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Does International Outsourcing Really Lower Workers Income?

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Abstract

We analyze the impact of international outsourcing on income, if the domestic labor market is imperfect due to the existence of a bargaining round between a firm and a labor union. We distinguish in our analysis the case, where the parties negotiate only over wages and as discussed in the political debate over wage and profit share. We find that in the first case outsourcing will reduce (increase) workers income, if the labor union bargaining power is sufficiently high (low) and outsourcing will increase workers income in the second case. For the amount of optimal international outsourcing, we find that it is in a pure wage bargaining system positive (negative) affected by a sufficiently high (low) labor union's bargaining power, while in a wage and profit share bargaining system higher union's bargaining power decreases the optimal amount of outsourcing.

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I.   Introduction

In the last years, because of the growing globalization international outsourcing, which is understood as buying of production parts from an independent foreign supplier, becomes an important part in firms' management to reorganize the production process.[1] Attended with this observation many people fear the wide consequences for the domestic labor market, especially for ordinary worker. Due to the possibility of substitution these consequences can be the loss of employment or a reduction of the wage and therefore a lower income.[2] An important role in this situation plays the labor market structure and the existence of a trade union, which can use its power to avoid a dramatic wage decrease and/or bargain with the firm over employment guarantees.

This paper presents a theoretical framework to analyze the effects of committed international outsourcing on worker's income, if workers are represented by a labor union.[3] Thus, we assume an imperfect domestic labor market, i.e. a firm and a labor union will negotiate over worker's remuneration, while we distinguish two kinds of negotiation. In the first part, we follow the classical bargaining approach, where only the wage will be determined, while in the second part we assume an alternative approach where the firm and the labor union bargain over wage and profit sharing.

Due to the actuality and importance of this topic, there is a growing literature relating to the effect of outsourcing or globalization on wages and employment. From a theoretical point of view, Danthine and Hunt (1994) show that due to globalization an intensified product market competition and due to that lower profits occur, which lead to a wage moderating effect in unionized sectors. A similar finding is presented by Glass and Saggi (2001). In opposite, Naylor (1998,

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[1]   Empirical studies like Hummels et al. (1998, 2001) or Yeats (2001) show the increase of imported intermediate goods over the last 30 years.

[2]   For an overview concerning the debate on employment effects due to outsourcing, see Freeman (1995) and Bhagwati et al. (2004).

[3]   In the committed case, outsourcing takes place before wage bargaining. Thus the external procurement is seen as a long-term contract that fixes the amount of outsourcing. See e.g. Perry (1997) for an overview about the relationship between outsourcing and wage bargaining.

1999) find that domestic unionized worker can gain by globalization in terms of higher wages and employment, since the total production expands if new markets can be served by the firms. Lommerud et al. (2009) showed that higher market integration favours outsourcing to low cost countries and increases the wage due to a less elastic labor demand. The reason is that the used inputs are complements and thus for a given amount of outsourcing the loss of the labor union of a higher wage will decrease. However, there are also studies as Skaksen and Sorensen (2001) or Koskela and Stenbacka (2009) which show that the wage effect of foreign direct investments or outsourcing is a priori ambiguous. In Skaksen and Sorensen (2001) the degree of substitution between the activities in the home country and abroad is decisive for the domestic wage effect. If the activities are good substitutes, than a lower domestic wage results and domestic employment lose, while a higher base wage occur for complementary activities and thus employment gains. In Koskela and Stenbacka (2009), the wage effect of outsourcing depends on the labor unions relative bargaining power, where it lowers (increases) the wage if the labor unions bargaining power sufficiently high (low).

Also in empirical studies the wage effect of international outsourcing is analyzed. In an early study Feentsra and Hanson (1999) show the wage reducing effect for low-skilled workers in the United States over the period 1979-1990. Senses (2010), also using U.S. data, provides empirical evidence of an increasing wage elasticity and thus for a wage moderating effect of outsourcing.[4] Focusing on German data Geishecker and Görg (2008) identify winners and losers from international outsourcing depending on the skills of the workers. Although the German labor market is characterized by relatively rigid wages, there can be a wage moderation effect of outsourcing, if it improves the outside option of the firm. The authors find that this will happen for low-skilled workers, which receive a lower wage with increasing outsourcing. In contrast, the high-skilled wage increases. This is reasonable with a higher relative high-skilled demand if the low-skilled intensive parts are outsourced.

As seen above the theoretical studies focusing on pure wage effects of international outsourcing by assuming that only the wage is determined by the

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[4] Similar findings are shown in earlier studies by Slaughter (2001) and Hasan et al. (2007).

bargaining between the firm and the labor union. However, not only the wage, but additional components as bonus payments or profit sharing can be the result of those bargaining.[5] The idea behind the incorporation of profit sharing in a compensation scheme is to stimulate the motivation and identification with the firm and thus increases productivity.[6] Using this assumption, we extend the above mentioned literature by implementing profit sharing as a part of the compensation scheme.[7] Distinguish the cases, where the union and firm negotiate only over wages, and as discussed in the political debate over wage and profit share, allow us to divide between a wage and income effect. Thus, our central research question is: Is there a justified fear of income loss of unionized worker?

