular working time category. The assumption of a stepwise uniform distribution of $\bar{h}$ enables an exact reproduction of the empirically observed working hours distribution. To calibrate the model so as to reproduce the elasticities simulated by the microsimulation model, we match the empirical elasticities with the algebraical elasticity values that may be obtained from our underlying preferences as represented by eqs. (1) and (2)[6]. Table A3 in the appendix compares the elasticities that result from our calibration procedure with the simulated elasticities from the microsimulation model. The reported elasticities reveal that our model is fairly good in approximating the overall level of labour supply reactions. However, as regards the ranking of the elasticities with respect to the individual working time categories, it turns out to be rather inflexible. Here a further model development is desirable. Having calibrated the parameters of our model, we are finally able to simulate how changes in the tax-benefit system will affect the working hours distribution. As shown in eq. (4), changes in taxes and benefits affect the critical values of $\overline{h}$. Given the calibrated density functions, which are held constant in the counterfactual, changes in the critical values of $\overline{h}$, in turn, translate into a new working hours distribution.

3.1.3 The Budget Constraint

Modelling labour supply as the outcome of a discrete choice model has the advantage that the budget constraint has to be determined for a finite set of hours only. In order to determine the budget constraint, it is necessary to calculate disposable incomes for each hours category. As disposable incomes may consist of net earnings resulting from positive labour supply as well as transfer payments, the German tax-benefit system has to be incorporated in the present modelling framework. The present section provides a description of the determination of disposable incomes and the features of the status-quo German tax-benefit system that are accounted for in the following analysis.

First, we calculate net earnings per month by deducting income taxes and social security contributions from gross monthly earnings. The details of these calculations are reported in the appendix. The disposable monthly income is obtained by adding transfer payments to net monthly labour earnings. Apart from SA, the most important transfer payments in Germany include unemployment benefits ("Arbeitslosengeld"), unemployment assistance ("Arbeitslosenhilfe"), housing benefits ("Wohngeld") and child benefits ("Kindergeld"). In the present model, we account for unemployment benefits and assistance, social assistance and child benefits[7], while housing benefits are neglected. In Germany, unemployment benefits (UB) are available for persons

[6] Readers who are interested in the derivation of the algebraical elasticities are referred to Boeters et al. (2004) which provides a more detailed description of the modelling framework and the underlying calibrations.

[7] At present, child benefits amount to 154 € per month for the first, second and third child and to 179 € per month from the fourth child on.

who have paid contributions to the statutory unemployment insurance for a minimum of one year. The duration of UB depends on the unemployed person's former labour market experience and age. The monthly amount received equals a constant fraction of previous net monthly earnings. At present, the replacement rate for persons without children is 60 per cent and for persons with children 67 per cent. UB are not means-tested. In terms of the present model, this implies for couple households that the entitlement to UB is completely independent of the labour or transfer income received by the respective spouse.

For those persons who do not have enough experience to obtain UB or who have exhausted their benefits unemployment assistance (UA) and SA become relevant. The replacement rate for UA payments for persons without children is 53 per cent and for persons with children 57 per cent. In contrast to UB, both welfare payments are means-tested, i.e payments are reduced if either the unemployed person or remaining household members receive other incomes. While UA is only available for those persons who have exhausted their UB, eligibility for SA does not require any former entitlement to UB. Persons eligible for UB or UA payments may be entitled to additional SA payments as long as UB or UA transfers fall short of the specified SA minimum income. Since the focus of the following simulations will be on a reform of SA, our model does take into account the means-tested nature of SA payments, but neglects the means-tested nature of UA payments. To incorporate the different transfer components in our model, we proceed as follows: first, we assign SA payments to all voluntarily unemployed singles and to those couple households whose adult members are both voluntarily unemployed[8]. Second, for positive hours of labour supply we distinguish three labour market states: a person who supplies a positive number of hours worked may be employed, which will be denoted as state (e). If the individual does not find a job and becomes involuntarily unemployed, he or she may either be entitled to UB or UA (b) or receive SA payments (n). However, owing to the static nature of the model, we are not able to determine the entitlement to UB or UA due to former contributions to the statutory unemployment insurance. Instead, we assume that a person who becomes unemployed is entitled to UB or UA with an exogenous given probability P_U and receives SA payments with probability $(1 - P_U)$. In the former case, UB and UA payments are then determined by the replacement ratio of net earnings that correspond to the chosen category of hours of labour supplied. More specifically, this replacement ratio is defined as a weighted average of UB and UA replacement rates where the weights are the respective shares of entitled persons who receive those benefits. SA payments, in contrast, do not depend on the category of hours supplied in the labour market. However, at this point it is important to note that due to the means-tested nature of SA payments, the entitlement of spouses to SA depends on labour or transfer income of the respective partner.

[8]For each household type, we split up those individuals that actually do not work into voluntarily and involuntarily unemployed in order to obtain household specific unemployment rates and non-participation rates. The shares of involuntarily unemployed persons are calibrated so as to match the resulting aggregate skill-specific unemployment rates with their empirical values in 2000 (IAB 2002).

