

Braun, Sebastian; Scheffel, Juliane

Working Paper

A note on the effect of outsourcing on union wages

SFB 649 Discussion Paper, No. 2007-034

Provided in Cooperation with:

Collaborative Research Center 649: Economic Risk, Humboldt University Berlin

Suggested Citation: Braun, Sebastian; Scheffel, Juliane (2007) : A note on the effect of outsourcing on union wages, SFB 649 Discussion Paper, No. 2007-034, Humboldt University of Berlin, Collaborative Research Center 649 - Economic Risk, Berlin

This Version is available at:

<https://hdl.handle.net/10419/25206>

Standard-Nutzungsbedingungen:

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

Terms of use:

Documents in EconStor may be saved and copied for your personal and scholarly purposes.

You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.

If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.

A Note on the Effect of Outsourcing on Union Wages

Sebastian Braun*
Juliane Scheffel*



* Humboldt-Universität zu Berlin, Germany

This research was supported by the Deutsche
Forschungsgemeinschaft through the SFB 649 "Economic Risk".

<http://sfb649.wiwi.hu-berlin.de>
ISSN 1860-5664

SFB 649, Humboldt-Universität zu Berlin
Spandauer Straße 1, D-10178 Berlin



A Note on the Effect of Outsourcing on Union Wages

Sebastian Braun

Humboldt Universität zu Berlin

Juliane Scheffel*

Humboldt Universität zu Berlin

May 28, 2007

We analyze the effect of outsourcing on union wages in a simple two-stage game between a firm and a union. In contrast to public perception the ease with which the firm can outsource parts of their production does not necessarily reduce the wage set by the union. Even in the simple model framework a surprisingly large number of conflicting effects is established.

JEL Classification: F16, J51, L24

Keywords: Collective Bargaining; International Outsourcing; Union Wages

*The authors are grateful to Michael C. Burda for fruitful discussions. This research was supported by the Deutsche Forschungsgemeinschaft through the SFB 649 ‘Economic Risk’ and by the German Federal Ministry of Education and Research (project 01AK702A). All remaining errors are ours. Address: Humboldt Universität zu Berlin, Institut für Wirtschaftstheorie II, Wirtschaftswissenschaftliche Fakultät, Spandauer Str. 1, 10099 Berlin, sbraun@wiwi.hu-berlin.de or scheffel@wiwi.hu-berlin.de

1 Introduction

One of the most important phenomena of the recent wave of economic integration is the rush of firms to outsource an expanding range of activities abroad. In the public debate, the growing importance of international outsourcing has sparked concerns about detrimental effects on workers in industrialized countries. Trade unions in western countries fear that outsourcing will lead to job losses but also to downward pressures on domestic wages. In particular, the question arises whether the possibility to outsource deteriorates the bargaining outcome for unionized workers.

In the academic realm, a number of theoretical contributions has shed light on the labor market effects of international outsourcing (see, for instance, Feenstra and Hanson 1996, Arndt 1997, Jones and Kierzkowski 2001). However, the issue of trade unionism is barely mentioned in these studies. The present paper aims at filling this gap by providing a theoretical analysis of the effect of outsourcing on wages subjected to collective bargaining agreements. We develop a simple two-stage game between a monopoly union and a firm. The union sets wages before the firm decides on the degree of outsourcing and the level of production.

The framework is closely related to the setup proposed recently by Lommerud et al. (2005). In our approach firms adapt their outsourcing decision to the bargained wage. On contrary, Lommerud et al. (2005) assume that the degree of outsourcing is already fixed before the wage bargaining takes place. This assumption is of crucial importance for the results. While they find, among other things, outsourcing to actually increase union wages, we find that the bargained wage is subjected to various effects pulling into different directions. The analysis therefore shows that the issue is more complex than the public debate often suggests.

2 Basic Model

We analyze a two-stage game between a firm and a monopoly union with the stages given as follows:

1. The union sets wages to maximize its utility function depending on the union wage premium ($w - \bar{w}$) and on employment n .
2. The firm chooses the level of output y and the degree of outsourcing k simultaneously.

In Lommerud et al. (2005) the two stages are exactly reversed. We believe that it is more reasonable to assume that the degree of outsourcing adapts to changing market conditions, such as the wage level. The setting implies that firms have the 'right to manage', i.e. they can choose the level of employment unilaterally. The game is solved by backward induction starting at the second stage.

