Wage Bargaining Systems and International Trade*

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Abstract

This paper sets up a two-country model with a unit mass of industries, a small number of oligopolistic competitors in each of these industries, and labour market imperfection due to union wage setting. The two countries are identical in all aspects but the degree of centralisation in wage bargaining. By accounting for this asymmetry, the model discusses how the interaction of international trade between countries with different labour market regimes affects welfare of workers and firm owners as well as inequality between these two groups. We show that a movement from autarky to free trade leads to a convergence of both countries in (group-specific) welfare and income distribution. A unilateral policy reform in one country has spillover effects and creates winners and losers in both countries.

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1 Introduction

The role of wage bargaining structures has long been a controversial subject in academics as well as in the political debate. Proponents of a lower degree of centralisation argue that this allows firms to adapt better to the current business environment and thereby securing employment. On the other hand, advocates of more centralised bargaining regimes highlight the advantage of incorporating the macroeconomic consequences of the wage setting on the inflation rate. This issue has rendered a lot of attention in the academic literature. One of the first and at the same time most prominent contributions in this respect is by Calmfors and Driffl (1988) who showed that countries perform best when being characterised by either lowest or highest levels of centralisation while results are worst in countries with an intermediate level. Subsequently, a bulk of literature has emerged to prove and disprove these findings for various economic variables. There is however no analysis of how trade integration between two countries that differ in this aspect of their labour market institutions affects the welfare of workers and firm owners and the income distribution between them. Consequently, a discussion of the consequences of a unilateral policy reform in such a context is missing as well. Given the crucial country-differences in this facet of the labour market (OECD, 2004) and the current discussion about the suggestions to rebuild the stability and growth pact in the Eurozone (the so-called Europlus pact) both questions are highly relevant for policy makers and a discussion missing in the academic literature.

Therefore the aim of this paper is twofold. First, we want to provide a detailed discussion of how market integration between two countries that differ in the degree of centralisation of wage bargaining affects the individual welfare of workers and firm owners and the distribution of income between these two groups of agents. For this purpose we set up a modified two-country model of general oligopolistic equilibrium (GOLE) along the lines of Neary (2009) with a continuum of industries and Cournot competition. To keep the analysis of trade between asymmetric countries as tractable as possible we simplify the basic GOLE setup in some perspectives. First, as in Egger and Etzel (2009) we distinguish two groups of agents, firm owners to whom accrue firm profits and workers to whom accrues wage income. This renders it possible to look at the beforementioned distributional effects of globalisation. Likewise, we introduce trade unions that are present in all sectors of an economy which features unemployment. In contrast to Egger and Etzel (2009), however, we consider countries that differ in the degree of centralisation of the wage bargaining. Country Home is characterised by unions at the industry-level, while in Foreign unions are active at the firm-level. Finally, and most importantly, we assume that productivity is the same across all sectors and between both countries. While this assumption rules out the opportunity to discuss intra-group inequality as well as the consideration of trade motives that are due to comparative advantage, it gives us at the same time the possibility to compute the real income as a true measure for group-specific welfare. Second, we want to analyse the spillover effects of a unilateral policy reform. Therefore, we allow country Home to
conduct a reform in its institutional setting on the labour market such that unions are active at
the firm level and examine the consequences for both countries.

We start our analysis with a description of the basic model structure and a closer look at
the role of the degree of centralisation for the wage setting of unions in the context of imperfect
competition on the product market. The characterisation of the closed economy follows the
findings from Egger and Etzel (2009). In the country with unions at the industry-level wage
claims are higher, output is lower and thus the price level higher compared to a country with
firm-level unions. This translates into a higher welfare for workers in Home and a higher welfare
of firm owners in Foreign. Consequently, unemployment is higher but inter-group inequality
lower in Home.

With this description of the closed economy at hand, we then move on to tackle the first
research question and analyse the effects of ongoing market integration between the two asym-
metric countries under consideration. We find that general trade effects are similar for both
countries. Internationalisation benefits firm owners whereas it makes workers worse off in con-
sumption prices. Looking at the relative trade effects between both countries, we conclude that
trade renders countries more similar although they still do not converge completely.