To illustrate the interdependence of labour and transfer incomes, Tables 2 and 3 summarise the different components of disposable income, y^D, for positive hours supplied in different labour market states for singles and couples, respectively[9]. Note that Table 2 not only applies to singles, but also to couple households with one non-participating partner, whereas Table 3 only applies to those couples with both partners participating in the labour market.

e	***b***	***n***
$y^N + SA(y^N)$	$UC + SA(UC)$	SA

Table 2: Components of disposable income of single participating individuals in different labour market states

fem. / ***male***	***e***	***b***	***n***
e	$y_m^N + y_f^N + SA(y_m^N + y_f^N)$	$UC_f + y_m^N + SA(UC_f + y_m^N)$	$y_m^N + SA(y_m^N)$
b	$UC_m + y_f^N + SA(UC_m + y_f^N)$	$UC_f + UC_m + SA(UC_f + UC_m)$	$UC_m + SA(UC_m)$
n	$y_f^N + SA(y_f^N)$	$UC_f + SA(UC_f)$	SA

Table 3: Components of disposable income of two participating individuals in different labour market states

In Tables 2 and 3, y^N denotes net income, SA represents social assistance and UC denotes unemployment compensation comprising UB and UA. In Table 3, the subscripts m and f represent labour or transfer incomes for husbands and wives, respectively. The entries in Tables 2 and 3 indicate that SA payments may also be available for households receiving positive labour earnings provided that total household income does not exceed the respective income allowances as described in Section 2. Households receiving transfer payments from other sources may also be eligible for SA, if transfers from other sources are smaller than the specified minimum income level. The fact that SA payments depend on total household income is indicated by the income arguments in $SA(.)$, which determine the level of SA.

The imposition of three labour market states requires that the value of disposable income for a particular category of positive working time be calculated as an

[9]In the following, the subscript j denoting the household type and hours of work as arguments determing the level of y^D will be dropped for convenience.

expected value. For singles, e.g., the expected value of the disposable income for a particular category of hours of work supplied is determined as a weighted average of the disposable income values in the three labour market states (e), (b) and (n), with the weights being the respective probabilities, $P(i)$, $i = e, b, n$:

$$E(y^D(h_k)) = \sum_{i=e,b,n} P(i)\ y^D(h_k, i), h_k > 0 \tag{6}$$

More specifically, we have $P(e) = (1-u)$, $P(b) = uP_U$ and $P(n) = u(1-P_U)$, with u representing the (household type specific) unemployment rate and P_U denoting the probability that an unemployed person is entitled to UB or UA[10]. For couples, the expected disposable income for a particular combination of hours of work is determined by the weighted average of disposable incomes corresponding to the 9 combinations of labour market states:

$$E(y^D(h_k^f, h_l^m)) = \sum_{g,i=e,b,n} P^m(g)P^f(i)\ y^D(h_k^f, h_l^m, g, i), h_k^f \text{ or } h_l^m > 0 \tag{7}$$

$P^m(g)$ and $P^f(i)$, $g, i = e, b, n$, represent the probabilities of male and female labour states and are defined as above. As mentioned in Section 3.1.1, we make the simplifying assumption that spouses decide on their optimal working time based on the average disposable income that results from the different hours categories open to the other spouse. I.e., the expected disposable income determining the expected consumption level for a particular category of hours worked in eq. (5) is given by

$$E(y^D(h_k^f)) = \sum_l \frac{P(h_k^f, h_l^m)}{P(h_k^f)} \sum_{g,i=e,b,n} P^m(g)P^f(i)\ y^D(h_k^f, h_l^m, g, i),\ h_k^f \text{ or } h_l^m > 0, \tag{8}$$

$$E(y^d(h_l^m)) = \sum_k \frac{P(h_k^f, h_l^m)}{P(h_l^m)} \sum_{g,i=e,b,n} P^m(g)P^f(i)\ y^D(h_k^f, h_l^m, g, i),\ h_k^f \text{ or } h_l^m > 0, \tag{9}$$

with e.g. $P(h_k^f, h_l^m)/P(h_k^f)$ denoting the probability that the husband supplies h_l^m hours of work, conditional upon h_k^f hours of work supplied by his wife.

To approximate the tax-transfer schedule, we derive from the calculations of the disposable income an average and an effective marginal rate of the total tax and transfer effects for each household type, hours-of work category and labour market state. Deviations from the benchmark gross income that occur in general equilibrium are taxed with the effective marginal effect of the tax and transfer system locally determined at the benchmark.

[10]For P_U we posit a value of 0.8, which is household independent and corresponds to the share of unemployed persons receiving unemployment benefits or unemployment assistance as reported by IAB (2002).

