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IMPERFECT GOODS AND LABOR MARKETS, AND THE UNION WAGE GAP

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Abstract

Existing theoretical literature fails to explain the differences between the pay of workers that are covered by union agreements and others who are not. This study aims at closing this gap by a single general-equilibrium approach that integrates a dual labor market and a two-sector product market. Our results suggest that the so-called 'union wage gap' is largely determined by the degree of centralization of the bargains, and, to a somewhat lesser extent, by the expenditure share of the unionized sector's goods.

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1 Introduction

Empirical literature on the union wage gap, i.e. the amount by which the pay of a worker who is covered by a firm-union agreement exceeds that of a worker who is not, is largely controversial. Due to different data sources, different periods of time under consideration, and different methodology, estimated wage gaps vary significantly. For instance, Blanchflower (1999) reports a union wage gap of 15.5% for the U.S., which he finds to be remarkably stable from 1983-1993. In the same time span the estimations of Hirsch and Schumacher (2002) fall from 25.5% to 23.5%. Bratsberg and Ragan (2002) report increasing U.S. wage gaps in some and decreasing in other industries. A rather extreme example is Canada. Here, Blanchflower (1996)'s estimation is 4.8% (insignificant), while Robinson (1989) obtains wage gaps from 20% up to 43%, depending on the methodology employed.

The puzzling diversity of the empirical work accompanies and amplifies the helplessness of the economic theory to explain the causes of the union wage premium. Usually the argumentation refers to the unions' "bargaining power". But since the latter cannot be measured directly, and indirect measures often use the union wage rate as explanatory variable, it is difficult to verify how the bargaining power evolves, and to which extent it impacts on the wage rate. If union density is taken as explanatory variable (or as a proxy for the bargaining power), there is no problem to obtain the necessary data. Because density has declined dramatically in the U.S. during the last 30 years (Blanchflower, 1996), whereas no such change has been recognized for the wage gap, it is obvious that it does not suffice to explain differences in the latter. Another strand of the literature, building up on the famous Calmfors and Driffill (1988) paper, focuses on the role of the bargaining structure for the outcome of the wage bargaining (for a short overview see Booth, Burda et al., 2000, p. 120ff).

In this contribution, we present a theoretical model designed to explain differences in the union wage gap. Apart from the bargaining structure, the size of the employed labor force, preferences towards the goods produced by the unionized sector, and the degree of competition on the goods markets are chosen as explanatory variables. Recently, a number of publications by the OECD and related researchers have stressed the importance of cross-market effects between labor and product markets (see e.g. Boeri, Nicoletti and Scarpetta (2000), Nicoletti, Bassanini et al. (2001), and Jean and Nicoletti (2002)). One major source of these spillovers is that the degree of

competition on the product market determines the amount of the rents that a firm can accrue, and that is available for any rent sharing mechanism like union wage bargaining. Apart from the internalization of otherwise external effects through a more central bargaining, this is the key mechanism that drives our results.

The Blanchard and Giavazzi (2001) paper is quite close to our analysis. In particular the modeling of the effects of market entry on competition draws from their paper. Except from some other points, one important difference is that we consider a dual labor market. Assuming a dual labor market turns out to cure some of the problems related theoretical work suffers from. First, the secondary labor market provides the natural 'exit option' for the unions bargaining over wages in the primary labor market. The common alternative, non-labor income, brings about troublesome side-issues like the financing of the unemployment benefits. Second, if one wants to generate imperfectly competitive product markets by increasing returns to scale, the easiest way to do this is to assume fixed costs. Therefore, a second, fixed factor of production is required, which may be thought of as a homogeneous good produced with a linear technology employing exclusively labor from the competitive secondary labor market. Most importantly, the dual labor market renders possible to derive the union wage gap.

The following section develops the theoretical model. Section 3 derives the results numerically. Section 4 summarizes the results and concludes.

2 The model

Imagine an economy composed of two sectors. One monopolistic competitive sector, producing heterogeneous goods with increasing returns to scale, and one perfectly competitive sector producing a homogeneous good[1] with constant returns to scale. This setup has recently been supported by empirical work on scale elasticities. After an examination of trade data from 71 countries, Antweiler and Trefler (2002) conclude: "Our results point to the importance of integrating constant- and increasing-returns-to-scale industries within a single general-equilibrium framework."

[1] In the related literature, a variety of interpretations of this 'rest of the economy' can be found. Dixit and Stiglitz (1977) propose 'time at the disposal of consumers', Blanchard and Kiyotaki (1987), and Dutt and Sen (1997) suggest 'real money balances', and Fujita, Krugman and Venables (1999) see it as 'agricultural good'.

The market for labor is dichotomized as well. Some workers receive the competitive wage rate, and some workers receive the (higher) union wage rate. While firms in the homogeneous sector employ exclusively workers from the competitive labor market, production in the heterogeneous sector requires unionized labor as an input. Since there is no surplus to be shared in the competitive sector, the union wage in this sector would coincide with the competitive wage rate, anyway.

Firms in the heterogeneous sector also each employ a fixed amount of non-unionized labor. Wages paid to these workers have the character of fixed costs, because the competitive wage rate is determined by the technology of the homogeneous sector. Assuming fixed costs is the simplest way to generate increasing returns to scale in the heterogeneous sector. In our interpretation it is the labor input for security agents, cleaner, and gate keeper, which is essential for the firm to produce goods, but is yet independent of the amount produced. Equivalently, the fixed input may be seen as the corresponding amount of the homogeneous good, if the respective service has been outsourced.

Workers

There are N homogeneous workers, indexed by j. Utility of a worker depends on the consumption of homogeneous and heterogeneous goods ($x_{0,j}$, and $x_{i,j}$ with $i = 1, 2, \ldots, n$, respectively). The utility function of a representative worker is

$$u_j = u(x_{0,j}, x_{1,j}, \ldots, x_{n,j}) = x_{0,j}^{1-\beta} \cdot X_j^{\beta} \tag{1}$$

with

$$X_j \equiv \left(n^{-(1-\rho)} \sum_{i=1}^{n} {x_{i,j}}^{\rho} \right)^{\frac{1}{\rho}} \quad 0 < \rho < 1$$

where $x_{0,j}$ stands for the homogeneous good, n gives the number of heterogeneous firms/ varieties,β symbolizes the expenditure share, and X_j is a composite index of the consumed varieties. ρ corresponds with the elasticity of substitution, σ, according to the definition $\sigma \equiv 1/(1-\rho) > 1$, and is derived endogenously through the relationship $\rho = 1 - 1/(\zeta \cdot n),\ \zeta > 0, \zeta n = \sigma > 1$, where the exogenous parameter ζ determines how strong ρ, and thereby also σ, depend on the number of firms[2]. An increasing number of firms n thus increases the elasticity of substitution between any

[2]For a somewhat more general formulation see Blanchard and Giavazzi (2001, p. 6).

two varieties. We see it as a proxy for the degree of transparency on the products market.

Apart from ρ being endogenous the main difference to the Dixit-Stiglitz framework is the term $n^{-(1-\rho)}$ in the definition of the composite index X. The effect of this term becomes clear when we assume that consumption of each heterogeneous variety is the same, i.e. $x_{1,j} = x_{2,j} = \ldots = x_j$. In this case we get $X_j = n \cdot x_j$. Hence, utility depends only on the total amount of consumption. In the Dixit-Stiglitz framework, in contrast, there is a direct utility gain from an increase of the number of firms/ varieties. Here, consumers profit from an increase of the number of firms only through the reduction of mark-ups by lower market power. We follow Blanchard and Giavazzi (2001, p. 7) in considering this effect of market entry to be most important.

