Regulation and wage bargaining

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Abstract

In many regulated industries labour unions are strong and there is clear empirical evidence of labour rent-sharing. We study optimal regulation in a model in which wages are determined endogenously by wage bargaining at the firm level. Compared to the case in which wages do not depend on the regime under which the firm is regulated, allowing for endogenously determined wages has ambiguous effects on the the regulatory contract. A seemingly robust conclusion, at least when worker bargaining power is considerable, is that incentives for cost efficiency should be stronger. Nevertheless, social welfare may well be higher.

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1. Wage setting in regulated industries

Traditionally, labor unions have been strong in many regulated industries. Wages and working conditions are determined by bargaining between unions and employers, and industry regulators, who are responsible for designing pricing and transfer schemes for the regulated firms, cannot usually control wages directly. Nevertheless, the choice of regulatory policy is likely to influence the outcome of the wage bargaining process. Consider for example, cost of service regulation in which firms are allowed a 'fair' rate of return on capital. Based on historical costs of labor and other inputs, regulated prices are fixed at the level of average costs. If costs are reviewed frequently, owners have little incentive to resist claims for higher wages since an increase in wages is compensated for by a corresponding increase in regulated prices. If, on the other hand, reviews are made less frequently, the regulatory scheme becomes more 'high powered' and provides stronger incentives for cost reductions. Standard bargaining theory predicts that such a change in regulatory policy results in an outcome with lower wages.

There is a considerable empirical literature devoted to the study of labor rent-sharing in regulated industries.[1] Ehrenberg (1979), in a detailed study of New York Telephone, presents a large body of evidence suggesting that workers of this company were paid a premium above non-union workers of comparable skills. Rose (1987) used the impact of deregulation on wages in the US trucking industry in the early 1980s to estimate rent-sharing in the pre-deregulation era, finding that workers had captured more than two-thirds of total industry rents.[2] Of particular interest is the study by Hendricks (1975), who, by comparing wage settlements between electric utilities in the US, found that wages were higher for utilities that expected the regulator to adjust prices following a new wage agreement.

The interaction between regulatory policies and wage setting in regulated industries does not seem to have received much attention in the theory of regulation. The standard approach has been to assume that, except for the firm's level of 'effort', the cost structure of a regulated firm is exogenous.[3] Based on this assumption, the analysis has focused on the trade off between providing incentives for cost-reducing efforts and rents captured by the privately informed firm.

[1] See Hendricks (1986) for a survey, with particular emphasis on studies of the effects of deregulation on wages.

[2] As one would expect, wage premiums in regulated industries differ between industries, as well as between firms within a given industry. In contrast to results from the trucking industry, Card (1996) found that relative earnings of airline workers declined by 10% after deregulation and concludes that 'taken as a whole, the evidence suggests that the rent premiums earned by airline workers in the regulatory era were relatively modest'.

[3] An exception is the literature studying the interaction between regulatory policy and firms' investment incentives, see e.g. Riordan and Sappington (1989), Dalen (1995), and Tirole (1986).

A fundamental insight from this literature is that by reducing the 'power' of the regulatory scheme, that is, by accepting a higher degree of cost pass-through, the regulator may reduce rents captured by the firm. This may no longer be true however, if wages are determined endogenously. In this case, the choice of regulatory scheme also influences the allocation of rents within firms, and the relationship between the power of the scheme and overall costs becomes more complicated.

In the next section, we present a straightforward extension of the Laffont and Tirole (1993) model to allow for endogenous wage determination. There are three players; a regulator, a manager and a worker. The manager is asked by the regulator to deliver a non-divisible good and receives a transfer depending on the overall cost performance of the firm. Output requires the input of labor, and costs are determined partly by the manager's level of effort and partly by the worker's wage. The wage, and possibly the effort level of the manager, is subject to negotiations between the manager and the worker.

We start our analysis in section 3, by focusing on how the regulatory contract affects the manager's ability to resist claims for high wages. We consider a game in which the regulator offers a contract to the manager who subsequently bargains with the worker over wage and managerial effort. It turns out that total firm rents is less sensitive to the power of the regulatory contract the stronger is the bargaining power of the worker. Consequently, the optimal contract yields stronger incentives when the manager lacks complete bargaining power than when he captures the entire firm rent. Compared to a case in which the wage level is fixed exogenously at the expected outcome of the wage bargaining process, social welfare is higher when wages are determined by bargaining at the firm level.