In our analysis, we find that in the case where the firm and the labor union bargain only over the base wage, outsourcing will reduce (increase) workers income, if the labor union's bargaining power is sufficiently high (low). In contrast, if the labor union and firm bargain simultaneously over wage and profit share, outsourcing will increase workers income, if the marginal costs of outsourcing are lower than the domestic outside option.

Knowing the effect of income respectively wage effects, we can due to comparative statics show, in which way the degree of labor market imperfection, i.e. union's bargaining power, affect domestic outsourcing demand under the different remuneration schemes will. Here we find, that the outsourcing demand under a pure wage bargaining system will become higher (lower) if the labor union's bargaining power is sufficiently high (low), while under a simultaneously wage and profit share bargaining system the amount of outsourcing decreases with a stronger labor union.

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[5] Empirical studies as Pendleton et al. (2001) show that profit sharing is an often used compensation scheme in many OECD countries. For further evidence regarding the incidence of profit sharing, see also Estrin et al. (1997) and Conyon and Freeman (2004).

[6] However, empirical studies show that the productivity effects are ambiguous. For an increasing effect on productivity, see Cable and Fitzroy (1980), while Jones and Pliskin (1991) and Kruse (1993) demonstrate negative productivity effects of profit sharing.

[7] There are some studies, who analyze the implementation of profit sharing in collective bargaining, e.g. Holmlund (1990) and Jerger and Michaelis (1999). Concerning the efficiency property, Pohjola (1987) and Anderson and Devereux (1989) show that also without an employment determination the outcome of a collective bargaining is efficient by introducing bargaining over wages and profit share. However, all studies abstract from outsourcing.

We proceed as follows. Section II presents the time sequences of decisions in terms of outsourcing, employment, wage formation and profit sharing. Section III investigates solving the model in terms of domestic labor demand, and bargaining process in terms of wage formation and both wage formation and profit sharing and also strategic outsourcing. Finally, we present conclusions in section IV.

II. Basic Framework

We assume that in our economy there is a representative firm which produces the final good using two activities. The relationship of these activities can be represented by the Cobb-Douglas production function

$$F = X^{\alpha} \cdot Y^{\beta} \quad \text{with } 0 < \alpha + \beta < 1 ,$$
(1)

where X and Y characterize the two input goods. We assume that the X-activity must take place in-house, whereas the Y-activity can be produced in house or outsourced. For simplicity, we assume a linear technology in every input production, where for one unit of the input good, one unit of labor, respectively outsourced input is needed. Therefore, we specify the production function for the input goods as

$$X = L_X$$
$$Y = L_Y + M ,$$

where L_X and L_Y present the labor demand in the specific activity and M the amount of outsourcing.

We further assuming, that labor in both activities is homogenous and that the overall workforce $L = L_X + L_Y$ will be represented by a labor union and thus. This assumption assures that no wage discrimination between the activities can be realized by the firm.

The structure of actions can be interpreted as sequential decisions on three stages. On the first stage, the representative firm commits to the amount of outsourcing before the bargaining process and domestic labor demand. After the firm has decided about outsourcing, the firm and the labor union bargain over i) the wage level or ii) over base wage and profit sharing. Since the firm has the right-to-manage, it determines the employment concerning its labor demand after knowing the bargaining results. We summarize these timing decisions in Figure 1.

Figure 1: *Time sequences*

Stage 1	Stage 2	Stage 3
outsourcing M	bargaining process (wage w or wage w and profit sharing τ)	labor demand L
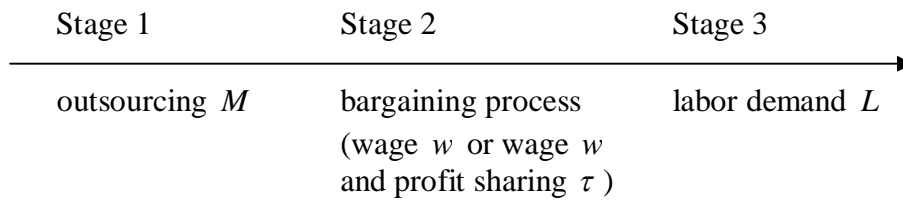
The decisions at each stage are analyzed by using backward induction.

III. Solving the model

In the ext parts, we solve the presented timing structure. We first, focus in the third stage by deriving the labor demand in both activities for given outsourcing. After that, we model the bargaining process by distinguish the mentioned two alternative approaches. While in the first, the firm and the labor union bargain only over the wage level, in the second approach, both parties negotiate about the wage and a profit share. Finally, on the first stage we solving for the optimal strategic outsourcing.

