ISSN 1503-299X

WORKING PAPER SERIES

No. 24/2002

WAGE BARGAINING AND EMPLOYER OBJECTIVES

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Wage bargaining and employer objectives

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Abstract
This paper compares union wage bargaining outcomes across different types of employers. Five different employer objectives are discussed; profit–, welfare– and output maximization, and two specifications of a Leviathan. The model shows that the ordering of the union wage level across employer types depends on the functional form of product demand. With constant elasticity of product demand, the wage tends to be lowest in the output maximization case, while with a linear product demand, the wage tends to be lowest under welfare maximization.

Keywords: *Wage bargaining; Employer objectives; Wage differentials*
JEL–classification: *J51; L22*

December 2002

* This paper is part of a project funded by the Norwegian Research Council. Comments from seminar participants at The Norwegian University of Science.

1. Introduction

The focus in the literature on trade union influence has mainly been on the role of bargaining structure, bargaining issues, and union preferences within profit–seeking firms. While much is known of how union preferences influence bargaining outcomes,[1] little attention is given to employers' objectives. There are probably larger differences in employer objectives, for example between for–profit and non–profit firms, than in unions preferences, which at least clearly include the wage level. During the latest decades, a growing fraction of the workforce has been employed in the public and non–profit sectors.[2] Trade unions are present to a greater degree at least in the public sector than in the profit–seeking industries.[3] There are also numerous reasons why for–profit enterprises may not solely be described by profit maximizing behaviour. The present paper compares wage bargaining outcomes across different types of employers.

Some theoretical papers have compared the outcome of collective bargaining in the private and public sectors.[4] Gravelle (1984) considers bargaining covering both the wage and employment levels in a profit maximization firm versus a welfare maximization firm. Haskel and Szymanski (1993) consider a wage bargaining model under similar assumptions on employer objectives. They find that without any weight on union utility in the objective of the public firm, the only sources of different wage levels are differences in bargaining power or differences in product market power. Holmlund (1997) assumes that the public sector consists of agencies maximizing output subjected to a budget–constraint. With bargaining at the agency level, the wage is higher in the public sector than in the private sector with equal union bargaining powers unless the market powers of the private firms are substantial. The model in the present paper assumes that product demand is independent of employer type in order to focus on the effect of employer objectives. In contrast to the above studies, the

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[1] See, e.g., Booth (1984), Carruth and Oswald (1987), Pemberton (1988), Pencavel (1991), and Oswald (1993).

[2] Between 1960 and 1990, government employment as a share of total employment rose from 12.8 to 27.7 in Norway, from 11.1 to 17.6 in the UK, and from 14.7 to 15.0 in the US, see Blank (1993) for the UK and the US. In the US, the value added in non–profit enterprises as a share of total value added rose from 2.9 to 4.3 percent between 1980 and 1997, see Ruhm and Borkoski (2000).

[3] Around 1990, the union density rate was higher in the public sector than in the private sector in 13 out of the 14 OECD countries with available data, see Blanchflower (1996). In the US, the density rate was 36.7 percent in the public sector and 12.9 percent in the private sector. The corresponding numbers for the UK were 55.4 and 37.8.

[4] A growing literature investigates union effects in the public sector. Recent theoretical contributions are Babcock et al. (1997), Strøm (1999) and Falch (2001). Gregory and Borland (1999) summarize the empirical literature on public sector labour markets.

present model includes fixed costs, and alternative functional forms of product demand are considered.

Welfare maximization is an ideal position of governments and non–profit organizations. In practice, when managers run subsidized public firms or agencies, output maximization is a description of an idealistic type of management. Freeman (1975) presents a comparison of non–profit and profit–seeking enterprises in this case. When the price is given, an output maximizing employer equates average costs and the price, in contrast to a profit maximizing employer who sets the marginal cost equal to the price.

Managers in all sectors are likely to have preferences that diverge from the preferences of the owners of the enterprises. The degree of influence of the managers' objectives is likely to depend on enterprise size and ownership structure. I discuss two extreme cases of enterprise behaviour when the objective of the management and the owners differ. Both cases assume that the management preferences unilaterally describe the employer. In the first case, the Leviathan maximizes revenue, and in the second case, the Leviathan has preferences over manager wage and management size.

Section 2 presents the different employer objectives discussed. The bargaining model is set out in Section 3, while the comparative results are derived in Section 4. Section 5 concludes.

2. Employer objectives

The following cases of employer objectives V are discussed:

Case 1. Profit maximization; $V = \Pi$ = profit.

Case 2. Welfare maximization; $V = \Pi + CS$ = profit + consumer surplus

Case 3. Output maximization; $V = X$ = output.

Case 4. Revenue maximization; $V = R$ = revenue.

Case 5. Management maximization; $V = v(M, \omega)$ = the managers' utility (M is the number of managers and ω is their wage).

In all cases, the utility functions must be interpreted as the loss of closing the firm or agency. Case 1 is the traditional profit–seeking firm. Cases 2 and 3 are the prevailing objectives of public firms or other non–profit organizations in the existing literature on collective bargaining. While welfare maximization is the traditional description of a 'benevolent dictator', application of welfare maximization by managers in public agencies gives few and weak control mechanisms for the government. Holmlund (1997) and Falch (2001) assume that bargaining occurs within government departments or bureaus that maximize the volume of public services. Output maximization is a description of second–best preferences in decentralized non–profit organization. The managers seek to enhance productivity.

Cases 1–3 neglect economic behaviour within the management in complex organizations. Cases 4 and 5 are two specifications of the objectives when the management behaves in a selfish way. Both cases are relevant for large business firms, non–profit enterprises, as well as the public sector. An implicit assumption in Case 4 is that the things from which managers derive satisfaction all vary directly with the size of the enterprise. This was suggested by Baumol (1959) for private firms and Niskanen (1971) for public agencies. Case 5 specifies the types of expenditures the managers prefer. The managers' utility is assumed to be positively related to their wage level and the management size.

Figure 1 illustrates the differences between the cases. Under profit maximization, optimality occurs when the marginal cost and the marginal income are equalized, as illustrated by point C1. In optimum under welfare maximum, point C2, the marginal cost is equal to the marginal propensity to pay. In the figure, there is a positive profit because the marginal cost is increasing and fixed costs are low. Under output maximization, the output increases until total costs become equal to the income, as illustrated by point C3. This is also the optimum under revenue maximization if the marginal revenue is positive at this point. If not, it is optimal with a lower production as illustrated by point C4. The last case, management maximization, can be seen as the management seeks to extract rents from the market in order to pay excess management wage costs. Thus, management utility is potentially at its maximum when profit is maximized. The outcome will be C5 = C1.

Figure 1 here

With wage bargaining, the marginal cost is not given only by technology, but is partly determined by the bargaining outcome. The impact of the different employer objectives on the bargaining outcome will reduce (increase) the output differences between the cases if the 'high production' employers have a worse (better) bargaining position than the 'low production' employers. Since employment differences mainly follow from Figure 1, the rest of this paper concentrate on wage differentials.