In section 4, we focus instead on how managerial incentives are affected by the fact that gains will have to be shared with the worker. We do this by considering a different a game in which managerial effort is determined before wage bargaining takes place. This introduces an additional distortion, as the manager's preferred effort level generally depends on relative bargaining strength; in particular, the manager's incentive to undertake costly efforts will be lower the stronger is the bargaining power of the worker. This effect turns out to have ambiguous implications for the power of the optimal regulatory contract.

Lastly, in section 5 we briefly discuss the possibility that the manager may act strategically in the bargaining process to influence regulatory policy. We show that when the marginal gain from managerial effort is positively related to the level of labor costs the manager does indeed have an incentive to accept high wage claims in order to induce the regulator to offer a high-powered contract and hence capture larger rents. Section 6 concludes.

2. Analytical framework

There are three players; a regulator, a manager, and a worker. The regulator offers the manager a contract to undertake a given task, which also requires the services of the worker. Total costs of production are given by

$$C = w + \beta - e, \tag{2.1}$$

where w is the worker's wage, β is an efficiency parameter, and e is the manager's level of effort. Neither the efficiency parameter nor effort undertaken by the manager are observable to the regulator, who regards β as a random variable, continuously distributed on the interval $[\underline{\beta}, \overline{\beta}]$. The manager is fully informed, while the worker may or may not observe β and e. The wage is determined by bargaining between the manager and the worker (we describe the details of the bargaining technology in the next section).

The worker's payoff is given by the wage w. The manager's payoff when undertaking the task depends partly on the net transfers t from the regulator and partly on his disutility of effort $\psi(e)$: $\pi = t - \psi(e)$. As is standard in the literature, we assume that $\psi(0) = 0$, that $\psi(e)$ is thrice continuously differentiable, and that $\psi'(e)$ is positive, increasing and convex. We limit attention to regulatory contracts that specify a linear relationship between costs of production and net transfers, that is, $t = a - bC$, so that the manager's utility may be written as

$$\pi = a - b\left[w + \beta - e\right] - \psi(e). \tag{2.2}$$

The objective function of the utilitarian regulator is assumed to be the sum of consumer surplus generated by the undertaking of the task S and the manager's and the worker's payoffs:

$$SW = S - [1 + \lambda]\,[t + C] + \pi + w, \tag{2.3}$$

where $1 + \lambda$ is the (general equilibrium) costs of public funds. Inserting for C from (2.1) and $t = \psi + \pi$ gives

$$SW = S - [1 + \lambda]\,[\beta - e + \psi(e)] - \lambda(\pi + w). \tag{2.4}$$

Although the regulator puts equal weights on consumers' surplus and the manager's and the worker's surplus, the regulator's objective function is decreasing in both π and w, because increasing transfers to the firm necessitates raising distorting taxes elsewhere in the economy.

A fully informed regulator would set transfers as low as possible without violating the participation constraints of the worker and the manager, that is, without reducing their pay-offs below their reservation values. At the full-information, first-best solution, the marginal disutility of effort equals the marginal cost savings of increased efforts; that is, $\psi'(e) = 1$.

The model has a number of distinguishing features which warrants comment. Firstly, in order to simplify the analysis we disregard moral hazard problems within the firm. In principle, one would want to allow for asymmetric information between the worker and the manager as well to take into account how the negotiated wage contract may affect worker incentives. Multi-level, principal-agent models are designed to address such issues, see e.g. Baron and Besanko (1992) and Melumand et al (1995). However, although such an extension may be useful, we do not believe it would alter significantly the insights derived from our simplified set up.

Secondly, while we assume that the regulator is able to commit fully to any regulatory policy of his own choice, we allow for the possibility that the manager is unable to make take-it-or-leave-it offers to the worker. This is again in contrast to the approach taken in the multi-level, principal-agent literature where it is generally assumed that at each level the superior is able to commit to any contract with subordinates. Ideally, one would want to allow for more general bargaining procedures at all levels of the hierarchy. However, due to the fundamental difficulties in designing realistic and tractable models of bargaining under asymmetric information, the mechanism design literature has traditionally resorted to highly simplifying assumptions about the distribution of bargaining power between the involved parties.[4] We consider our model as a first step towards a more realistic modelling of contract settlement in multi-level hierarchies. Admittedly, our set up introduces a certain asymmetry between the regulator-manager and the manager-worker relationships. On the other hand, in certain settings such an asymmetry might well be reasonable; if, for example, the regulator is facing a number of different firms reputational effects may provide commitment power.