Maximization of the utility function (1) under a budget constraint yields the demand functions

$$X_j = \frac{\beta y_j}{P} \quad \text{and} \quad x_{0,j} = \frac{(1-\beta) y_j}{p_0} \tag{2}$$

where y_j denotes the income of worker j, p_0 is the price of the homogeneous good, and P is the price index of the heterogeneous goods, defined by

$$P = \left(\frac{1}{n} \sum_{i=1}^{n} p_i^{\frac{\rho}{\rho-1}} \right)^{\frac{\rho-1}{\rho}} \tag{3}$$

(see Blanchard and Giavazzi, 2001, p. 7). Income y_j of a worker is either the union wage rate w_i or the competitive wage rate $\overline{w}$. Minimizing the expenditures for a given value of X_j yields the following individual demand function for variety x_i:

$$x_{i,j} = \left(\frac{P}{p_i} \right)^{\frac{\rho}{1-\rho}} \frac{\beta y_j}{n p_i} \tag{4}$$

Hence, aggregated demand for this good is

$$x_i = \left(\frac{P}{p_i} \right)^{\frac{\rho}{1-\rho}} \frac{\beta}{n p_i} Y \tag{5}$$

and depends linearly on the total income of workers $Y \equiv \sum_{j=1}^{N} y_j$.

Firms

Firms in both sectors maximize profits. The homogeneous good x_0 is produced employing exclusively labor from the competitive labor market. The good serves as a

numeraire. Technology is assumed to be linear (no fixed costs), and standardized without loss of information to $x_0 = L_0$. Market entry occurs until firms just break even. This implies together with the assumed production function that the competitive wage rate is one: $\overline{w} = p_0 \equiv 1$. The number of firms in the perfectly competitive sector is undetermined.

Each heterogeneous good is produced by a different firm, employing respectively a fixed amount of Δ units of labor from the competitive labor market. The amount of unionized labor input can be derived from the technology constraint

$$L_i(x_i) = \frac{x_i}{\alpha} \tag{6}$$

where the constant α symbolizes exogenous variable output per unionized worker. Profit π of a representative firm reads

$$\pi_i = x_i \cdot p_i - L_i \cdot w_i - \Delta$$

After substituting L_i by the technology constraint and p_i by the inverse demand function, maximization of π_i yields the optimum price

$$p_i = \frac{w_i}{\alpha\rho} \quad \text{or} \quad p_i = \frac{w_i}{\alpha}\frac{\sigma}{\sigma - 1} \tag{7}$$

The mark-up over marginal costs is a negative function of n, since ρ depends positively on the number of firms n.

Market entry is free and costless. Firms enter/ exit the market until the profits of an additional firm would be negative. In a symmetric equilibrium all firms $i \neq 0$ are equal ($x_i = x$, $p_i = p$, $L_i = L$, $w_i = w$ and $\pi_i = \pi = 0$).

Unions

Assuming that workers are distributed evenly across all firms in the heterogeneous sector[3], the probability of a worker to get employed there is $n*L/N$. Those who don't become employed in the primary labor market must work for the competitive wage rate. Each trade union maximizes the expected utility of a representative worker, and bargains with a fraction γ of the firms in the unionized sector of the economy over the wage rate w ("right-to-manage model"). The number of unions is thus $1/\gamma$.

[3]If workers were distributed unevenly, some of them could increase the probability of an employment by reallocating themselves to a firm where less workers are attached.

Given our assumptions the expected utility of a representative worker is

$$U^+ = \frac{nL}{N} u_j(w, P^+) + \left(1 - \frac{nL}{N}\right) u_j(1, P^+)$$

if there is an agreement with the firms and

$$U^- = u_j(1, P^-)$$

if there is no agreement[4]. P^+ and P^- represent the price index of the heterogeneous goods, respectively in the cases of an agreement and of no agreement. The bargaining parties thus take into account that the price index differs in these two cases.

Timing of the model

Since our model is static, there is no chronological order of the decisions, actions, and reactions. But, by assuming a specific informational status of the workers, firms and unions, we determine what may be called a logical order.

One of the main differences to Blanchard and Giavazzi (2001) is the way market entry is modeled. In their paper, firms face entry costs, which have a similar character as the fixed costs have in ours. But since these costs are sunk costs, it is difficult to explain why the number of firms should shrink after a marginal deterioration of their economic situation. Blanchard and Giavazzi (2001, p. 17) argue that "firms which die are not replaced". But it remains open why these firms should die in the model because profits are strictly positive. In our model all firms that enter the market actually have the fixed costs. Thus, starting from a zero profit equilibrium, a deterioration of the firms' situation leads to losses, which push some firms out of the market. But - as the entry costs in the Blanchard and Giavazzi framework - the fixed costs do not affect the wage bargain, if they arise independently of whether or not there is an agreement.

From these considerations it follows that consistency of the model requires that i) first market entry/ exit decisions are taken. ii) Then fixed costs arise for those firms that are in the market. iii) Wage bargains take place independently of each other. It must be assumed that the bargaining parties know the outcome of all other bargains e.g. through a heuristic process, which is terminated in the long-run equilibrium we

[4]Since all agents fare better in the case of an agreement, this second term serves only as the 'conflict point' during the bargain, but is never realized.

look at. This assumption allows us to abstract from the strategic interplay between different bargains that otherwise would occur. Even though this assumption may be grossly unrealistic, we prefer to follow the standard in bargaining theory here. Once wages are determined, iv) goods are produced, sold and consumed. However, in a long-run equilibrium only those firms that can actually cover fixed costs enter the market.

The wage bargain

Both, unions and firms, take into account the aggregate demand functions the firms face. They are equally aware of the responses of employment, workers' income and prices regarding changes of the wage rate. In contrast, they take the number of firms in the heterogeneous sector as given, because it is determined "before" the bargaining.

The Nash product describing the asymmetric bargaining problem is[5]

$$NP = \gamma n[px - Lw] \cdot [U^{+} - U^{-}]^{\delta} \tag{8}$$

where δ denotes the relative bargaining power of the union (Nickell, 1999, p. 3). Constraints of the maximization are: the demand function (5), the technology of the firm (6), the optimum price of the good (7), the definition of the price index (3), and the composition of the total income. The two latter equations have to be modified to take into account whether or not workers are covered by the agreement.

From the union's and the corresponding γn firms' point of view, the heterogeneous goods' price index depends on the agreed wage because the goods prices depend on the wage rate and the number of firms is not negligible relative to the entire economy. If we differentiate between firms that are covered and not covered (in the latter case p_i, L_i and w_i carry a bar, symbolizing that these values are given to the bargaining parties), definition (3) becomes

$$P = \left[\frac{1}{n}\left(\sum_{i=1}^{\gamma n} p_i^{\frac{\rho}{\rho-1}} + \sum_{i=\gamma n+1}^{n} \overline{p_i}^{\frac{\rho}{\rho-1}}\right)\right]^{\frac{\rho-1}{\rho}} \tag{9}$$

[5]As noted earlier, wages, demand, labor input etc. are the same for all firms in a symmetric equilibrium. Nevertheless, the bargaining parties consider these variables to depend on the result of the bargain if they are related to them, and as exogenous if they are related to other firms/ workers. Therefore, it is not correct to omit the index in the following equations. Instead, we would have to employ another index for firms that are covered and those that are not covered by the result of the bargain. We skip this index for the ease of the representation.