3.2 Union wage bargaining

Embedding the process of wage determination in our general equilibrium framework is a crucial element for the evaluation of social welfare reforms since it enables us to take into account the repercussions of a welfare reform on equilibrium wages. In PACE-L, wages are determined by sector-specific bargaining between an employers' association and a trade union. The bargaining outcome is modelled as the maximisation of a Nash function, which includes the objective functions of both parties and their respective fallback options. We adopt the "right to manage" approach: parties bargain over wages, and firms afterwards decide over labour demand given the bargained wage. This labour demand reaction in turn is anticipated in the wage bargaining. The firms' objective is their profit, while the fallback option is no production and, thus, zero profits. The union represents two types of workers, high-skilled and low-skilled. For each sector s and skill type r, the union's objective function, $\Gamma_{r,s}$, is employment, $L_{r,s}$, times the value of a job, $V_{r,s}$, minus the value of unemployment, $V_{U,r}$:

$$\Gamma_{r,s} = L_{r,s} \left(V_{r,s} - V_{U,r} \right) \tag{10}$$

Following the search literature (see e.g. Pissarides, 1990), $V_{r,s}$ and $V_{U,r}$ are calculated as value functions. Both can be expressed as weighted averages of labour incomes and transfer payments. The weights are determined through the respective probabilities of employment and unemployment in the future, given the equilibrium transition probabilities between the two labour market states. We then calculate the steady state values of the two labour market states under the assumption that job-seekers must be indifferent between any two of the sectors[11]. As usual in dual-labour-market type models, this results in the relation that the higher the "surplus from working" is, the lower the quit rate from unemployment must be (see Acemoglu 2001).

We assume that the trade union is utilitaristic with respect to the different household types. The marginal tax rates determining the change in net wages as well as the values of the states of employment and unemployment that appear in eq. (10) are therefore calculated as weighted averages over all household types and all hours of work categories. In turn, the general equilibrium wage that results from the bargaining process is used to derive the income positions of all households in all possible labour market states. Deviations from the benchmark gross income are taxed with the total marginal effect of the tax and transfer system locally determined at the benchmark. The two labour markets for low and high-skilled labour are balanced by aggregating on the demand side over sectors and on the supply side over household types (where frequencies of household types are fixed). We assume that the structure of labour input (with respect to household types) is uniform across sectors. Household-specific unemployment rates are aggregated into economy-wide unemployment per skill group. Changes in aggregate unemployment are distributed among household types proportional to their benchmark unemployment.

[11] For a more detailed description of the wage bargaining module see Böhringer et al. (2002) and Boeters et al. (2004).

4 Expected economic effects

4.1 Labour supply

The following sections discuss the economic effects that may be expected from a reform of the German SA system in terms of our modelling framework. As discussed earlier, changes in the tax and benefit system as induced by the reform scenarios presented in Section 2 affect the distribution of labour supply across different options of working time via their impact on changes in the critical values of the autonomous preference parameter $\bar{h}$, which determine the shares of individuals choosing different working time options. This change depends largely on the difference between the CES-components of the household utility function corresponding to different working time categories. The relative attractiveness of different working time categories therefore results from the difference in leisure as well as disposable household incomes and their relative evaluation as determined by the underlying parameters of the utility function, a^L, σ and β. These parameters determine the elasticities of labour supply in a given working time category with respect to the gross wage in this category. Table A3 in the appendix documents that empirical as well as calibrated elasticities are always non-negative[12]. Given these elasticities, one may expect the increase in the share of individuals choosing a particular working time category to become larger, the larger (smaller) the change in the income difference with respect to the lower (higher) working time category. For a low-skilled single person without children, Figures 1 and 2 illustrate the relative income positions of 0 and 15 hours of labour supply. Whereas under the status-quo system an increase in labour supply from 0 to 15 hours translates into an incremental disposable income of roughly 100 €, the reform scenarios 1 and 2 involve an increase in disposable income of about 430 € or 270 €, respectively. As can also be seen from Figures 1 and 2, the relative income position of 30 hours exhibits only a slight improvement as compared to 15 hours, whereas the relative income position of 30 and 38 hours of labour supply remains unchanged. As a consequence, we expect increases in the share of singles without children choosing 15 hours and 30 hours of labour supply and decreases in the probability of zero hours of labour supply, with the changes being larger in Scenario 1. As female singles without children feature larger elasticities than their male counterparts, we expect all reactions to be more pronounced for single women.

[12] To check how well our calibrated elasticities reproduce simulations derived by the underlying microsimulation model, we simulate a stylised policy scenario taking the form of a ten per cent cut in the SA minimum income as simulated by Buslei and Steiner (1999). While Buslei and Steiner (1999) report increases in labour supply measured in hours of 0.27 per cent for male singles, 0.12 per cent for female singles, 0.21 per cent for married men and 0.07 per cent for married women, we obtain corresponding figures of 0.08, 0.43, 0.21 and 0.09 per cent. Although our simulations do not preserve the ranking of the effects for singles, we believe that our model is able to reproduce the overall magnitude of the partial equilibrium labour supply effects obtained by the microsimulation model quite well. In this regard, it has to be emphasised that PACE-L and the underlying microsimulation model are not directly comparable as they rely on different fomulations of the budget constraints: while in PACE-L voluntarily unemployed individuals are bound to receive SA, in Buslei and Steiner (1999) voluntarily unemployed individuals may additionally receive UA or UB.