3. The bargaining model

Assume a rent maximizing trade union covering all workers. The union loss during a dispute is $U = N(w - \bar{w})$, where w is the wage of the union members N and $\bar{w}$ is their reservation wage. The determination of $\bar{w}$ will not be discussed in this paper. The present analysis considers whether different employer objectives give rise to wage differentials within a given structure of the economy, and does not analyse any general equilibrium effects of changes in the objectives for a large segment of firms.

Because there seems to be some disagreement on whether unions have bargaining power over other issues than wages, see, e.g., Pencavel (1991) and Oswald (1993), only wage bargaining is considered in the present paper. In addition, I follow the main part of the literature by only considering a static 'one–shot' bargaining game, and by assuming that the employer unilaterally set the employment after the wage bargain.[5]

The Nash bargaining solution illustrates the bargaining outcome. The Nash maximand is

$$\Omega = V^{\gamma} U , \tag{1}$$

where γ is the relative bargaining power of the employer. Maximizing (1) with respect to the union wage yields the wage mark–up over the reservation wage as

$$\frac{w - \bar{w}}{w} = -\frac{1}{\varepsilon_{Nw} + \gamma\,\varepsilon_{Vw}} . \tag{2}$$

There are two potential sources of wage differentials between employer types. The values of the wage elasticity of demand for labour $\varepsilon_{Nw} = \frac{\partial N}{\partial w}\frac{w}{N}$ and the wage elasticity of the employer objective $\varepsilon_{Vw} = \frac{\partial V}{\partial w}\frac{w}{V}$ may depend on the preferences of the employer. With an elastic demand for labour the union wage demand is low since a marginal increase in the wage has a large negative impact on employment. The employer's resistance against paying a higher wage is only related to how much the objective is reduced. Evaluating the elasticities, one must take into account two constraints facing the employers. The profit must be nonnegative, $\Pi = R - wN - \omega M \geq 0$, and the wages must not fall short of the reservation wages, $w \geq \overline{w}$ and $\omega \geq \overline{\omega}$.

In order to highlight the effect of different employer objectives, capital is extracted from the model as in, e.g., Booth (1984), Carruth and Oswald (1987) and Oswald (1993). In addition, the demand and production functions are assumed to be equal in all cases. The following production function is used throughout the paper.

$$X = \begin{cases} 0 & \text{if } M < 1 \\ aN^{\alpha} & \text{if } M \geq 1, \quad \alpha \leq 1. \end{cases} \tag{3}$$

Management is introduced into the model in order to discuss a more realistic Leviathan type of organizations, Case 5, than simply revenue maximization. For the other cases, there is fixed costs. It is assumed that production requires a coordinating management. The minimum number of managers is normalized to unity, and a rise in management size above unity is assumed to have no effect on production. With this production function, it is optimal in Cases 1–4 to set M = 1 and the manager's wage equal to his reservation wage $\overline{\omega}$. Thus, $\overline{\omega}$ is fixed administrative costs, or fixed operational–dependent costs, in these cases.[6]

The specification of the production function merits some discussion of the employer objective in Case 5. If one think about a firm where the owner initially hires one manager, which is the minimum required, Case 5 implies that this manager prefers to have others by his side, but that the utility function will not change as more managers are hired. One can interpret the utility function as the utility function of the CEO, as in Migué and Bélanger (1974). But notice that, as will be become evident, union wage and employment is independent of the functional form of the manager(s) utility function, which only determines how management rent is divided between manager wage and management size.

In order for the union to be able to increase the wage, there must be rents to share. As usual in the literature on trade unions, the market in which the enterprise operates is assumed to be of

[5] Repeated wage bargaining games where introduced by Espinosa and Rhee (1989) and Strand (1989). For example Grout (1984) and Falch (2001) assume that employment is determined prior to the wage bargain.

[6] Allowing the optimal management size to depend on output size will complicate the model considerably without introducing new mechanisms.

the monopolistic competition type.[7] Often different types of employers operate in different product markets. How the product demand influences union wages is, however, well known in the literature. For example, increased elasticity of product demand will make a wage rise more costly for the union because the loss of employment increases. To emphasize the pure effect of employer objectives, I will assume that the product demand is equal in all cases discussed.[8]

The inverse demand function is $P = P(X)$ and the revenue is $R = P(X)X$. The elasticity of the revenue with respect to production, denoted $\kappa = \frac{\partial R}{\partial X}\frac{X}{R} = \kappa(X) \leq 1$, is interpreted as an indicator of product market competitiveness. When the price is given for the enterprise, $\kappa = 1$, while the marginal revenue is equal to zero for $\kappa = 0$.[9] The elasticity of product market competitiveness with respect to employment is denoted $\varepsilon_{\kappa N} = \frac{\partial \kappa}{\partial N}\frac{N}{\kappa}$.

Table 1 presents the expressions for ε_{Nw} and ε_{Vw} in the different cases, where subscript denotes the cases. J is an indicator variable for whether the profit–constraint is binding,

$$J = \begin{cases} 0 \text{ if } \Pi > 0 \\ 1 \text{ if } \Pi = 0. \end{cases} \tag{4}$$

The profit is assumed to be positive in Case 1 ($\Pi_1 > 0$), while the profit–constraint is binding in Cases 3 and 5 ($\Pi_3 = \Pi_5 = 0$). For a given wage, there may be a positive profit in optimum in Case 4. But since the employer only care about the revenue, increased wage does not decrease the employer utility level if $\Pi_4 > 0$. Thus, in bargaining optimum, $\Pi_4 = 0$.

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[7] If the firm has no market power ($\kappa = 1$, see below), there is constant return to scale ($\alpha = 1$), and there is no fixed costs, the profit will be equal to zero and it is impossible for the union to increase the wage above the reservation wage.

[8] For public sector agencies, the government often determines the demand. A downward sloping demand function may thus require a justification. Consider a simple median voter model, the standard framework in public finance. The median voter is decisive and solely determines the behaviour of the government. The median voter is faced with the budget–constraint $Y_m(1–t) = C_m$ (Y_m is the income level, t is the tax rate, and C_m is the private consumption). The budget–constraint of the government is $tY = PX$ (Y is total private income and P is the price of the publicly provided good X). Combining the budget–constraints yields $Y_m = \tau PX + C_m$, where $\tau = Y_m/Y$ is the tax share of the median voter. τ and P are assumed to be exogenous in this type of models. Maximizing a quasi–concave median voter utility function, $v = v(X, C_m)$, subjected to $Y_m = \tau PX + C_m$, yields the demand function $X = X(P, Y_m, \tau)$, where $\partial X/\partial P < 0$. In this case, the budget of the public sector agency R must be seen as determined by a rule corresponding to such a demand function, which implies that the size of the budget depends on the wage level.