Since workers are distributed evenly across all firms, total income from the point of view of the bargaining parties reads

$$\begin{aligned} Y &= \sum_{j=1}^{\gamma N}\left[\frac{nL_i}{N}w_i + \left(1-\frac{nL_i}{N}\right)\right] + \sum_{j=\gamma N+1}^{N}\left[\frac{n\overline{L_i}}{N}\overline{w_i} + \left(1-\frac{n\overline{L_i}}{N}\right)\right] \\ &= \sum_{j=1}^{\gamma N}\left[\frac{nL_i}{N}(w_i-1)\right] + \sum_{j=\gamma N+1}^{N}\left[\frac{n\overline{L_i}}{N}(\overline{w_i}-1)\right] + N \end{aligned} \tag{10}$$

The resulting wage rate is not amenable to a formal representation in general. Only in the benchmark case of decentralized bargaining ($\gamma \to 0$) a closed form can be found, which is

$$w_i|_{\gamma\to 0} = \frac{\delta+\rho}{\rho(1+\delta)}$$

All other variables follow from the wage rate in a straightforward manner. Except from the special case of decentralized bargaining, numerical methods are appropriate to solve for the wage rate and all other endogenous variables. This exercise is carried out in section 3. Since ρ depends on the number of firms n, the latter has to be derived before we can determine the wage rate. Other variables that are related to the macro level are the price index P and total income Y.

The macro level

For the aggregation the variables that are determined at the level of the bargain, we assume symmetry. In a symmetric equilibrium the price index (3) becomes

$$P = p_1 = p_2 = \ldots = p$$

The cost-of-living price index $\hat{P}$ can be derived by a weighting of the prices in both sectors with the respective expenditure shares:

$$\hat{P} = P^{\beta}\cdot 1^{1-\beta} = p^{\beta} \tag{11}$$

Given symmetry, aggregate income (10) becomes

$$Y = nL(w-1) + N$$

Like in the Dixit-Stiglitz framework the number of firms/ heterogeneous goods is determined through the assumption that firms' profits are zero in equilibrium. Since there are fixed costs, this does not imply a breakdown of the wage bargains

because of absent rents. In comparison with Blanchard and Giavazzi (2001), a small deterioration of the firms' situation unambiguously leads to a decrease of the number of firms. Setting $\pi_i = 0$ and employing some of the previously derived results and definitions, we obtain for n:

$$n = \sqrt{\frac{\beta Y}{\Delta \zeta}}$$

The three equations for the price index P, total income Y and the number of firms n determine - together with the results and definitions derived before - the simultaneous long-run equilibrium. The following variables are endogenous: wage rate w, variable employment per firm L, product price p, demand x, number of firms n, total income Y, price index P, and elasticity of substitution σ. Other variables, like the demand for the homogeneous good may be deduced from them. The results depend on the number of workers N, output per unionized worker α, the expenditure share of the heterogeneous goods β, the unions' relative bargaining power δ, the fixed labor input Δ, the degree of centralization of the bargain γ, and on the parameter ζ, which indicates how strong competition on the goods market is affected by market entry. It is possible to verify the correctness of the outcome by means of the redundant equilibrium condition of the homogeneous market: $x_0^{demand} = (1-\beta)Y = N - n(L+\Delta) = x_0^{supply}$.

3 Calibration

The first goal the calibration of the model strikes for is to derive an exemplary equilibrium. Analyzing the properties of this equilibrium may help to understand the complex interactions between the endogenous variables. If we would restrict the analysis to decentralized bargaining ($\gamma \to 0$), it could also be executed analytically. Yet, this parameter turns out to be a crucial one. In addition, the calibration renders possible to quantify the resulting effects and to contrast one with the other. The disadvantage that only special and possibly exceptional cases are looked at can be reduced by a sensitivity analysis.

Second, a calibration allows to tailor the parameters to the situation of a specific country. A comparison of the model's results with data may give some guidance as to the extent of the model's predictive power. And, most importantly, once a model

has proven to fit the data well, the application to a country's economic situation permits to derive what policy suits best for any given pursued objective.

A lack of data and the objective to work out differences between countries in a stylized and focused fashion forced us to restrict the numerical analysis to seven countries: The United States, the United Kingdom, West Germany, Denmark, Canada, Italy and Japan. These countries have been chosen because the necessary data have been available at least for some years, and because they are quite different with regard to the degree of centralization of the wage bargains and the union coverage rate. If the data were available, we calibrated the model for the years 1980, 1985, 1990 and 1994.

The data

The following parameters are chosen to distinguish a country's specific situation at different points in time: β, the expenditure share of the heterogeneous goods; N, the size of the workforce, and γ, which we refer to as "the degree of centralization of the wage bargains". Although the latter is relatively stable over time (Kenworthy, 2000, p. 13), we account for variations of it because the considered time span is fairly long, and because γ affects the endogenous variables strongly. It is needless to say that these three parameters cannot give a sound impression of a country's economic situation. Yet, it turns out that they suffice to explain much of the differences in the union wage gap between the included countries.

We adjust β until the share of workers that are covered by a bargain coincides with the bargaining coverage rate, taken from Traxler (1996, p. 274), supplemented by OECD (1997, p. 71), whenever the records are comparable[6]. I.e. we derive the decrease of union coverage in many countries from an assumed relative decrease of the consumers' valuation of goods produced in the unionized sector. This means that we abstract from many causes that may have influenced the coverage rates, too, e.g. the political environment, etc. Examples for the shift of preferences away from the

[6]Unfortunately, "the definition and measurement of bargaining coverage is not unambiguous" (Booth et al., 2000, p. 26). One difference between the reported coverage rates is that some adjust for the fact that in some countries not all of the workers have the legal right to bargain. From the role of the parameter in the model is is clear that we must take the unadjusted coverage rate. Therefore, the OECD data were only useful for those countries where all workers have the right to bargain, so that both rates coincide. For instance, this is the case in Italy.

unionized sector's goods are very common and include sectors like 'steel' and 'public transports'[7].

The most difficult decision is regarding the appropriate measure of γ, the degree of centralization. There is an abundance of qualitative indicators designed to describe it (for a comprehensive survey see Kenworthy, 2000). In addition, some authors claim that coordination rather than centralization would be the appropriate measurement (Soskice, 1990). We chose to take Iversen (1998)'s indicator of wage bargaining centralization, mainly because it is available annually for all countries that we included[8]. It must be stressed, however, that there are considerable quantitative and qualitative differences between the alternative indicators (Kenworthy, 2000). The origin of the Iversen indicator is displaced such that the smallest value, corresponding with firm-level bargaining, is zero[9]. N is civilian employment, taken from the US Department of Labor (2002, p. 11)[10]. The 1980 value is standardized to unity, respectively.