2.1 Stage 2: Production and Outsourcing Decision

Consider a firm facing a linear demand function given by

$$p = a - by. \quad (1)$$

In order to produce the final good, the firm requires a continuum of intermediary inputs defined on the interval $k \in [0, 1]$. The firm can either produce an intermediate good at some wage w or import it from a foreign supplier at cost c . The unit costs of importing an intermediate good are assumed to be smaller than those of in-house production, i.e. $c < w$. The assumption can be thought of as reflecting, for instance, lower foreign wages. Total unit costs ω are therefore given as

$$\omega = kc + (1 - k)w. \quad (2)$$

In addition, the firm incurs some fixed costs whenever it outsources a particular task along the value chain. These costs may include expenditures necessary to find an appropriate foreign supplier, costs for supervising the contract with the foreign firm etc. The fixed costs of outsourcing vary with the type of input and are assumed to increase over the interval. For simplicity, we postulate quadratic fixed costs

$$G(k) = \frac{1}{2} \varepsilon k^2, \quad (3)$$

with ε denoting an exogenous cost shift parameter. The firm maximizes profits by choosing output y and the degree of outsourcing k simultaneously. Yet, the maximization problem reads

$$\max_{y,k} \{ \Pi = (p - \omega)y - G(k) \}. \quad (4)$$

First-order conditions are then given by

$$k(y, w) = \frac{(w - c)y}{\varepsilon}, \quad (5)$$

$$y(k, w) = \frac{a - \omega}{2b}. \quad (6)$$

Equation (5) shows that the marginal benefits from outsourcing are determined by the product of output and the difference between domestic wages and foreign costs. Hence, the firm will find it more profitable to outsource the production of intermediate inputs if (i) sizable cost differences between home and foreign production exist and (ii) the production level is large. Equation (6) establishes the usual first-order condition for the optimal output given marginal cost ω .

Solving the first-order conditions simultaneously yields explicit solutions for k and y depending on the wage level w :

$$k(w) = \frac{(a-w)(w-c)}{2b\varepsilon - (w-c)^2}, \quad (7)$$

$$y(w) = \frac{(a-w)\varepsilon}{2b\varepsilon - (w-c)^2}, \quad (8)$$

where $2b\varepsilon > (w-c)^2$ for stability. Note that higher fixed costs of outsourcing not only diminish the degree of outsourcing k , but also reduce the output level y because marginal costs are higher with lower levels of outsourcing (as $w > c$). We will now analyze the effect of union wage setting on the decision variables of the firm.

Consider first the effect of higher domestic wages on the degree of outsourcing. Differentiating the first-order condition (5) with respect to k yields

$$\frac{\partial k(y, w)}{\partial w} = \frac{1}{\varepsilon} \left[y + (w-c) \frac{\partial y}{\partial w} \right]. \quad (9)$$

Hence, increasing the domestic wage will induce more outsourcing by the direct effect on the wage differential $(w-c)$. However, there is a second, potentially negative effect, which works through the effect of domestic wages on the production level. A potential decline in output following higher domestic wages will reduce the marginal benefit of importing intermediate goods and therefore lower k . The total effect of higher union wages on outsourcing is then, perhaps surprisingly, ambiguous.¹ From now on, we will assume that the positive effect prevails and higher domestic wages induce outsourcing.²

We now turn our attention to the effect of union wages on output. Taking the first derivative of equation (6) with respect to w gives

$$\frac{\partial y}{\partial w} = -\frac{1}{2b} \left[(1-k) - (w-c) \frac{\partial k}{\partial w} \right]. \quad (10)$$

If outsourcing is not feasible (i.e. $k = 0$), equation (10) reduces to $-\frac{1}{2b}$. Higher wages increase marginal costs and therefore lower output. With positive levels of outsourcing marginal costs are partly exogenous and are thus not influenced by union wage setting. Hence, the negative (direct) effect of higher union wages on output is dampened by the factor $1-k$. In addition, there is an (indirect) effect of wages on output working through the impact of wages on the outsourcing decision. A higher degree of outsourcing reduces marginal costs and therefore increases output. The total effect is indeterminate.