[9] Some has argued that the demand for numerous governmental services is likely to be inelastic, i.e., κ is low. The empirical evidence, however, indicates that the wage elasticity of demand for labour is not substantially different in the public and private sectors, see Ehrenberg and Schwarz (1986) and Freeman (1986).

Table 1 here

The wage elasticities of labour demand and the employer objective may differ across employer types for five reasons. They are described in the next section.

4. Comparative results

Because discrete different outcomes will be compared, the functional form of product demand must be specified. I will consider both a demand with constant elasticity and a linear demand.

4.1. Constant elasticity product demand

Assume that the inverse demand function is given by $P = bX^{-\psi}$, $0 < \psi < 1$. The revenue is $R = bX^{\kappa}$, where $\kappa = 1-\psi$. Now κ is equal in all cases, and $\varepsilon_{\kappa N} = 0$. In Case 2, the consumer surplus $CS_2 = \frac{1-\kappa}{\kappa} R_2$, which yields the wage elasticity of the employer objective as

$$\left(\varepsilon_{Vw}\right)_2 = \frac{\alpha\kappa}{\alpha\kappa\left(1+\frac{\varpi}{w_2 N_2}\right)-1}. \tag{5}$$

$\left(\varepsilon_{Vw}\right)_2$ is independent of whether the profit–constraint is binding ($\Pi_2 = 0$) or not ($\Pi_2 > 0$).

The comparative results are summarized in two propositions. In the first proposition, fixed costs are neglected, and Case 5 is not taken into account.

Proposition 1.

For constant elasticity product demand and $\varpi = 0$, $w_3 \leq w_1 = w_2 = w_4$. Strict inequality holds for $\gamma > 0$.

Proof: The results follow from inspection of ε_{Nw} and ε_{Vw} in Table 1.

With a monopoly union, $\gamma = 0$, the wage is solely determined by the labour demand elasticity. Without fixed administrative costs, $\varpi = 0$, the elasticity is equally determined by the parameters α and κ in all cases, and it follows that the union wage is independent of the employer objective. When the employer has bargaining power ($\gamma > 0$), the size of the wage elasticity of the employer objective matter. This is basically the same model as in Haskel and

Szymanski (1993) and Holmlund (1997). As in Haskel and Szymanski (1993), the present model implies equal wages under profit and welfare maximization. Holmlund (1997) shows that an output maximizing employer may have stronger incentives to withstand union wage pressure than a profit maximizing employer because in the former case, the objective is more sensitive to wage changes. In the present model where the product market competitiveness is equal for all employer types in contrast to Holmlund's model, output maximization stands out as a special case. The wage elasticity of the employer objective is equal in all cases except in Case 3, where the elasticity is larger, $\left|(\varepsilon_{Vw})_i\right| < \left|(\varepsilon_{Vw})_3\right|$, i = (1, 2, 4).[10] A wage increase is more 'costly' under output maximization than in the other cases. When the wage increases, some of the increased cost is put into a higher price. This increases revenue, which partly reduces the negative effect on the employer utility level of a higher wage in all cases except in Case 3. Under output maximization, monetary measures are not directly included in the objective. This will be denoted the *non–monetary objective effect*.[11]

Proposition 2 extends the comparison to take into account the fixed costs ($\bar{\omega} > 0$), which makes it possible to include Case 5 into the analysis.

Proposition 2.

For constant elasticity product demand and $\bar{\omega} > 0$;

(i) *When* $\gamma = 0$, $w_3 = w_4 < w_1 = w_5$. *If* $\Pi_2 > 0$, $w_2 = w_1 = w_5$. *If* $\Pi_2 = 0$, $w_2 = w_3 = w_4$.

(ii) *When* $\gamma > 0$, $w_1 < w_5$ *and* $w_3 < w_4 < w_5$. *If* $\Pi_2 > 0$, $w_1 < w_2 < w_5$. *If* $\Pi_2 = 0$, $w_2 = w_4$.

Proof: The results follow from inspection of ε_{Nw} and ε_{Vw} in Table 1.

Without employer bargaining power ($\gamma = 0$), introducing fixed costs obviously does not influence the employment level under profit maximization because the employment–decision

[10] Holmlund (1997) only considers public sector agencies with a fixed budget, implying $\kappa = 0$. Thus, the wage elasticity of demand for labour is more elastic in the private sector than the public sector, working in the direction of lower wage in the private sector. Setting $\kappa = 0$ in Case 3 in the present model, it follows that $w_3 < w_1$ if $\kappa_1 < \frac{1}{1+\alpha}$. Then the *non–monetary objective effect* dominates the effect of the different labour demand elasticities.

[11] In a monopoly union model with inelastic labour demand, Strøm (1999) presents two additional arguments for lower wage in the local public sector than the private sector. First, with inelastic demand, higher wage has to be financed by higher taxes, which partially lowers the disposable wage for all union members. Second, higher wage means less local public services available for the union members. Both effects are likely to be absent for firm specific unions in the private sector.

of the firm only depends on marginal values. Case 5 may be described as two–step maximization. First, profit is maximized, and second, the profit is divided between M and ω. Only the first step is relevant for the determination of N. Thus, from the union point of view, there are no differences between Cases 1 and 5. In Cases 3 and 4, however, the employment must be reduced when $\overline{\omega}$ increases. The profit–constraint implies that after a wage rise, and thereby reduced employment, each worker must cover a larger share of the fixed costs. The vertical distance between the average cost curve and a curve describing average variable costs increases. Thus, the wage elasticity of labour demand is more elastic in Cases 3 and 4 than in Cases 1 and 5, which also is demonstrated by Freeman (1975). This will be denoted the *fixed costs' labour demand effect*, which consequently works in the direction of low wage in Cases 3 and 4. If the profit–constraint is not binding in case 2 ($\Pi_2 > 0$), the employment level is independent of the size of $\overline{\omega}$ as in Cases 1 and 5. If the magnitude of the fixed costs implies that the profit–constraint gets binding in Case 2 ($\Pi_2 = 0$), however, the constraint determines the labour demand in Case 2 in the same way as in Cases 3 and 4.

Part (ii) of Proposition 2 reveals a third channel trough which wage differentials may arise. The *fixed costs' employer objective effect* follows from the fact that fixed costs influence the wage elasticity of the employer objective differently across cases. While administrative costs are only a cost component in Cases 1–4, they influence the management utility level directly in Case 5. Thus, in Case 5, ωM is a component that contributes to increased employer utility, and thereby $\left|(\varepsilon_{Vw})_5\right| < \left|(\varepsilon_{Vw})_i\right|$, i = (1, 2, 3, 4). Combined with the fact that $\left|(\varepsilon_{Nw})_5\right| \leq \left|(\varepsilon_{Nw})_i\right|$, the *fixed costs' employer objective effect* yields that the wage is highest in Case 5.

