The Impact of Labor Market Reforms on Capital Flows, Wages and Unemployment[†]

Thomas Beissinger[*‡]

[*] *Department of Economics, University of Regensburg*
D-93040 Regensburg, Germany

March 2001

Abstract

The paper contributes to the globalization debate by scrutinizing the international spillover effects which are provoked if a single country reduces the generosity of the unemployment compensation system or weakens labor union power. For this purpose a two-country model with imperfect competition in goods and labor markets and perfect competition in capital markets is developed. It is demonstrated that the comparative-static results depend on the degree of capital mobility, the degree of competition in the goods market and the institutional setup of the unemployment compensation system.

Keywords: Globalization, Capital Mobility, Unemployment, Unemployment Compensation, Wage Bargaining, Monopolistic Competition, Welfare State.

JEL classification: E24, F21, F41, J23, J51, J65

[†]I thank Eva Ackstaller, Oliver Buesse, Joseph Falkinger, Volker Großmann, Joachim Möller, Gwen Pelka, Michael Pflüger, Winfried Vogt and the participants of the annual conference of the Verein für Socialpolitik in Berlin for valuable comments and suggestions.

[‡]Phone: (++49) (941) 943-2740, fax: (++49) (941) 943-2735, E-mail: Thomas.Beissinger@wiwi.uni-regensburg.de, Homepage: http://www.wiwi.uni-regensburg.de/beissinger

1 Introduction

There can be no doubt that trade liberalization and deregulation of financial markets have led to highly integrated goods and capital markets during the last decades. These developments, frequently subsumed under the general heading "globalization", have initiated a lively debate among economists as well as the general public about the potential winners and losers of the increased openness of economies. One aspect of this debate focuses on the consequences of globalization on the welfare state and labor market institutions. It is feared that the domestic economy may be adversely affected by a dismantling of welfare states or deregulation of labor markets abroad (cf. Rodrik (1997)).

On theoretical grounds such fears are often backed up by models in which labor mobility plays a central role.[1] If an economy with a generous welfare state attracts a huge number of immigrants from economies which have lowered public provisions, this may lead to higher unemployment and lower real wages as long as the domestic welfare state remains unchanged. Despite the plausibility of the theoretical argument, the empirical evidence points to a surprisingly low labor mobility between countries, which seems to suggest that such fears are exaggerated (cf. Krueger (2000)). However, perfect labor mobility is not necessary for competitive forces to exert pressure on uncompetitive labor market institutions; free flows of goods or capital could prove to be sufficient.

The following analysis contributes to this discussion by scrutinizing the spillover effects on other countries which are provoked if a single country reduces the generosity of the unemployment compensation system or weakens labor union power. By this the paper takes up Pemberton's (1999) claim that social security policies must be analyzed in an open-economy context, since international spillovers have to be taken into account. In the two-country framework developed in this paper spillover effects may occur because goods and capital markets are internationally integrated. However, in the model labor markets are separated due to the (simplifying) assumption that international mobility of labor is completely hindered by cultural and linguistic barriers. National labor markets are characterized by country-specific labor market institutions which influence the result

[1] See, for instance, the discussion in Sinn (1998).

of wage bargains taking place between firms and labor unions. It is assumed that one country undertakes labor market reforms which are aimed at increasing employment in that country. The reforms may consist of the reduction of unemployment benefits, the modification of labor market legislation to reduce labor union power in wage negotiations or attempts of the government to encourage corporatist behavior by "round-table talks" between government, employers' organizations and labor unions. In the globalization debate it is feared that such reforms harm other countries with respect to real wages and employment. In this paper it is analyzed whether and under which conditions these fears are justified.

Another important point of the following analysis is to demonstrate that the impact of labor market reforms on other countries heavily depends on the institutional setup of the unemployment compensation system in the respective countries. By this, the paper contributes to a strand of the literature which recently emerged in reaction to Atkinson, Micklewright (1991), who complained about theoretical analyses which have largely ignored real-world differences in unemployment compensation systems.[2] In most economies unemployment compensation is usually implemented as two-tier system comprising earnings-related unemployment benefits and flat-rate unemployment assistance. In the model presented below the focus is on the extreme cases where unemployment compensation in a country is either earnings-related or paid as flat-rate transfers. This makes it clearer how institutional differences influence comparative-static outcomes and nevertheless leads to important insights for real-world unemployment compensation systems. The German and UK systems of unemployment compensation most closely resemble the considered (extreme) cases, since in Germany both unemployment benefits and unemployment assistance are earnings-related, whereas in the UK both are paid as flat-rate transfers.[3]

It is sometimes objected that the integration of goods and capital markets, if viewed in

[2]Focusing on different aspects, for instance Goerke (2000) and Schluter (1997) demonstrate (in closed-economy models) that flat-rate and earnings-related unemployment compensation systems lead to different labor market outcomes.

[3]A description of different unemployment compensation systems can be found in Schmid *et al.* (1992).

historical perspective, is not a new phenomenon but was already a characteristic feature of economies at the turn of the twentieth century. Some economists therefore are inclined to downplay the role of globalization for the shape of the welfare state. However, such a conclusion seems to be premature. The reason is that in the early twentieth century welfare states, as we know them today, were nonexistent. Conversely, when modern welfare states came into being, economies were relatively closed - especially with respect to capital flows. Hence, for instance, Mishra (1999) argues that from the standpoint of the welfare state the openness of economies with respect to capital mobility is an entirely new and important development which could lead to a dismantling of social security provisions. To scrutinize whether such a hypothesis can be backed up by theoretical considerations, in this paper the following strategy is adopted. Throughout the paper it is assumed that goods markets are integrated. The impact of country-specific labor market reforms on other countries then first is analyzed for a world with immobile capital, before the model variant with perfect capital mobility is considered.

It turns out that the spillover effects of country-specific labor market reforms not only depend on the degree of capital mobility and the institutional setup of the unemployment compensation system, but also on the degree of competition in the goods market. To show this result, a model with monopolistic competition in the goods market is chosen, where varying degrees of competition are represented by different sizes of the elasticity of the demand for goods. If the demand elasticity is infinite, the model reduces to the limiting case with perfect competition in the goods market. I know of no other paper where all these aspects of country-specific labor market reforms are simultaneously discussed in a single model.[4]

The remainder of the paper is organized as follows. In section 2 the theoretical framework

[4] A two-country model with *perfect* competition in the goods market and wage bargaining in the labor market is analyzed by Lejour, Verbon (1996). In that paper the results (also) depend on their assumption of perfect competition in the goods market. Other studies with integrated goods markets and separated labor markets are Corneo (1995) and Naylor (1998). However, these authors do not take account of capital flows. They also restrict their analysis to a small, single industry located in both countries and hence do not consider the macroeconomic consequences of changing wage pressure in one country, which for instance are due to changing aggregate income.

for a two-country model with imperfectly competitive labor and product markets is introduced. In section 3 the comparative-static results for a world with immobile capital are presented. In section 4 it is analyzed how the results change if capital is perfectly mobile and the induced capital flows are taken into account. In both sections first the simpler case with perfect competition in the goods market is discussed, before the more general model variant based on monopolistic competition is examined. It is shown that the qualitative results in all considered cases depend on whether the unemployment compensation system is based on earnings-related or flat-rate benefits. The concluding remarks appear in section 5.

2 The theoretical framework

In the two-country model developed in this paper it is assumed that all goods are tradable, i.e. the no-tradable goods sector is neglected. The outcome of the wage-setting process is influenced by the relative bargaining power of firms and unions, the preferences of labor unions for employment and wages and the institutional setup of the social security system. It is assumed that countries are different with respect to these variables but otherwise are identical. The differences in wage setting may lead to country-specific wage and price levels which can persist since migration of the labor force is impeded by cultural and linguistic barriers. Beside the number of households also the number of firms in both countries is exogenously given, which may be due to barriers to market entry provoked by sunk costs. Since there is no entry and exit of firms, the wage equilibration mechanism described in Davis (1998) is not at work in this paper.

The model is intended to be a description of the longer run, where expectations are correct and nominal rigidities play no role. As a consequence, monetary policy has no effect on the real side of the economy but only governs the path of the nominal variables. Since money is neutral, it is neglected altogether in the model. The role of government is restricted to the provision of unemployment benefits financed by income taxes.