III.1. 3rd stage: Domestic Labor Demand

The firm decides on domestic labor to maximize the profit function

$$\underset{L_X; L_Y}{Max} \pi = L_X^\alpha \left(L_Y + M\right)^\beta - w\left(L_X + L_Y\right) - f\left(M\right), \quad (2)$$

by taking outsourcing, M, as given. For the cost of outsourcing, $f\left(M\right)$, we assume that there are some other costs associated with outsourcing such as the price of the intermediate goods. Such costs could be costs for transport, which are exponential increasing with higher outsourcing. To allow for an exponential cost increase, we model a quadratic cost function, $f\left(M\right) = \frac{1}{2} c M^2$, $c > 0$, with $f'\left(M\right) > 0$ and $f''\left(M\right) > 0$. As one can see from (2), the he firm maximizes profits with respect to L_X and L_Y. This leads to the standard result, that employment is set where marginal productivity equals the wage rate. From these first-order conditions we get as the labor demand for given outsourcing[8]

$$L_X = w^{-\frac{1}{1-\alpha-\beta}} \cdot \alpha^{\frac{1-\beta}{1-\alpha-\beta}} \cdot \beta^{\frac{\beta}{1-\alpha-\beta}}, \quad (3a)$$

$$L_Y = w^{-\frac{1}{1-\alpha-\beta}} \cdot \alpha^{\frac{\alpha}{1-\alpha-\beta}} \cdot \beta^{\frac{1-\alpha}{1-\alpha-\beta}} - M. \quad (3b)$$

Thus, the overall domestic labor demand is

$$L = L_X + L_Y = \left(\alpha + \beta\right) \cdot w^{-\frac{1}{1-\alpha-\beta}} \cdot \alpha^{\frac{\alpha}{1-\alpha-\beta}} \cdot \beta^{\frac{\beta}{1-\alpha-\beta}} - M. \quad (4)$$

As one can see from equation (4), domestic labor demand is a negative function of both wage and the amount of outsourcing, where the substitutability of low-skilled labour and international outsourcing is consistent with empirical evidence, e.g. presented by Görg and Hanley (2005).

Since we focus on wage bargaining, the labor union keeps in mind the reaction of labor demand concerning wage changes, while the degree of labor

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[8]   Notice, that also in the presence of bargained profit sharing, where the profit of firms owner is $\left(1-\tau\right) \cdot \pi$, we yield the same labor demand reactions, since it works as a profit tax. Since this kind of tax is neutral, the domestic labor demand is independent of bargained profit sharing.

demand reaction is presented by the wage elasticity of labor demand. In the presence of outsourcing the wage elasticity of the labor, $\eta = -\dfrac{\partial L}{\partial w}\dfrac{w}{L}$, can be written as

$$\eta = \frac{1}{1-\alpha-\beta}\left(1+\frac{M}{L}\right) > 1. \qquad (5)$$

Notice that the wage elasticity (5) depends on wage and outsourcing. For the effects of these variables, we find $\eta_w = \dfrac{1}{1-\alpha-\beta}\cdot\dfrac{\eta}{w}\cdot\dfrac{M}{L} > 0$ and $\eta_M = \dfrac{\eta}{L} > 0$. Therefore, with higher domestic wage and higher outsourcing labor demand becomes more elastic. In the absence of outsourcing, the wage elasticity $\eta|_{M=0} = \dfrac{1}{1-\alpha-\beta}$ is constant and smaller than in the presence of outsourcing.[9]

III.2. 2nd stage: Bargaining Process

On this stage, the firm and a labor union bargain over i) the wage level or ii) over the wage and profit sharing. We distinguish between these scenarios since both are possible in observed bargaining rounds.[10]

The outcome of the bargaining process is assumed to be determined by the Nash-Bargaining-Solution, where the Nash-Product is defined as

$$\Omega = \left(U - U_0\right)^\gamma \cdot \left(\hat{\pi} - \pi_0\right)^{1-\gamma}.$$

In the above notation, U_0 and π_0 are the disagreement payoffs for the union respectively the firm. In the case of a disagreement, there is no production,

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[9] These findings are in line with empirical evidence as shown by Slaughter (2001), Hasan et al. (2007) and Senses (2010).

[10] While in most European countries as Austria, Germany, Sweden or Finland the wage is the central determinant in a bargaining between the union and the firm, in France there exists a obligatory profit share system for firms with more than 50 worker, while in the bargaining round, the firm and the labor union determine the details as the calculation formula or the duration. See also Pendleton et al. (2001).

implying that every union member get the outside option. Formally this is expressed as $U_0 = N \cdot b$, where b captures the exogenous minimum income for labor union members N. On the other side, due to no production, the firm loses its investment in outsourcing, which means that the firm has an incentive for an agreement due to its loss $\pi_0 = -f(M)$.

III.2.1 Parties Bargaining Only Over Wages

Assuming that only the wage will be determined, we can express the bargaining problem as

$$\max_{w} \Omega = (U - U_0)^\gamma \cdot (\hat{\pi} - \pi_0)^{1-\gamma}.$$

To describe the preferences of the labor union we model an utilitaristic union utility $U = u(w) \cdot L + u(b) \cdot (N - L)$ in case of agreement, where the individual utility u is linear in income, i.e $u(w) = w$ and $u(b) = b$. Combining this with the unions outside option U_0, we can express the union rent as $\overline{U} = U - U_0 = (w - b)L$.

Also the bargaining rent of the firm $\overline{\pi} = \pi - \pi_0$ can be expressed explicitly. Since the profit in case of agreement is $\pi = F - wL - f(M)$ and the disagreement profit $\pi_0 = -f(M)$, we get as the rent $\overline{\pi} = F - wL$.