In a next step we continue to address our second research question. How does a unilateral
policy switch towards a less central bargaining regime affect the trading partner? While the
spillover effects of labour market reforms are currently a prominently discussed issue in the
aftermath of the (Euro)crisis, the academic literature is quite narrow. Davis (1998) is one of
the most prominent papers in this field. In his model, trade occurs due to differences in factor
endowments and furthermore the capital-abundant country has a labour market imperfection by
means of a minimum wage. He argues that a reduction in this minimum wage reduces domestic
unemployment but at the same time hurts its trading partners due to `exporting' lower wages.
A similar argument is brought forward by Davidson, Martin, and Matusz (1999). In contrast
to these contributions, recent models building upon the new (new) trade theory find opposing
results. Egger and Kreickemeier (2009) construct a trade model of heterogeneous firms based
upon Melitz (2003) and also look at minimum wages in order to compare results with Davis
(1998). In their analysis, only the labour costs of the marginal firm equalise. A decrease in
the minimum wage reduces domestic unemployment thereby leading to a higher income per
capita. This positive income effect is then also beneficial for the Foreign country because of an
increase in demand. Felbermayr, Larch, and Lechthaler (2009) allow for search unemployment
with heterogeneous firms and come to similar results. Furthermore, the empirical analysis in
their paper shows that a unilateral policy reform that increases the efficiency on the labour
market is beneficial for the trading partner. All of these papers, however, neglect one labour
market institution that still is highly relevant in most OECD countries: the bargaining partners.
When one is talking about the need and ways to coordinate wage policies, he has to examine
the role of wage bargaining systems. One recent paper that looks at the impact of different
bargaining regimes is by Braun (2011). He introduces trade unions into a model of heterogenous firms with endogenous markups (Melitz and Ottaviano, 2008) and compares three different situations on the labour market: perfect competition, industry-level unions, firm-level unions. However, he only considers a closed economy so that he can neither analyse trade effects of an integration between asymmetric countries nor the spill-over effect of national policy reforms. In another paper Braun and Spielmann (2010) construct a two-country unionised duopoly model and examine the effects of a wage subsidy and discuss effects and limits of policy coordination in such a context. Therefore, we conduct a policy reform such that Home changes towards firm-level unions and look at the consequences for Home as well as the spillover effects on its trading partner. We find that a unilateral policy reform in one country induces spillover effects on its trading partner and creates winners and losers. Workers in Home lose in real terms as do firm owners in Foreign, whereas the net effect for workers in Foreign is zero. It turns out that the only beneficiary of such a reform are firm owners in Home.

The remainder of the paper is organised as follows. Section 2 introduces the theoretical framework and shows how the general oligopolistic equilibrium model of Neary (2009) has to be modified in order to account for union wage setting. Section 3 characterizes the autarky equilibrium and provides insights on how the degree of centralisation affects the outcome in the closed economy in the two countries under consideration. Section 4 considers trade between two asymmetric countries and shows how the opening up to trade affects wage payments, profits, aggregate employment, and welfare. Beyond that, this section also provides insights on how trade changes the rent sharing between firm owners and workers as well as the group-specific welfare between the different groups of agents. In Section 5 we analyze the impact of a unilateral policy reform in Home on the domestic and foreign economy. The last section concludes with a brief summary of the most important results.

2 The basic model

We conduct our analysis in a model of general oligopolistic equilibrium (GOLE). In this framework firms have market power within their own industry but cannot influence the economy-wide variables. The modeling of consumption and technology follows Neary (2009). Similar to Egger and Etzel (2009) we assume that (i) positive firm profits do not accrue to workers but rather to firm owners and (ii) that labour markets are unionised. Additionally, in this setup we consider two countries that differ in their labour market institutions. Details of the general model strategy are outlined in subsections 2.1 - 2.3.

2.1 Preferences and consumer demand

Preferences of the representative consumer in country $m = H, F$ are described by an additively separable utility function over a continuum of different goods, whereby the sub-utility for each
of these goods is quadratic. Denoting consumption of good \( z \) by consumers from country \( m \) by \( x^m(z) \), utility can be written as

\[
U^m[\{x^m(z)\}] = \int_0^1 ax^m(z) - \frac{1}{2} bx^m(z)^2 dz. \tag{1}
\]

The budget constraint of the representative consumer is given by

\[
\int_0^1 p^m(z)x^m(z)dz \leq I^m, \tag{2}
\]

whereby \( m \) indicates that a variable differs between the two countries due to the asymmetry on the labour market. Hence, \( p^m(z) \) denotes the price of good \( z \) in country \( m \), and \( I^m \) is aggregate income in country \( m \). Maximizing utility (1) subject to a binding budget constraint (2) gives the inverse demand function for good \( z \) by consumers from country \( m \):

\[
p^m(z) = \frac{1}{\lambda^m}[a - bx^m(z)], \tag{3}
\]

where \( \lambda^m \) is the country-specific marginal utility of income which in the GOLE framework is a function of the first and second moments of prices,

\[
\mu^m_1 = \int_0^1 p^m(z)dz \quad \text{and} \quad \mu^m_2 = \int_0^1 p^m(z)^2 dz, \tag{4}
\]

respectively, as well as aggregate income, \( I^m \), with all these variables being country-specific. Therefore, rearranging the budget constraint yields

\[
\lambda^m[\{p^m(z), I^m\}] = \frac{a\mu^m_1 - bI^m}{\mu^m_2}. \tag{5}
\]

For a more detailed discussion about the interpretation of \( \lambda^m \) see Neary (2009) and the cited literature.

### 2.2 Technology and production

We assume the same continuum of sectors and the same competitive environment in both countries with each industry producing a separate good \( z \). Furthermore, in each sector only a small exogenous number of firms, \( n \), is active and they compete in quantities. Firms do not face any investment costs for establishing a production facility. They use one unit of labour to produce one unit of output. Hence, in contrast to Neary (2009) and Egger and Etzel (2009) we assume that productivity is identical across sectors and countries. Therefore we can normalise productivity \( \alpha(z) \) to one in both countries and sectors so that unit production cost of firm \( j \) in any sector \( z \) are denoted by \( c^m_j(z) = \alpha(z)w^m_j = w^m_j \). While this rules out the possibility to analyse intra-group inequality as well as trade motives based upon comparative advantage it gives us on
the other hand the opportunity to compute the real income as 'true' measure of group-specific welfare for workers and firm owners in both countries.