2.1 Demand for goods

It is assumed that in both countries A and B there are $F/2$ firms and L households. Household preferences are identical and comprise all goods produced in this two-country world. The representative consumer in country h has the following utility function:

$$U^h = F^{\frac{\kappa-1}{\kappa}} \left(\sum_{i=1}^{F/2} \left(Y_{iA}^h\right)^\kappa + \sum_{i=1}^{F/2} \left(Y_{iB}^h\right)^\kappa \right)^{\frac{1}{\kappa}}, \qquad 0 < \kappa < 1, \qquad h = A, B, \tag{1}$$

where $\kappa \equiv (\eta-1)/\eta$ and $\eta > 1$. Y_{ij}^h denotes the quantity of good i produced in country $j = A, B$ which is purchased by the representative consumer located in country $h = A, B$. It is assumed that each consumer is endowed with one unit of labor and one unit of capital which are both supplied inelastically. Since migration is excluded, labor can only be supplied in the respective home country. However, capital can be supplied to the country which offers the higher real interest rate. Of course, this implies that in equilibrium the real interest rate must be the same in both countries. The nominal income I of every consumer comprises capital income, dividends and wage income or unemployment benefits. Customs duties, value added taxes and transportation costs are neglected in the model. This implies that the price P_{ij} for a specific good is the same for consumers and producers of either country. The representative consumer of country h faces the budget constraint

$$\sum_{i=1}^{F/2} P_{iA} Y_{iA}^h + \sum_{i=1}^{F/2} P_{iB} Y_{iB}^h = I^h, \qquad h = A, B. \tag{2}$$

Corresponding to the utility function in eq. (1) the aggregate price index P is defined as

$$P = F^{\frac{1}{\eta-1}} \left(\sum_{i=1}^{F/2} P_{iA}^{1-\eta} + \sum_{i=1}^{F/2} P_{iB}^{1-\eta} \right)^{\frac{1}{1-\eta}}. \tag{3}$$

By maximizing eq. (1) with respect to Y_{ij}^h and taking account of eqs. (2) and (3), the demand functions of each consumer can be derived. To obtain the demand function for the producer of good i in country j, one has to aggregate over the consumers of both countries. Defining world real income Y as sum of the country-specific real income levels

(in terms of the aggregate good), the demand function for good Y_{ij} is given by

$$Y_{ij}^d = p_{ij}^{-\eta} \frac{Y}{F}, \qquad i = 1, \ldots, F/2, \quad j = A, B. \tag{4}$$

In this equation p_{ij} denotes relative prices in terms of the aggregate good, i.e. $p_{ij} \equiv P_{ij}/P$. The elasticity of the demand for goods is constant and equals η (in absolute values). Of course, in general equilibrium world real income Y is itself an endogenous variable, but from the firm's point of view it is taken as exogenous due to the assumed large number of firms. Note that the parameter $\kappa \equiv (\eta - 1)/\eta$ is a function of the demand elasticity and can be interpreted as a measure of the degree of competition in the goods market. With perfect competition the demand elasticity is infinite and hence $\kappa = 1$. With monopolistic competition in the goods market $\kappa < 1$, with κ getting lower when the demand elasticity is decreasing. In the following analysis κ will play an important role in distinguishing model variants with different degree of competition in the goods market.

In this model there is no rationing, so production Y_{ij} is always equal to demand Y_{ij}^d. In equilibrium all firms belonging to the same country are facing the same (country-specific) wage rate and the same real interest rate. Furthermore, firms share the same technology. Firms in country j therefore choose the same (relative) price, i.e. $p_{ij} = p_j$. It also holds that $Y_j = (F/2)\, Y_{ij}$, where Y_j denotes production in country j. This leads to the following inverse demand function for country j:

$$p_j = \left(\frac{Y}{2Y_j} \right)^{1-\kappa}, \qquad j = A, B. \tag{5}$$

If written in relative changes, this equation becomes

$$\widehat{p}_j = (1 - \kappa) \left(\widehat{Y} - \widehat{Y}_j \right), \qquad j = A, B, \tag{6}$$

where a hat over a variable denotes relative changes.

2.2 Demand for labor and capital in every country

Producers act as monopolistic competitors, taking account of the product demand function (4) when choosing factor demands. The behavior of firms is determined by the fact

that there is a large number of firms in every country, which implies that the single firm is small compared to the (national) economy as a whole. As a result, each firm does not need to consider the consequences of its actions for the aggregate variables and for the other firms.

For the determination of factor demands the following sequence of events is assumed in line with the literature[5]. In a first step firms choose the stock of capital. Then wages are determined in a wage bargain between firms and labor unions. As last step firms choose the optimal employment level given the predetermined capital stock and wages.

Firms use the Cobb-Douglas technology $Y_{ij} = N_{ij}^{\alpha} K_{ij}^{1-\alpha}$, where N_{ij} is employment and K_{ij} is the stock of capital of firm i in country $j = A, B$. Each firm chooses the employment level according to the condition $\partial R_{ij}/\partial N_{ij} = w_{ij}$, where R_{ij} denotes the (real) revenue function and w_{ij} the real wage in terms of the aggregate good, i.e. $w_{ij} \equiv W_{ij}/P$, where W_{ij} is the nominal wage. Marginal revenue with respect to employment is

$$\frac{\partial R_{ij}}{\partial N_{ij}} = \kappa\, p_{ij}\, \frac{\partial Y_{ij}}{\partial N_{ij}} = \kappa \left[Y_{ij}^{\kappa-1} \left(\frac{Y}{F} \right)^{1-\kappa} \right] \frac{\partial Y_{ij}}{\partial N_{ij}}. \tag{7}$$

The fact that marginal revenue is a function of world real income is of uttermost importance for the results of this paper. All other things being constant, an increase in aggregate income leads to a rise in the relative price p_{ij} and hence to a rise of marginal revenue, i.e. $\partial^2 R_{ij}/(\partial N_{ij} \partial Y) > 0$. For given real wages and capital stock a rise in Y will induce the firm to increase labor demand. This reduces the marginal product of labor and p_{ij} (which has risen due to the increase in Y) until the first order condition for a profit maximum is restored. In the following the impact of aggregate income on marginal revenue and hence labor demand will be called the *aggregate income effect*. With perfect competition in the goods market $\kappa = 1$ and therefore $p_{ij} = 1$, so the first-order condition for a profit maximum reduces to $\partial Y_{ij}/\partial N_{ij} = w_{ij}$. Also note that in eq. (7) marginal revenue with respect to employment is an increasing function in the stock of capital, i.e. $\partial^2 R_{ij}/(\partial N_{ij} \partial K_{ij}) > 0$.

[5]See, for instance, Hoel (1990) and Michaelis (1998). Grout (1984) discusses the consequences of this assumption compared to the case where unions can commit themselves to a wage rate before investments are determined. See also the discussion in van der Ploeg (1987).

If the Cobb Douglas production function is inserted in eq. (7), the first order condition for maximum profits leads to the following labor demand functions:

$$N_{ij} = \left\{ w_{ij}^{-1} \alpha\kappa K_{ij}^{(1-\alpha)\kappa} \left(\frac{Y}{F}\right)^{1-\kappa} \right\}^{\frac{1}{1-\alpha\kappa}}, \qquad i = 1, \ldots, F/2, \quad j = A, B. \tag{8}$$

When firms determine the capital stock on the first stage they take account of the wage level that will result on the second stage and of the employment level they will choose on the third stage. Denoting the real interest rate in terms of the aggregate good as r, firms choose the stock of capital according to $\partial R_{ij}/\partial K_{ij} = r + N_{ij}\, \partial w_{ij}/\partial K_{ij}$, since the bargained real wage, in general, depends on the level of the capital stock. However, in the case of a Cobb-Douglas production function it holds that $\partial w_{ij}/\partial K_{ij} = 0$, as will be shown in a moment. The demand for capital is then given by

$$K_{ij} = \left\{ r^{-1}(1-\alpha)\kappa N_{ij}^{\alpha\kappa} \left(\frac{Y}{F}\right)^{1-\kappa} \right\}^{\frac{1}{1-(1-\alpha)\kappa}}, \qquad i = 1, \ldots, F, \quad j = A, B. \tag{9}$$

It is assumed that all firms and labor unions of the respective country are identical, hence $p_{ij} = p_j$ and $w_{ij} = w_j$ must hold in equilibrium. It follows that $N_j = (F/2)N_{ij}$, $K_j = (F/2)K_{ij}$ and $Y_j = (F/2)Y_{ij}$, where N_j, K_j and Y_j denote the national levels of employment, the stock of capital and output, respectively. The production function for each country (in relative changes) is therefore given by

$$\widehat{Y}_j = \alpha \widehat{N}_j + (1-\alpha)\widehat{K}_j, \qquad j = A, B \tag{10}$$

From eqs. (8) and (9) the relative change in the demand for labor and capital for every country can be derived as

$$\widehat{N}_j = -\frac{1}{1-\psi_N}\widehat{w}_j + \frac{\psi_K}{1-\psi_N}\widehat{K}_j + \frac{1-\kappa}{1-\psi_N}\widehat{Y}, \qquad j = A, B \tag{11}$$

and

$$\widehat{K}_j = -\frac{1}{1-\psi_K}\widehat{r} + \frac{\psi_N}{1-\psi_K}\widehat{N}_j + \frac{1-\kappa}{1-\psi_K}\widehat{Y}, \qquad j = A, B, \tag{12}$$

where $\psi_N \equiv \alpha\kappa$ and $\psi_K \equiv (1-\alpha)\kappa$. Employment can be substituted by unemployment, since $N_j = (1-u_j)L$, where L is the labor supply in every country which is equal to the fixed number of households. Hence

$$\widehat{N}_j = -(1/\beta_j)\,\widehat{u}_j, \qquad \beta_j \equiv (1-u_j)/u_j > 0, \qquad j = A, B. \tag{13}$$