Maximizing the Nash-Product (see also chapter 7 in Cahuc and Zylberberg, 2004), the first order condition can be written as $\Omega_w = 0 = \gamma \dfrac{\overline{U}_w}{\overline{U}} + (1-\gamma) \dfrac{\overline{\pi}_w}{\overline{\pi}}$.[11]

Using our earlier results we have

$$\frac{\overline{U}_w}{\overline{U}} = \frac{L_w}{L} + \frac{1}{w-b} = \frac{1}{w} \cdot \left(-\eta + \frac{w}{w-b} \right), \tag{6a}$$

and

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[11]   For notational convenience, we use the subscript as a characterization for the first derivative, i.e. $\Omega_w = \partial\Omega / \partial w$.

$$\frac{\bar{\pi}_w}{\bar{\pi}} = -\frac{1}{w}\frac{\alpha + \beta}{(1-\alpha-\beta)+M/L}. \tag{6b}$$

Using these expressions and the wage elasticity of labor as well, the first-order condition of the Nash-product can be solved to

$$w = A(w,M,\gamma)\cdot b, \tag{7}$$

which corresponds to the standard result that the wage consist of the outside option and a mark-up bigger than one. As one can see, in our framework, the mark-up $A = \frac{\gamma\cdot\eta[\eta(1-\alpha-\beta)-(\alpha+\beta)]+(1-\gamma)(\alpha+\beta)}{(\eta-1)\gamma\cdot[\eta(1-\alpha-\beta)-(\alpha+\beta)]+(1-\gamma)(\alpha+\beta)} > 1$ depends on the relative bargaining power of the labor union γ, outsourcing M and wage w. Therefore, equation (7) is an implicit formulation.

Knowing the bargained wage, we can distinguish the extreme cases of monopoly labor union, which set the wage independent from the firm, and the absence of a labor union, where the firm sets the wage. The approach of a monopoly labor union is characterized by $\gamma = 1$, where the wage is $w\big|_{\gamma=1} = \frac{\eta}{(\eta-1)}\cdot b$, while in the absence of bargaining power of the labor union $w\big|_{\gamma=0} = b$.[12]

For answering our research question and characterizing the wage effect of outsourcing, we now turn to a detailed analysis. Implicit differentiation of (7) with respect to outsourcing gives $\frac{dw}{dM} = \frac{A_M b}{1 - A_w b}$ and by substituting $b = w/A$ we can characterize the impact of international outsourcing on wage formation as

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[12] Since $\eta > 1$, it is easy to see that the relative bargaining power of the labor union will have a positive effect on the mark-up. In the general case $0 < \gamma < 1$ this means $A_\gamma > 0$.

$$\frac{dw}{dM} = \frac{\dfrac{A_M w}{A}}{1 - \dfrac{A_w w}{A}} \, , \qquad (8)$$

where $1 - \dfrac{A_w w}{A} > 0$.[13]

The outsourcing effect on the mark-up, $\dfrac{A_M w}{A}$, is a priori ambiguous and depends on the relationship of the relative bargaining power of the labor union, γ, and the outsourcing and labor ratio, M/L. For the impact of outsourcing on the mark-up, we find

$$A_M \begin{Bmatrix} > \\ = \\ < \end{Bmatrix} 0 \quad if \quad \gamma \begin{Bmatrix} < \\ = \\ > \end{Bmatrix} \frac{(1-\alpha-\beta)(\alpha+\beta)}{(1-\alpha-\beta)(\alpha+\beta) + [(1-\alpha-\beta)+M/L]^2} \, . \qquad (9)$$

Thus, for a sufficient strong (weak) labor market imperfection characterized by the relative bargaining power of the labor union, outsourcing has a wage moderating (wage increasing) effect. Therefore, to be more precisely, we have $A_M < 0$ in the case of monopoly union, $\gamma = 1$, and $A_M > 0$ in the absence of wage bargaining.

As above, we can also identify the wage effect of outsourcing in the extreme cases. Since with unilateral wage setting by the firm, the wage will be the lowest possible level, which is the exogenous outside alternative income, outsourcing has no wage effect, i.e. $\dfrac{dw}{dM}\Big|_{\gamma=0} = 0$. In contrast, in the case of monopoly labor union we find that $A_M\big|_{\gamma=1} < 0$, which gives that $\dfrac{dw}{dM}\Big|_{\gamma=1} < 0$.

Concerning the more general case where both parties are endowed with a positive bargaining power, i.e. $0 < \gamma < 1$, we can summarize as

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[13]   For the detailed derivations see Appendix A.

Proposition 1: *If the firm and the labor union bargain only over the base wage, outsourcing will reduce (increase) workers income, if the labor union's bargaining power is sufficiently high (low).*

A similar result is obtained by Koskela and Stenbacka (2009) in the model where profit sharing has not been analyzed.

For the economic intuition we can identify two opposite mechanisms explaining the effects of the outsourcing on wage formation. First, with higher outsourcing the wage elasticity of labor demand (5) becomes more elastic. Since with a more elastic labor demand, a higher wage increases the utility loss of less employment. This mechanism on unions utility inducing discipline and thereby a less aggressive labor union, which means a lower wage mark-up. Second, as outsourcing and labor are substitutes with higher outsourcing firm's profit is less depending on labor costs. Thus outsourcing moderates the profit-reducing effect π_w / π of a wage increase, which promotes a higher wage mark-up. As equation (9) reflects, the overall effect on the negotiated wage of increased outsourcing is a trade-off between these two forces, while the first effect dominates when the labor market imperfection γ is sufficiently strong.