¹ $\frac{\partial k(w)}{\partial w} = \frac{2(a-w)(w-c)^2 + (2b\varepsilon - (w-c)^2)(a+c-2w)}{(2b\varepsilon - (w-c)^2)^2} \leq \geq 0$

² A necessary and sufficient condition for this assumption to hold is that $a \geq c + \frac{4b\varepsilon(w-c)}{2b\varepsilon - (w-c)^2}$, i.e. market size must exceed some threshold level. The main findings of the paper are not affected by this assumption. However, the effects of some channels identified in proposition 1 will change if the negative effect dominates. Detailed results for this case can be obtained from the authors upon request.

2.2 Stage 1: Wage Determination

At the first stage the monopoly union sets the wage as to maximize a standard utility function

$$\max_w \{U = n(w - \bar{w})\}, \quad (11)$$

where \bar{w} denotes the outside option of domestic workers. The domestic employment level is given by total output multiplied by the share of production remaining in-house

$$n = (1 - k)y. \quad (12)$$

Plugging equation (12) into (11) and differentiating with respect to w gives the following first-order condition:

$$\begin{aligned} n &= -(w - \bar{w}) \frac{\partial n}{\partial w} \\ \Leftrightarrow (1 - k)y &= -(w - \bar{w}) \left((1 - k) \frac{\partial y}{\partial w} - \frac{\partial k}{\partial w} y \right). \end{aligned} \quad (13)$$

The marginal benefit of an increase in wages is equal to the employment level while the marginal costs are given by the wage premium multiplied by the resulting loss in employment. In contrast to a model without outsourcing the union also takes into account the effect of wages on the share of production that is produced domestically. This effect is not present in the paper by Lommerud et al. (2005), since their study assumes that the outsourcing decision has already been made when wage bargaining takes place.

We establish the main result of this paper by analyzing the effect of exogenous shifts in the cost parameter ε on the union's first-order condition. The higher ε is the lower k will be for any given wage level. For very large values of ε outsourcing is no credible option for the firm. Hence, we study to which extent the ease (in terms of costs) of the firm to outsource parts of its production influences union wages. Taking the first derivative of equation (13) with respect to ε gives

$$\underbrace{(1 - k) \frac{\partial y}{\partial \varepsilon}}_{(1)} - \underbrace{\frac{\partial k}{\partial \varepsilon} y}_{(2)} = (w - \bar{w}) \left[\underbrace{\frac{\partial k}{\partial \varepsilon} \frac{\partial y}{\partial w}}_{(3)} - \underbrace{(1 - k) \frac{\partial^2 y}{\partial w \partial \varepsilon}}_{(4)} + \underbrace{\frac{\partial^2 k}{\partial w \partial \varepsilon} y}_{(5)} + \underbrace{\frac{\partial k}{\partial w} \frac{\partial y}{\partial \varepsilon}}_{(6)} \right]. \quad (14)$$

Proposition 1 *Increasing the costs of outsourcing has an ambiguous effect on the wage set by the union. We can distinguish the following channels through which wages are affected:*

1. *Higher costs of outsourcing increase marginal cost of production thereby decreasing the level of output. This decreases employment and the marginal benefits of an increase*

in wages. Consequently, the union tends to set lower wages.

- 2. Higher values of ε decrease k . For a given output level, domestic employment and marginal benefits increase. The union responds by increasing wage demands.*
- 3. Outsourcing partly exogenizes marginal production costs. With $\frac{\partial y}{\partial w} < 0$ ($\frac{\partial y}{\partial w} > 0$) higher union wages cause smaller decreases (increases) in the demand for domestic labor for high levels of outsourcing.³ Higher outsourcing costs dampen this effect by lowering k and therefore induce the union to set lower (higher) wages.*
- 4. The negative effect of higher wages on output (and thus employment) is exacerbated by higher costs of outsourcing as it becomes more difficult for firms to resort to foreign suppliers. Marginal costs of demanding high wages increase and the union sets a lower wage rate.*
- 5. Higher outsourcing costs impede firm's ability to outsource when facing high domestic wage rates. Hence, the employment loss of a marginal increase in w shrinks and the union increases its wage demand.*
- 6. 6. Parts of the marginal costs for unions implied by higher wages are caused by the resulting increase in k . These marginal costs are lower for a low level of output that results from high outsourcing costs. Hence, the union tends to set higher wages in the presence of higher outsourcing costs.*

Proof 1 *See Appendix.*

3 Conclusion

In the present paper we have analyzed the effect of outsourcing on wages of unionized workers in a simple two-stage game between a firm and a monopoly union. In contrast to public perception the ease with which the firm can outsource parts of their production does not necessarily reduce the wage set by the monopoly union. In fact, even in the simple model framework a surprisingly large number of effects pulling into different directions are established. Hence, careful empirical research is needed to establish the net effect of outsourcing on union wages.