4.2 Wage formation and employment

When discussing the impact of the reform scenarios on wage formation, the main focus will be on the unionised labour market environment as presented in Section 3.2, since this model appears to provide a fairly realistic description of German labour market institutions. The imposition of any welfare reform raises the question of how negotiated wages will respond to these reforms. In this regard, the repercussions of the above discussed reform scenarios on the bargaining process operate through two different channels. First, as the reforms suggest a decrease in the marginal transfer withdrawal rate with the remaining income tax system being unchanged, both scenarios give rise to a reduction in the effective marginal tax rate at the bottom of the income distribution. However, as under both reform scenarios SA eligibility may extend to higher incomes levels, the effective marginal tax rate may increase for incomes between the status-quo and the reform breakeven income. Whether average skill-specific effective marginal tax rates decrease or increase largely depends on the underlying household and hours of work distribution, since the effective marginal tax rates being taken into account by an utilitaristic union are based on weighted averages over all household types and all hours of work categories. With a constant average tax rate, an increase in the effective marginal tax rate raises the degree of tax progression. According to the theoretical literature, this will lead to wage moderation on behalf of unions (see Koskela and Vilmunen 1996). Second, both reform scenarios have an adverse effect on the fall-back position of unions which stems from two different sources: on the one hand, by stimulating labour supply both reform scenarios reduce the value of unemployment as the probability of unemployment at given labour demand increases. On the other hand, cuts in the SA payments lower the expected income when being unemployed. In sum, the negative impact on the fall-back position of unions is likely to translate into lower union wages.

5 Simulation results

5.1 Partial labour supply effects

The following results focus on the labour supply reactions with constant wages. Moreover, we consider no balancing of the government budget surplus or deficit induced by our simulated policies. To compare our predictions from Section 4.1 with the numerical simulation results, Table 4 exemplifies the labour supply responses for low-skilled female and male singles without children. The figures reported in Table 4 reveal that the results are in accordance with the expected effects that have been discussed in Section 4.1. In particular, we do observe increases in the share of low-skilled singles without children choosing 15 hours and 30 hours of labour supply and decreases in the share of the zero hours category, with the changes generally being larger in Scenario 1. Moreover, the labour supply reactions turn out to be considerably stronger for single women due to their higher labour supply elasticities. In sum, in Scenario 1 (2), the changing hours distributions result in an increase in participation rates by 1.64 (0.76) percentage points for men and by 9.19 (4.23) percentage points for women,

respectively.

Hours category	Benchmark share single men	Scenario 1	Scenario 2	Benchmark share single women	Scenario 1	Scenario 2
0	0.1321	0.1157	0.1245	0.2463	0.1544	0.2040
15	0.0492	0.0655	0.0567	0.2274	0.3100	0.2654
30	0.0062	0.0063	0.0062	0.0592	0.0679	0.0629
38	0.6309	0.6307	0.6308	0.2990	0.2989	0.2991
49 (47)	0.1816	0.1819	0.1817	0.1682	0.1688	0.1685

Table 4: Hours distribution singles without children

Source: Own calculations.

While Table 4 was confined to low-skilled singles without children, Table 5 presents the aggregate effects on participation rates, average working time and supplied hours of work for different types of individuals. The terms in brackets apply to the effects of Scenario 2. The aggregate effects depend on the magnitudes of the household-specific labour supply elasticities and the overall distribution of household types. Compared to the participation reactions of low-skilled singles without children, the aggregate increase in participation rates of singles turns out to be less pronounced since low-skilled singles without children constitute a relatively small proportion in the overall household distribution. In Table 5, average working time effects refer to the working time of those individuals who supply positive hours of work, while the effect on labour supply represents the overall effect on labour supply measured in hours of work. In our scenarios, positive changes in participation rates generally reduce average working time. The reason is that our modelling framework restricts individuals formerly not participating in the labour market to switch to the adjacent working time category, involving an amount of hours supplied that is always below the average. This is particularly relevant for married women whose decrease in average working time is found to be considerably larger than that of married men. Moreover, the relative attractiveness of higher working time categories as compared to lower categories is not improved by our reform scenarios, which unambiguously reduces average working time of those individuals supplying positive hours of work. In sum, the overall effect on supplied hours of work always turns out to be positive since the decrease in average working time is dominated by the increase in participation rates.

Individual type:	Couple men	Couple women	Singles	Low-skilled	High-skilled	All
	REFORM SCENARIO 1 (SCENARIO 2)					
Participation rate (change in percentage points)	0.8747	0.8335	2.3922	1.8818	1.1831	1.2854
	(0.4301)	(0.4867)	(1.0852)	(0.9262)	(0.5841)	(0.6342)
Average working time (change in per cent)	-0.1128	-0.7826	-1.6025	-0.1559	-0.1055	-0.7409
	(-0.0510)	(-0.4459)	(-0.7280)	(-0.0676)	(-0.0481)	(-0.3620)
Labour supply measured in hours (change in per cent)	0.8240	0.3646	0.9849	1.2242	0.6915	0.7555
	(0.4100)	(0.2147)	(0.4608)	(0.5940)	(0.3458)	(0.3756)
Additional labour supply in 1000 persons				66.3	243.2	309.5
				(32.7)	(120)	(152.7)
Budget (Tax revenue minus transfer expenditures – change in per cent)						3.7854
						(2.2947)

Table 5: Effects on labour supply at constant wages

Source: Own calculations.