Thirdly, we restrict attention to the case in which the regulator contracts with the manager of the firm only and not with the workers directly. Furthermore, we assume that the regulatory contracts are not conditioned on the worker's wage. It is a matter of fact that the jurisdiction of regulators typically do not include the right to contract with workers or set standards for wages and working conditions, and it is beyond the scope of this paper to consider why this is so.[5] By restricting the set of regulatory contracts, we are able to compare the performance of such

[4] Even under such assumptions, narrowing the range of reasonable outcomes may be problematic due to multiplicity of equilibria, see eg von der Fehr and Kühn (1995).

[5] See Tirole (1994) for a discussion of the optimal organisation of government and reasons for introducing multiple government agencies with limited jurisdiction. Laffont and Martimort (1995) demonstrate that in order to avoid collusion and side-contracting between agents, delegating incentive contracts may be optimal if communication between the upper and lower levels of a hierarchy is not limitless.

contracts with optimal regulation, which, in our simplified set up involves fixing the wage level at the worker's reservation wage. In a more general setting, however, allowing for regulatory contracts that condition on wage settlements would not necessarily imply that the regulator preset wages entirely; if, for example, the worker's reservation wage is observed only imperfectly by the regulator an optimal regulatory contract may well leave scope for wage premiums.

3. Affecting incentives to resist wage claims

Intuitively, it seems obvious that the regulatory contract may affect the incentives, and indeed the ability, of the management of regulated firms to resist wage claims. In particular, one might expect that an optimal regulatory contract will provide stronger incentives for cost efficiency (that is, allows less cost pass-through) when worker's are in a strong bargaining position. In this section we present a set up designed to illustrate this intuition. In particular, we consider the following game: The government first offers the manager a contract. If the contract is rejected, the game ends, and both the worker and the manager obtain their reservation utilities. If, on the other hand, the contract is accepted, the worker and the manager bargain over the worker's wage and managerial effort (alternatively, as we discuss in more detail in the next section, the manager decides upon effort after the wage is set).

In order to characterize the optimal regulatory contract, we proceed as follows: First we solve the bargaining game for a given contract $\{a, b\}$ and calculate the expected cost and the expected transfer from the regulator to the manager. Then we derive the optimal regulatory scheme as the contract that maximizes expected social surplus.

3.1. The Bargaining Game

In this section, we assume that the manager and the worker are symmetrically informed (we return to this assumption in later sections). Consequently, after the manager has accepted the regulatory contract, he bargains with the worker over effort and wage, both parties taking into account how the outcome of the bargaining game affects costs and hence the transfer from the regulator. For simplicity we assume that the outcome of the bargaining game is given by the Nash sharing rule. Furthermore, we apply the common assumption in the labor market literature that the relevant disagreement point is given by the agents' outside options, see for instance Pissarides (1990). We denote the worker's disagreement point by w^r, while we normalize the firm's disagreement point to zero. The Nash product is then

$$N = [w - w^r]^{\delta} \pi^{1-\delta} = [w - w^r]^{\delta} \{a - b[\beta - e + w] - \psi(e)\}^{1-\delta} \qquad (3.1)$$

where δ denotes the 'bargaining power' of the worker. The Nash solution is given by the values of e and w that maximizes the Nash product. First-order conditions for maximum may be written

$$\frac{1-\delta}{\delta} b[w - w^r] = a - b[w + \beta - e] - \psi(e), \text{ and} \qquad (3.2)$$

$$\psi'(e) = b. \qquad (3.3)$$

The right-hand side of (3.2) shows the manager's rent, which is equal to $[1-\delta]\, b/\delta$ times the wage premium $w - w^r$. Consequently, the share of the rent that is allocated to the worker is larger the smaller is b (the more incentive-powered is the contract) and the higher is δ, the worker's bargaining power. In particular, if b is small, a large part of any wage increase is compensated for by an increase in the transfers from the regulator. It is easy to see that the agreed wage rate is decreasing in b.