Since the number of competitors within each industry is finite (or small), firms anticipate that they can influence industry-level variables, whereas they rationally take aggregate, economy-wide variables as given. As a consequence, firms in each country treat $\lambda^m$ parametrically and therefore face linear demand functions, according to (3). However, in contrast to a partial equilibrium model $\lambda^m$ is endogenous for an economy as a whole. Considering product market clearing, $\sum_{i=1}^{n} y_{i}^m = x^m(z)$, and accounting for demand function (3), we can then write real profits at the margin of firm $j$ (in sector $z$)\(^1\) in country $m$ as

$$\Pi_j^m \equiv \lambda^m \pi_j^m = \left[ a - b \sum_{i=1}^{n} y_{i}^m - \lambda^m c_j^m \right] y_j^m. \quad (6)$$

These profits are subject to a proportional income tax, $t$, which is common in both countries, non-distortionary, and, hence, does not impact the firm owner’s profit-maximising output choice. Throughout our analysis we focus on the case of positive supply of all firms and, therefore, restrict our attention to parameter configurations that lead to $a > c_j^m$ for all $j$ and $m$.

### 2.3 Labour market and endowments

Regarding the determination of factor return $w_j^m$, we abandon the assumption of a perfectly competitive labour market as in Neary (2009) as well as the assumption of two countries with symmetric labour market imperfections as in Egger and Etzel (2009). Instead we assume that the two countries differ in the degree of centralisation of the wage setting. Country Home is populated by industry-level unions and country Foreign by firm-level unions.\(^2\) In order to focus explicitly on the role of the degree of centralisation we assume the same monopoly union setup in both countries. This gives us a two-stage game in which at first unions set their rent-maximising wage rate given the labour demand of firms and then the firms retain the right-to-manage employment. Given the beforementioned asymmetry of both countries unions differ in their objective function such that any Home union is interested in total employment in one sector, whereas each union in Foreign only regards the employment at the firm-level as the relevant variable. The objective function of the industry-wide trade union in Home therefore is given by

$$V^H = (\lambda^H w^H - \lambda^H w^H) n^H t^H, \quad (7)$$

\(^1\)Since productivities are the same within a country, all firms in a country have the same profits, irrespective of which industry $z$ they are active in.

\(^2\)It would also be possible to consider a model in which unions are active only in one country, or to allow for unions being active even at an economy-wide level. However, according to OECD (2004), at least in the OECD countries unions still seem to play an important role and they are furthermore active either at the firm- or the industry-level as the two predominant degrees of centralisation in OECD countries so that we stick our attention to these two regimes.
while the objective function of the firm-level unions in Foreign is

$$V^F_j = (\lambda^F w^F_j - \lambda^F \bar{w}^F_j) t^F_j,$$

(8)

respectively, where $\bar{w}^m = \beta w^m$ denotes the unemployment benefit in each country $m$. Unemployment benefits are determined endogenously as a share $\beta$ of the ongoing wage rate and financed by a proportional income tax that applies the same tax rate, $t$, to all types of income. The (net) replacement ratio $0 < \beta < 1$ is assumed to be identical in both countries. To complete the characterisation of the labour market in our model, we finally assume that each country is populated by the same amount $L$ of identical workers, each of them endowed with one unit of labour.

3 The closed economy

In both countries the equilibrium outcome is determined by the solution to a two-stage problem with unions setting wages and firms choosing employment at stage one and firms competing in output at stage two. We start this section by deriving the different wage claims of the unions and its implications for the output and employment decision of firms before moving to aggregate variables to analyse unemployment, inter-group inequality and (group-specific) welfare.

3.1 The effect of the degree of centralisation on wage claims and output

At stage 2, firms choose profit-maximising output levels. With firms anticipating that all their competitors in industry $z$ are identical and set the same output level, $y_i = y_k \forall i, k \neq j$, the solution to the profit-maximisation problem of firm $j$ in any sector $z$ in Home and Foreign is given by

$$y^H_j = \frac{a - \lambda^H w^H_j}{b(n + 1)}$$

(9)

$$y^F_j = \frac{a + (n - 1)\lambda^F w^F_i - n\lambda^F w^F_j}{b(n + 1)}$$

(10)

according to (6). Obviously, in Foreign the optimal decision depends on the wage paid by the other competitors in industry $z$. This is not the case in Home because there a union sets the wage for all firms within one industry simultaneously, i.e. $w^H_i = w^H_j = w^H$. Given the one-to-one production technology we can directly insert the respective labour demand function from (9) and (10) into the corresponding union objective function (7) and (8) and maximise the resulting expression. We then obtain the real pre-tax wage income of workers at the margin in
any industry $z$ in Home and Foreign:

$$W^H \equiv \lambda^H w^H = \frac{a}{2 - \beta},$$  \hspace{1cm} (11)

$$W^F \equiv \lambda^F w^F = \frac{a}{1 + n(1 - \beta)}.$$  \hspace{1cm} (12)

It is noteworthy to see that the wage claims differ due to the country-specific institutional setup of the labour market in both countries. Less centralised bargaining structures imply strategic considerations in the wage setting of unions. A firm-level union is aware of its influence on the competitiveness of its bargaining partner and therefore sets wages more cautiously. In contrast, with centralised unions this effect is internalised which leads to higher wage claims by unions in Home. The impact of the social security system, however, is the same in both countries. A more generous social security system, i.e. a higher replacement ratio $\beta$ and thus a higher unemployment benefit translates into more aggressive wage setting of unions since it constitutes a higher income in case of non-employment.