The results in Table 5 indicate that in both reform scenarios, the effects on labour supply are more pronounced among single households than among couple households. One important reason is that couple households are less likely to be affected by the reform since they exhibit a larger share of households with more than one child, who face a relatively smaller reduction in the basic SA rate. As regards couples in Scenario 1, we obtain smaller increases in participation rates for women than for men. Interestingly, this result is reversed under Scenario 2[13]. However, despite the larger increase in female participation rates the overall increase in supplied hours of work of married women is lower in Scenario 2 due the more pronounced decrease in average working time. Moreover, participation responses of low-skilled individuals are stronger than the reactions of high-skilled individuals. The mechanism behind this result is that low-skilled workers are more likely to be affected by the disincentives of

[13]These different reactions are due to different working time categories open to couple men and women. While couple men are bound to switch from non-participation to a full-time 38 hours job, couple women are restricted to switch to lower working time categories (see Table A2). The fact that switching from non-participation to a 38-hours job instead to a 9.5-hours job entails a relatively higher income difference leads to relatively stronger male participation reactions. However, the difference between the change in the relative attractiveness of the lowest working time category for men and women is lower under Scenario 2. This is because both scenarios involve virtually no transfer withdrawal in the lowest female working time category, while Scenario 2 implies a lower cut in the basic SA rate, thereby inducing a smaller increase in male disposable income. Together this leads to relatively lower participation reactions of couple men in Scenario 2.

the status-quo system. Finally, as expected, the effects of Scenario 1 turn out to be stronger than in Scenario 2. Measured in persons, Scenario 1 involves an additional labour supply of about 310.000 persons as compared to about 153.000 additional persons in Scenario 2. As high-skilled labour represents a considerably larger fraction of our relevant population (85.4 per cent), the additional labour supply of high-skilled workers exceeds that of low-skilled labour in absolute terms. With respect to the government budget, both scenarios entail an increase in the surplus of tax revenue over transfer expenditures which stems both from lower SA payments and higher income tax revenues and social security contributions.

5.2 General equilibrium

Tables 6a and 6b present the general equilibrium effects on labour supply and employment.

Individual type:	Couple men	Couple women	Singles	Low-skilled	High-skilled	All
			REFORM SCENARIO 1			
Participation rate (change in percentage points)	0.8420	0.7820	2.3770	1.8416	1.1496	1.2509
Average working time (change in per cent)	-0.1158	-0.7480	-1.6033	-0.1583	-0.1086	-0.7326
Labour supply measured in hours (change in per cent)	0.7859	0.3396	0.9682	1.1798	0.6653	0.7270
Additional labour supply in 1000 persons				64.9	236.3	301.2
Budget (Tax revenue minus transfer expenditures – change in per cent)						0.9632
Marginal income tax recycling (change in percentage points)						-0.18
Effective marginal tax rate (change in percentage points)				0.9693	0.6870	
Gross wage (change in per cent)				-2.2012	-1.2945	
Additional employment in 1000 persons				51	221.9	272.9
Unemployment rate (change in percentage points)				-0.7079	-0.0631	

Table 6a: General equilibrium effects on labour supply, wages and employment Scenario 1

Source: Own calculations.

These effects take into account the general equilibrium wage responses as well as the labour demand reactions. The change in the budget surplus is recycled by a uniform cut in the marginal income tax. This reduction turns out to be stronger in Scenario 1 as compared to Scenario 2 due to the larger change in the budget surplus.

Individual type:	Couple men	Couple women	Singles	Low-skilled	High-skilled	All
			Reform Scenario 2			
Participation rate (change in percentage points)	0.4161	0.4716	1.0830	0.9109	0.5737	0.6231
Average working time (change in per cent)	-0.0509	-0.4344	-0.7328	-0.0688	-0.0479	-0.3602
Labour supply measured in hours (change in per cent)	0.3949	0.2083	0.4538	0.5718	0.3369	0.3651
Additional labour supply in 1000 persons				32.1	117.9	150
Budget (Tax revenue minus transfer expenditures – change in per cent)						0.8062
Effective marginal tax rate (change in percentage points)				1.1293	0.0872	
Marginal income tax recycling (change in percentage points)						-0.14
Gross wage (change in per cent)				-1.2348	-0.6387	
Additional employment in 1000 persons				24.9	110.2	135.1
Unemployment rate (change in percentage points)				-0.4333	-0.0266	

Table 6b: General equilibrium effects on labour supply, wages and employment Scenario 2

Source: Own calculations.