In contrast, we chose not to vary the production technology across countries and time (parameters α and Δ in the model). Even though these parameters play an important role for the level and dynamics of wages and income, we abstract from variations in them because our focus is on the comparative-static effects of the bargaining structure and the size of the unionized sector. In addition, it is difficult to obtain reliable data on costs. The latter is equally valid for the parameters δ (relative union bargaining power) and ζ (determining how strong the number of varieties affects the elasticity of substitution). We chose to employ the same parameter values for ζ and δ for each point in time and country because the lack of data would otherwise make the results additionally arbitrary.

Table 1 below specifies the three-digit parameter values employed. α is standardized to unity for the ease of computation. Fixed labor input Δ is 0.002, which causes a ratio of fixed costs to total costs (cost disadvantage ratio, CDR) within the range 13.6%–24.5%[11]. Furthermore, we specify the parameter δ and ζ as 1 and 0.1,

[7]Pencavel (2002) takes the stance that shifts in demand are not the primary reason for the decline in union membership (density) in Britain.

[8]Actually, the 1994 value has to be taken from 1993, which is the last one published.

[9]To avoid computational problems, a value of 0.0001 rather than literally zero is the minimum (employed for the US and for Canada).

[10]This source converts the national data such that they approximate U.S. concepts. The Danish values stem from OECD (2001, p. 20f.).

[11]These values are somewhat higher than the estimations of the CDR by Harrison, Rutherford and Tarr (1994), but are comparable with those of e.g. Elbehri and Hertel (1999).

respectively, implying symmetric bargaining and a relatively weak responsiveness of the elasticity of substitution with regard to market entry. In the sensitivity analysis, we show to which extent the results depend on these specifications.

Table 1: Parameter specification

	Canada			Denmark			Germany			Italy		
year	1985	1990	1994	1980	1990	1994	1980	1985	1990	1980	1990	1994
β	0.491	0.494	0.472	0.823	0.823	0.824	0.901	0.882	0.897	0.996	0.972	0.965
γ	0.000	0.000	0.000	0.404	0.257	0.329	0.242	0.243	0.249	0.071	0.071	0.194
N	1.061	1.194	1.200	1.000	1.068	1.015	1.000	0.982	1.055	1.000	1.044	0.987

	Japan		U.K.			U.S.A.				Each country/ year	
year	1980	1990	1980	1990	1994	1980	1985	1990	1994	α	1.000
β	0.352	0.293	0.842	0.595	0.598	0.372	0.298	0.270	0.268	Δ	0.002
γ	0.160	0.265	0.052	0.052	0.052	0.000	0.000	0.000	0.000	δ	1.000
N	1.000	1.130	1.000	1.084	1.043	1.000	1.079	1.196	1.239	ζ	0.100

The results

The cross-country comparison is executed with regard to 1) the union wage gap, and 2) real wages of workers on the primary and on the secondary labor market. Real wages are calculated by deflating the nominal wage rates with the cost-of-living price index (11).

i) The union wage gap

Figure 1 shows the relative differences between the union wages and the competitive wage rates in the model. The highest wage gap is found in the U.S., where it equals 14.7% in 1980, increases to 16.3% in 1985 and then decreases to 15.9% in 1994. Canada features the second highest value, which is roughly 11.5%. The U.K. wage gap increases from 8.2% in 1980 to 9.7% in 1994. In contrast, the union wage gap decreases in Japan from about 10.5% in 1980 to 7.2% in 1990. In the time span, the Danish union wage gap increases from 3.0% to 5.2%, and then decreases to 4.2% in 1994. The German and Italian values remain nearly constant from 1980 to 1990 (5.4% and 7.1%, respectively). In 1994 the Italian wage gap falls to 5.9%, whereas the German value could not be calculated because of missing data.

Decentralized wage bargaining explains obviously the high wage gap in Canada and the U.S. Unions disregard the negative effect higher wages have on the aggregate price level, since the number of represented workers is small relative to the total workforce. The inverse accounts for Denmark, where the wage bargains concern the largest part of the workforce, and the wage gap is the lowest. Danish unions internalize the negative effect higher wages have to a great extent. This effect is well explored in the literature (for a short summary of different external effects that may be internalized see e.g. Booth et al., 2000, p. 120f.), and it causes much, yet not all of the differences between the countries' development of the wage gap.

Since Canada and the U.S. have both decentralized bargaining, and the relative variations of the total workforce are similar, differences in union coverage explain why Canada's wage gap is roughly 4 percentage points lower. But why should a higher union coverage rate yield a lower wage? Usually, it is taken for given that coverage is a proxy for a union's strength, which is supposed to have a positive effect on the negotiated wage rate. In our framework, in contrast, a higher coverage rate is caused by a higher expenditure share of the unionized sector of the economy, so that there are more monopolistically competitive firms. This implies that the heterogeneous goods become closer substitutes (ρ increases) so that the optimum prices, and the firms' ability to accrue rents, diminishes. Therefore, union wages decrease. The moderate increase of the wage gap in the U.K. can also be explained by changes of the expenditure share. In all other countries the expenditure shares remained relatively stable.

However, the decrease of the unionized sector in the U.S. did not lead to a relevant increase of the wage gap, because the relatively strong increase of the total workforce works against this effect. More workers lead to a higher number of firms, which enhances competition in the goods markets. This reduces rents and union wages. In Canada, this effect yields the moderate decrease of the wage gap from 1985 to 1990. For all other countries, the variations of the total workforce are small relative to the variations of union coverage and the degree of centralization.

ii) Real wages

The course of each considered country's real wages is shown in figures 2 and 3 for the unionized and the competitive labor market, respectively. Before going into detail, it should be emphasized that we do not claim that these variables are mainly

determined by the considered explanatory factors. In particular, one would conjecture that real income depends strongly on the employed technology, which differs between countries. The technology parameters are assumed to be constant over time and equal across countries, however. This means that we abstract from technological progress and related issues. Nonetheless, we find it worth to examine, how much of the differences in the countries' performance are due to variations of the bargaining structure, the size of the unionized sector, and the size of the labor force.

The model predicts that the highest real wages in the primary sector occur in the U.S. Here, and in the U.K., we also observe the strongest increase of the real wage rate during the 1980s. The reason is, besides the modest increases of the union wages in these countries, that the expenditure share β of the goods produced by firms that face union wage bargaining has dramatically declined in the considered time span. This lowers the cost-of-living price index (11) and raises real wages. In the U.S and the U.K. ever less workers profited ever more from the existence of trade unions.

In all other considered countries the real wage rate on the primary labor market remained fairly constant, amounting to roughly 0.96 in Japan and Canada, and 0.87 in Italy, Germany and Denmark. For Canada, Italy and Germany this result is to be expected, since the nominal union wages (union wage gap plus one) are quite stable, but this is not the case for Japan and Denmark. In the latter countries opponent effects act upon the real wage rate: In Japan, the nominal union wage rate declines in the 1980s. At the sime time the prices of the heterogeneous goods sink (due to lower wages), and the expenditure share of the competitively produced goods rises, which both lowered the price index. In Denmark, the nominal wage rate increased in the 1980s because of a decentralization of the wage bargaining (at a still high level). At the same time the cost-of-living price index increased, because the price of the heterogeneous goods rose. This sufficed to compensate the nominal wage increases to a great extent, because the weight of the heterogeneous goods in the consumption bundle was high.