2.3 Wage setting in every country

It is assumed that in every country wage bargains take place at the firm level. For the utility function U_{ij} of labor union i in country j the following functional form is used:

$$U_{ij} = N_{ij}^{\phi_j} \left[w_{ij}(1-t_j) - z_j \right], \qquad \phi_j > 0, \qquad \forall i, j, \tag{14}$$

where ϕ_j represents the union's preferences for employment relative to wages and t_j denotes the income tax rate, $j = A, B$. The variable z_j is the expected real income of a worker in country j who loses his job in the firm under consideration.[6] As the bargaining parties are small units compared to the whole (national) economy, z_j is exogenous for the single firm or union. The real wage in terms of the aggregate good w_{ij} is obtained from maximizing a Nash bargain with zero fall-back positions for unions and firms, $U_{ij}^{\chi_j} \Pi_{ij}^{1-\chi_j}$, where $0 < \chi_j < 1$. The parameter χ_j denotes the bargaining power of a representative union in country j and Π_{ij} the (real) profits of the respective firm. After some rearrangement, the first-order condition for this optimization problem can be written as

$$w_{ij}(1-t_j) = \frac{\mu_j}{\mu_j - 1} z_j, \qquad \text{with} \quad \mu_j = \mu_j(\phi_j, \chi_j) \equiv \frac{\phi_j + \frac{1-\chi_j}{\chi_j}\alpha\kappa}{1-\alpha\kappa}. \tag{15}$$

The bargained real wage at the firm level is a mark-up on the expected alternative income z_j, where the mark-up is a negative function of μ_j. In order to get a meaningful solution it must be assumed that $\mu_j > 1$. μ_j is a function of the elasticities of employment and profits with respect to the wage, which are both constant in the Cobb-Douglas case. As a result, the bargained real wage is independent of the chosen stock of capital, i.e. $\partial w_{ij}/\partial K_{ij} = 0$. As underlying causes of a variation in μ_j only changes in ϕ_j and χ_j are considered. From the definition of μ_j in eq. (15) follows:

$$\widehat{\mu}_j = \frac{\phi_j}{(1-\alpha\kappa)\mu_j}\widehat{\phi}_j - \frac{1}{\chi_j \mu_j}\widehat{\chi}_j. \tag{16}$$

Since migration is excluded, the expected alternative income z_j depends solely on variables specific to country j:

$$z_j = (1-u_j)\, w_j(1-t_j) + u_j s_j, \tag{17}$$

[6] For similar specifications see, for example, Oswald (1985) and Manning (1991, 1995).

where w_j is the average wage level and s_j is the real unemployment compensation in country j (both in terms of the aggregate good). The probability of finding a job elsewhere in that country negatively depends on the respective unemployment rate u_j. In most economies unemployment compensation is usually implemented as two-tier system comprising earnings-related unemployment benefits and flat-rate unemployment assistance. Such a mixed system could be defined as:

$$s_j = \gamma_j \rho_j w_j (1 - t_j) + (1 - \gamma_j) b_j \qquad 0 \leq \gamma_j \leq 1, \quad 0 < \rho_j < 1, \quad b_j > 0, \tag{18}$$

where γ_j denotes the percentage of unemployed who receive earnings-related unemployment benefits. ρ_j is the replacement ratio and b_j denotes flat-rate unemployment benefits (in real terms). It is assumed that earnings-related benefits are a function of after-tax wages. This corresponds, for instance, to the German system of unemployment compensation.[7] In the following the focus is on the extreme cases where unemployment compensation is either earnings-related ($\gamma = 1$) or paid as flat-rate transfers ($\gamma = 0$). This makes it clearer how institutional differences influence comparative-static outcomes and nevertheless leads to important insights for real world unemployment compensation systems.

Within a country all firms and unions are identical, hence $w_{ij} = w_j$ must hold in equilibrium. Using the definitions of z_j and s_j together with the firm-level wage equation (15), the national wage-setting equation is

$$w_j \left(\frac{\mu_j u_j (1 - \gamma_j \rho_j) - 1}{\mu_j u_j} \right) = (1 - \gamma_j) \frac{b_j}{1 - t_j}. \tag{19}$$

In the pure earnings-related unemployment compensation system ($\gamma_j = 1$) the wage-setting equation alone already determines the level of unemployment. The reason is that in this case the expression in parentheses on the left-hand side, which contains only the unemployment rate as endogenous variable, must be zero. Before writing the wage-setting

[7] In accordance with the literature, in eq. (18) it is assumed that earnings-related benefits are a function of the average wage level in the respective country. This guarantees that z_j is exogenous in the firm level bargain. Without this assumption the analysis would be more complicated but qualitatively unchanged. See also Beissinger, Egger (2000) for a more detailed discussion of this issue within an intertemporal framework.

equations in relative changes, first the implications of the government budget constraint on the wage-setting process are taken into account.

2.4 Implications of the government budget constraint for the bargained real wage

Tax revenues are solely used to finance unemployment benefits. In this case the government budget GB_j is given by $\mathrm{GB}_j = t_j w_j N_j - (L - N_j) s_j$. Taking account of the definition of s_j in eq. (18) the government budget is balanced if

$$t_j = \begin{cases} u_j \rho_j / (1 - u_j(1 - \rho_j)) & \text{for} \quad \gamma = 1 \\ u_j b_j / (w_j(1 - u_j)) & \text{for} \quad \gamma = 0. \end{cases} \tag{20}$$

In the earnings-related unemployment compensation system ($\gamma = 1$) the outcome of the wage bargain does not depend on the level of income taxes. This is due to the fact that unemployment benefits are a constant fraction of after-tax wages. Hence the wage-setting equation (19) in relative changes is

$$\widehat{u}_j = \Omega_j, \qquad \text{with} \qquad \Omega_j \equiv -\widehat{\mu}_j + \frac{\rho_j}{1 - \rho_j} \widehat{\rho}_j. \tag{21}$$

With flat-rate benefits ($\gamma = 0$) the government budget constraint has an impact on the bargained real wage, since the income tax rate shows up in the wage-setting equation $w_j = \mu_j u_j b_j / [(\mu_j u_j - 1)(1 - t_j)]$. For a meaningful solution it must be assumed that $\mu_j u_j > 1$. Inserting eq. (20) (when $\gamma = 0$) for t_j in this equation and writing the resulting expression in relative changes leads to

$$\widehat{w}_j = -\nu_j \widehat{u}_j + \widetilde{\Omega}_j \text{ with } \nu_j \equiv \frac{1 - \mu_j u_j^2}{(\mu_j u_j - 1)(1 - u_j)}; \; \widetilde{\Omega}_j \equiv \frac{-(1 - u_j)\mu_j \widehat{\mu}_j}{(\mu_j u_j - 1)(\mu_j - 1)} + \widehat{b}_j \tag{22}$$

From eq. (22) it is clear that the condition $\mu_j u_j > 1$ is not sufficient to guarantee the empirically confirmed result that higher unemployment leads to lower wages. The reason is that higher unemployment also implies higher payroll taxes which leads to higher wage pressure. For $\partial \widehat{w}_j / \partial \widehat{u}_j < 0$ to hold, additionally the assumption $\mu_j u_j^2 < 1$ is needed. Taken together higher unemployment only lowers the bargained real wage if $u_j^{-1} < \mu_j < u_j^{-2}$. In the following it is assumed that this condition holds, which implies $\nu_j > 0$.

The change in the tax rate, which is necessary for balancing the government budget, can be computed from eq. (20). With an earnings-related unemployment compensation system one gets

$$\widehat{t}_j = \frac{1}{1-u_j(1-\rho_j)}\widehat{u}_j + \frac{1-u_j}{1-u_j(1-\rho_j)}\widehat{\rho}_j, \qquad j = A, B \tag{23}$$

and with flat-rate benefits:

$$\widehat{t}_j = \frac{1}{1-u_j}\widehat{u}_j + \widehat{b}_j - \widehat{w}_j, \qquad j = A, B \tag{24}$$

2.5 Capital market equilibrium and aggregate output

The real interest rate r (in terms of the aggregate good) equilibrates supply and demand for capital, hence $K_A + K_B = K$, where K is the total supply of capital in the two-country world. Note that in this model the real interest rate must be the same in both countries. Since it is assumed that the supply of capital is fixed, it must hold that

$$\widehat{K}_A = -(K_B/K_A)\,\widehat{K}_B. \tag{25}$$

Turning to aggregate output which is equal to world real income, it has already been pointed out that Y is a function of national output levels. Since national prices P_j and hence also relative prices $p_j \equiv P_j/P$, $j = A, B$, may differ, aggregate output has to be written as $Y = p_A Y_A + p_B Y_B$. With the inverse demand functions (5) and the national Cobb-Douglas production functions one obtains as the relative change of aggregate output:

$$\widehat{Y} = \alpha\delta\widehat{N}_A + \alpha(1-\delta)\widehat{N}_B + (1-\alpha)\delta\widehat{K}_A + (1-\alpha)(1-\delta)\widehat{K}_B, \tag{26}$$

where $\delta \equiv Y_A^\kappa/(Y_A^\kappa + Y_B^\kappa)$ and $0 < \delta < 1$.