Compared to the partial labour supply effects, the figures reveal that in general equilibrium, the labour supply responses tend to be mitigated due to the negative impact the reforms have on wages. In this regard, both scenarios involve a stronger downward pressure on low-skilled wages than on high-skilled wages. The economic mechanisms driving this result are threefold: first, both reform scenarios entail a more pronounced increase in participation rates of low-skilled as compared to high-skilled labour. Second, as can be seen from Tables 6a and 6b, both reform scenarios raise the effective marginal tax rates of low-skilled workers to a larger extent than those of

high-skilled workers. Based on the tax progression argument, this leads to stronger wage moderation on behalf of low-skilled workers. Third, in all sectors, firms can be shown to feature higher labour demand elasticities for low-skilled than for high-skilled workers. Since these elasticities measure the union's cost of a wage increase in terms of foregone employment, the incentive for unions to lower wages is relatively larger for low-skilled labour. Note, however, that despite the larger response of low-skilled wages, the extent to which increases in participation rates are offset in general equilibrium turns out to be larger for high-skilled labour than for low-skilled labour. While participation rates of low-skilled labour are found to be reduced by 2.1 per cent (1.7 per cent in Scenario 2), participation rates of high-skilled workers decrease by 2.8 per cent (1.8 per cent in Scenario 2) as compared to the partial equilibrium reactions. This may be explained by the fact, that our underlying labour supply elasticities for high-skilled workers are generally larger than those for low-skilled workers (see Table A3 in the appendix). In sum, the general equilibrium effects confirm our theoretical predictions from Section 4.2. However, the figures suggest that the feed-back effects on labour supply resulting from general equilibrium wage effects appear to be rather small. Note that this may to a small extent be attributed to lower income taxes owing to our underlying income tax recycling, which tends to offset adverse labour supply effects brought about by the wage reductions. As regards the effects on employment, the wage reductions translate into lower unemployment rates. As the ratio of high-skilled to low-skilled wages increases, unemployment rates of low-skilled workers decrease by more percentage points than those of high-skilled labour. In absolute terms, the general equilibrium simulations predict an additional employment of about 272.000 (135.000) persons. These figures indicate that under Scenario 1 the expected increase in employment may be substantial, while the employment effects under Scenario 2 appear to be rather modest. The higher employment under Scenario 1 comes at the cost of a substantial reduction in SA payments for those individuals who become involuntarily unemployed and are not entitled to UB or UA. Note that this distributional problem stems from the fact that we did not take into account the possibility of a guaranteed income in communal work programs for those employable SA recipients who do not find a job in the regular labour market. With this omission, our simulated labour supply effects are likely to be underestimated, since the expected income when supplying positive hours of work would be larger with a guaranteed income from a public-work job. However, provided that employment in a communal work program entails a considerably larger disutility of work than a job in the regular labour market, this downward bias is likely to be mitigated.

6 Conclusions

We have used a computable general equilibrium (CGE) model to assess the effectiveness of recent social welfare reform proposals in terms of their impact on labour supply and unemployment. Our simulations included a cut in the SA minimum income level associated with a reduction in the marginal transfer withdrawal rate. Before summarising our numerical results there are several caveats to be kept in mind: first, our specification of the budget constraint relies on the assumption that all voluntarily

unemployed persons are restricted to the receipt of SA payments and are not entitled to UB or UA payments. In practice, this is likely to be violated as one may expect a considerable number of UB or UA recipients to be voluntarily unemployed. The fact that this feature is missing in our modelling strategy is likely to lead to an overestimation of the employment effects, since voluntarily unemployed UB or UA recipients are - at least in the short run - not affected by changes in the SA system. Second, we neglected communal work programs leading to a guaranteed minimum income for those employable SA recipients who do not find a job in the regular labour market. With this omission, our simulated labour supply effects are presumably slightly underestimated. In sum, we expect the downward bias through the last effect to be quantitatively less important than the first effect.

Summing up the numerical simulation results, our analysis has produced plausible effects that are qualitatively in line with the numerical results obtained by former microsimulation studies (see e.g. Steiner and Jacobebbinghaus 2003). As expected, labour supply effects are found to be relatively larger for low-skilled individuals since they are more likely to be affected by the disincentives of the present status-quo system. Moreover, the reactions among couple households turn out be less pronounced than participation responses among single households since the latter exhibit a smaller share of households with more than one child which face lower cuts in SA payments. For both reform scenarios, the feed-back effects on labour supply resulting from general equilibrium wage effects are found to be rather modest. This is particularly true for low-skilled workers who feature lower labour supply elasticities than high-skilled workers. Both reform proposals entail a slight decrease in unemployment which amounts to less than one percentage point. This result suggests that the union wage reactions are sufficiently strong to prevent additional labour supply translating into higher unemployment. Primarily due to the higher increase in low-skilled labour market participation, wages and unemployment rates of low-skilled workers are reduced to a larger extent as compared to high-skilled workers. The main lesson from the numerical simulations is that substantial employment effects are to be expected only from major cuts in welfare payments associated with a significant reduction in transfer withdrawal rates.

References

[1] Acemoglu, Daron (2001): Good Jobs versus Bad Jobs, Journal of Labor Economics 19, 1-21.

[2] Blundell, Richard and Thomas MaCurdy (1999): Labor Supply: A Review of Alternative Approaches, in: Handbook of Labor Economics Vol. 3, Ashenfelter, Orley and David Card (eds.), 1559-1695.

[3] Böhringer, Christoph, Stefan Boeters and Michael Feil (2002): Taxation and Unemployment: An Applied General Equilibrium Approach for Germany, ZEW-Discussion-Paper 02-39, Mannheim.