Comparing Cases 1–4, the fixed costs as a share of union wage costs, $\frac{\overline{\omega}}{wN}$, differs across cases simply because the employment levels differ. The *fixed costs' employer objective effect* is the only difference between Cases 1 and 2 when $\Pi_2 > 0$. Because $\frac{\overline{\omega}}{w_2N_2} < \frac{\overline{\omega}}{w_1N_1}$, $\left|(\varepsilon_{Vw})_2\right| < \left|(\varepsilon_{Vw})_1\right|$, and consequently, $w_1 < w_2$. Since the only difference between Cases 3 and 4 is the *non–monetary objective effect*, $w_3 < w_4$. All this proves that the wage is lowest either in Case 1 or 3. The *fixed costs' labour demand effect* and the *non–monetary objective effect* work in the direction of lowest wage in Case 3, while the *fixed costs' employer objective effect* works in the direction of lowest wage in Case 1. $\left|(\varepsilon_{Vw})_3\right| < \left|(\varepsilon_{Vw})_1\right|$ requires both a high value of $\overline{\omega}$ and a high value of κ. In order to have $w_1 < w_3$, it is also necessary that γ is high since

$\left|(\varepsilon_{Nw})_1\right| < \left|(\varepsilon_{Nw})_3\right|$. Thus, although it is in general ambiguous whether the wage is lowest in Case 1 or 3, the wage is likely to be lowest in Case 3. A small numerical version of the model is presented in Table 2 to through more light on the role of the parameters $\overline{\varpi}$, γ and κ.

Table 2 here

The benchmark example in Table 2 is the monopoly union model without fixed costs. In Example 2, the relative bargaining power of the employer is 0.67, and it follows directly from Proposition 1 that the wage is lowest in Case 3. Introducing fixed costs when $\gamma = 0$ reduces the wage in the cases with a binding profit–constraint. In the other cases, the labour demand elasticity is unchanged. Example 4 combines Examples 2 and 3, and the wage is still lowest in Case 3. Example 5 increases the product market competitiveness κ and normalizes the employment in Case 3 to be at the same level as in Example 4. In this example, both κ, γ and $\overline{\varpi}$ is high, and the wage is equal in Cases 1 and 3. Table 2 also confirms that the wage is never higher in Cases 1–4 than in Case 5. Regarding Cases 2 and 4, the wage tends to be lowest in Case 4, but the differences are small.

4.2. Linear product demand

Is Propositions 1 and 2 due to the assumed functional form of product demand? Assuming constant elasticity of product demand is extreme in the way that the marginal revenue is always positive. For a more 'linear' product demand, the marginal revenue may be negative, and the product market competitiveness κ is decreasing in output size. The comparative results under a linear product demand function are presented in the next propositions.

Proposition 3.

For linear product demand and $\overline{\varpi} = 0$;

(i) *When* $\gamma = 0$, $w_2 \leq w_1$ *and* $w_2 \leq w_3 = w_4$. *Strict inequalities hold for* $\alpha < 1$.

(ii) *When* $\gamma > 0$, $w_2 \leq w_1$ *and* $w_2 < w_3 < w_4$. *Strict inequality holds for* $\alpha < 1$.

Proof: See Appendix A.

Cases 3 and 4 are equal from the union's point of view, and $w_3 = w_4$ when $\gamma = 0$. Comparing Cases 2–4, it is evident that $N_2 \leq N_3 = N_4$, where strict inequality holds for $\alpha < 1$. Because $\frac{\partial\kappa}{\partial X} < 0$, $\kappa_2 \geq \kappa_3 = \kappa_4$, and the *κ's labour demand effect* yields that $w_2 \leq w_3 = w_4$. Comparing Cases 2–4 with Case 1 is complicated by the fact that $\varepsilon_{\kappa N} < 0$, working in the direction of lowest wage in Cases 2–4. The *κ's labour demand effect* is not solely determined by the value of κ, but also by $\varepsilon_{\kappa N}$. Appendix A proves that the effect via $\varepsilon_{\kappa N}$ dominates when Cases 1 and 2 are compared, yielding that $w_2 \leq w_1$. Comparing Cases 1 and 3, the result depends on the value of α. For $1 < \alpha < 0.5$, $w_1 < w_3$, while for $\alpha < 0.5$, $w_3 < w_1$.

The last effect influencing the wage differentials is the effect of κ on the value of ε_{Vw}. This *κ's employer objective effect* works in the same direction as the *κ's labour demand effect*. Appendix A shows that the *κ's employer objective effect* dominates the *non–monetary objective effect*, yielding that $w_2 < w_3$ when $\overline{\varpi} = 0$.

In Proposition 4, all five mechanisms of wage differentials influence the results.

Proposition 4.
For linear product demand and $\overline{\varpi} > 0$;
(i) When $\gamma = 0$, $w_2 < w_1 = w_5$ and $w_3 = w_4$. If $\Pi_2 = 0$, $w_2 = w_3 = w_4$.
(ii) When $\gamma > 0$, $w_1 < w_5$, $w_2 < w_5$ and $w_3 < w_4$. If $\Pi_2 = 0$, $w_2 < w_3$.

Proof: See Appendix A.

Comparing Case 2 and Cases 3–4 when $\gamma = 0$, the *fixed costs' labour demand effect* works in the opposite direction of the *κ's labour demand effect* if the profit–constraint is not binding in Case 2 ($\Pi_2 > 0$), making the sign of the wage differential ambiguous. In the most general case with both employer bargaining power ($\gamma > 0$) and fixed costs ($\overline{\varpi} > 0$), the wage can be lowest either in Case 1, 2 or 3. It is no longer possible to generally determine the sign of the wage differential between Cases 1 and 2 because the *fixed costs' employer objective effect* works in the direction of lowest wage in Case 1. Comparing Cases 2 and 3, the *fixed costs' labour demand effect* may give lowest wage in Case 3 if the profit–constraint is not binding in Case 2. But since both the 1 *κ's labour demand effect* and the *κ's employer objective effect* work in the direction of a lower wage in Case 2 than in Cases 1 and 3, it is likely that the wage is lowest under welfare maximization.

The wage is highest in one of the Leviathan cases. While the *fixed costs' labour demand effect* and the *fixed costs' employer objective effect* work in the direction of highest wage in Case 5, the *κ's labour demand effect* and *κ's employer objective effect* work in the direction of highest wage in Case 4. To investigate the importance of the two latter effects, Table 3 presents simulations similar to the simulations in Table 2.

Table 3 here

In the first example, the parameter values are chosen such that the values of κ_3 and N_3 are equal to the values in Example 1 Table 2. The results confirm that the *κ's labour demand effect* yields lowest wage in Case 2, and highest wage in Cases 3 and 4 since $\alpha > 0.5$. Introducing bargaining power of the employer (Example 2) has a small effect in Case 4 because κ is low at the present high employment level. A revenue maximization employer seems to be in a weak position in wage bargaining when $\partial\kappa/\partial X < 0$. When κ gets low, the employer has little to lose from a wage increase. The *non–monetary objective effect* markedly reduces the wage in Case 3 compared to Case 4. However, the wage in Case 3 is still higher than in Cases 1 and 5. The *non–monetary objective effect* is not strong enough to alter the sign of the wage differential between these cases.