³This is the effect driving the results of Lommerud et al. (2005).

Appendix

Proof of Proposition 1

The directions of channel one, two, five and six follow directly from equation (14) and the results of section 2.1. It remains to be shown that $\frac{\partial^2 y}{\partial w \partial \varepsilon} < 0$ and $\frac{\partial^2 k}{\partial w \partial \varepsilon} < 0$. Calculating the latter derivative explicitly gives

$$\frac{\partial^2 k}{\partial w \partial \varepsilon} = \frac{2b(a+c-2w)}{(2b\varepsilon - (w-c)^2)^2} - \frac{4b[2(a-w)(w-c)^2 + (2b\varepsilon - (w-c)^2)(a+c-2w)]}{(2b\varepsilon - (w-c)^2)^3}. \quad (15)$$

The second term on the right hand side of equation (15) is positive by the assumption $\frac{\partial k}{\partial w} > 0$. In order to show that the total effect is indeed negative, we distinguish between two cases: 1. $a+c-2w < 0$ and 2. $a+c-2w > 0$. In the first case the negativity of the derivative follows immediately. For the second case we have to show that the first term is smaller than the second one. Therefore,

$$\begin{aligned} 2b(a+c-2w)(2b\varepsilon - (w-c)^2) &\leq 4b[2(a-w)(w-c)^2 + (a+c-2w)(2b\varepsilon - (w-c)^2)], \\ \Leftrightarrow (a+c-2w)(2b\varepsilon - (w-c)^2) &\leq 4(a-w)(w-c)^2 + 2(a+c-2w)(2b\varepsilon - (w-c)^2) \\ \Leftrightarrow -(a+c-2w)(2b\varepsilon - (w-c)^2) &\leq 4(a-w)(w-c)^2 \end{aligned}$$

This condition is satisfied by assumption. The negativity of $\frac{\partial^2 y}{\partial w \partial \varepsilon}$ can then be easily established by differentiating equation (10) with respect to ε and using $\frac{\partial^2 k}{\partial w \partial \varepsilon} < 0$. \square

References

- Arndt, Sven W.**, “Globalization and the Open Economy,” *The North American Journal of Economics and Finance*, 1997, 8 (1), 71–79.
- Feenstra, Robert C. and Gordon H. Hanson**, “Globalization, Outsourcing, and Wage Inequality,” *American Economic Review*, 1996, 86 (2), 240–45.
- Jones, Ronald W. and Henryk Kierzkowski**, “A Framework for Fragmentation,” in Sven W. Arndt and Henryk Kierzkowski, eds., *Fragmentation: New Production Patterns in the World Economy*, Oxford: University Press, 2001, pp. 17–34.
- Lommerud, Kjell Erik, Frode Meland, and Odd Rune Straume**, “Can Deunionization Lead to International Outsourcing?,” CESifo Working Paper Series CESifo Working Paper No. 1545, CESifo GmbH 2005.

SFB 649 Discussion Paper Series 2007

For a complete list of Discussion Papers published by the SFB 649, please visit <http://sfb649.wiwi.hu-berlin.de>.