[4] Boeters, Stefan, Michael Feil and Nicole Gürtzgen (2004): Discrete Working Time Choice in an Applied General Equilibrium Model, mimeo, Mannheim.

[5] Bonin, Holger, Wolfram Kempe and Hilmar Schneider (2002): Kombilohn oder Workfare? Zur Wirksamkeit zweier arbeitsmarktpolitischer Strategien, IZA Discussion Paper No. 587, Bonn.

[6] Breyer, Friedrich, Wolfgang Franz, Stefan Homburg, Reinhold Schnabel and Eberhard Wille (2004): Reform der Sozialen Sicherung, Berlin, Heidelberg: Springer.

[7] Buslei, Hermann and Viktor Steiner (1999): Beschäftigungseffekte von Lohnsubventionen im Niedriglohnbereich, ZEW Wirtschaftsanalysen 42, Baden-Baden: Nomos.

[8] Graafland, Johan J., Ruud A. de Mooij, André G.H. Nibbelink and Ate Nieuwenhuis (2001): MIMICing Tax Policies and the Labour Market, Amsterdam: Elsevier.

[9] Institut für Arbeitsmarkt- und Berufsforschung (2002): IAB-Zahlenfibel – Ergebnisse der Arbeitsmarkt- und Berufsforschung in Tabellen, Nürnberg.

[10] Kaltenborn, Bruno (2000): Reformkonzepte für die Sozialhilfe und ihre Konsequenzen für Fiskus und Arbeitsangebot, Mitteilungen aus der Arbeitsmarkt- und Berufsforschung 33, 68-79.

[11] Koskela, Erkki and Jouko Vilmunen (1996): Tax Progression is Good for Employment in Popular Models of Trade Union Behaviour, Labour Economics 3, 65-80.

[12] Ochel, Wolfgang (2003): Welfare to Work in the U.S.: A Model for Germany?, Finanzarchiv 59, 91-119.

[13] Pissarides, Christopher A. (1990): Equilibrium Unemployment Theory, Oxford: Basil Blackwell.

[14] Sinn, Hans-Werner et al. (2002): Aktivierende Sozialhilfe. Ein Weg zu mehr Beschäftigung und Wachstum, IFO-Schnelldienst 55, 3-52.

[15] Soest, Arthur van (1995): Structural Models of Family Labour Supply: a Discrete Choice Approach, Journal of Human Resources 30, 63-88.

[16] Statistisches Bundesamt (2002): Sozialleistungen, Fachserie 13, Reihe 2, Sozialhilfe, Stuttgart.

[17] Steiner, Viktor (2000): Können durch einkommensbezogene Transfers an Arbeitnehmer die Arbeitsanreize gestärkt werden?, Mitteilungen aus der Arbeitsmarkt- und Berufsforschung 33, 385-395.

[18] Steiner, Viktor and Peter Jacobebbinghaus (2003): Reforming Social Welfare as We Know It? A Microsimulation Study for Germany, ZEW Discussion Paper No. 03-33, Mannheim.

[19] Wissenschaftlicher Beirat beim Bundesministerium für Wirtschaft und Technologie (2002): Gutachten zur „Reform des Sozialstaats für mehr Beschäftigung im Bereich gering qualifizierter Arbeit“ 28./29. June 2002, Hamburg.

[20] Zimmermann, Klaus F. (2003): Beschäftigungspotentiale im Niedriglohnsektor, Vierteljahreshefte zur Wirtschaftsforschung 72, 11-24.

A Appendix

A.1 Classification of household types

Abbreviation	Definition
CLLxK*)	Couple, woman low-skilled, man low-skilled, x children
CLHxK	Couple, woman low-skilled, man high-skilled, x children
CHLxK	Couple, woman high-skilled, man low-skilled, x children
CHHxK	Couple, woman high-skilled, man high-skilled, x children
ML0	Male single, low-skilled, no children
MH0	Male single, high-skilled, no children
WL0	Female single, low-skilled, no children
WH0	Female single, high-skilled, no children
yKL*)	Single (male or female), low-skilled, y children
yKH	Single (male or female), high-skilled, y children

**) x =0 1,2,3; y = 1,2,3. x, y = 3 refer to households with more than 2 children.*

Low-skilled labour: persons without any formal vocational training
High-skilled labour: persons holding a vocational or university degree

Table A1: Household disaggregation

A.2 Classification of hours of work categories

Individuals	Hours options				
men, married	0			38	49
men, single	0	15	30	38	49
women, single	0	15	30	38	47
women, married	0	9,5	24	38	47