With administrative costs and a monopoly union (Example 3), the wage in Cases 3 and 4 is lower than the wage in Cases 1 and 5, reflecting that the *fixed costs' labour demand effect* is stronger than the *κ's labour demand effect* when these cases are compared. However, with some employer bargaining power, the *κ's employer objective effect* results in relatively bad performance in Cases 3 and 4 from the employers point of view.

In the simulations, the wage is always lowest in Case 2.[12] It is striking that while the wage is lowest in Case 3 in the simulations with constant elasticity of product demand, the three cases with lower employment have lower wages in the simulations with a linear demand. The counterpart to this result is that in the latter simulations, the wage is always lowest in Case 2, while in the former simulations, Case 2 is among the cases with highest wage. The functional form of the product demand seems to be extremely important for how well a specific type of employer performs in wage bargaining.

5. Conclusion

Employers differ for a variety of reasons. This paper has revealed five channels through which wage bargaining outcomes may depend on employer objectives. Four of these channels influence the wage bargaining outcome within all types of employers by altering the wage elasticities of labour demand and the employer objective. The different channels are summarized in Table 4, which presents the effects on the relative wage between the profit maximizing case and the other cases discussed.

Table 4 here

The *non–monetary objective effect* is specific to the output maximization case. When the employer does not care about monetary issues, changes in monetary values have no direct effect on the utility level. Thus, increased price following a wage rise has no independent effect on the employer objective, making such an employer more hesitant against wage increases than employers with monetary objectives. To the extent that public sector objectives are related to non–monetary issues, this effect may contribute to a lower wage in the public sector than the private sector, consistent with the evidence of lower union wage mark–up in the public sector than in the private sector in the US [e.g., Ehrenberg and Schwarz, 1986, and Blanchflower, 1996]. Unfortunately, little work has been done on this issue outside the US, but Blanchflower (1996) find only a minor difference in the union wage mark–up between the sectors in the UK.

The *fixed costs' labour demand effect* works in the direction of low wage when the employer is faced with a profit–constraint because then fewer workers must cover the fixed costs after a wage rise. The *fixed costs' employer objective effect* works in the direction of low wage in cases with relatively low employment because then fixed costs per worker is high. The *κ's labour demand effect* and the *κ's employer objective effect* say how differences in the level of

[12] Notice that the profit–constraint in Case 2 is never binding in the simulations in Table 3.

product market competitiveness κ influences the wage elasticities. When κ is negatively related to output size (the product demand function is more 'linear' than under constant elasticity), both channels work in the direction of lower wage under welfare maximization than in the other cases.

The formal analysis and the simulations reveal some notable findings. Increased 'linearity' of product demand tends to favour employers with low production. The Leviathan type of employer with low production considered (management maximization) performs quite well in the wage bargaining under a linear product demand and performs badly under a product demand with constant elasticity. For the other case of a Leviathan considered (revenue maximization), the production is high, and the performance of the employer is related to the product demand function in the opposite way as the former case. Another important finding is that both employers maximizing welfare and output may perform better in the wage bargaining than a profit maximizing employer. The condition for output maximization to perform better than profit maximization is that the product demand is not 'too linear'. As the 'linearity' increases, the disadvantage of high production in the output maximization case gets larger than the advantage of having a non–monetary objective. On the other hand, the condition for a welfare maximizing employer to perform better in the wage bargaining than a profit maximizing employer is a product demand that is 'linear enough'. As the linearity increases, the advantage of a more elastic product demand than marginal revenue gets larger than the disadvantage of high production.

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Appendix A.

Proof of Proposition 3

Consider the inverse linear product demand function P = m–nX. Then the first order conditions in the different cases can be written

$$w_i N_i = \alpha\left(m - 2nX_i\right)X_i, \qquad i = 1,5, \tag{A.1}$$

$$w_i N_i = \left[\alpha + J\left(1-\alpha\right)\right]\left(m - nX_i\right)X_i - J\overline{\omega}, \quad i = 2,3,4, \tag{A.2}$$

where J = 1 in Cases 3 and 4 and if $\Pi_2 = 0$. Further, it follows that

$$\kappa = \frac{m - 2nX}{m - nX}, \tag{A.3}$$

$$\varepsilon_{\kappa N} = \alpha\frac{\partial\kappa}{\partial X}\frac{X}{\kappa} = -\frac{\alpha nmX}{\left(m - 2nX\right)\left(m - nX\right)}. \tag{A.4}$$

Utilizing (A.1)–(A.4), the wage elasticities of the demand for labour can be written

$$\left(\varepsilon_{Nw}\right)_i = \frac{m - 2nX_i}{\alpha\left(m - 4nX_i\right) - \left(m - 2nX_i\right)}, \qquad i = 1,5, \tag{A.5}$$

$$\left(\varepsilon_{Nw}\right)_i = \frac{m - nX_i - J\frac{\overline{\omega}}{X_i}}{\alpha\left(m - 2nX_i\right) - \left(m - nX_i\right) + J\frac{\overline{\omega}}{X_i}}, \qquad i = 2,3,4, \tag{A.6}$$

Utilizing (A.1)–(A.4) and that the consumer surplus $CS = \frac{1}{2}nX^2$, the wage elasticities of the employer objective can be written

$$\left(\varepsilon_{Vw}\right)_1 = \frac{\alpha\left(m - 2nX_1\right)}{\alpha\left(m - 2nX_1\right) - \left(m - nX_1\right) + \frac{\overline{\omega}}{X_1}}, \tag{A.7}$$

$$\left(\varepsilon_{Vw}\right)_2 = \frac{\left(1+J\right)\alpha\left(m - nX_2 - J\frac{\overline{\omega}}{X_2}\right)}{\alpha\left[m - \left(1+J\right)nX_2\right] - \left[m - \left(\frac{1}{2} + J\frac{1}{2}\right)nX_2\right] + \frac{\overline{\omega}}{X_2}} \tag{A.8}$$

$$\left(\varepsilon_{Vw}\right)_3 = \frac{\alpha\left(m - nX_3 - \frac{\overline{\omega}}{X_3}\right)}{\alpha\left(m - 2nX_3\right) - \left(m - nX_3\right) + \frac{\overline{\omega}}{X_3}}, \tag{A.9}$$

$$\left(\varepsilon_{Vw}\right)_4 = \frac{\alpha\frac{m-2nX_4}{m-nX_4}\left(m - nX_4 - \frac{\overline{\omega}}{X_4}\right)}{\alpha\left(m - 2nX_4\right) - \left(m - nX_4\right) + \frac{\overline{\omega}}{X_4}}, \tag{A.10}$$

$$\left(\varepsilon_{Vw}\right)_5 = \frac{\alpha\left(m - 2nX_5\right)}{\alpha\left(m - 2nX_5\right) - \left(m - nX_5\right)}. \tag{A.11}$$