- 001 "Trade Liberalisation, Process and Product Innovation, and Relative Skill Demand" by Sebastian Braun, January 2007.
- 002 "Robust Risk Management. Accounting for Nonstationarity and Heavy Tails" by Ying Chen and Vladimir Spokoiny, January 2007.
- 003 "Explaining Asset Prices with External Habits and Wage Rigidities in a DSGE Model." by Harald Uhlig, January 2007.
- 004 "Volatility and Causality in Asia Pacific Financial Markets" by Enzo Weber, January 2007.
- 005 "Quantile Sieve Estimates For Time Series" by Jürgen Franke, Jean-Pierre Stockis and Joseph Tadjuidje, February 2007.
- 006 "Real Origins of the Great Depression: Monopolistic Competition, Union Power, and the American Business Cycle in the 1920s" by Monique Ebell and Albrecht Ritschl, February 2007.
- 007 "Rules, Discretion or Reputation? Monetary Policies and the Efficiency of Financial Markets in Germany, 14th to 16th Centuries" by Oliver Volckart, February 2007.
- 008 "Sectoral Transformation, Turbulence, and Labour Market Dynamics in Germany" by Ronald Bachmann and Michael C. Burda, February 2007.
- 009 "Union Wage Compression in a Right-to-Manage Model" by Thorsten Vogel, February 2007.
- 010 "On σ -additive robust representation of convex risk measures for unbounded financial positions in the presence of uncertainty about the market model" by Volker Krätschmer, March 2007.
- 011 "Media Coverage and Macroeconomic Information Processing" by Alexandra Niessen, March 2007.
- 012 "Are Correlations Constant Over Time? Application of the CC-TRIG_t-test to Return Series from Different Asset Classes." by Matthias Fischer, March 2007.
- 013 "Uncertain Paternity, Mating Market Failure, and the Institution of Marriage" by Dirk Bethmann and Michael Kvasnicka, March 2007.
- 014 "What Happened to the Transatlantic Capital Market Relations?" by Enzo Weber, March 2007.
- 015 "Who Leads Financial Markets?" by Enzo Weber, April 2007.
- 016 "Fiscal Policy Rules in Practice" by Andreas Thams, April 2007.
- 017 "Empirical Pricing Kernels and Investor Preferences" by Kai Detlefsen, Wolfgang Härdle and Rouslan Moro, April 2007.
- 018 "Simultaneous Causality in International Trade" by Enzo Weber, April 2007.
- 019 "Regional and Outward Economic Integration in South-East Asia" by Enzo Weber, April 2007.
- 020 "Computational Statistics and Data Visualization" by Antony Unwin, Chun-houh Chen and Wolfgang Härdle, April 2007.
- 021 "Ideology Without Ideologists" by Lydia Mechtenberg, April 2007.
- 022 "A Generalized ARFIMA Process with Markov-Switching Fractional Differencing Parameter" by Wen-Jen Tsay and Wolfgang Härdle, April 2007.

SFB 649, Spandauer Straße 1, D-10178 Berlin
<http://sfb649.wiwi.hu-berlin.de>

This research was supported by the Deutsche
Forschungsgemeinschaft through the SFB 649 "Economic Risk".



- 023 "Time Series Modelling with Semiparametric Factor Dynamics" by Szymon Borak, Wolfgang Härdle, Enno Mammen and Byeong U. Park, April 2007.
- 024 "From Animal Bait to Investors' Preference: Estimating and Demixing of the Weight Function in Semiparametric Models for Biased Samples" by Ya'acov Ritov and Wolfgang Härdle, May 2007.
- 025 "Statistics of Risk Aversion" by Enzo Giacomini and Wolfgang Härdle, May 2007.
- 026 "Robust Optimal Control for a Consumption-Investment Problem" by Alexander Schied, May 2007.
- 027 "Long Memory Persistence in the Factor of Implied Volatility Dynamics" by Wolfgang Härdle and Julius Mungo, May 2007.
- 028 "Macroeconomic Policy in a Heterogeneous Monetary Union" by Oliver Grimm and Stefan Ried, May 2007.
- 029 "Comparison of Panel Cointegration Tests" by Deniz Dilan Karaman Örsal, May 2007.
- 030 "Robust Maximization of Consumption with Logarithmic Utility" by Daniel Hernández-Hernández and Alexander Schied, May 2007.
- 031 "Using Wiki to Build an E-learning System in Statistics in Arabic Language" by Taleb Ahmad, Wolfgang Härdle and Sigbert Klinke, May 2007.
- 032 "Visualization of Competitive Market Structure by Means of Choice Data" by Werner Kunz, May 2007.
- 033 "Does International Outsourcing Depress Union Wages? by Sebastian Braun and Juliane Scheffel, May 2007.
- 034 "A Note on the Effect of Outsourcing on Union Wages" by Sebastian Braun and Juliane Scheffel, May 2007.

SFB 649, Spandauer Straße 1, D-10178 Berlin
<http://sfb649.wiwi.hu-berlin.de>

This research was supported by the Deutsche
 Forschungsgemeinschaft through the SFB 649 "Economic Risk".