Substituting the wage rate from (11) and (12) into the best-reply function of (9) and (10) gives equilibrium output and employment levels of any firm $j$ in Home and Foreign, respectively,

$$y^H = t^H = \frac{a(1 - \beta)}{b(n + 1)(2 - \beta)}$$  \hspace{1cm} (13)

$$y^F = t^F = \frac{na(1 - \beta)}{b(n + 1)(1 + n(1 - \beta))}.$$  \hspace{1cm} (14)

Higher union wage claims in Home exhibit higher production cost and, thus, firms in Home have lower output (and employment) compared to their counterparts in Foreign. On the other hand, the impact of the unemployment benefit is qualitatively the same in both countries. A higher replacement ratio increases costs, thereby reducing output per firm. Finally, with a (perceived) linear demand function and oligopolistic competition the corresponding pre-tax real profit at the margin of any firm $j$ in country $m$ is quadratic in output, i.e. $\Pi^m = b(y^m)^2$.

### 3.2 Aggregate variables

These insights from the previous subsection at hand, we can now solve the general equilibrium and turn towards aggregate variables, foremost group-specific welfare and inter-group inequality in the two countries. To close the model we first take a look at the labour market clearing condition

$$(1 - u^m)L = \int_0^1 n_l^m(z)dz$$  \hspace{1cm} (15)

which indicates that with unions being present in all sectors our model captures unemployment. However, having institutional differences on the labour market this leads to different wages set and, hence, substantially differing employment levels between the two countries. Looking
directly at the unemployment rate in both countries, we find

\[ u^H_a = 1 - \frac{na(1 - \beta)}{bL(n + 1)(2 - \beta)} \quad (16) \]
\[ u^F_a = 1 - \frac{n^2a(1 - \beta)}{bL(n + 1)[1 + n(1 - \beta)]}. \quad (17) \]

Straightforward to our results for the firm-level we observe that the unemployment rate is higher in a country with centralised bargaining. As noted above, strategic considerations are missing when setting wages at the industry level which leads to higher wage claims, lower employment per firm and, hence, a higher rate of unemployment at the aggregate level. The impact of the replacement ratio follows our previous results. A surge in the replacement ratio increases production costs, reduces output and employment and therefore leads to a higher unemployment rate.

As a further economic variable of interest we realise that the institutional difference on the labour market also affects the price index of an economy. Aggregating output over every firm and sector and using (3) yields

\[ P^H \equiv \lambda^H p^H = \frac{a(n + 2 - \beta)}{(n + 1)(2 - \beta)} \quad (18) \]
\[ P^F \equiv \lambda^F p^F = \frac{a[1 + n(2 - \beta)]}{(n + 1)[1 + n(1 - \beta)]} \quad (19) \]

for the price level in Home and Foreign, respectively. Of course, with homogenous firms and industries the price is the same in every industry within a country so that \( P^m \) is the aggregate price index at the margin in country \( m \). However, given the asymmetries in the labour market imperfection, prices vary between the two countries. With centralised unions wage claims are higher and thus total output lower which is reflected in a higher price level in Home compared to Foreign. It is obvious then, that anything that increases production cost (such as e.g. an increase in the unemployment benefit) translates directly into a higher price index.

We can then turn our attention toward the consequences of different labour market institutions on measures of group-specific welfare and inequality. Having the wage rate of workers as well as the price level in country \( m \) and given the formulation of the marginal utility of income in (5) we can calculate the real income of workers as a true measure of group-specific welfare.\(^3\) One crucial advantage of this measure is, that it does not depend on the marginal utility of income which therefore allows us to compare the two countries in a more convenient way. Using (11) and (18) for Home and (12) and (19) for Foreign, respectively, we get the real wage income

\[^3\text{As is shown in Neary (2009) the utility index can also be written as } \tilde{u}^m = \frac{I^m - \frac{b}{a} \mu^F}{\nu^2}. \text{ With homogenous industries and neglecting } a \text{ and } b \text{ this reduces to } \tilde{u}^m = \frac{I^m}{\mu^F} \text{ for which we can then insert the income of the respective group of agents.}\]
of employed workers in prices \( \tilde{w}^m = \frac{w^m}{p^m} \) as follows

\[
\tilde{w}^H = \frac{n + 1}{n + 2 - \beta} \quad (20)
\]

\[
\tilde{w}^F = \frac{n + 1}{1 + n(2 - \beta)} \quad (21)
\]

Comparing both countries we realise that the welfare of employed workers in Home is greater than the one of their counterparts in Foreign. This result is not straightforward since it comprises two opposing effects that are based upon the country differences in the degree of centralisation. On the one hand, workers in Home receive a higher wage rate which ceteris paribus increases the welfare. On the other hand, these higher wages, as we have seen before, lead to higher prices and thus reduce the real income of workers. In sum, the first effect dominates so that the centralised wage bargaining makes workers in Home better off than workers in Foreign with decentralised wage setting. An increase in the replacement ratio has in both countries two opposite effects. It leads to higher wage claims, thereby increasing workers’ welfare but at the same time imposes a negative effect through higher prices. Again, it is the positive wage effect that exceeds so that a more generous social security system makes employed workers better off.