III.2.2 Simultaneous Bargaining Over Wage and Profit Share

As mentioned in the introduction, there are several studies concerning the simultaneous negotiation about profit sharing and wages. However, these studies abstracted from strategic outsourcing.

Before we formally analyze this bargaining process, we have to modify our objective function of the labor union and the firm. Since we assume that the union utility depends on income, now we have to write the utility in case of agreement as $U = wL + \tau\pi$, where τ characterizes the share of profit which is distributed to the worker. Of course, also the profit of the firms owner will change. Now he get in the case of agreement $(1 - \tau) \cdot \pi$. Since the value of disagreements are the same as in

section III.2, i.e. $U_0 = N \cdot b$ and $\pi_0 = -f(M)$, the rents are now represented by $\overline{U} = U - U_0 = (w-b)L + \tau\pi$ and $\overline{\pi} = (1-\tau)\pi + f(M)$. In this setting the Nash-Product has to be maximized concerning wage and profit share, i.e. $\max\limits_{w,\tau} \Omega = \overline{U}^\gamma \cdot \overline{\pi}^{1-\gamma}$. As the first order conditions, we get

$$\Omega_w = 0 = \gamma \frac{\overline{U}_w}{\overline{U}} + (1-\gamma)\frac{\overline{\pi}_w}{\overline{\pi}}, \tag{10a}$$

and

$$\Omega_\tau = 0 = \gamma \frac{\overline{U}_\tau}{\overline{U}} + (1-\gamma)\frac{\overline{\pi}_\tau}{\overline{\pi}}. \tag{10b}$$

Using $\overline{U}_\tau = \pi$ and $\overline{\pi}_\tau = -\pi$ from (10b) we have $\frac{\gamma}{\overline{U}} = \frac{1-\gamma}{\overline{\pi}}$. Putting this expression in (10a), we get $0 = \overline{U}_w + \overline{\pi}_w$, where $\overline{U}_w = L_w(w-b) + (1-\tau)L$ and $\overline{\pi}_w = -(1-\tau)L$. Using these results, we obtain as the negotiated base wage in the presence of simultaneous negotiations with wage and profit sharing as

$$w = b, \tag{11}$$

so that the negotiated wage in the presence of negotiated profit sharing is equal to the exogenous outside option for labor union members.[14]

By comparing the negotiated wages (7) and (11) implies that the wage in the simultaneous wage and profit sharing-bargaining is smaller than (equal to) in the case without profit sharing negotiation if there is a positive (zero) relative bargaining power of the labor union. The intuition for this finding is relative simple, since the parties bargain over the distribution of the earned rent. If there is no labor union, the whole rent will be earned by the firm. Since, the rent is influence by the employment and the highest rent is realized with the highest employment, the firm decrease the paid wage to the lowest level, which is the outside option b. The same mechanism leads to the derived result (11) in the presence of simultaneous

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[14] This corresponds to the well known results of Weitzman (1987).

bargaining of profit sharing and wage. However, in that case the negotiated profit share determines the distribution of the rent between the firm and the labor union.

Implementing (11) in $\frac{\gamma}{U} = \frac{1-\gamma}{\pi}$ and using the labor demand (3a) and (3b) we obtain as the bargained profit share

$$\tau = \gamma \cdot \frac{b^{-\frac{\alpha+\beta}{1-\alpha-\beta}} \cdot \alpha^{\frac{\alpha}{1-\alpha-\beta}} \cdot \beta^{\frac{\beta}{1-\alpha-\beta}}(1-\alpha-\beta) + bM}{b^{-\frac{\alpha+\beta}{1-\alpha-\beta}} \cdot \alpha^{\frac{\alpha}{1-\alpha-\beta}} \cdot \beta^{\frac{\beta}{1-\alpha-\beta}}(1-\alpha-\beta) + bM - f(M)} . \qquad (12)$$

From (12) we see that in the absence of outsourcing the profit share corresponds to the relative bargaining power of the labor union, i.e. $\tau\big|_{M=0} = \gamma$, [15] while in the presence of outsourcing the bargaining profit share is smaller than the relative bargaining power of the labor union, i.e. $\tau\big|_{M>0} < \gamma$.

As mentioned above, the profit share determines how the created rent associated with the lowest possible wage level. Therefore, one would expect that the distribution of the rent is driven by the relative bargaining power, where the share of the rent for every party equals its relative bargaining power. However, as shown in equation (12) this does not hold in our framework and the assumption of strategic outsourcing. The economic intuition for this result is the following. Since the amount of outsourcing is determined before the bargaining take place, the firm has an incentive for an agreement and to avoid the negative profit in being the costs associated with the outsourcing commitment. Thus the firm faces a weaker position as with zero-profits, where only the relative bargaining power is decisive for the distribution, and therefore it receives a lower share of the rent as its relative bargaining power predict.

Since the base wage is the exogenous outside option, in the case of simultaneous bargaining, the wage component isn't affecting by outsourcing, which is different to our former analysis.