3 Results with immobile capital as benchmark case

For the comparative-static analysis it is assumed that in country A labor market reforms are undertaken which are aimed at increasing employment in that country. Such reforms could, for instance, be modifications of labor market legislation to reduce labor union

power in wage negotiations, which would amount to a reduction of χ_A. A further example are attempts of the government to encourage "corporatist behavior" of labor unions, which could be modeled as an increase in labor unions' preferences for employment, ϕ_A. Employment-enhancing reforms also could be the reduction of unemployment benefits, i.e a decrease in ρ_A (or b_A). In the political debate such reform proposals usually attract the greatest attention. The focus of the analysis is on the spillover effects, which country A might exert on country B due to the domestic labor market reforms. In the theoretical model all types of labor market reforms lead to $\Omega_A < 0$ (or $\widetilde{\Omega}_A < 0$) in the wage-setting equation of country A, whereas it is assumed that $\Omega_B = 0$ (and $\widetilde{\Omega}_B = 0$). Hence it suffices to analyze the consequences of $\Omega_A < 0$ (or $\widetilde{\Omega}_A < 0$) on the endogenous variables of the system. Depending on the type of unemployment compensation system, the complete model comprises the endogenous variables $\widehat{Y}$, $\widehat{r}$, $\widehat{w}_j$, $\widehat{p}_j$, $\widehat{t}_j$, $\widehat{Y}_j$, $\widehat{N}_j$, $\widehat{K}_j$, $\widehat{u}_j, j = A, B$. The exogenous variables are: $\widehat{\phi}_A, \widehat{\chi}_A, \widehat{\rho}_A$ (or $\widehat{b}_A$).

To facilitate the understanding of the model's implications it is useful first to scrutinize the consequences of country-specific labor market reforms when capital is immobile. This can also be justified by the fact that after World War II the creation of the modern welfare state took place in a world where the mobility of capital was severly restricted. With immobile capital it holds that $\widehat{K}_A = \widehat{K}_B = 0$, i.e. the stock of capital is fixed in every country. According to eq. (26) changes in aggregate output are then only caused by changes in employment in one of the countries. If this equation is inserted in the labor demand equations (11), it becomes evident that labor demand of every country is influenced by the employment level of the other country. The labor demand equations can be solved for real wages, which leads to the following inverse labor demand equations:

$$\widehat{w}_A = -(\omega_1 - \omega_2)\widehat{N}_A + \omega_3\widehat{N}_B \qquad \text{and} \qquad \widehat{w}_B = -(\omega_1 - \omega_3)\widehat{N}_B + \omega_2\widehat{N}_A, \tag{27}$$

where

$$\omega_1 \equiv (1 - \alpha\kappa) \quad \omega_2 \equiv (1 - \kappa)\alpha\delta \quad \omega_3 \equiv (1 - \kappa)(1 - \delta)\alpha, \text{ and } 0 < \omega_i < 1. \tag{28}$$

Due to eq. (13) it holds that $\widehat{u}_j = -\beta_j\widehat{N}_j$. Since it is assumed that labor market reforms are only undertaken in country A , the wage-setting equations with earnings-related benefits

can be written as:

$$\widehat{N}_A = -\Omega_A/\beta_A \qquad \text{and} \qquad \widehat{N}_B = 0. \tag{21'}$$

If benefits are paid as flat-rate transfers, the wage-setting equations are:

$$\widehat{w}_A = \nu_A\beta_A\widehat{N}_A + \widetilde{\Omega}_A \qquad \text{and} \qquad \widehat{w}_B = \nu_B\beta_B\widehat{N}_B. \tag{22'}$$

To derive the solution for real wages and employment in both countries, the labor demand equations (27) must be combined with the respective wage-setting equations (21′) or (22′). The model can be further simplified by first considering the results if perfect competition prevails in the goods market, before going over to the more general model with monopolistic competition in the goods market.

3.1 Perfect competition in the goods market

With perfect competition in the goods market the same homogenous product is produced in both countries. Since labor and capital are immobile, a trivial model is obtained where both countries in principle are closed economies and consumers of each country are exactly consuming the produced output of their own country. With $\kappa = 1$ the labor demand equations (27) do not depend on employment of the other country, since in this case $\omega_2 = \omega_3 = 0$ and $\omega_1 = (1-\alpha)$. As a result, country B is not affected by the labor market reforms in country A, i.e. $\widehat{N}_B = 0$ and $\widehat{w}_B = 0$. With respect to country A, the following results are obtained:

3.1.1 Earnings-related unemployment benefits. In this case the change in employment is determined by the wage-setting equation alone, i.e. $\widehat{N}_A = -\Omega_A/\beta_A > 0$, since $\Omega_A < 0$. The change in real wages is then obtained from the inverse labor demand equation as $\widehat{w}_A = -\omega_1\widehat{N}_A < 0$.

3.1.2 Flat-rate unemployment benefits. In this case both real wages and employment have to be simultaneously determined by the wage-setting and labor demand equation of country A. This leads to $\widehat{N}_A = -\widetilde{\Omega}_A/((1-\alpha)+\nu_A\beta_A) > 0$, since $\widetilde{\Omega}_A < 0$. From the inverse labor demand equation it follows that $\widehat{w}_A = -\omega_1\widehat{N}_A < 0$.

3.2 Monopolistic competition in the goods market

Two important aspects of the model variant with monopolistic competition must be stressed. Firstly, country B is affected by the labor market reforms in country A, since labor demand also depends on the employment level of the other country. Secondly, the implications of such reforms for country B depend on the unemployment compensation system in that country. If unemployment benefits are earnings-related, employment is alone determined by the wage-setting equation, which is only influenced by domestic variables. As a result, employment in country B is *not* affected by the reforms undertaken abroad. In contrast, with flat-rate benefits employment and real wages are determined simultaneously by the interplay of wage-setting and labor-demand equation. Since labor demand is influenced by the employment level of country A, the employment level in country B will be affected by the labor-market reforms undertaken in the other country.

When deriving the results for the more general model with monopolistic competition in the goods market, first the sign of $(\omega_1 - \omega_2)$ and $(\omega_1 - \omega_3)$ in the inverse labor demand equations (27) must be determined. From the definitions in eq. (28) it follows that $\omega_1 - \omega_2 = 1 - (\kappa\alpha + (1-\kappa)\alpha\delta)$. Since $\kappa\alpha + (1-\kappa)\alpha\delta < \kappa\alpha + (1-\kappa)\alpha$ it holds that $\kappa\alpha + (1-\kappa)\alpha\delta < \alpha$. As a result $0 < (\omega_1 - \omega_2) < 1$. From the same equation it can also be seen that $\omega_1 - \omega_3 = 1 - (\delta\alpha\kappa + (1-\delta)\alpha)$. Since $\delta\alpha\kappa + (1-\delta)\alpha < \delta\alpha + (1-\delta)\alpha$, it follows that $\delta\alpha\kappa + (1-\delta)\alpha < \alpha$. Hence $0 < (\omega_1 - \omega_3) < 1$. As a result, the inverse labor demand curves in eq. (27) are falling in the $\widehat{w}_j$-$\widehat{N}_j$-space $(j = A, B)$.

3.2.1 Earnings-related unemployment benefits. In this case the solution for employment and real wages can again be determined recursively. From eq. (21′) it immediately follows that $\widehat{N}_A = -\Omega_A/\beta_A > 0$, whereas $\widehat{N}_B = 0$. From eq. (27) the consequences for real wages in both countries can be derived. Since $\omega_1 - \omega_2 > 0$, real wages in country A will decline. However, in contrast to the model variant with perfect competition in the goods market, real wages in country B will rise. This result is best understood by going back to eq. (7). A rise in Y leads to an increase in marginal revenue with respect to employment. With constant real wages this would lead to an increase in labor demand. However, employment N_B will not change since it is determined by the wage-setting equation. As a

result the aggregate income effect leads to rising real wages until the equality of marginal revenue and real wages is restored again.

In section A.1 in the appendix the complete results for the endogenous variables are summarized. Inserting the results for employment into eq. (10) and eq. (26) leads to $\widehat{Y}_A > 0$, $\widehat{Y}_B = 0$ and $\widehat{Y} > 0$. Since the rise in aggregate output is less than the increase in production of country A, it follows from eq. (6) that $\widehat{p}_A < 0$, whereas $\widehat{p}_B > 0$. Of course, this implies that relative prices p_A/p_B have changed in favor of country A, i.e. they have decreased. Since unemployment (and possibly also ρ_A) is declining in country A, due to eq. (23) income taxes in this country will decrease, whereas income taxes in country B remain unchanged. Since unemployment benefits are a fixed percentage of after-tax wages, it follows that unemployment benefits in country B rise. As a result the employed and unemployed persons in country B are *positively* affected by the labor market reforms in country A. The interesting point is that this result is obtained although relative prices have changed in favor of country A, which means that for given world income country A has gained a greater share of demand. The reason is that due to the reforms in country A real world income has increased and the aggregate income effect dominates the relative price effect.

3.2.2 Flat-rate unemployment benefits. In this case the model can no longer be solved recursively. The combination of the wage-setting equations (22′) with the labor demand equations (27) leads to

$$\widehat{N}_A = -\Lambda^{-1}\left[\omega_1 - \omega_3 + \nu_B\beta_B\right]\widetilde{\Omega}_A \qquad \text{and} \qquad \widehat{N}_B = -\Lambda^{-1}\,\omega_2\,\widetilde{\Omega}_A, \tag{29}$$

where Λ is defined as

$$\Lambda \equiv \left[(\omega_1 - \omega_2 + \nu_A\beta_A)(\omega_1 - \omega_3 + \nu_B\beta_B)\right] - \omega_2\omega_3. \tag{30}$$

Note that in eq. (30) the expression in brackets is positive whereas the last term is negative. Λ can be written as $[(\omega_1 - \omega_3 + \nu_B\beta_B)\nu_A\beta_A + (\omega_1 - \omega_2)\nu_B\beta_B] + \omega_1(\omega_1 - \omega_2 - \omega_3)$. Again the expression in brackets is positive. Bearing in mind the definitions of ω_i in eq. (28), it holds that $(\omega_1 - \omega_2 - \omega_3) = 1 - \alpha > 0$. As a result $\Lambda > 0$.