Table A2: Discrete working hours by household types

A.3 Labour supply elasticities

Household	Elasticities couple men				Elasticities couple women and singles							
	1(e)[1)]	1(c)[1)]	2(e)	2(c)	1(e)	1(c)	2(e)	2(c)	3(e)	3(c)	4(e)	4(c)
CLL0K[2)]	1.51	1.83	1.67	1.02	0.07	0.25	0.56	0.29	0.76	0.75	0.29	0.50
CLH0K	4.14	5.15	4.81	3.26	0.19	0.67	1.33	0.90	1.72	1.52	0.82	0.76
CHL0K	3.32	4.27	4.06	2.77	0.22	0.42	1.46	1.45	2.44	2.25	1.56	1.23
CHH0K	3.61	4.60	4.58	3.14	0.20	0.57	1.33	1.42	2.28	2.39	1.53	1.14
CLL1K	1.27	1.62	1.72	1.04	0.05	0.29	0.37	0.27	0.28	0.42	0.07	0.21
CLH1K	3.41	3.44	4.64	3.07	0.15	0.76	0.93	0.69	0.84	0.59	0.25	0.19
CHL1K	2.55	3.47	3.82	2.69	0.25	0.51	1.00	0.74	1.04	0.74	0.36	0.27
CHH1K	3.43	4.45	4.69	3.24	0.24	0.88	1.23	1.24	1.50	1.31	0.73	0.48
CLL2K	1.44	1.79	1.86	1.30	0.06	0.47	0.57	0.15	0.58	0.08	0.23	0.02
CLH2K	2.49	3.43	3.70	2.18	0.13	0.66	0.77	0.44	0.65	0.28	0.21	0.07
CHL2K	2.04	2.78	3.12	2.03	0.14	0.45	0.75	0.70	0.60	0.57	0.17	0.16
CHH2K	3.79	4.85	5.09	3.61	0.26	0.91	1.03	0.90	1.13	0.75	0.53	0.26
CLL3K	1.00	0.55	1.50	1.53	0.06	0.47	0.21	0.19	0.11	0.08	0.02	0.001
CLH3K	2.69	3.56	3.79	2.62	0.06	0.69	0.43	0.31	0.22	0.14	0.05	0
CHL3K	2.49	2.57	2.94	2.75	0.18	0.85	1.06	0.45	1.15	0	0.39	0
CHH3K	4.23	5.42	5.62	3.83	0.25	0.81	0.89	1.01	0.83	0.66	0.32	0.06
ML0	-	-	-	-	-	0.04	-	0.81	1.54	1.75	1.98	0.88
MH0	-	-	-	-	-	0.02	-	0.84	1.55	1.80	2.09	0.94
WL0	-	-	-	-	0.43	0.50	2.15	2.04	3.08	3.09	1.61	1.75
WH0	-	-	-	-	0.38	0.14	2.34	2.44	3.28	3.88	3.08	1.84
1KL	-	-	-	-	0.29	0.10	1.16	1.17	1.64	1.80	1.14	0.80
1KH	-	-	-	-	0.31	0.26	1.88	2.13	2.41	2.58	1.87	1.15
2KL	-	-	-	-	0.09	0.23	0.09	0	0.80	0.62	0.83	0
2KH	-	-	-	-	0.19	0.36	1.48	1.96	1.97	1.85	1.62	0.65
3KL	-	-	-	-	0.06	0.35	0.18	0	0.93	0	0.54	0
3KH	-	-	-	-	0.06	0.21	0.43	0	0.47	0.48	0.44	0.49

Table A3: Partial labour supply elasticities

[1)]: 1, 2, 3, 4: positive working time categories; (e) empirical value, (c) calibrated value.

[2)]: For abbreviations see Table A1.

A.4 Calculation of net earnings

Gross monthly earnings are obtained by multiplying the gross hourly wage with monthly hours of work corresponding to the respective category of weekly labour supply. For low-skilled labour we impute a gross hourly wage of about 10.8 €, while the gross hourly wage for high-skilled workers is assumed to amount to 14.3 €. Both

wages represent the average gross hourly wages for the respective qualification levels of the subpopulation represented by our 26 household types as reported by the German SOEP for the year 2000. Low-skilled workers are defined as persons without any formal vocational training, whereas individuals holding a vocational or university degree are assumed to represent high-skilled labour. To obtain net earnings per month, income taxes and social security contributions are to be deducted from gross monthly earnings. The share in social security contributions borne by employees is taken to amount to 20 per cent of gross monthly earnings. At present, gross monthly earnings of 400 € are being exempted from social security contributions[14]. Income taxes are calculated on the basis of taxable income, which is obtained by subtracting a standard deduction from gross earnings. To determine income taxes to be paid by each household type, we apply the present German income tax schedule to taxable earnings[15]. For couple households, income tax legislation allows for marital income splitting: according to this method, the tax schedule is applied to half of the joint taxable income, while the resulting tax amount is doubled to obtain total income taxes to be paid by the couple.

[14]Since April 2003, there is a phase-in range for social security contributions, with the amount borne by employees successively increasing from about 4 per cent to 20 per cent of gross earnings within a gross monthly income range between 400 € and 800 €. However, the present calculations abstract from this phase-in range and simply assume a social security contribution rate of 20 per cent for gross monthly earnings exceeding 400 €.

[15]The German income tax schedule is smoothly progressive. At present, taxable earnings below 7235 € per year are being exempted from income taxes (§ 32a, EStG). For the sake of simplicity, we apply to all taxable income amounts which exceed this tax allowance the schedule specified for taxable earnings between 9252 and 55007 €. For a income range corresponding to taxable earnings between 7235 and 9252 € per annum, this involves a slight overestimation of income taxes.