Similarly to workers we can also derive the real income of firm owners as their measure of individual welfare. It is defined as \( \tilde{\pi}^m = \frac{\Pi^m}{p^m} = [1 - \tilde{w}^m]y^m \) and also has the advantage of not depending on the country-specific marginal utility of income anymore. Using (13), (14), (18), and (19) entails

\[
\tilde{\pi}^H = \frac{a(1 - \beta)^2}{b(n + 1)(2 - \beta)(n + 2 - \beta)} \quad (22)
\]

\[
\tilde{\pi}^F = \frac{n^2a(1 - \beta)^2}{b(n + 1)[1 + n(1 - \beta)][1 + n(2 - \beta)]} \quad (23)
\]

Comparison shows that firm owners in Foreign have a higher individual welfare than their rivals in Home. Opposed with lower wage claims by unions firms in Foreign produce more and face a lower price level and, thus, are strictly better off in real terms than their counterparts in Home. In contrast to workers, the impact of the unemployment benefit is unambiguous. A higher replacement ratio reduces firm profits through higher cost of production and harms them furthermore as consumers via a higher price index.

Regarding income inequality between employed workers and firm-owners we compute the profit-wage ratio which is defined as \( \xi^m = \frac{\tilde{\pi}^m}{\tilde{w}^m} \) and hence given by

\[
\xi^H = \frac{a(1 - \beta)^2}{b(n + 1)^2(2 - \beta)} \quad (24)
\]

\[
\xi^F = \frac{n^2a(1 - \beta)^2}{b(n + 1)^2[1 + n(1 - \beta)]} \quad (25)
\]
These two expressions indicate that inequality is higher in Foreign than in Home which leads to the conclusion that more centralised wage bargaining regimes lead to more equal distribution of income between firm owners and workers. A higher unemployment benefit reduces inter-group inequality and benefits workers relative to firm owners in real terms.

As a final economic variable of interest we inspect total welfare which is measured by the indirect utility function. Inserting direct demand functions into (1) entails

\[
\tilde{U}^H \equiv -\left(\lambda^H\right)^2(p^H)^2 = -\frac{a^2(n + 2 - \beta)^2}{(n + 1)^2(2 - \beta)^2}
\]

\[
\tilde{U}^F \equiv -\left(\lambda^F\right)^2(p^F)^2 = -\frac{a^2[1 + n(2 - \beta)]^2}{(n + 1)^2[1 + n(1 - \beta)]^2}
\]

for Home and Foreign, respectively. Consumers dislike high prices and therefore total welfare is higher in the country with the lower degree of centralisation in wage bargaining.

## 4 The open economy

In this section, we consider trade between the two countries as described in the previous section. We abstract from any trade impediments and other barriers to trade and assume that goods markets are fully integrated whereas the national labour markets remain segmented and workers are immobile between the two countries. Again we first compute the wage setting of unions and output decision of firms in both countries before turning our attention to aggregate variables, especially the trade effects on unemployment, (group-specific) welfare and inter-group inequality.

### 4.1 Wage claims and output in the open economy

Aggregate world demand in the open economy is given by demand from consumers in both countries. Thus,

\[
p_t(z) = \bar{a} - \frac{b}{\bar{\lambda}} \bar{\lambda} t(z),
\]

where \(\bar{a} = 2a\) denotes the world demand intercept, \(\bar{\lambda} = \lambda^H + \lambda^F\) the world marginal utility of income and \(t\) indicates trade. The real profits at the margin of a firm \(j\) in country \(m\) then are

\[
\Pi_{j,t}^m \equiv \bar{\lambda}_{j,t} y_j^m = 2a - b \left( \sum_{i=1}^n y_i^m + \sum_{i=1}^n y_i^{-m} \right) - \lambda^m c_j^m y_j^m.
\]
used to compute the following rent-maximising wage claims in Home and Foreign, respectively,

\[ W^H_t = \bar{\lambda}w^H_t = \frac{2a[1 + 2n(2 - \beta)]}{(n + 1)(2 - \beta)[(n + 1) + 2n(1 - \beta)] - n^2}, \]  

\[ W^F_t = \bar{\lambda}w^F_t = \frac{2a[n + (n + 1)(2 - \beta)]}{(n + 1)(2 - \beta)[(n + 1) + 2n(1 - \beta)] - n^2}. \]

Comparing (11) with (11') and (12) with (12') shows that wage claims in the two countries are differently affected by trade integration. In Home the impact of trade is ambiguous and depends on the parameter constellation of \( \beta \) and \( n \), i.e. on the interplay of the intensity of competition and the scope of the social security system.\(^4\) The higher the competition in autarky, the more likely wage claims will shrink due to ongoing market integration. In Foreign, on the one hand, the increased international competition ceteris paribus also leads to a more moderate wage setting. Here, however, this effect is not as severe, since the autarky wages were not set as aggressive as in Home. On the other hand, the unions in Foreign realise that their counterparts in the other country were able to enforce higher wages (in autarky) which increases the wage setting for a given labour demand. In sum, this second effect always dominates so that market integration leads to higher wage claims in Foreign.