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[15]   For this standard result see also Holmlund (1990).

However to determine the income effect of outsourcing, we has to show the effect of outsourcing on the negotiation outcome. Here we find that (see Appendix B)

$$\frac{\partial \tau}{\partial M} = \gamma \frac{cM\left[V + \frac{1}{2}bM\right]}{\left(V + bM - f(M)\right)^2} > 0, \tag{13}$$

where $V = b^{-\frac{\alpha+\beta}{1-\alpha-\beta}} \alpha^{\frac{\alpha}{1-\alpha-\beta}} \beta^{\frac{\beta}{1-\alpha-\beta}}(1-\alpha-\beta) > 0$ so that the bargained profit share depends positively on outsourcing.

However, our research question focuses on the income effect of outsourcing. For an employed individual the income under this kind of compensation scheme is $\omega = b + \tau \cdot \frac{\pi^*}{L}$, where the income effect of outsourcing can be formalized by

$$\frac{\partial \omega}{\partial M} = \frac{\partial \tau}{\partial M} \cdot \frac{\pi^*}{L} + \frac{\tau}{L^2}\left[\frac{\partial \pi^*}{\partial M} \cdot L - \frac{\partial L}{\partial M} \cdot \pi\right] > 0. \tag{14}$$

Using the former results (4) and (13), we have $\frac{\partial \tau}{\partial M} > 0$ and $\frac{\partial L}{\partial M} < 0$. To determine the outsourcing effect on profit, we need the indirect profit function π^*. Using the derived result, we find that $\pi^* = (1-\alpha-\beta) \cdot \alpha^{\frac{\alpha}{1-\alpha-\beta}} \cdot \beta^{\frac{\beta}{1-\alpha-\beta}} \cdot b^{-\frac{\alpha+\beta}{1-\alpha-\beta}} + b \cdot M - f(M)$ and thus $\frac{\partial \pi^*}{\partial M} = b - \frac{\partial f(M)}{\partial M}$. As this formulation shows, under the assumption that the marginal cost of outsourcing, $\frac{\partial f(M)}{\partial M}$, are lower than the domestic marginal cost of labor, b, we have $\frac{\partial \pi^*}{\partial M} > 0$ and therefore an unambiguous income increasing effect of outsourcing.

We can summarize our findings as.

Proposition 2: *If the labor union and firm bargain simultaneously over wage and profit share, outsourcing will increase workers income, if the marginal costs of outsourcing are lower than the domestic outside option.*

As one can see from (14), outsourcing affects the income due to two working channels. The first part shows the increasing share effect, since every worker get a higher share of the per capita profit. The second mechanism is shown by the expression in brackets. On the one side, higher outsourcing will increase the profit, if the marginal costs of outsourcing are lower than the domestic marginal costs of labor, which lead to a higher income. On the other side, higher outsourcing decreases the employment and thus increases the per capita profit. Due to these effects, an employment worker will benefit from higher outsourcing since the profit share the overall and per capita profit increase.

III.3 Optimal Strategic Outsourcing

So far we restricted our self to a short run analysis, where the amount of outsourcing is given respectively constant, while the firm has committed itself. We now relax this point of view by exploring the initial stage of outsourcing decision and therefore focusing on a long run perspective, where the firm sets determines its investments into outsourced production. We can thus characterizing, in which way the equilibrium production mode is affected by the labor market characteristics concerning the relative bargaining power under the different bargaining structure.

III.3.1 Optimal Outsourcing if Parties Bargaining only Over Wages

Concerning the timing structure, presented in Section II, the representative firm has been assumed to commit to outsourcing to maximize profit (2) subject to domestic labor demand (4), and wage formation (7). As we showed above, the

indirect profit function is $\pi^* = (1 - \alpha - \beta) \cdot \alpha^{\frac{\alpha}{1-\alpha-\beta}} \cdot \beta^{\frac{\beta}{1-\alpha-\beta}} \cdot w^{-\frac{\alpha+\beta}{1-\alpha-\beta}} + w \cdot M - f(M)$.

Thus the firms optimizing problem can be characterized by

$$\max_{M} \pi^* \text{ s.t. } w = A(w, M, \gamma) \cdot b \text{ and } f(M) = \frac{1}{2} cM^2 \qquad (15)$$

Differentiating the indirect profit function gives as the first order condition

$$\frac{\partial \pi^*}{\partial M} = w - cM - \frac{dw}{dM} \cdot L_Y = 0. \qquad (16)$$

As equation (16) pointed out, the level of outsourcing depends on the used employment in activity Y and on the labor market imperfection, which determines the wage effect (see equation (9)). As one can see from (16), that under $L_Y > 0$ and $dw/dM < 0$ it follows that $cM > w$ and the amount of outsourcing lies above the outsourcing level were domestic and foreign marginal costs are equal. Since outsourcing moderates the wage only in the presence of a sufficiently high union bargaining power, we can conclude that under $L_Y > 0$ strategic outsourcing is an increasing function of the labor market imperfection. Therefore, in the presence of a strong labor union, the firm reaps an additional benefit with higher outsourcing, by inducing a wage moderating effect.[16]

We can summarize our finding as

> **Proposition 3:** *If parties bargaining over wages, strategic outsourcing will become higher (lower) if the labor union's bargaining power is sufficiently high (low).*

This result can be explained as follows. On the one hand, higher outsourcing increases the total production costs, but on the other hand, it leads to a wage moderates if the labor union sufficiently strong. Thus, outsourcing becomes an

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[16]   For a graphical argumentation see Koskela and Schöb (2009).

strategic instrument for the firm due to the saving of wage bill. As equation (16) characterized, the optimal amount of outsourcing is given, where but effects are equalized. However, if there is now employment in activity Y ($L_Y = 0$) or now wage moderating effect, $dw/dM = 0$, than we get the usual result, where the marginal costs have to be the same.