Going back to eq. (29), it follows that employment in *both* countries will rise if labor market reforms are undertaken in country A (remember that $\widetilde{\Omega}_A < 0$). By inserting the

result for $\widehat{N}_B$ into the respective wage-setting equation (22′), it can be seen that real wages in country B will rise. For country A there are two effects working in opposite direction. The direct impact of the labor market reforms, i.e. $\widetilde{\Omega}_A < 0$, leads *cet. par.* to lower real wages, whereas the implied rise in employment increases real wage demands. If the solution for $\widehat{N}_A$ is inserted in eq. (22′), one gets

$$\widehat{w}_A = \frac{-\nu_A\beta_A[\omega_1 - \omega_3 + \nu_B\beta_B] + \Lambda}{\Lambda}\,\widetilde{\Omega}_A = \frac{(\omega_1 - \omega_2)\nu_B\beta_B + \omega_1(1-\alpha)}{\Lambda}\,\widetilde{\Omega}_A < 0.$$

As a result, real wages in country A will unanimously decrease in response to the labor market reforms. The complete results for the endogenous variables are summarized in section A.2 of the appendix. With rising employment also production in both countries and hence aggregate output increase, whereas unemployment rates go down. The positive results for country B are obtained although relative prices change in favor of country A. Since in country B real wages and employment are rising, tax revenues will increase. To guarantee a balanced government budget the income tax rate is therefore reduced. For country A the relative change in income taxes is not immediately obvious. In section A.2 of the appendix it is demonstrated that the income tax rate in country A will decrease.

3.3 Comparison of main results with immobile capital

Before going over to the more general model with capital mobility, the results derived above with respect to unemployment and real wages are summarized in *table* 1. With perfect competition in the goods market ($\kappa = 1$) and immobile labor and capital, country B is completely insulated from labor market shocks originating abroad. In country A the labor market reforms lead to rising employment and declining real wages. The qualitative results hold irrespective of the unemployment compensation system in both countries.

With monopolistic competition in the goods market ($0 < \kappa < 1$), it follows that the employees in country B are positively affected by employment-enhancing labor market reforms in country A. With both unemployment compensation systems the employees in country B will profit from real wage increases. In the case with flat-rate benefits country B will also experience employment gains. These results are valid although relative prices

Table 1

Results for country B if country A undertakes employment-enhancing labor market reforms in a world with immobile capital

	Degree of competition in the goods market			
	$\kappa = 1$		$0 < \kappa < 1$	
earnings-related benefits	$\widehat{u}_B = 0$	$\widehat{w}_B = 0$	$\widehat{u}_B = 0$	$\widehat{w}_B > 0$
flat-rate benefits	$\widehat{u}_B = 0$	$\widehat{w}_B = 0$	$\widehat{u}_B < 0$	$\widehat{w}_B > 0$

Notes: If $\kappa = 1$, perfect competition prevails in the goods market. $0 < \kappa < 1$ describes a situation with monopolistic competition. In all model variants the results for country A are $\widehat{u}_A < 0$ and $\widehat{w}_A < 0$.

move in favor of country A. The reason is that the aggregate income effect, which influences labor demand in both countries, dominates the relative price effect.

Due to the results of *table* 1 it must be concluded that in a world with immobile capital fears of a "race to the bottom" of welfare states are not justified. Since country B is either not affected or positively influenced by labor-market reforms abroad, there seems to be no need to diminish the generosity of the domestic welfare system. However, modern welfare states today have to deal with a situation where capital mobility has significantly increased. In the next section it is therefore scrutinized whether the results derived so far are also obtained when induced capital flows are taken into account.

4 The implications of country-specific labor market reforms in a world with mobile capital

To simplify the model variant with mobile capital, from now on the analysis is confined to the case of a *symmetric initial equilibrium* in the sense, that in the initial equilibrium real wages, the stock of capital, employment and hence also unemployment rates and production levels are equal.[8] This assumption implies that $\beta_A = \beta_B = \beta$ and $\nu_A = \nu_B = \nu$.

[8] It has been checked that the qualitative results are not affected by this assumption.

The wage-setting equations with earnings-related benefits can now be written as:

$$\widehat{N}_A = -\Omega_A/\beta \qquad \text{and} \qquad \widehat{N}_B = 0. \tag{21''}$$

With flat-rate benefits, the wage-setting equations become:

$$\widehat{w}_A = \nu\beta\widehat{N}_A + \widetilde{\Omega}_A \qquad \text{and} \qquad \widehat{w}_B = \nu\beta\widehat{N}_B. \tag{22''}$$

For the capital market the assumption of a symmetric initial equilibrium implies that

$$\widehat{K}_A = -\widehat{K}_B. \tag{25'}$$

Since production levels are equal in the initial equilibrium, it holds that $\delta = 1/2$ in eq. (26) for aggregate output. This leads to

$$\widehat{Y} = (\alpha/2)\,(\widehat{N}_A + \widehat{N}_B). \tag{31}$$

Hence relative changes in aggregate output are only due to relative changes in national employment levels.

4.1 Perfect competition in the goods market

As in section 3 first the (simpler) model variant with perfect competition in the goods market is considered. Since in this case a homogenous good is produced, capital mobility now leads to factor price equalization.[9] With $\kappa = 1$ the factor demand equations (11) and (12) become:

$$\widehat{N}_j = -(1/(1-\alpha))\,\widehat{w}_j + \widehat{K}_j, \qquad j = A, B \tag{32}$$

$$\text{and} \qquad \widehat{K}_j = -(1/\alpha)\,\widehat{r} + \widehat{N}_j, \qquad j = A, B. \tag{33}$$

Inserting eq. (33) into eq. (32) leads to $\widehat{w}_j = -((1-\alpha)/\alpha)\,\widehat{r}$ for $j = A, B$. Hence, real wages and the real interest rate move in the opposite direction. Since the real interest

[9] This can already be seen by inserting the national version of the capital demand equation (9) into the national version of the labor demand equation (8) and taking into account that $\kappa = 1$. It follows that real wages must be equal, i.e. $w_A = w_B$.

rate is the same for both countries, it also follows that $\widehat{w}_A = \widehat{w}_B$, which, of course, must hold in the case of factor price equalization. To derive the solution for $\widehat{N}_j$, $\widehat{K}_j$, $\widehat{w}_j$ and $\widehat{r}$, eqs. (32) and (33) must be combined with the capital market equilibrium condition (25′) and the respective wage-setting equations (21″) or (22″).

4.1.1 Earnings-related unemployment benefits. With $\Omega_A < 0$ it immediately follows from the wage-setting equations (21″) that $\widehat{N}_A > 0$, whereas $\widehat{N}_B = 0$. Taking account of these expressions in the remaining equations, one also obtains: $\widehat{K}_A = -\Omega_A/(2\beta) > 0$ and $\widehat{K}_B = -\widehat{K}_A < 0$. The changes in factor prices are given as $\widehat{r} = -\alpha\Omega_A/(2\beta) > 0$ and $\widehat{w}_A = \widehat{w}_B = (1-\alpha)\Omega_A/(2\beta) < 0$.

4.1.2 Flat-rate unemployment benefits. In this case eqs. (22″), (25′), (32) and (33) must be considered simultaneously. The solutions for employment, capital and factor prices are then given by

$$\widehat{N}_A = -\frac{1-\alpha+2\nu\beta}{(1-\alpha+\nu\beta)2\nu\beta}\,\widetilde{\Omega}_A > 0 \qquad \widehat{N}_B = \frac{1-\alpha}{(1-\alpha+\nu\beta)(2\nu\beta)}\,\widetilde{\Omega}_A < 0$$

$$\widehat{K}_A = -\frac{1}{2\nu\beta}\,\widetilde{\Omega}_A > 0 \qquad \widehat{K}_B = -\widehat{K}_A < 0$$

$$\widehat{w}_A = \widehat{w}_B = \frac{1-\alpha}{2(1-\alpha+\nu\beta)\widetilde{\Omega}_A} < 0 \qquad \widehat{r} = -\frac{\alpha}{2(1-\alpha+\nu\beta)}\widetilde{\Omega}_A > 0.$$

The results for both cases can be summarized as follows: The labor market reforms in country A lead there to lower real wages, higher employment and a higher stock of capital. The capital is attracted via higher real interest rates. Due to capital outflows country B is harmed by the reforms in country A, which is in contrast to all discussed model variants with immobile capital. A lower stock of capital implies a declining labor demand. If benefits are earnings-related the real wage response in country B is flexible enough to prevent changes in employment. However, the employees in country B are experiencing a real wage decline, which in equilibrium is the same as in country A. With flat-rate benefits the decrease in real wages in country B is only brought about by shrinking employment. Hence in this case employees in country B are adversely affected in two ways: first by shrinking employment and second by declining real wages. Since in country A employment and capital are increasing, it follows that production in country A is rising. Due to the capital outflow (and shrinking employment in the case of flat-rate benefits) production in country B is decreasing.