Equation (3.3) defines the optimal value of managerial effort e as an increasing and concave function of b; that is, $e^* = e(b)$, $e' > 0$, $e'' < 0$ (since ψ' is convex). Note that e^* is independent of β (this is not a general result, but follows from our linear specification of the cost function). It also follows from equation (3.2) that w is increasing in a as well; the more there is to bargain over, the higher is the wage. The same holds for a decrease in the cost parameter β. Our findings so far can thus be summarized in the following lemma:

Lemma 1. *The wage agreement is given by* $w^* = w(a, b, \beta, \delta, w^r)$, *where* $\frac{\partial w}{\partial a} > 0$, $\frac{\partial w}{\partial b} < 0$, $\frac{\partial w}{\partial \beta} < 0$, $\frac{\partial w}{\partial \delta} > 0$ *and* $\frac{\partial w}{\partial w^r} > 0$.

3.2. The optimal regulatory contract

We are now able to characterize the optimal policy of a regulator with perfect foresight who is informed about the bargaining technology. Since managerial rent is costly to the regulator, the contract will leave no net payoff to the least efficient managerial type. Since the right-hand side in (3.2) shows the managerial rent, it follows that the optimal contract yields $w = w^r$ at $\beta = \overline{\beta}$ (as long as $b^* > 0$). For any given value of b, the optimal value of the constant term a is given by

$$a = b\left[\overline{\beta} - e^* + w^r\right] + \psi(e^*). \qquad (3.4)$$

Inserting (3.4) into (3.2) gives

$$w - w^r = \delta\left[\overline{\beta} - \beta\right]. \qquad (3.5)$$

That is, as long as the regulator makes sure that the worker and the manager of the most inefficient type produce with binding participation constraints, the wage level becomes independent of the power of the incentive scheme. To understand this result, note that an increase in b (which increases the incentive to undertake effort) has two opposite effects on the payoff of the worker. On the one hand, an increase in b increases the total rent that is allocated to the firm. Since the rent is shared between the worker and the manager, this effect tends to increase the wage. On the other hand, an increase in b reduces the responsiveness of transfers to changes in wages, making wage increases more costly to the manager and thereby reducing the workers' bargaining position. With our parametrization of the model, it turns out that the two effects exactly offset each other.

Combining (2.2) and (3.2) gives $\pi = [w - w^r][1 - \delta]/\delta$. Inserting for w from (3.5) then gives us

$$\pi = b[1-\delta]\left[\overline{\beta} - \beta\right]. \tag{3.6}$$

Consequently, the manager's payoff is higher the more productive is the firm (ie, the lower is β) and the higher is the power of the incentive scheme (b) and the bargaining power of the manager ($1 - \delta$).

The combined rent obtained by the manager and the worker equals

$$\pi + w = \{b[1-\delta] + \delta\}\left[\overline{\beta} - \beta\right] + w^r \tag{3.7}$$

The social planner sets b so as to maximize expected social welfare. Substituting (3.7) into (2.4) and taking expectations with respect to β, we find that the planner's problem is to maximize

$$E\,SW = S - [1+\lambda][E\beta - e + \psi(e)] - \lambda\{b[1-\delta] + \delta\}\left[\overline{\beta} - E\beta\right] - \lambda w^r, \tag{3.8}$$

where $e = e(b)$ is given implicitly by (3.2). By taking derivatives and recalling that $\psi'(e) = b$ we find that the first-order condition for the regulator's problem is

$$[1-b]\,e'(b) = \frac{\lambda}{1+\lambda}[1-\delta]\left[\overline{\beta} - E\beta\right]. \tag{3.9}$$

Since, by assumption, $\psi'''(e) \geq 0$, we have that $e''(b) \leq 0$. It follows that the left-hand side of (3.9) is decreasing in b. Consequently, since the right-hand side is independent of b, the solution is unique. Furthermore, a higher value of the right-hand side implies a lower value of b.

In the case of symmetric information ($\overline{\beta} = \underline{\beta} = E\beta$), the optimal contract makes the manager a residual claimant to the profit of the firm ($b = 1$). Under asymmetric information, however, the regulator trades of efficiency against information rents and offers a less high-powered incentive contract, since this reduces socially costly rents captured by efficient types. Note that when $\delta = 1$, the optimal contract is to set $b = 1$. In this case, the rent to the manager is always zero. Since the wage is independent of b, there is no trade-off between efficiency and rent in this case, and the firm (in effect, the worker) is residual claimant.