Proof of part (i)

It follows from (2) that $w_2 \leq w_1$ if $\left|(\varepsilon_{Nw})_1\right| \leq \left|(\varepsilon_{Nw})_2\right|$ (recall that $\gamma = 0$). Inspection of (A.5) and (A.6) reveals that this is true if (recall that $\overline{\varpi} = 0$ and that J = 0 when $\overline{\varpi} = 0$)

$$\frac{m - 4nX_1}{m - 2nX_1} \leq \frac{m - 2nX_2}{m - nX_2}. \tag{A.12}$$

(A.12) is fulfilled if $X_2 \leq 2X_1$, or equivalently, $N_2 \leq 2^{\frac{1}{\alpha}} N_1$. Thus, evaluating the first order conditions (A.1) and (A.2) for $N_2 = 2^{\frac{1}{\alpha}} N_1$, it must be the case that $w_2 \leq w_1$. Inserting $N_2 = 2^{\frac{1}{\alpha}} N_1$ into (A.2), it follows that $w_2 \leq w_1$ if $2^{\frac{\alpha-1}{\alpha}} \leq 1$. This is always fulfilled for $\alpha \leq 1$, with strict inequality for $\alpha < 1$. This proves that $w_2 \leq w_1$.

Recall that the expressions of ε_{Nw} are equal in Cases 2 and 3 when $\overline{\varpi} = 0$. It follows thus that $w_3 \leq w_1$ if $N_3 \leq 2^{\frac{1}{\alpha}} N_1$. By a similar reasoning as above, it follows that $w_3 \leq w_1$ if $2^{\frac{\alpha-1}{\alpha}} \leq \alpha$. This is fulfilled if $\alpha \leq 0.5$. For $\alpha > 0.5$, the condition is not fulfilled. Thus, $w_1 = w_3$ if $\alpha = 1$ or $\alpha = 0.5$, $w_1 < w_3$ if $0.5 < \alpha < 1$, and $w_3 < w_1$ if $\alpha < 0.5$.

Comparing Cases 2 and 3, it is evident that $N_2 \leq N_3$, where strict inequality holds for $\alpha < 1$. Thus, $\kappa_2 \geq \kappa_3$ because $\frac{\partial \kappa}{\partial X} < 0$. This proves that $\left|(\varepsilon_{Nw})_3\right| \leq \left|(\varepsilon_{Nw})_2\right|$ and $w_2 \leq w_3$. Lastly, $w_3 = w_4$ because the first order conditions, determining the wage elasticities of the demand for labour, are equal in these cases.

Proof of part (ii)

The effects on the wages via the preferences of the employers work in the direction of lower wage in Case 2 than in Case 1 if $\left|(\varepsilon_{Vw})_1\right| < \left|(\varepsilon_{Vw})_2\right|$. Inspection of (A.7) and (A.8) reveals that $\left|(\varepsilon_{Vw})_1\right| \leq \left|(\varepsilon_{Vw})_2\right|$ if (recall that $\overline{\varpi} = 0$)

$$\frac{m - 2nX_1}{m - nX_1} \leq \frac{m - nX_2}{m - \frac{1}{2}nX_2}. \tag{A.13}$$

(A.13) is fulfilled if $X_2 \leq 2X_1$. This is the same condition as for $\left|(\varepsilon_{Nw})_1\right| \leq \left|(\varepsilon_{Nw})_2\right|$. Thus, both $\left|(\varepsilon_{Nw})_1\right| \le \left|(\varepsilon_{Nw})_2\right|$ (the *κ's labour demand effect*) and $\left|(\varepsilon_{Vw})_1\right| \le \left|(\varepsilon_{Vw})_2\right|$ (the *κ's employer objective effect*), proving that $w_2 \le w_1$. Strict inequalities hold for $\alpha < 1$.

$N_1 < N_4$ yields that $\kappa_4 < \kappa_1$. Thus, from (A.7) and (A.8), it follows that $\left|(\varepsilon_{Vw})_4\right| < \left|(\varepsilon_{Vw})_1\right|$. The *κ's employer objective effect* work in the direction of lower wage in Case 1 than in Case 4. Combined with $\left|(\varepsilon_{Vw})_1\right| \le \left|(\varepsilon_{Vw})_2\right|$ and $\left|(\varepsilon_{Nw})_4\right| \le \left|(\varepsilon_{Nw})_2\right|$, this proves that $w_2 < w_4$. Because $\frac{m-2nX}{m-nX} < 1$, it follows from (A.9) and (A.10) that $\left|(\varepsilon_{Vw})_4\right| \le \left|(\varepsilon_{Vw})_3\right|$. This proves that $w_3 < w_4$.

Comparing Cases 2 and 3, it follows from (A.8) and (A.9) that $\left|(\varepsilon_{Vw})_3\right| < \left|(\varepsilon_{Vw})_2\right|$ if

$$X_2 < 2kX_3, \quad \text{where } k = \frac{\alpha m}{m + (2\alpha - 1)nX_3}, \tag{A.14}$$

or equivalently, $N_2 < (2k)^{\frac{1}{\alpha}} N_3$. Recalling that $\left|(\varepsilon_{Nw})_3\right| \le \left|(\varepsilon_{Nw})_2\right|$, it must follow from (A.2) that $w_2 < w_3$ for $N_2 = (2k)^{\frac{1}{\alpha}} N_3$ if (A.14) holds. Inserting $N_2 = (2k)^{\frac{1}{\alpha}} N_3$ into the first order condition in Case 2, it follows that $w_2 < w_3$ if

$$X_3 > \frac{m}{n}K, \qquad \text{where } K = \frac{2^{\frac{\alpha-1}{2\alpha-1}}\alpha - 1}{2\alpha - 1} \tag{A.15}$$

For $\alpha = 1$, $K = 0$. For $\alpha < 1$ and $\alpha \ne 0.5$, $K < 0$. Thus, $K \le 0$ for each $\alpha \ne 0.5$, and (A.15) is fulfilled for each $\alpha \ne 0.5$. For $\alpha = 0.5$, it follows directly from (A.14) that $\left|(\varepsilon_{Vw})_3\right| < \left|(\varepsilon_{Vw})_2\right|$ because $X_2 < X_3$ (recall that $\Pi_2 > 0$ when $\bar{\varpi} = 0$). This proves that $w_2 < w_3$.

Proof of Proposition 4.

Consider again the linear product demand $P = m–nX$. Then the relevant elasticities are given by (A.5)–(A.11).