Regarding the real competitive wage rate, all effects can be traced back to variations of the price index because the nominal wage rate is taken as the numeraire. The highest values result for Japan. Compared to the U.S., Japan's price index is lower because the prices of the heterogeneous goods are lower. In both countries, the real wage rate in the secondary sector increased because of a shrinking weight

of the expensive heterogeneous goods. The same effect causes the real competitive wage in the U.K. to rise in the 1980s, at a substantially lower level, however. The only country with a decreasing real competitive wage rate in the 1980s is Denmark. This results from a rise of the heterogeneous goods' prices, which was due to higher union wages.

Cum grano salis, the results that follow from the courses of the nominal and real wages in the model can be summarized as follows: The expenditure share of the unionized sector's goods (influencing union coverage) determines real income per worker, whereas the distribution of income between unionized and competitive labor (the union wage gap) depends primarily on the degree of centralization of the bargaining. Countries with a low coverage rate fare better in terms of real income. This results not because a low coverage acts as a discipline on wage demands. Instead, the latter are largely determined by the bargaining structure, i.e. the degree of centralization of the bargaining. The result obtains because a lower expenditure share of the unionized sector comes along with a higher share of the fully competitive sector, which causes a lower cost-of-living price index. In contrast to most contributions that adopt the Dixit-Stiglitz framework of monopolistic competition, more firms/ varieties in the heterogeneous sector are not valued per se. Otherwise, the disadvantage of fewer heterogeneous varieties would (partially) compensate the advantage of lower prices.

Comparison with empirical evidence

i) The union wage gap

There is no lack of empirical work on the union wage gap. The problem is rather that the existing empirical literature is inconsistent because of differences with regard to the employed data and the methodology. The extent to which the estimated wage gaps differ is substantial. For instance, Robinson (1989, p. 655) found a wage gap of approximately 20% for Canada, using OLS, and up to 43%, using other methods. In contrast, Blanchflower (1996, p. 28) reports an insignificant wage gap of 4.8% for Canada. The Blanchflower (1999) estimate for the U.S. amounts to 15.5% and is relatively constant over time, while e.g. Hirsch and Schumacher (2002, p. 29) obtain a wage gap that increases from about 17% in 1973 to more than 26% in 1984, and then decreases to ca. 20% in 2001.

Blanchflower (1996) is the only study we found that includes nearly all countries for which we parametrized the model (except from Denmark). The underlying data from the International Social Survey Programm Series (ISSP, 1985-1993) doesn't allow to control for important variables such as industry, which is likely to bias the estimations upwards. More reliable are the results in Blanchflower (1999), using CPS data for the U.S. and the 1983 General Household Survey for the U.K. The estimated wage gaps of 15.5% and 10%, for the U.S. and the U.K. respectively, fit the results depicted in figure 1 remarkably well. But also Hirsch and Schumacher (2002) obtained the finding of a nearly constant wage gap from 1985 to 1994, yet on a roughly 10 percentage points higher level. The Blanchflower (1996) estimate for Italy is 7.2%, which is quite close to our result as well. In contrast, the estimated wage gap for Japan (47.8%) is much higher than what the model predicts (and also much higher than what we think is plausible). The estimates for Germany (3.4%, including East Germany) and Canada (4.8%) are lower than what our model predicts. However, Blanchflower and Freeman (1992) find a wage gap of 6% for West Germany, which is quite close to our result. Blanchflower (1996, p. 23, footnote 17) cites several studies that estimate a wage gap for Canada which is close to the outcome of our model.

In summary, the model's results for the union wage gap are relatively close to the estimates of a number of empirical studies. However, given the amount to which these estimates vary, no parametrization of the model can match the results with all empirical results.

ii) Real income

In the model as well as in reality, real income depends strongly on the technology employed for production. Since we abstract from technological progress, the model cannot predict the dynamic formation of real income. But the considered parameters, the size of the labor force N, the relative size of the unionized sector β, and the degree of centralization of the bargain γ, do have an influence on real income. Therefore, we find it worth comparing the outcome of the model with the data. Because of the reasons outlined above, this comparison refers to a ranking of the countries with respect to real income per capita, rather than to the actual amount of income.

Real income per capita is taken from the World Bank's 'World Development Indicators' (WDI) database (GNI per cap, PPP, current international $). Unfortunately, there are no data for West Germany, so it had to be excluded from the comparison.

In addition, the 1980 value for Canada could not be calibrated because of missing data. This is unfortunate, since a smaller number of countries increases the probability that any random process yields a ranking, which corresponds well with the true one.

Figure 4 depicts the ranking with respect to income per capita for the remaining 5 respective 6 countries for 1980 and 1990. Given that the model abstracts from any technological difference between the countries, the predicted ordering is remarkably close to the data. In 1980 the difference between the predicted and the actual rank for Italy, the U.K., Denmark, and the U.S., is only one. Japan's rank differs by two. In 1990 the result is similar. The model's ordering is correct with respect to Canada, differs by one for Japan, the U.S., Denmark and Italy, and differs by two for the U.K. Except from the inclusion of Canada, the main difference between the ranking of 1980 and 1990 is the fall of the Danish income per capita relative to the other countries, which is predicted correctly by the model.

We do not claim that cross-country differences in income per capita are mainly caused by differences of the union coverage rate and the degree of centralization of the wage bargains. But these factors seem to explain some of those differences - at least for countries, where the technological development is relatively similar. Nonetheless, an extension of the analysis by more countries and more points in time would be needed to strengthen our assertion. The following sensitivity analysis aims at clarifying how much of the results is caused by the assumption of specific numerical values for the exogenous variables.

4 Sensitivity analysis

To assess the responsiveness of the simultaneous equilibrium with respect to variations of the exogenous variables, we first define a benchmark case for the subsequent analysis. For the country-characterizing variables β and γ we chose the intermediate values 0.6 and 0.2, respectively. N is 1, and all other variables have the values given in table 1.

Figure 5 depicts the deviation of the endogenous variables union wage w, real income per capita (y per cap), number of firms n, price of a heterogeneous variety p, number of employed per firm L, and elasticity of substitution σ (sigma) with

respect to the benchmark case. We consider variations of the productivity of labor α, the relative bargaining power of a union δ, the fixed labor input Δ, and the measure of responsiveness of σ with respect to market entry ζ. The course of n is only depicted for variations of ζ because in all other cases the deviation from the standard (benchmark) case coincides with that of σ. Each of these exogenous variables runs from 50% to 150% of the standard case.

If α departs from its benchmark value of one, most variables retain their standard equilibrium value. Changes occur with respect to the price of the heterogeneous good, and, thereby, real income per capita. The reason is that, with the assumed constant elasticity utility function, the positive effect of an increase in productivity on the profit of a firm is exactly balanced by the negative effect of a lower composite price index (for a criticism of the model because of this feature see Nickell, 1999, p. 4). Therefore, the number of firms, the elasticity of substitution, the union wage, and employment per firm remain constant. Nonetheless, workers benefit from the lower prices of the heterogeneous goods, caused by decreasing marginal costs and a constant mark-up, through an increase of real income. The ordering of the countries would be unaffected by changes of α, though, as long as the parameter is equal across countries.