4.2 Monopolistic competition in the goods market

In this section it is scrutinized whether the results derived above also hold when there is monopolistic competition in the goods market. The impact of country A's labor market reforms on country B now depends on three effects: the relative price effect, the aggregate income effect and the effect caused by induced capital flows. For the comparative-static analysis it is useful to consider the long-run factor demand functions that depend on factor prices and aggregate output. From eqs. (11) and (12) it follows for $0 < \kappa < 1$

$$\widehat{N}_j = -\frac{\psi_K}{1-\kappa}\widehat{r} - \frac{1-\psi_K}{1-\kappa}\widehat{w}_j + \widehat{Y} \qquad j = A, B \tag{34}$$

and

$$\widehat{K}_j = -\frac{1-\psi_N}{1-\kappa}\widehat{r} - \frac{\psi_N}{1-\kappa}\widehat{w}_j + \widehat{Y} \qquad j = A, B. \tag{35}$$

To obtain these equations, it was taken into account that $1-\psi_N-\psi_K = 1-\kappa$.[10] The wage-setting equations (21″) or (22″) (depending on the unemployment compensation system), eq. (25′) for capital market equilibrium, eq. (31) for aggregate output and eqs. (34) and (35) form a subsystem of the complete model, which must be considered to determine the solution for the endogenous variables $\widehat{r}$, $\widehat{Y}, \widehat{N}_j$, $\widehat{K}_j$ and $\widehat{w}_j$, for $j = A, B$.

4.2.1 Earnings-related unemployment benefits. In this case the analysis is again facilitated by the fact that employment changes are determined by the wage-setting equation alone and are given as $\widehat{N}_A = -\Omega_A/\beta > 0$ and $\widehat{N}_B = 0$. Eq. (31) then reduces to $\widehat{Y} = -\alpha\Omega_A/(2\beta) > 0$. Considering the difference in factor changes and taking account of eq. (25′), it is easily derived that $\widehat{w}_A - \widehat{w}_B = [\beta(1-\psi_K)]^{-1}(1-\kappa)\,\Omega_A < 0$ and

$$\widehat{K}_A = -\widehat{K}_B = -\frac{\psi_N}{2(1-\kappa)}(\widehat{w}_A - \widehat{w}_B) = -\frac{\alpha\kappa}{2\beta(1-\kappa(1-\alpha))}\Omega_A > 0,$$

where in the last expression the definitions $\psi_N \equiv \alpha\kappa$ and $\psi_K \equiv (1-\alpha)\kappa$ were taken into account. Since $\widehat{w}_A \neq \widehat{w}_B$, it is obvious that with monopolistic competition in the goods market factor price equalization does *not* result. If the solutions for employment, capital and aggregate output are inserted into the factor demand equations (34) and (35), one

[10] These equations are not defined with perfect competition in the goods market, where $\kappa = 1$.

gets a system of three independent equations for the factor prices $\widehat{w}_A$, $\widehat{w}_B$ and $\widehat{r}$ with the solutions $\widehat{r} = -\alpha\Omega_A/2\beta > 0$ and

$$\widehat{w}_A = \frac{2(1-\alpha)(1-\kappa)+\alpha(1-\alpha\kappa)}{2\beta(1-\kappa(1-\alpha))}\,\Omega_A < 0 \text{ and } \widehat{w}_B = \frac{\alpha[\kappa(2-\alpha)-1]}{2\beta(1-\kappa(1-\alpha))}\,\Omega_A \lesseqgtr 0. \quad (36)$$

The complete results for all endogenous variables of the model are summarized in section A.3 in the appendix. The labor market reforms in country A lead to lower real wages, higher employment and an inflow of capital, which is accompanied by a rise in the real interest rate. Since employment and the stock of capital in country A are rising, production in that country increases as well. In country B, however, the outflow of capital leads to lower production although the employment level remains unchanged. The increase in production in country A is higher than the decrease in country B. Hence, aggregate output increases, as can be seen from the results in section A.3. It follows that $\widehat{Y} - \widehat{Y}_A < 0$ and $\widehat{Y} - \widehat{Y}_B > 0$. With these results it can be concluded from eq. (6) that $\widehat{p}_A < 0$ and $\widehat{p}_B > 0$. Relative prices therefore change in favour of country A. Since in country A unemployment (and depending on the type of shock probably also the replacement ratio) decrease, income taxes in country A will decline as well, whereas they remain unchanged in country B. The labor market reforms lead to declining real wages in country A, although the capital inflow has a positive impact on the labor demand curve. In country B the change in real wages depends on the sign of $\kappa(2-\alpha)-1$. If $\kappa > 1/(2-\alpha)$ real wages in country B will decrease, otherwise they will increase. Hence, it is possible that the employees in country B will profit from the labor market reforms in country A. For this to happen the degree of competition in the goods market must not be too high.

4.2.2 Flat-rate unemployment benefits. Unfortunately, the comparative-static analysis is quite a tedious task in the case of flat-rate unemployment benefits and capital mobility. The reason is that one must simultaneously find the solution for the subsystem of eight equations, which has been summarized at the beginning of section 4.2. Appendix A.4 contains the solution for the complete model and an explanation how this solution can be derived. Due to these results it follows that the labor market reforms in country A again lead there to higher employment, a higher stock of capital and lower real wages. The change in real wages and employment in country B, which experiences

capital outflows, is not immediately clear. From appendix (A.4) it can be seen that the implications for employment and real wages in country B depend on the sign of the expression $(1-\alpha)(\eta-1)-1$. If $\eta > 1+1/(1-\alpha)$, or which amounts to the same condition $\kappa > 1/(2-\alpha)$, then employment and real wages in country B will decline, otherwise they will increase. Also note that the sign for the change in payroll taxes in country B depends on the same condition. The change in payroll taxes in country A depends on all parameters of the system. The sign may be either positive or negative, since lower real wages imply lower tax revenues but higher employment also reduces government transfers to the unemployed. Whereas production in country A is rising, the result for country B again depends on the elasticity for the demand of goods. However, the condition for a declining output in country B is less stringent than the condition for declining real wages and employment, since the capital outflow dampens production even if employment increases. From appendix A.4 it can be seen, that a *sufficient* condition for a declining production in country B is $\eta > 1/(1-\alpha)$, which is the same as $\kappa > \alpha$. Whatever the result for production in country B, it again holds that due to the labor market reforms aggregate output in country A will rise.

4.3 Comparison of main results with mobile capital

In section 3 it has been shown that depending on the degree of competition in the goods market country B will profit from employment-enhancing labor market reforms in country A or is not affected at all. However, these results are modified if capital mobility is taken into account.

A comparison of the results in *table* 2 shows that country B is profiting from the labor market reforms in country A, if

$$\kappa < \frac{1}{2-\alpha} \quad \text{or equivavently} \quad \eta < 1+\frac{1}{1-\alpha}. \tag{37}$$

Otherwise the reforms in country A will have a negative impact on country B. It again holds that with earnings-related benefits only real wages in country B are influenced, whereas with flat-rate benefits also unemployment changes. As a result, country B is only adversely affected if the elasticity of the demand for goods and hence the degree

Table 2

Results for country B if country A undertakes employment-enhancing labor market reforms in a world with perfect capital mobility

	Degree of competition in the goods market			
	$0 < \kappa < (2-\alpha)^{-1}$		$(2-\alpha)^{-1} < \kappa \leq 1$	
earnings-related benefits	$\widehat{u}_B = 0$	$\widehat{w}_B > 0$	$\widehat{u}_B = 0$	$\widehat{w}_B < 0$
flat-rate benefits	$\widehat{u}_B < 0$	$\widehat{w}_B > 0$	$\widehat{u}_B > 0$	$\widehat{w}_B < 0$

Notes: If $\kappa = 1$, perfect competition prevails in the goods market. $0 < \kappa < 1$ describes a situation with monopolistic competition. In all model variants the results for country A are $\widehat{u}_A < 0$ and $\widehat{w}_A < 0$.

of competition in the goods market is sufficiently high. If this condition is not fulfilled, country B will profit from the labor market reforms abroad. The reason is that in the latter case the aggregate income effect, which has a positive effect on country B, is stronger than the relative price effect and the induced capital flows, which both have a negative impact on country B.

5 Summary and Conclusions

This analysis contributes to the globalization debate by examining how other countries are affected if a single country weakens labor union power or reduces the generosity of unemployment benefits. In the two-country model developed in this paper it is assumed that monopolistic competition (or as a special case perfect competition) prevails in the goods market and the labor market outcome is influenced by wage bargains taking place between firms and labor unions. Goods and capital markets are integrated, whereas labor markets are separated since it is assumed that international mobility of labor is hindered by cultural and linguistic barriers. In the model two variants of unemployment compensation systems are considered with benefits either being earnings-related or paid as flat-rate transfers. By this it was demonstrated that institutional settings matter for comparative-static outcomes.