Proof of part (i)

Because the first order conditions are equal in Cases 1 and 5, $w_1 = w_5$. If the profit–constraint is not binding in Case 2 ($\Pi_2 > 0$), the wage elasticities in Cases 1, 2 and 5 is independent of the value of $\bar{\varpi}$. Thus, the result from part (i) Proposition 3 carries over. Notice, however, that

$\Pi_2 > 0$ only if $\alpha < 1$ when $\bar{\varpi} > 0$. Thus, w_2 is strictly lower than $w_1 = w_5$. If the profit–constraint is binding in Case 2 ($\Pi_2 = 0$), utilizing (A.5) and (A.6) gives that $w_2 < w_1$ if

$$\frac{m-4nX_1}{m-2nX_1} < \frac{m-2nX_2}{m-nX_2} + \frac{(m-2nX_2)}{(m-nX_2)} \frac{\alpha\bar{\varpi}}{(m-nX_2)X_2 - \bar{\varpi}}. \tag{A.16}$$

Compared to (A.12), there is a new term on the right hand side of the inequality. Clearly, if $X_2 = 2X_1$, the condition is fulfilled with strict inequality in contrast to the situation when $\bar{\varpi} = 0$. Thus, $w_2 < w_1$ if $X_2 \leq 2X_1$, which always holds even when the profit–constraint is not binding as proved above. This proves that $w_2 < w_1 = w_5$.

If $\Pi_2 = 0$, the outcomes in Cases 2–4 are equally determined by the profit–constraint, and thus $w_2 = w_3 = w_4$. Notice that this implies that w_3 (= w_4) < w_1 when $\Pi_2 = 0$. Fixed costs increases $\left|(\varepsilon_{Nw})_3\right|$, which may make $w_3 < w_1$ even though $\alpha > 0.5$. Thus, when $\bar{\varpi}$ is so high that $\Pi_2 = 0$ in Case 2, $\left|(\varepsilon_{Nw})_3\right|$ has increased so much that the wage is always lower in Case 3 than in Case 1.

If $\Pi_2 > 0$, two opposite effects may make $\left|\varepsilon_{Nw}\right|$ smaller or larger in Case 3 than in Case 2. First, $N_2 < N_3$, giving the result in part (i) Proposition 3 (the *κ's labour demand effect*). Second, $\left|(\varepsilon_{Nw})_3\right|$ is increasing in the fixed cost $\bar{\varpi}$ (the *fixed costs' labour demand effect)*. For a small $\bar{\varpi}$, the former effect dominates, making $w_2 < w_3$. For a large $\bar{\varpi}$, N_3 will be small and close to N_2. Thus, the former effect is minor while the latter effect is large. Thus, there exists a critical level of $\bar{\varpi}$, say $\bar{\varpi}^c$, for which $w_2 < w_3 = w_4$ if $\bar{\varpi} < \bar{\varpi}^c$ and $w_3 = w_4 < w_2$ if $\bar{\varpi} > \bar{\varpi}^c$.

Proof of part (ii)

From (A.7) and (A.11), it follows that $\left|(\varepsilon_{Vw})_5\right| < \left|(\varepsilon_{Vw})_1\right|$ because $\bar{\varpi}$ are not included in $(\varepsilon_{Vw})_5$. Since $(\varepsilon_{Nw})_1 = (\varepsilon_{Nw})_5$, this proves that $w_1 < w_5$. From (A.8) and (A.11), it is clear that $\left|(\varepsilon_{Vw})_5\right| < \left|(\varepsilon_{Vw})_2\right|$, independent of the size of Π_2. Since $\left|(\varepsilon_{Nw})_5\right| \leq \left|(\varepsilon_{Nw})_2\right|$, this proves that $w_2 < w_5$. Comparing Cases 3 and 4, it follows from (A.9) and (A.10) that $\left|(\varepsilon_{Vw})_4\right| < \left|(\varepsilon_{Vw})_3\right|$. Since $(\varepsilon_{Nw})_3 = (\varepsilon_{Nw})_4$, this proves that $w_3 < w_4$.

Comparing Cases 1 and 2, two opposite effects may make $|\varepsilon_{Vw}|$ smallest or largest in Case 2. First, without fixed costs, $|(\varepsilon_{Vw})_1| < |(\varepsilon_{Vw})_2|$ (the *κ's employer objective effect*). Second, fixed costs have a larger effect on $|(\varepsilon_{Vw})_1|$ than on $|(\varepsilon_{Vw})_2|$ (the *fixed costs' employer objective effect*). When $\Pi_2 > 0$, $|(\varepsilon_{Vw})_1| < |(\varepsilon_{Vw})_2|$ if

$$\frac{m - 2nX_1}{m - nX_1}\left(1 - \frac{\bar{\omega}}{X_2}\right) \leq \frac{m - nX_2}{m - \frac{1}{2}nX_2}\left(1 - \frac{\bar{\omega}}{X_1}\right) \tag{A.17}$$

Since $X_1 < X_2$, the value of the parenthesis on the left hand side of the inequality is greater than the value of the parenthesis on the right hand side. Thus, $X_2 \leq 2X_1$ is not a sufficient condition for (A.17) to hold, and, generally, it is ambiguous whether the wage is lowest in Case 1 or 2.

If $\Pi_2 > 0$, the sign of the wage differential between Cases 2 and 3 is ambiguous by part (i) of the proposition. If $\Pi_2 = 0$, the outcome in the two cases will be equal if the wage is equal. Because $(\varepsilon_{Nw})_2 = (\varepsilon_{Nw})_3$, it follows that, $w_2 < w_3$ if $|(\varepsilon_{Vw})_3| < |(\varepsilon_{Vw})_2|$ for $X_2 = X_3$. Comparing (A.8) and (A.9), it is clear that this is fulfilled. This proves that $w_2 < w_3$ if $\Pi_2 = 0$.

Table 1: Wage elasticities

	ε_{Nw}	ε_{Vw}
Case 1 (Profit maximization)	$\frac{1}{\alpha\kappa_1 + (\varepsilon_{\kappa N})_1 - 1}$	$\frac{\alpha\kappa_1}{\alpha\kappa_1\left(1+\frac{\bar{\omega}}{w_1N_1}\right)-1}$
Case 2 (Welfare maximization)	$\frac{1}{\alpha\kappa_2\left(1+J\frac{\bar{\omega}}{w_2N_2}\right)-1}$	$\frac{\alpha(1-J\kappa)\left(1-J+J\frac{w_2N_2+\bar{\omega}}{CS_2}\right)}{\alpha(1-J+J\kappa)\left(1+\frac{\bar{\omega}}{w_2N_2}\right)-1-(1-J)\alpha\frac{CS_2}{w_2N_2}}$
Case 3 (Output maximization)	$\frac{1}{\alpha\kappa_3\left(1+\frac{\bar{\omega}}{w_3N_3}\right)-1}$	$\frac{\alpha}{\alpha\kappa_3\left(1+\frac{\bar{\omega}}{w_3N_3}\right)-1}$
Case 4 (Revenue maximization)	$\frac{1}{\alpha\kappa_4\left(1+\frac{\bar{\omega}}{w_4N_4}\right)-1}$	$\frac{\alpha\kappa_4}{\alpha\kappa_4\left(1+\frac{\bar{\omega}}{w_4N_4}\right)-1}$
Case 5 (Management maximization)	$\frac{1}{\alpha\kappa_5 + (\varepsilon_{\kappa N})_5 - 1}$	$\frac{\alpha\kappa_5}{\alpha\kappa_5 - 1}$