In contrast, variations of the union bargaining power δ affect all endogenous variables. This effect is yet remarkably small, which implies that our results do not hinge on specifications of this parameter. If the relative strength of a union increases with respect to the corresponding γ firms, the equilibrium wage on the primary labor market is slightly higher. This is to be expected, as well as the almost equal increase of the product prices, whereas the slight increases of the number of firms deserves some explanation. For a given elasticity of substitution (which is equal to the price elasticity of demand), an increase of the union wage rate brings about an equal relative increase of the product price, and thus of a firm's revenue. But, due to the fixed costs, the relative increase of the firm's total costs is lower, so that profits increased, if market entry wouldn't foil this effect. The additional firms bring about a slightly higher price elasticity of demand, so that the increase of the product price is actually a bit smaller than the increase of the wage rate.

Variations of the fixed labor input Δ affect directly the profits of all firms in the heterogeneous sector. Higher fixed costs mean that some firms exit the market,

which reduces competition for the surviving firms (lower σ ="sigma"). Therefore, the product prices and the amount produced per firm increase. The latter brings about that employment per firm rises, too. In contrast, the impact of Δ on the union wage rate is negligible.

Deviations of ζ (product market transparency) from the benchmark case affect the endogenous variables relatively strongly. An exception is the union wage rate, which remains almost constant. If ζ is above the standard value of 0.1, the price elasticity of demand is higher than in the benchmark case. Therefore, the mark-up and the product prices are lower, which implies a deterioration of the firms' profits, the number of firm decreases. The latter mitigates the increase of the elasticity of substitution. Employment per firm is higher, because the remaining firms produce more than in the benchmark case.

One conclusion we draw from the sensitivity analysis is that the union wage rate is remarkably stable with regard to variations of the exogenous variables. This result holds for the parameters which describe the technology, as well as for union strength and ζ, the responsiveness of the elasticity of substitution with respect to the number of varieties. Therefore, we can be quite sure that the results for the union wage gap we derived in the previous section are caused by differences of the coverage rate and the degree of centralization, which stem from reliable sources. With one modification the same accounts for real income per capita. The latter also depends strongly on α, i.e. the technology employed.

In contrast, employment per firm, the elasticity of substitution, and the number of firms depend more on the specification of Δ and ζ, in particular. Therefore, one should not take the numerical results concerning these variables too serious. It should be noted, however, that the deviations of the endogenous variables are not extreme, given the relatively strong variation of the exogenous variables. They amount to a maximum of roughly +/- 40%.

5 Summary and conclusions

The theoretical model developed in the first part of this study is designed to capture some of the most important channels by which labor and goods markets interact. A special focus of the analysis is on the causes of the union wage premium. Sub-

sequently, we derive numerical results by calibrating the model for seven countries that are characterized by different expenditure shares of the unionized sector, degrees of centralization of the bargains, and growth rates of civilian employment. Although the analysis is based on a limited number of countries and points in time, the following results seem to be fairly stable:

- The union wage gap largely depends on the degree of centralization of the bargains, and, to a somewhat lesser extent, on the expenditure share of the unionized sector's goods and on the size of the employed labor force. At odds with a widely held view, the latter two have a negative effect on the wage gap because competition on the goods market is reinforced, which reduces the bargained wage rate.

- In contrast, the bargaining power of unions and union density, commonly regarded as important explanatory factors, turn out to have only a limited influence on the union wage premium.

- Differences between countries with respect to real income per worker can partially be explained by the expenditure share of the unionized sector and, to a lesser extent, by the degree of centralization. This result is weakened by the circumstance that it is based on a ranking of the countries and that only a small number of countries is considered.

A sensitivity analysis shows that these results hold in general if alternative numerical specifications are chosen. Yet, real income depends strongly on the technology parameter α. But this does not affect the ordering of the countries with respect to real income per worker, if variations of this parameter across countries parallel each other.

Our results underline the importance of spillovers between labor and product markets (see also Boeri et al. (2000), Nicoletti et al. (2001), and Jean and Nicoletti (2002)). As an example, union coverage, the share of workers that are covered by all wage bargains in an economy, is strongly influenced by the preference parameter β, which denotes the expenditure share of the heterogeneous goods. Wage bargaining requires some degree of imperfection on the product markets, so that there are rents to be bargained over. A stronger propensity of the workers/ consumers towards heterogeneous goods thus augments the unionized sector of the economy. But the higher

coverage rate does not increase wages, as may be suspected from a partial equilibrium view. Instead, the higher number of firms enhances competition, reducing mark-ups and wages.

References

Antweiler, W., D. Trefler (2002), 'Increasing Returns and All That: A View from Trade', *American Economic Review*, vol. 92, 93–119.

Blanchard, O. J., F. Giavazzi (2001), 'Macroeconomic Effects of Regulation and Deregulation in Goods and Labor Markets', Working Paper 8120, National Bureau of Economic Research.

Blanchard, O. J., N. Kiyotaki (1987), 'Monopolistic Competition and the Effects of Aggregate Demand', *American Economic Review*, vol. 77, 647–666.

Blanchflower, D. G. (1996), 'The Role and Influence of Trade Unions in the OECD', Discussion Paper 310, Centre for Economic Performance.

— (1999), 'Changes over Time in Union Relative Wage Effects in Great Britain and the United States', in: 'The History and Practice of Economics: Essays in Honour of Bernard Corry and Maurice Peston', (Daniel, S., P. Arestis, J. Grahl, eds.), Edward Elgar, Cheltenham, U.K.

Blanchflower, D. G., R. B. Freeman (1992), 'Unionism in the US and other Advanced OECD Countries', in: 'Labor Market Institutions and the Future Role of Unions', (Bognanno, M., M. Kleiner, eds.), pp. 56–79, Blackwell, Oxford.

Boeri, T., G. Nicoletti, S. Scarpetta (2000), 'Regulation and Labour Market Performance', Discussion Paper 2420, Centre for Economic Policy Research.

Booth, A., M. Burda, et al. (2000), *What Do Unions Do in Europe? Prospects and Challenges for Union Presence and Union Influence*, mimeo, Fondazione Rodolfo Debenedetti.

Bratsberg, B., J. F. Ragan (2002), 'Changes in the Union Wage Premium by Industry - Data and Analysis', *Industrial and Labor Relations Review*, forthcoming.

Calmfors, L., J. Driffill (1988), 'Bargaining Structure, Corporatism and Macroeconomic Performance', *Economic Policy*, vol. 3, 13–47.

Dixit, A. K., J. E. Stiglitz (1977), 'Monopolistic Competition and Optimum Product Diversity', *American Economic Review*, vol. 67, 297–308.

Dutt, A. K., A. Sen (1997), 'Union Bargaining Power, Employment, and Output in a Model of Monopolistic Competition with Wage Bargaining', *Journal of Economics*, vol. 65, 1–17.

Elbehri, A., T. W. Hertel (1999), 'Economic Integration, Market Structure and Growth Dynamics', Paper presented at the Second Annual Conference on Global Economic Analysis, Denmark.

Fujita, M., P. R. Krugman, A. J. Venables (1999), *The Spatial Economy: Cities, Regions and International Trade*, MIT Press, Cambridge, Mass.

Harrison, G., T. Rutherford, D. Tarr (1994), 'Product Standards, Imperfect Competition, and Completion of the Market in the European Union', Policy Research Working Paper 1293, World Bank, Washington D.C.

Hirsch, B. T., E. J. Schumacher (2002), 'Match Bias in Wage Gap Estimates Due to Earnings Imputation', *Journal of Labor Economics*, forthcoming.