The effect of unionization on domestic wage level is also presented in Lommerud et al. (2009). In contrast to our analysis, they find an outsourcing decreasing impact of the labor unions bargaining power, since higher outsourcing decreases firm's marginal costs and thus the labor demand elasticity becomes less elastic, which lead to higher wages. This results from the assumption of complementary inputs. As in our analysis, higher outsourcing decreases domestic labor, but due to the complementarily for the remaining domestic inputs, an additional rent due to higher wages can be realized by the union. Thus the major difference between the analyses results from different framework concerning the production technology.

III.3.2 Optimal Outsourcing if Parties Bargaining Over Wage and Profit Share

Since in that scenario, the wage is set to the constant outside option, the indirect profit becomes $\pi^* = (1-\alpha-\beta) \cdot \alpha^{\frac{\alpha}{1-\alpha-\beta}} \cdot \beta^{\frac{\beta}{1-\alpha-\beta}} \cdot b^{-\frac{\alpha+\beta}{1-\alpha-\beta}} + b \cdot M - f(M)$. Thus the firms problem is characterized by[17]

$$\max_M (1-\tau)\pi^* \text{ s.t. } \tau = \gamma \cdot \Phi. \tag{17}$$

Under the former derived results, we get as the first order condition $0 = (1-\tau) \cdot \dfrac{\partial \pi^*}{\partial M} - \dfrac{\partial \tau}{\partial M} \cdot \pi^*$, which can be simplified to

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[17]   According to (12) the profit share mark-up is $\Phi = \dfrac{\pi^* + bM}{\pi^* + bM - f(M)}$.

$$\frac{\partial\left[(1-\tau)\pi^*\right]}{\partial M} = (1-\tau)\cdot(b-cM) - \frac{\partial\tau}{\partial M}\cdot\pi^* = 0. \tag{18}$$

Since $\frac{\partial\tau}{\partial M}\cdot\pi^* > 0$ and $0 < \tau < 1$ we see from (19) that $b > cM$. This lies in contrast to the case, where the parties bargain only over wages, which means that the firm will choose an amount of outsourcing lower than the level, where the marginal costs of outsourcing equals the marginal cost of domestic labor. Comparing the optimal amount of outsourcing under the different bargaining approaches and the assumption $b < w$, we can conclude from the conditions $b > cM$ respectively $w < cM$, that the bargained profit share approach leads to a lower investment in outsourced production.

However, our focus is the impact of labor market imperfection. As one can see from (13), the increasing effect of outsourcing on profit sharing depends positively on the union's bargaining power. Thus, the firm's owner faces a higher incentive of lower outsourcing in the presence of a strong labor union to reap a higher share of the profit.

>**Proposition 4:** *If parties bargaining over wage and profit share, strategic outsourcing will become lower with higher labor union's bargaining power.*

Thus, the bargaining structure and the power of the labor union are crucial for the amount of outsourcing. The reason for this is that a stronger labor union induces different effects on the firm's costs parameters.

In the case of a bargaining profit share, the wage is the exogenous alternative income and does not affected by outsourcing. Thus, the relevant cost parameter in this approach is the distribution parameter, respectively the profit share. Since higher outsourcing decreases the share of profit the firm owner earned, due to a higher loss in case of a disagreement, there is independent of the power of the union an incentive for less outsourcing. However, the profit share also reflects the bargaining power, which means that a higher bunion bargaining power decreases the firms profit share, this incentive will be reinforced by a stronger labor

union. Therefore, higher outsourcing distributes a higher share of the profit to the work force and lowers the firm's owner income. Due to this, the firm will react with less outsourcing, if the labor union becomes stronger.

In contrast, if the parties bargain only over the wage, the wage is the cost parameter. Since there is only a wage moderating effect of outsourcing, if the labor union is sufficiently high, only in the case of a strong labor union the firm can realize a higher profit due to an increasing amount of outsourcing. Therefore, a strong labor union increases the incentive for higher outsourcing, due to lower the labor cost.

Following from this argumentation, it is straight forward to see, that the different bargaining structures lead to different amount of outsourcing for a given union's bargaining power. Thus, we can conclude that bargaining over wages and profit sharing leads to less outsourcing than a classical wage bargaining.

IV. Conclusions

The main goal of this paper was to show the effect of outsourcing on workers income, if the domestic labor market is characterized by a market imperfection, which was modeled as a bargaining between a firm and a labor union. In our analysis we distinguished the approaches, where in the first case the union and firm negotiate only over wages, in the second case, as discussed in the political debate, the parties bargain over wage and profit share.