In a first step the consequences of labor market reforms were analyzed for a world with immobile capital. In country A, where the reforms are undertaken, unemployment and real wages decline. The impact on other countries (country B) depends on the degree of competition in the goods market. With perfect competition country B is completely insulated from the consequences of country A's labor-market reforms. If goods markets are characterized by monopolistic competition two effects must be taken into account: the change in relative prices leads to a shift of relative demand towards goods produced in country A. However, the rise in world real income increases labor demand in country B and therefore is favorable for that country. It has been shown that the aggregate income effect dominates the relative price effect, resulting in rising real wages in country B. The employment effects in country B depend on the unemployment compensation system. With flat-rate unemployment benefits the unemployment rate declines, whereas in the case of earnings-related benefits the unemployment rate remains unchanged. Due to these results it has been concluded that other countries are not harmed by a dismantling of the welfare state abroad if capital is immobile.

Nowadays, modern welfare states have to deal with a situation where capital mobility has significantly increased. In a second step it therefore was scrutinized how the results have to be modified if capital is perfectly mobile. The employment-enhancing labor market reforms in country A now provoke three effects: along with the relative price effect country B is adversely affected by the induced capital flows, which are directed towards country A. However, depending on the degree of competition in the goods market, these effects may be overcompensated by the aggregate income effect which has a positive impact on labor demand in country B. If product market competition is low, other countries may profit from the reforms undertaken in country A. If competition in the goods market is sufficiently high (with perfect competition being the limiting case) then country B is adversely affected by the reforms. As in the case with immobile capital the spillover effects depend on the unemployment compensation system in country B. With earnings-related benefits only real wages are affected, whereas with flat-rate benefits also the unemployment rate will change.

Consider as an example Great Britain, where benefits are paid as flat-rate transfers and

Germany with earnings-related unemployment benefits and assume that capital is perfectly mobile. A reduction in labor union power or unemployment benefits in Great Britain will lead to declining real wages in Germany if product market competition between both countries is sufficiently high. If this condition is not met real wages will rise. On the other hand if benefits are reduced in Germany, this will affect real wages *and* unemployment in Great Britain. If product market competition is sufficiently high then in Great Britain real wages will decline and unemployment will rise.

The focus of this paper has been on the sign of spillover effects and not on an explicit modeling of strategic government interaction between countries. However, the analysis makes it clear that based on the results of this paper as a next step the strategic interaction between countries must be analyzed. The reason is that country-specific social security policies exert a (positive or negative) externality on other countries. If country A diminishes social security transfers and product market competition and capital mobility are low, other countries will profit from such a shock. This could lead to a situation where each country postpones labor market reforms and waits for other countries first to implement such reforms. However, if product market competition and capital mobility are high, other countries will be adversely affected by these reforms. If the welfare system remained unchanged in other countries, country A would profit from such a policy not only because of the rise in employment but also because the real wage decline is dampened by the capital inflow. Since the assumption of relatively high product market competition and capital mobility seems quite realistic, the model offers a theoretical justification for the hypothesis that there could be the danger of a "race to the bottom", where each country tries to attract capital by gradually reducing the welfare state.

A Appendix:

For all model variants the signs for the endogenous variables refer to employment-enhancing labor market reforms in country A. In this case $\Omega_A < 0$ or $\widetilde{\Omega}_A < 0$. If the reforms are due to an increase in labor unions' preferences for employment, ϕ_A, or a decrease in labor union power, χ_A, it holds that $\widehat{\mu}_A > 0$. If the reforms are solely based on a decrease in ρ_A or b_A then $\widehat{\mu}_A = 0$.

A.1 Comparative-static results with earnings-related unemployment benefits in both countries and immobile capital

The results for the complete model are:

$$\widehat{u}_A = \Omega_A < 0 \qquad \widehat{u}_B = 0$$

$$\widehat{N}_A = -\frac{1}{\beta_A}\,\Omega_A > 0 \qquad \widehat{N}_B = 0$$

$$\widehat{Y}_A = -\frac{\alpha}{\beta_A}\,\Omega_A > 0 \qquad \widehat{Y}_B = 0$$

$$\widehat{w}_A = \frac{\omega_1 - \omega_2}{\beta_A}\,\Omega_A < 0 \qquad \widehat{w}_B = -\frac{\omega_2}{\beta_A}\,\Omega_A > 0$$

$$\widehat{p}_A = \frac{\omega_3}{\beta_A}\,\Omega_A < 0 \qquad \widehat{p}_B = -\frac{\omega_2}{\beta_A}\,\Omega_A > 0$$

$$\widehat{t}_A = \frac{(-\widehat{\mu}_A + [(\rho_A/(1-\rho_A) + (1-u_A)]\widehat{\rho}_A)}{1 - u_A(1-\rho_A)} < 0 \qquad \widehat{t}_B = 0$$

$$\widehat{Y} = -\frac{\alpha\delta}{\beta_A}\,\Omega_A > 0$$

A.2 Comparative-static results with flat-rate unemployment benefits in both countries and immobile capital

In the text it was shown that $0 < (\omega_1 - \omega_2) < 1$ and $0 < (\omega_1 - \omega_3) < 1$. The expression $\Lambda > 0$ is defined in equation (30). The results for the complete model are:

$$\widehat{u}_A = \frac{\beta_A(\omega_1 - \omega_3 + \nu_B\beta_B)}{\Lambda}\,\widetilde{\Omega}_A < 0 \qquad \widehat{u}_B = \frac{\beta_B\omega_2}{\Lambda}\,\widetilde{\Omega}_A < 0$$

$$\widehat{N}_A = -\frac{\omega_1 - \omega_3 + \nu_B\beta_B}{\Lambda}\,\widetilde{\Omega}_A > 0 \qquad \widehat{N}_B = -\frac{\omega_2}{\Lambda}\,\widetilde{\Omega}_A > 0$$

$$\widehat{Y}_A = -\frac{\alpha(\omega_1 - \omega_3 + \nu_B\beta_B)}{\Lambda}\,\widetilde{\Omega}_A > 0 \qquad \widehat{Y}_B = -\frac{\alpha\omega_2}{\Lambda}\,\widetilde{\Omega}_A > 0$$

$$\widehat{w}_A = \frac{\nu_B\beta_B(\omega_1 - \omega_2) + \omega_1(1-\alpha)}{\Lambda}\,\widetilde{\Omega}_A < 0 \qquad \widehat{w}_B = -\frac{\omega_2\nu_B\beta_B}{\Lambda}\,\widetilde{\Omega}_A > 0$$

$$\widehat{p}_A = \frac{\omega_3[\nu_B\beta_B + (1-\alpha)]}{\Lambda}\,\widetilde{\Omega}_A < 0 \qquad \widehat{p}_B = -\frac{\omega_2[\nu_B\beta_B + (1-\alpha)]}{\Lambda}\,\widetilde{\Omega}_A > 0$$

$$\widehat{t}_A = \frac{1}{1-u_A}\widehat{u}_A - \widehat{w}_A + \widehat{b}_A < 0 \qquad \widehat{t}_B = \frac{1}{\Lambda}\frac{\mu_B u_B\beta_B\omega_2}{(\mu_B u_B - 1)}\,\widetilde{\Omega}_A < 0$$

$$\widehat{Y} = -\frac{\alpha\delta[\nu_B\beta_B + (1-\alpha)] + \alpha\omega_2}{\Lambda}\,\widetilde{\Omega}_A > 0$$

The result $\widehat{t}_A < 0$ is derived in the following way: Inserting the solution for $\widehat{u}_A$ and $\widehat{w}_A$ in the equation for $\widehat{t}_A$ leads to

$$\widehat{t}_A = \frac{\Gamma\widetilde{\Omega}_A}{(1-u_A)\Lambda} + \widehat{b}_A,\ \Gamma \equiv \beta_A(\omega_1 - \omega_3 + \nu_B\beta_B) - (1-u_A)[\nu_B\beta_B(\omega_1-\omega_2) + \omega_1(1-\alpha)].$$

Due to the definition in eq. (13) it holds that $(1-u_A) = \beta_A u_A$. Hence Γ can be written as $\Gamma = \beta_A\nu_B\beta_B[1-u_A(\omega_1-\omega_2)] + \beta_A[(\omega_1-\omega_3) - u_A\omega_1(\omega_1-\omega_2-\omega_3)]$. Here it was taken into account that $1-\alpha = (\omega_1-\omega_2-\omega_3)$. Since $0 < \omega_1-\omega_2 < 1$, the first term in brackets is positive. Also the term in the second bracket is positive, since $\omega_1-\omega_3 > \omega_1-\omega_2-\omega_3$ and $\omega_1 < 1$. As a result $\Gamma > 0$, which leads to $\widehat{t}_A < 0$.