Iversen, T. (1998), 'Wage Bargaining, Central Bank Independence, and the Real Effects of Money', *International Organization*, vol. 52, 469–504.

Jean, S., G. Nicoletti (2002), 'Product Market Regulation and Wage Premia in Europe and North America: An Empirical Investigation', Working Paper 318, OECD Economics Department.

Kenworthy, L. (2000), 'Quantitative Indicators of Corporatism: A Survey and Assessment', Discussion Paper 4, Max-Planck-Institut für Gesellschaftsforschung.

Nickell, S. J. (1999), 'Product Markets and Labour Markets', *Labour Economics*, vol. 6, 1–20.

Nicoletti, G., A. Bassanini, et al. (2001), 'Product and Labour Markets Interactions in OECD Countries', Working Paper 312, OECD Economics Department.

OECD (1997), 'OECD Employment Outlook', Paris.

— (2001), 'Labor Force Statistics: 1980 – 2000', Paris.

Pencavel, J. (2002), 'The Surprising Retreat of Union Britain', in: 'Seeking a Premier League Economy', (Blundell, R., D. Card, R. B. Freeman, eds.), National Bureau of Economic Research, Cambridge, MA.

Robinson, C. (1989), 'The Joint Determination of Union Status and Union Wage Effects: Some Tests of Alternative Models', *Journal of Political Economy*, vol. 97, 639–667.

Soskice, D. (1990), 'Wage Determination: The Changing Role of Institutions in Advanced Industrialized Countries', *Oxford Review of Economic Policy*, vol. Vol. 6, No. 4, 36–61.

Traxler, F. (1996), 'Collective Bargaining and Industrial Change: A Case of Disorganization? A Comparative Analysis of Eighteen OECD Countries', *European Sociological Review*, vol. Vol. 12, No. 3, 271–287.

US Department of Labor (2002), 'Comparative Civilian Labor Force Statistics: Ten Countries, 1959 – 2001', (www.bls.gov/fls/flsforc.pdf).

World Bank (2000), 'World Development Indicators', CD-ROM.