For the first case, it has been found that outsourcing will reduce (increase) workers income, if the labor union's bargaining power is sufficiently high (low). In contrast, we found that outsourcing will increase workers income, if the labor union and firm bargain over wage and profit share.

Concerning the effect of the labor market imperfection on strategic outsourcing we find also a different result. The reason for this is that outsourcing has different effects on the firm's costs parameter. If the parties bargain only over the wage level, the wage is the cost parameter. Since the impact of outsourcing on the wages depends on the union's bargaining power, this will affect the optimally

amount of outsourcing. Here we find that due to the wage moderating (increasing) effect of outsourcing in the presence of a sufficiently strong labor union, outsourcing will become higher (lower) if the labor union's bargaining power is sufficiently high (low).

If the wage and the profit share are determined simultaneously, the wage equals the exogenous alternative income. This means that only the profit share characterizes the firms cost parameter. Since the profit share is increasing in the power of the labor union and outsourcing, it results an incentive for less outsourcing and thus for a higher income of the firm.

Due to this knowledge, we can compare the optimal amount of outsourcing under the different bargaining approaches. Here we find that for an equal and sufficiently strong labor union, the firm's optimal investment in outsourced products is lower in the case of simultaneously bargained wage and profit share. Thus, for lowering the fear of substitution of domestic employment, the union has an incentive for adopting profit sharing as a part of the bargaining and compensation package.

Appendix A: Derivation of the wage effects

As the mark-up we have $A = \dfrac{\gamma \cdot \eta[\eta(1-\alpha-\beta)-(\alpha+\beta)]+(1-\gamma)(\alpha+\beta)}{(\eta-1)\gamma \cdot [\eta(1-\alpha-\beta)-(\alpha+\beta)]+(1-\gamma)(\alpha+\beta)} = \dfrac{T}{Z}$

and depends on the wage w and the amount of outsourcing M. The impact of the base wage can be written as $A_w = \dfrac{T_w \cdot Z - T \cdot Z_w}{Z^2}$, where

$T_w = \gamma \cdot \eta_w \cdot ((1-\alpha-\beta)+M/L) - \gamma \cdot \eta \dfrac{M}{L^2} L_w$ and $Z_w = T_w + \gamma \cdot \dfrac{M}{L^2} L_w$. Using this we have

$$A_w = \frac{\gamma}{Z^2}\left[-\eta_w \cdot \gamma \cdot \left((1-\alpha-\beta)+\frac{M}{L}\right)^2 - \frac{M}{L}\frac{\eta}{w}(1-\gamma)(\alpha+\beta) \right]. \qquad (A1)$$

Since $\eta_w = \dfrac{1}{1-\alpha-\beta}\dfrac{\eta}{w}\dfrac{M}{L} > 0$ we have $A_w < 0$ and thus $1 - \dfrac{A_w w}{A} > 0$.

In a similar way we analyze the impact of outsourcing on the mark-up. Here we

have $A_M = \dfrac{T_M \cdot Z - T \cdot Z_M}{Z^2}$, where $T_M = \gamma \cdot \eta_M \cdot \left((1-\alpha-\beta) + \dfrac{M}{L} \right) + \gamma \cdot \eta \dfrac{L - M \cdot L_M}{L^2}$

and $Z_M = T_M - \gamma \cdot \dfrac{L - M \cdot L_M}{L^2}$. Using these expressions, we find that

$$A_M = \frac{\gamma}{Z^2} \frac{\eta}{L} \left[-\gamma (\eta(1-\alpha-\beta) - (\alpha+\beta))^2 + (1-\gamma)(\alpha+\beta)(1-\alpha-\beta) \right]. \quad (A2)$$

From (A2) we have

$$A_M \begin{Bmatrix} < \\ = \\ > \end{Bmatrix} 0 \text{ as } \gamma \begin{Bmatrix} > \\ = \\ < \end{Bmatrix} \frac{(\alpha+\beta)(1-\alpha-\beta)}{[\eta(1-\alpha-\beta) - ((\alpha+\beta))]^2 + (\alpha+\beta)(1-\alpha-\beta)} , \quad (A3)$$

which gives equation (9) by using the wage elasticity (5). QED.

Appendix B: Relationship between profit sharing and outsourcing

Equation (12) can be written as

$$\tau = \gamma \cdot \frac{V + bM}{V + bM - f(M)}, \quad (B1)$$

where $V = b^{-\frac{\alpha+\beta}{1-\alpha-\beta}} \cdot \alpha^{\frac{\alpha}{1-\alpha-\beta}} \cdot \beta^{\frac{\beta}{1-\alpha-\beta}} (1-\alpha-\beta)$. The effect of outsourcing on bargained profit sharing is $\dfrac{\partial \tau}{\partial M} = \gamma \dfrac{-f(M) \cdot b + f'(M) \cdot V + f'(M) \cdot bM}{(V + bM - f(M))^2}$. Using $f(M) = \dfrac{1}{2} cM^2$, we can reformulate the effect of outsourcing on profit share to

$$\frac{\partial \tau}{\partial M} = \gamma \frac{cM \left[V + \dfrac{1}{2} bM \right]}{(V + bM - f(M))^2} , \quad (B2)$$

which is equation (13). QED.

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