We want to compare this regulatory contract with the optimal scheme in the case in which wages are set independently of the regulatory contract (say, by wage bargaining at the industry, or economy, level) and thus regarded as exogenous by the regulator. Denote this exogenous wage by $\bar{w}$. It is then easy to show that this is a special case of our model obtained in the limit when $\delta \to 0$, and with $\bar{w}$ substituted in for the worker's outside option.[6] By inserting $\delta = 0$ into (3.6) we find that the manager's payoff is given by

$$\pi^E = b\left[\overline{\beta} - \beta\right]. \tag{3.10}$$

Comparing (3.10) and (3.6), we find that the manager's information rent is larger when wages are exogenous than when they are determined by bargaining at the firm level. On the other hand, this rent is less than the combined rent obtained by the manager and the worker when they are allowed to bargain over wages; in particular, comparing (3.7) and (3.10), we have $\pi + w - w^r > \pi^E$ when $\delta > 0$ and $b < 1$. This implies that cost differences between firms will tend to be smaller when wages are endogenous. With exogenous wages, any cost difference between firms can be traced back to differences in efficiency (β). When wages are endogenous, however, efficiency differences are partially mitigated by the fact that more efficient types pays higher wages.

While the overall information rent to the firm is larger in the case with endogenous wages, the marginal effect on rents by an increase in b is nevertheless smaller. In the case of an endogenous wage, the increase in rents from a marginal increase in the slope b is $[1-\delta]\left[\overline{\beta} - \beta\right]$. With an exogenous wage, however, the corresponding increase in rents amounts to $\overline{\beta} - \beta$. Consequently, we would expect the optimal contract to involve a smaller b when wages are exogenously set than when they depend on the regulatory contract. Inserting $w^r = \overline{w}$ and $\delta = 0$ into the welfare function (3.8), it follows that the planner with exogenous wages chooses b so as to maximize

$$E\,SW^E = S - [1+\lambda]\left[E\beta - e + \psi(e)\right] - \lambda\overline{w} - \lambda b\left[\overline{\beta} - E\beta\right]. \tag{3.11}$$

The first-order condition for maximum is given by

[6]If the wage is determined outside the firm, for instance by bargaining at the industry level, this wage will typically differ from the relevant outside option for the worker in the case that wages are determined by in-firm bargaining.To emphasise this, we use different symbols for the exogeneous wage rate $\bar{w}$ and the outside option w^r

$$[1-b]\, e'(b) = \frac{\lambda}{1+\lambda}\left[\overline{\beta} - E\beta\right]. \tag{3.12}$$

Consequently, we have the following result:

Proposition 1. *Compared to the optimal regulatory contract with fixed wages, the optimal regulatory contract with wages determined by bargaining at the firm level yields stronger incentives for efficiency (ie, a higher b).*

Both with exogenous and with endogenous wages the regulator faces a trade-off between incentives and rent extraction. A high-powered incentive scheme leads to high effort and a low degree of rent extraction, and the optimal scheme is the one where the two effects are balanced at the margin. However, when the wage level is endogenous, the b parameter also affects wage settlement. In particular, a higher b makes it more costly for the manager to accept wage claims and hence reduces the worker's bargaining position. Consequently, when wages are determined by bargaining at the firm level, the rent extraction effect of lowering incentives becomes weaker. Indeed, since wages are in fact independent of b, the regulator can extract rent from the manager only. As the manager gets merely a share of the total rent, it follows that rent extraction is less important than when the wage level is exogenous. Therefore, the regulator should put relatively less weight on rent extraction and correspondingly more weight on effort.

3.3. Centralized versus decentralized bargaining

Firm-specific wage bargaining leads to wage flexibility, in the sense that wages adjust according to the productivity of the firm. A natural question to consider is therefore whether such wage flexibility may in fact be welfare improving. The answer to this question obviously depends on how wages would alternatively be determined. If the regulator can himself set the wage level he will do better than if he has to rely on the outcome of a bargaining process. However, and as argued in the introduction, this is typically not an option.