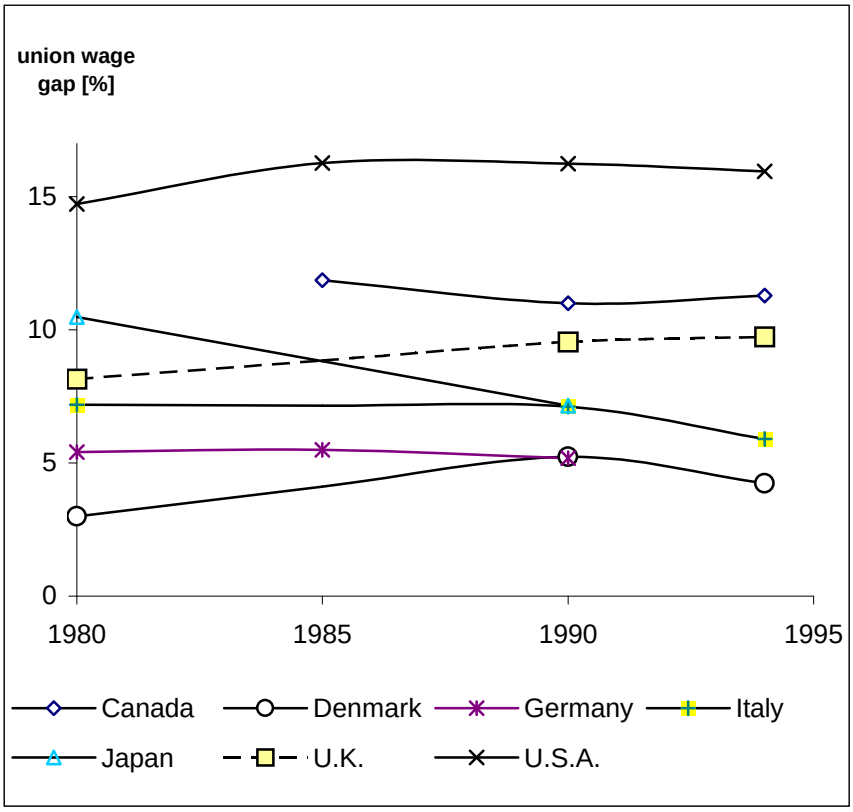

Figure 1: The union wage gap

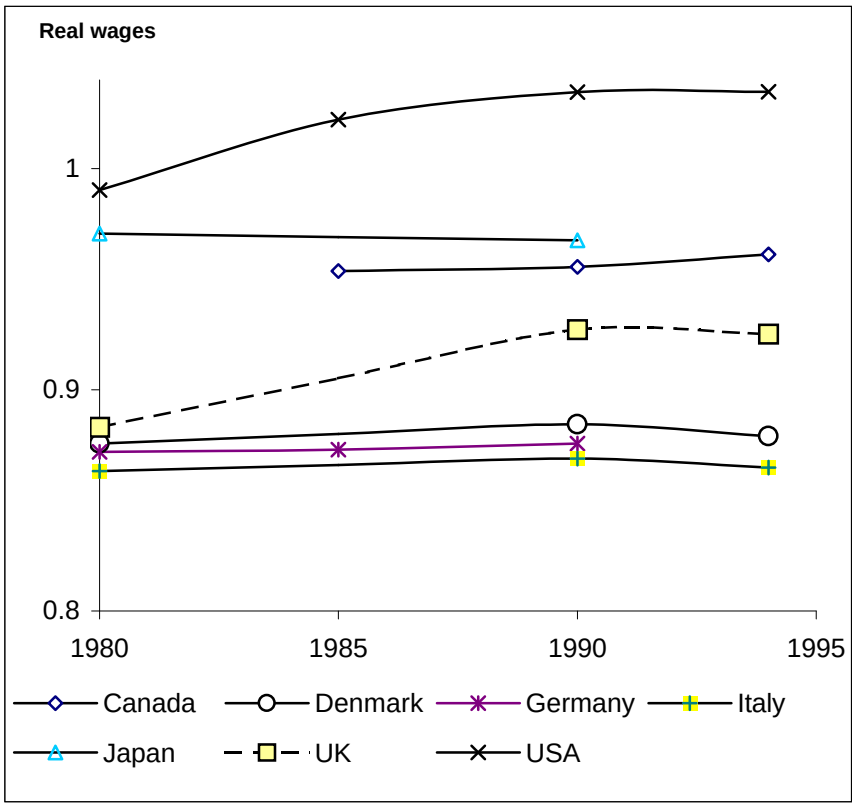

Figure 2: Real wage, unionized labor market

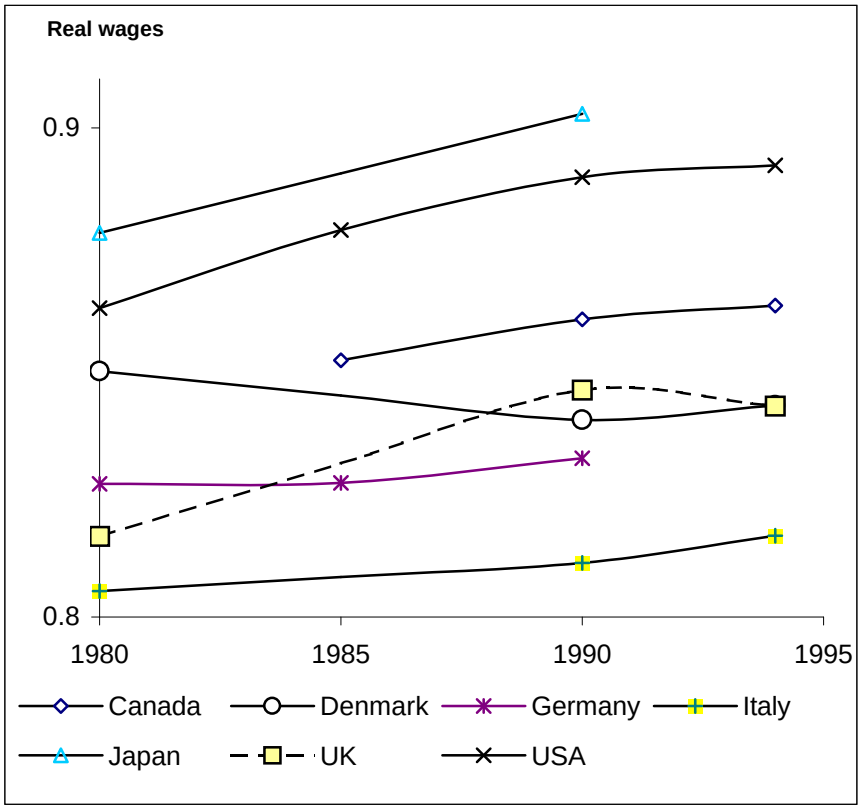

Figure 3: Real wage, competitive labor market

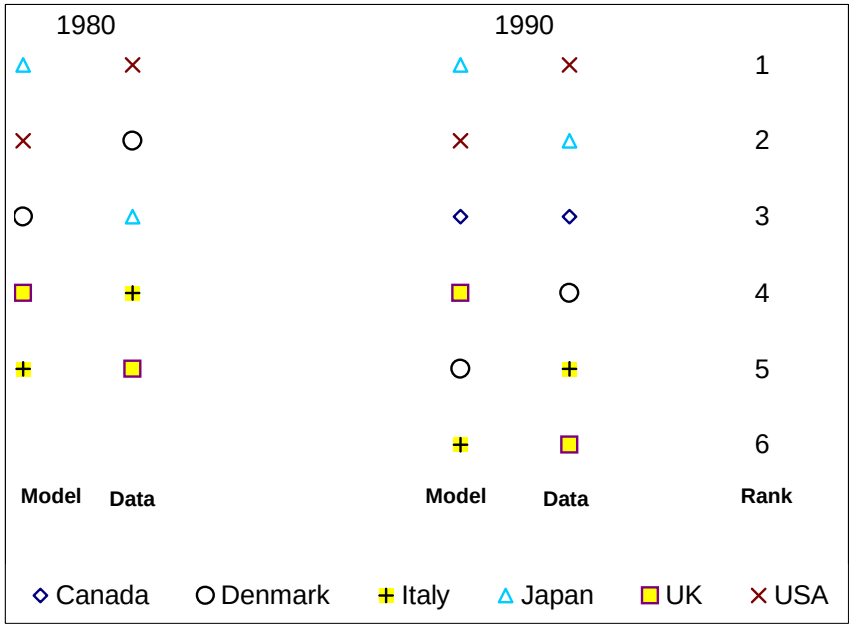

Figure 4: Ranking: income per capita

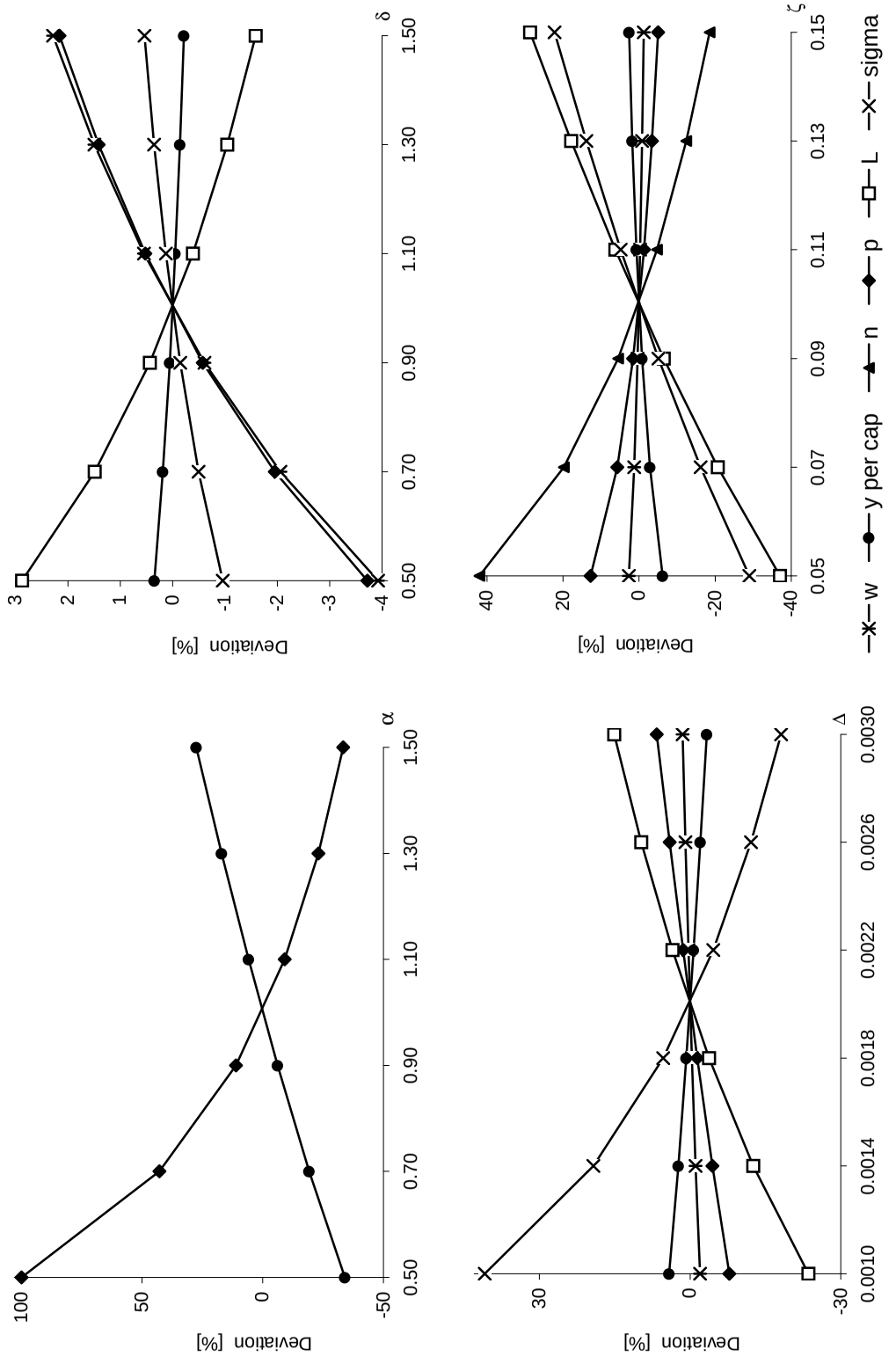

Figure 5: Sensitivity analysis

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