Given the rent-maximising wage rates we can then solve the first stage of the game which yields the following output and employment levels for any firm \( j \) in sector \( z \) in both countries, respectively

\[ y^H_t = l^H_t = \frac{2a(n + 1)(1 - \beta)[1 + 2n(2 - \beta)]}{b(2n + 1)[(n + 1)(2 - \beta)[(n + 1) + 2n(1 - \beta)] - n^2]}, \]  

\[ y^F_t = l^F_t = \frac{4na(1 - \beta)[n + (n + 1)(2 - \beta)]}{b(2n + 1)[(n + 1)(2 - \beta)[(n + 1) + 2n(1 - \beta)] - n^2}}. \]

Comparing output levels in autarky with those in the open economy, we see that firms in both countries produce more after the market integration. For given wages, firms expand their activity. However, wage claims change due to ongoing market integration. In Home it is very likely that they become more moderate and hence both effects go in the same direction, thus leading to higher output levels per firm. In contrast, Foreign wage claims become more aggressive which implies an opposing effect on the output level of firms. However, in sum, the market size effect dominates the cost effect so that also firms in Foreign produce more than in autarky.

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\(^4\)In case of a monopoly firm wage claims will increase for any replacement ratio. Otherwise this effect is not clear. If there are e.g. two firms active, wage claims will increase if the replacement ratio is higher than 0.1849. For three firms this threshold increases up to 0.6223.
4.2 Aggregate variables in the open economy

The new world price that holds for all consumers is then given by

\[ P_t = \bar{\lambda} p_t = \frac{2a[n + (n + 1)(2 - \beta)](1 + 2n(2 - \beta))}{(2n + 1)(n + 1)(2 - \beta)(n + 1) + 2n(1 - \beta)} - n^2. \]  

Although world production has increased the perceived price effect is contrary for both countries. Comparing the world price with the two respective autarky prices we see that trade exhibits a pro-competitive effect for Home while this effect does not occur for country Foreign. The intuition for this result is as follows. In a model with oligopolistic competition and asymmetric countries trade integration renders the aggregated demand curve more elastic and with one integrated market entails a world price that lies between the two autarky prices.

This enables us to look at the individual welfare of workers and firm owners. Beginning with the first group, the real wage in terms of the world price yields

\[ \tilde{w}_t^H = \frac{2n + 1}{n + (n + 1)(2 - \beta)} \]  

\[ \tilde{w}_t^F = \frac{2n + 1}{1 + 2n(2 - \beta)}. \]  

As noted above, trade integration moderates wage claims in Home and, hence, decreases welfare of workers for a given price level. However, opening up for trade leads to a decrease in the price index for Home consumers which allows workers to purchase more goods for any wage rate. In sum, the wage effect dominates the price effect and thus, ongoing trade liberalisation makes workers worse off in Home. The impact on workers in Foreign is opposite but leads to the same conclusion. Here, workers experience an increase in the wage rate which makes them ceteris paribus better off but at the same time trade leads to a surge in the price index compared to the autarky scenario. Therefore, trade imposes two opposing effects and it is the wage effect that is stronger. Hence, we can conclude that ongoing market integration leads to welfare losses for workers in both countries, irrespective of the degree of centralisation in the bargaining regime.

We can then continue to look at the individual welfare of firm owners. Their respective real profit in terms of the world price is given by

\[ \tilde{\pi}_t^H = \frac{2a(n + 1)^2(1 - \beta)^2[1 + 2n(2 - \beta)]}{b(2n + 1)[n + (n + 1)(2 - \beta)][(n + 1)(2 - \beta)(n + 1) + 2n(1 - \beta)] - n^2} \]  

\[ \tilde{\pi}_t^F = \frac{8n^2a(1 - \beta)^2[2n(1 - \beta)]}{b(2n + 1)[1 + 2n(2 - \beta)][(n + 1)(2 - \beta)(n + 1) + 2n(1 - \beta)] - n^2}. \]

Comparing real profits in autarky and free trade we see that firm owners in both countries benefit by ongoing market integration. The greater market creates more demand for their products which ceteris paribus translates into higher real profits for given prices. Furthermore, for Home the perceived price level decreases which implies an additional welfare gain. In contrast, the
perceived price index increase for Foreign but is not strong enough to overturn the profit increase which puts firm owners in both countries as net winners of internationalisation in this model.

It is then straightforward to take a closer look at the inter-group inequality between employed workers and entrepreneurs after opening up for trade. The profit-wage ratio yields

\[
\xi^H_t = \frac{2a(n+1)^2(1-\beta)^2[1+2n(2-\beta)]}{b(2n+1)^2\{(n+1)(2-\beta)[(n+1) + 2n(1-\beta)] - n^2\}}, \tag{24'}
\]

\[
\xi^F_t = \frac{8n^2a(1-\beta)^2[n + (n+1)(2-\beta)]}{b(2n+1)^2\{(n+1)(2-\beta)[(n+1) + 2n(1-\beta)] - n^2\}}, \tag{25'}
\]

for Home and Foreign, respectively. In line with our previous results we find that the gap in real income between both types of individuals increases in both countries.