A.3 Comparative-static results with earnings-related unemployment benefits in both countries and mobile capital

The results for the complete model are:

$$\widehat{u}_A = \Omega_A < 0 \qquad \widehat{u}_B = 0$$

$$\widehat{N}_A = -\frac{1}{\beta}\,\Omega_A > 0 \qquad \widehat{N}_B = 0$$

$$\widehat{K}_A = -\frac{\alpha\kappa}{2\beta(1-\kappa(1-\alpha))}\Omega_A > 0 \qquad \widehat{K}_B = -\widehat{K}_A < 0$$

$$\widehat{Y}_A = -\frac{\alpha(2-\kappa(1-\alpha))}{2\beta(1-\kappa(1-\alpha))}\,\Omega_A > 0 \qquad \widehat{Y}_B = \frac{(1-\alpha)\alpha\kappa}{2\beta(1-\kappa(1-\alpha))}\,\Omega_A < 0$$

$$\widehat{w}_A = \frac{2(1-\alpha)(1-\kappa)+\alpha(1-\alpha\kappa)}{2\beta(1-\kappa(1-\alpha))}\,\Omega_A < 0 \qquad \widehat{w}_B = \frac{\alpha[\kappa(2-\alpha)-1]}{2\beta(1-\kappa(1-\alpha))}\,\Omega_A \lesseqgtr 0$$

$$\widehat{p}_A = \frac{\alpha(1-\kappa)}{2\beta(1-\kappa(1-\alpha))}\,\Omega_A < 0 \qquad \widehat{p}_B = -\widehat{p}_A < 0$$

$$\widehat{t}_A = \lambda_A\Omega_A + \lambda_A(1-u_A)\widehat{\rho}_A < 0 \qquad \widehat{t}_B = 0$$

$$\widehat{Y} = -\frac{\alpha}{2\beta}\,\Omega_A > 0 \qquad \widehat{r} = -\frac{\alpha}{2\beta}\,\Omega_A > 0$$

A.4 Flat-rate unemployment benefits in both countries and mobile capital

If equation (31) is inserted in the employment equations (34) and capital equations (35), one obtains four equations for the seven unknowns $\widehat{r}, \widehat{N}_j, \widehat{K}_j$ and $\widehat{w}_j\,(j = A, B)$. The real wages can be eliminated by taking account of the wage equations $(22'')$. If it is also taken into account, that $\widehat{K}_A = -\widehat{K}_B$, one obtains the following three equations for $\widehat{N}_A, \widehat{N}_B$ and $\widehat{r}$:

$$\widehat{N}_A[1+\eta(1-\psi_K)\nu\beta - \frac{\alpha}{2}] = -\eta\psi_K\widehat{r} + \frac{\alpha}{2}\widehat{N}_B - \eta(1-\psi_K)\widetilde{\Omega}_A$$

$$\widehat{N}_B[1+\eta(1-\psi_K)\nu\beta - \frac{\alpha}{2}] = -\eta\psi_K\widehat{r} + \frac{\alpha}{2}\widehat{N}_A$$

$$\widehat{r} = \frac{\alpha-\eta\psi_N\nu\beta}{2\eta(1-\psi_N)}\widehat{N}_A + \frac{\alpha-\eta\psi_N\nu\beta}{2\eta(1-\psi_N)}\widehat{N}_B - \frac{\eta\psi_N}{2\eta(1-\psi_N)}\widetilde{\Omega}_A,$$

where $\psi_N \equiv \alpha\kappa$, $\psi_K \equiv (1-\alpha)\kappa$ und $\eta \equiv 1/(1-\kappa)$ for $\kappa \neq 1$. Solving this equation system, the sign of the following expression Θ turns out to be crucial:

$$\Theta \equiv -2\beta\nu\left(\alpha(\alpha-2)(\eta-1)\right) + 4\beta\nu + 2\beta^2\nu^2\left(\alpha(\eta-1)+1\right) + 2(1-\alpha) \tag{A.1}$$

Bearing in mind that $\nu > 0$, $0 < \beta < 1$, $0 < \alpha < 1$ and $\eta > 1$ it turns out that all products are positive. As a result $\Theta > 0$. With the solution for $\widehat{N}_A$, $\widehat{N}_B$, and $\widehat{r}$ the solution for the other variables can be derived successively. The results are:

$$\begin{aligned}
\widehat{u}_A &= \frac{\beta[2\beta\nu(1-\alpha+\alpha\eta)+(1-\alpha)(2+\alpha\eta)+\alpha^2]}{\Theta}\widetilde{\Omega}_A < 0 \\
\widehat{u}_B &= \frac{\alpha\beta[1+(1-\alpha)(1-\eta)]}{\Theta}\widetilde{\Omega}_A \lesseqgtr 0 \\
\widehat{N}_A &= -\frac{[2\beta\nu(1-\alpha+\alpha\eta)+(1-\alpha)(2+\alpha\eta)+\alpha^2]}{\Theta}\widetilde{\Omega}_A > 0 \\
\widehat{N}_B &= \frac{\alpha[(1-\alpha)(\eta-1)-1]}{\Theta}\widetilde{\Omega}_A \lesseqgtr 0 \\
\widehat{K}_A &= -\frac{\alpha(\eta-1)(\beta\nu+(1-\alpha))}{\Theta}\widetilde{\Omega}_A > 0; \qquad \widehat{K}_B = -\widehat{K}_A < 0 \\
\widehat{Y}_A &= -\frac{\alpha[\nu\beta(1+\eta+\alpha(\eta-1))+1+\eta(1-\alpha)]}{\Theta}\widetilde{\Omega}_A > 0 \\
\widehat{Y}_B &= \frac{\alpha[\beta\nu(1-\alpha)(\eta-1)+\eta(1-\alpha)-1]}{\Theta}\widetilde{\Omega}_A \lesseqgtr 0 \\
\widehat{w}_A &= \frac{-\beta\nu[-(\eta-1)(\alpha-\alpha^2)+(\alpha-2)]+2(1-\alpha)}{\Theta}\widetilde{\Omega}_A < 0 \\
\widehat{w}_B &= \frac{\alpha\beta\nu[(1-\alpha)(\eta-1)-1]}{\Theta}\widetilde{\Omega}_A \lesseqgtr 0 \\
\widehat{p}_A &= \frac{\alpha(\nu\beta+1-\alpha)}{\Theta}\widetilde{\Omega}_A < 0; \qquad \widehat{p}_B = -\widehat{p}_A > 0 \\
\widehat{t}_A &= (1/1-u_A)\widehat{u}_A + \widehat{b}_A - \widehat{w}_A \lesseqgtr 0 \\
\widehat{t}_B &= \frac{\alpha\beta((1/1-u_B)+\nu)[1+(1-\alpha)(1-\eta)]}{\Theta}\widetilde{\Omega}_A \lesseqgtr 0 \\
\widehat{r} &= \widehat{Y} = -\frac{\alpha(\nu\beta(1-\alpha+\alpha\eta)+1)}{\Theta}\widetilde{\Omega}_A > 0
\end{aligned}$$

Literature

Atkinson, A., Micklewright, J., 1991, Unemployment Compensation and Labor Market Transitions: A Critical Review, Journal of Economic Literature, 29, 1679–1727.

Beissinger, T. and Egger, H., 2000, Some Pitfalls in Dynamic Wage Bargaining Models, University of Regensburg Discussion Paper No. 343, July.

Corneo, G., 1995, National Wage Bargaining in an Internationally Integrated Product Market, European Journal of Political Economy, 11, 503–520.

Davis, D.R., 1998, Does European Unemployment Prop Up American Wages? National Labor Markets and Global Trade, American Economic Review, 88(3), 478–494.

Goerke, L., 2000, Bismarck versus Beveridge. Flat- and Earnings-Related Unemployment Insurance in an Efficiency Wage Framework, Finanzarchiv, 57(3), 243–260.

Grout, P., 1984, Investment and Wages in the Absence of Binding Contracts: A Nash Bargaining Approach, Econometrica, 52, 449–460.

Hoel, M., 1990, Local versus Central Wage Bargaining with Endogenous Investments, Scandinavian Journal of Economics, 92(3), 453–469.

Krueger, A.B., 2000, From Bismarck to Maastricht: The March to European Union and the Labor Compact, Labor Economics, 7, 117–134.

Lejour, A.M., Verbon, A.A., 1996, Capital Mobility, Wage Bargaining, and Social Insurance Policies in an Economic Union, International Tax and Public Finance, 3, 495–514.

Manning, A., 1991, The Determinants of Wage Pressure: Some Implications of a Dynamic Model, Economica, 58, 325–340.

Manning, A., 1995, Developments in Labour Market Theory and Their Implications for Macroeconomic Policy, Scottish Journal of Political Economy, 42(3), 250–266.

Michaelis, J., 1998, Zur Ökonomie von Entlohnungssystemen, Mohr, Siebeck: Tübingen.

Mishra, R., 1999, Globalization and the Welfare State, Cheltenham and Northampton: Edward Elgar.

Naylor, R., 1998, International Trade and Economic Integration when Labour Markets are Generally Unionised, European Economic Review, 42, 1251–1267.

Oswald, A.J., 1985, The Economic Theory of Trade Unions: An Introductory Survey, Scandinavian Journal of Economics, 87(2), 160–193.

Pemberton, J., 1999, Social Security: National Policies With International Implications, Economic Journal, 109, 492–508.

Rodrik, D., 1997, Has Globalization Gone Too Far? Institute for International Economics, Washington, DC.

Schmid, G., Reissert, B., Bruche, G., 1992, Unemployment Insurance and Active Labor Market Policy: An International Comparison of Financing Systems, Detroit: Wayne State University Press.

Schluter, C., 1997, On the Performance of Social Benefit Systems, Economic Journal, 107, 489–502.

Sinn, H.-W., 1998, European integration and the future of the welfare state, Swedish Economic Policy Review, 5, 113–132.

van der Ploeg, F., 1987, Trade Unions, Investment, and Employment, European Economic Review, 31, 1465–1492.