Table 2. Simulated outcomes, inverse demand is $P = bX^{-\psi}$

Example	1		2		3		4		5	
Parameter values	$\overline{\omega} = 0$ $\gamma = 0$ $\kappa = 0.5$ $b = 20$		$\overline{\omega} = 0$ $\gamma = 2$ $\kappa = 0.5$ $b = 20$		$\overline{\omega} = 5$ $\gamma = 0$ $\kappa = 0.5$ $b = 20$		$\overline{\omega} = 5$ $\gamma = 2$ $\kappa = 0.5$ $b = 20$		$\overline{\omega} = 5$ $\gamma = 2$ $\kappa = 0.8$ $b = 5.3$[a]	
Dependent variable	w	N	w	N	w	N	w	N	w	N
Case 1 (Profit maximization)	2.50	6.9	1.50	16.3	2.50	6.9	1.45	17.2	1.14	29.8
Case 2 (Welfare maximization)	2.50	22.1	1.50	51.7	2.50	22.1	1.49	52.5	1.17	52.2
Case 3 (Output maximization)	2.50	32.0	1.30	95.2	2.34	32.0	1.29	90.0	1.14	90.0
Case 4 (Revenue maximization)	2.50	32.0	1.50	75.0	2.34	32.0	1.48	71.3	1.17	84.7
Case 5 (Management maximization)	-	-	-	-	2.50	6.9	1.50	16.3	1.19	26.8

Parameter values are $a = \overline{w} = 1$ and $\alpha = 0.8$. The values of b, $\overline{\omega}$, γ and $\kappa = 1-\psi$ are given in the second row of the table.

[a] In Example 5, the value of b chosen such that the employment in Case 3 is equal in Examples 4 and 5.

Table 3. Simulated outcome, inverse demand is $P = m–nX$

Example	1		2		3		4		5	
Parameter values	$\overline{\omega} = 0$ $\gamma = 0$ $m = 7.50$[a] $n = 0.1563$[a]		$\overline{\omega} = 0$ $\gamma = 2$ $m = 7.50$ $n = 0.1563$		$\overline{\omega} = 5$ $\gamma = 0$ $m = 7.50$ $n = 0.1563$		$\overline{\omega} = 5$ $\gamma = 2$ $m = 7.50$ $n = 0.1563$		$\overline{\omega} = 5$ $\gamma = 2$ $m = 5.00$[b] $b = 0.0775$[b]	
Dependent variable	w	N	w	N	w	N	w	N	w	N
Case 1 (Profit maximization)	2.42	13.1	1.50	24.0	2.42	13.1	1.45	24.7	1.24	25.1
Case 2 (Welfare maximization)	2.17	27.8	1.41	51.0	2.17	27.8	1.39	51.9	1.21	47.9
Case 3 (Output maximization)	2.50	32.0	1.66	54.3	2.34	32.0	1.61	52.7	1.33	52.7
Case 4 (Revenue maximization)	2.50	32.0	2.08	41.9	2.34	32.0	1.98	41.4	1.45	45.7
Case 5 (Management maximization)	2.42	13.1	1.50	24.0	2.42	13.1	1.50	24.0	1.29	23.9

Parameter values are $a = \overline{w} = 1$ and $\alpha = 0.8$. The values of m, n, $\overline{\omega}$ and γ are given in the second row of the table.

[a] The value of m and n is chosen such that κ and N are equal in the present and previous (Table 2) simulations for Case 3 in Example 1.

[b] In example 5, κ is increased by reducing n. The value of m is chosen such that the employment in Case 3 is equal in Examples 4 and 5.

Table 4. The effects on the relative wage between profit maximization (Case 1) and the other cases

	Case 2, $\Pi_2 > 0$ (Welfare maximization)	Case 2, $\Pi_2 = 0$ (Welfare maximization)	Case 3 (Output maximization)	Case 4 (Revenue maximization)	Case 5 (Management maximization)
The non–monetary objective effect	None	None	Positive	None	None
The fixed costs' labour demand effect	None	Positive	Positive	Positive	None
The fixed costs' employer objective effect	Negative	Negative	Negative	Negative	Negative
The κ's labour demand effect	Positive	Positive	Negative if $\alpha > 0.5$	Negative if $\alpha > 0.5$	None
The κ's employer objective effect	Positive	Positive	Negative	Negative	None

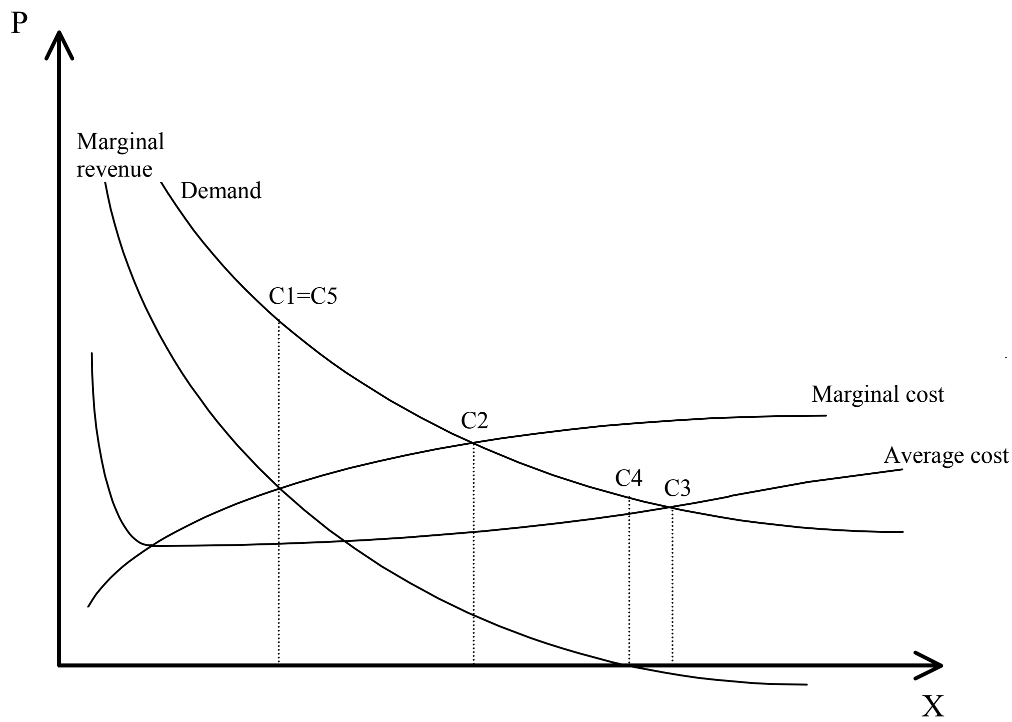

Figure 1: Outcome and employer type