**Proposition 1** A shift from autarky to free trade has qualitatively the same effects for both countries. It shrinks the welfare of employed workers while it benefits the firm owners and thus increases inter-group inequality between these two groups while on the other hand reducing unemployment.

### 4.3 Relative trade effects of Home and Foreign

In the previous section we investigated the general trade effects for both countries. While we have seen that for most of the variables the trade effects go into the same direction, another crucial question however, might be, what can be said about the relative trade effects for Home and Foreign, i.e. whether one country will gain (or lose) in some aspects relative to the other country. We address this question by calculating the difference in difference for our crucial variables under autarky and trade between Home and Foreign (see Appendix).

Beginning with output this analysis shows that the increase in the output by opening up for trade is larger for firms from country Foreign than for firms from country Home. Since unions in Foreign are already in the closed economy taking into account the competitive market structure, the decrease in the real wage at the margin is not as high in Foreign than in Home. But still, the relative wage differential between Home and Foreign is such, that firms from country Foreign have lower costs and thus a competitive advantage. Hence, it is immediate that also employment per firm is increasing more strongly in Foreign relative to Home, thereby having a stronger positive effect on overall employment. While workers that did not have a job in autarky and got employed through internationalisation are clearly better off, the effect on the workers is not clear in general. In both countries the real wage has decreased by opening up for trade. However, the workers in country Foreign gain relative to workers in Home, i.e. ongoing market integration benefits workers in a country with a less centralised degree of wage finding relative to workers in a country with a more centralised wage bargaining regime. In contrast, the opposite is true for firm owners. Although, firms from Foreign have a clear cost advantage compared to their rivals from the other country, they are relatively worse off. This somewhat surprising
result depends on the wage-setting behaviour of unions. Unions in Home realise that domestic firms have a lower competitiveness and thus are willing to set lower wages to secure employment. On the other hand, unions in Foreign see that their domestic firms have a clear cost advantage and thus set even higher wages than in autarky. Both effects combined can explain the relative gain in welfare by firm owners from the country with the cost disadvantage. Therefore, we can conclude this section with the following proposition.

**Proposition 2** Trade integration between countries with different degrees of centralisation in the wage bargaining leads to convergence and renders both countries more similar.

### 5 Unilateral policy reform in Home

So far we have analysed the consequences of trade integration between two asymmetric countries. In a next step, we want to have a closer look at possible consequences and spillover effects of a unilateral policy reform in one country. In our case, this policy switch consists of Home moving towards a less centralised wage bargaining regime. Given the recent data (OECD, 2004) and especially the latest plans by the European Union this seems to be a plausible and relevant type of reform on the labour market.

Obviously, such a policy reform changes the objective function of the unions in Home. Since they are now active at the firm-level it is identical to the one of unions in Foreign. This implies the following real wage at the margin for both countries

\[
W_{t,r} = \frac{2a}{1 + 2n(1 - \beta)}
\]

whereby \( r \) denotes a variable after the reform was conducted. As we see, a change in the institutional setting in one country not only affects the wage claims in this country but also those of its trade partner. In Home, unions do not internalise the strategic effect anymore which renders their wage setting behaviour more cautious and, thus, makes firms in Home more competitive. In answer to facing cost-cutting rivals from abroad also unions in Foreign are willing to set more moderate wages. Therefore, by the policy reform in Home wage claims in both countries are reduced. Since wages are the only costs for firms, this change directly affects the output decision of firms. The lower wage claims in Home increase the market power (output and employment) of firms for given wages in the other country. However, wages in Foreign are also decreasing which partly absorbs this competition effect. In sum, the direct cost effect is stronger which leads to higher output levels by Home firms. In contrast, in Foreign it is the competition effect that outweighs the cost decrease and thus reduces output per firm. Consequently, we have two opposing forces on the world price. Total output increases in one country while it decreases in the other country. It is the direct output effect in the country source of the reform that dominates. Therefore, world output rises which leads to a fall in the
world price.

With these insights at hand we can now determine the policy effects on welfare and inequality in both countries. Starting with welfare of workers in Home there are two competing effects. First, lower wage claims reduce c.p. the real income of workers. Secondly, however, the labour market reform also decreases the world price so that workers are able to buy more for a given income. The first (direct) effect dominates which puts the workers on a lower individual welfare level than in the pre-reform time. Due to the globalised world, also the welfare of workers in Foreign is affected. Here, the effects on wage claims and the world price are equally strong and exactly cancel out inducing no change in the welfare of workers. Thus, we can conclude, that the gap in the welfare of workers decreases, i.e. workers in Home lose relative to workers in Foreign.

We can then turn to examine welfare of firm owners. Although not having an analytical solution, the effect has to be clear. The income share $1 - \tilde{w}_{t,R}$ per unit of output has increased in Home which leads c.p. to a surge in the real income of firm owners. Furthermore, firm owners in Home are able to produce more output which adds to this effect. Therefore, a switch towards less central regimes of wage bargaining benefits firm owners in the country that is source of the reform. But what about the welfare level of their counterparts in the other country? With constant real wage costs, the real income of entrepreneurs does not change for a given level of output. However, since output shrinks, the spillover effects induce a lower real profit income for entrepreneurs in Foreign. They are hence a loser of the domestic unilateral policy reform of the trading partner. Finally, the result for inter-group inequality is then straightforward. The distribution of income becomes less equal in Home and more equal in Foreign. Therefore we can conclude our analysis of the unilateral policy reform by summing up the results in the following proposition.

**Proposition 3** A unilateral policy reform in one country induces spillover effects on its trading partner and creates winners and losers. Workers in Home lose in real terms as do firm owners in Foreign, while the net effect for workers in Foreign is zero. The only beneficiary of such a reform are firm owners in Home.

## 6 Conclusion

to be written
References


Appendix

Relative trade effects between Home and Foreign

To determine the relative trade effects between the two countries we calculate the difference in the variables of interest between Home and Foreign in the closed and open economy and look how they change. Starting with the real wage at the margin we find

\[ \Delta_{HF}^{W,a} \equiv \frac{(n - 1)(1 - \beta)}{(2 - \beta)[1 + n(1 - \beta)]} \]

\[ \Delta_{HF}^{W,t} \equiv \frac{2a(n - 1)(1 - \beta)}{(n + 1)(2 - \beta)[(n + 1) + 2n(1 - \beta)] - n^2}. \]

The difference in difference then is given by

\[ \Delta_{HF}^{W,t} - \Delta_{HF}^{W,a} = \frac{a(n - 1)(1 - \beta)[(2n - 1)(2 - \beta) + n^2(1 - \beta)[1 + 2(2 - \beta)]]}{(2 - \beta)[1 + n(1 - \beta)][(n + 1)(2 - \beta)[(n + 1) + 2n(1 - \beta)] - n^2}} \]

which shows that the wage premia in the country with the centralised wage bargaining structure shrinks by opening up for trade. Doing the same exercise for the output (employment) level of an individual firm, this entails

\[ \Delta_{HF}^{y,a} \equiv y_{H}^{a} - y_{F}^{a} = \frac{(n - 1)(1 - \beta)}{b(n + 1)(2 - \beta)[1 + n(1 - \beta)]} \]

\[ \Delta_{HF}^{y,t} \equiv y_{H}^{t} - y_{F}^{t} = \frac{2a(n - 1)(1 - \beta)}{b[(n + 1)(2 - \beta)[(n + 1) + 2n(1 - \beta)] - n^2}] \]

for autarky and trade. Finally, the relative trade effect shows

\[ \Delta_{y,a}^{HF} - \Delta_{y,t}^{HF} = \frac{a(n - 1)(1 - \beta)[(n^2 - 1)(2 - \beta) - n^2]}{b(n + 1)(2 - \beta)[1 + n(1 - \beta)][(n + 1)(2 - \beta)[(n + 1) + 2n(1 - \beta)] - n^2}}. \]

Looking at the welfare of workers we have

\[ \Delta_{w,a}^{HF} \equiv w_{H}^{a} - w_{F}^{a} = \frac{(n - 1)(n + 1)(1 - \beta)}{(n + 2 - \beta)[1 + n(2 - \beta)]} \]

\[ \Delta_{w,t}^{HF} \equiv w_{H}^{t} - w_{F}^{t} = \frac{(n - 1)(2n + 1)(1 - \beta)}{(n + n + 1)(2 - \beta)[1 + 2n(2 - \beta)]} \]

and, thus,

\[ \Delta_{w,t}^{HF} - \Delta_{w,a}^{HF} = - \frac{n(n - 1)(1 - \beta)[n(3 - 2\beta) + (2 - \beta)^2[1 + 2n(n + 1)]]}{(n + 2 - \beta)[1 + n(2 - \beta)][1 + 2n(2 - \beta)][n + (n + 1)(2 - \beta])}. \]
while for the firm owners we get

\[ \Delta_{HF}^{\tilde{\pi},t} \equiv \tilde{\pi}_t^H - \tilde{\pi}_t^F = - \frac{a(n - 1)(1 - \beta)^2[1 + n(n + 2)(2 - \beta)]}{b[n + (n + 1)(2 - \beta)][1 + 2n(2 - \beta)][(n + 1)(2 - \beta)][(n + 1) + 2n(1 - \beta) - n^2]} \]  

\[ \Delta_{HF}^{\tilde{\pi},a} \equiv \tilde{\pi}_a^H - \tilde{\pi}_a^F = - \frac{a(n - 1)(1 - \beta)^2[1 + n(n + 2)(2 - \beta)]}{b(n + 1)(2 - \beta)(n + 2 - \beta)[1 + n(1 - \beta)][1 + n(2 - \beta)]} \]  

(41)

(42)

For all variables we see that differences disappear for \( n = 1 \) which is plausible because in this case the degree of centralisation does not make a difference anymore since wages are set for the complete industry anyways. Furthermore, these results prove that the differences between the two countries become smaller for all variables. Hence, we can conclude that market integration between two countries that differ in the wage bargaining structure renders them more similar in all relevant aspects.