Here we instead assume that the alternative wage determination process yields a constant wage equal to the *ex ante* expected negotiated wage derived above. To simplify the expressions we assume hereafter that the outside option $w^r = 0$, and thus compare the outcome of the model with endogenous and exogenous wages with the exogenous wage level fixed at

$$\overline{w} = \delta\left[\overline{\beta} - E\,\beta\right] \tag{3.13}$$

In this case, the average wage bill is the same with and without wage bargaining, and we can therefore analyze whether wage flexibility per se increases or decreases welfare. In particular, leaving aside the question of whether centralized bargaining may on average lead to different wage levels than decentralized bargaining, this allows us to shed some light on the desirability of having wage bargaining occur at the industry, or economy, level rather than at the firm level.

Since, for a given b, the manager's effort is the same with exogenous and with endogenous wages, the comparison is relatively straightforward. For any given b, let the constant term a be set optimally, so that the expected social welfare with bargaining ($SW(b)$) and with fixed wages ($SW^E(b)$) are given by (3.8) and (3.11), respectively. We then have

$$SW(b) - SW^E(b) = \lambda b\delta \left[\overline{\beta} - E\beta\right] > 0. \tag{3.14}$$

Since this holds for all b, we must also have $max_b SW(b) > max_b SW^f(b)$. Consequently, we have the following result:

Proposition 2. *As long as wages are the same in expected terms, social welfare is higher when wages are determined by bargaining at the firm level than when they are set independently of the regulatory regime and the efficiency of the firm.*

If the regulator can choose, therefore, he may want to allow the manager and the worker of each firm to bargain over wages, at least as long as such bargaining does not result in a general increase in labor costs. This raises the question of whether in fact such an opportunity would be welcomed by the parties involved. Obviously, workers in high-productivity firms (with low β's) will prefer the opportunity of bargaining, while workers in low productivity firms would prefer a fixed wage (and vice versa for the managers). Nevertheless, it may still be the case that in expected terms the worker and the manager are better off with wage bargaining than with a fixed wage.

Under the assumption that in expected terms the wage is the same, the worker is obviously indifferent between the two wage-setting regimes. For the manager, on the other hand, the opportunity to bargain at the firm level introduces two opposing effects. On the one hand, for a given contract b, the manager loses from the having to share part of the overall information rent with the worker. On the other, since in the case of firm-level bargaining the regulator offers a more high-powered incentive scheme, the overall rent over which the manager and the worker bargain becomes larger.

Denote the optimal contracts when wages are endogenous and exogenous by, respectively, $\left\{a^B, b^B\right\}$ and $\left\{a^E, b^E\right\}$ (B stands for 'bargaining' and E for 'exogenous'). Correspondingly, the manager's expected rent in the two cases are $\pi^B = b^B [1-\delta] \left[\overline{\beta} - E\beta\right]$ and $\pi^E = b^E \left[\overline{\beta} - E\beta\right]$, respectively. The manager, therefore, prefers local bargaining if and only if $b^B [1-\delta] \geq b^E$.

The relationship between b^B and b^E may be explored by comparing (3.9) and (3.12):

$$\left[1 - b^B\right] e'(b^B) = [1 - \delta] \left[1 - b^E\right] e'(b^E). \tag{3.15}$$

It is in general not possible to characterize precisely the relationship between b^B and b^E, since this depends on the shape of the function $e(b)$, which from the first-order condition $\psi'(e) = b$, is determined by the shape of $\psi'(e)$. However, in the particular case in which $\psi''' = 0$, implying that the relationship between effort and the incentive contract is linear, we are able to obtain clear results. We may then eliminate $e'(b)$ from both sides of (3.15), and use the resulting expression to find the critical value for b^E (or b^B) for which the manager prefers firm-level bargaining. We formulate the result in the following proposition:

Proposition 3. *Assume $\psi''' = 0$ (implying that $e'(b)$ is a constant). Then the manager's expected payoff is larger in the case in which wages are endogenously determined by bargaining at the firm level than in the case in which wages are exogenously fixed at $\overline{w} = \delta\left[\overline{\beta} - E\,\beta\right]$, that is, $\pi^B > \pi^E$, if and only if*

$$b^E < \frac{1-\delta}{2-\delta} \quad (\textit{or } \; b^B < \frac{1}{2-\delta}) \tag{3.16}$$

Consequently, the manager prefers wage flexibility only if the regulatory contract is sufficiently low-powered, in which case rents are small. Note that since the critical value is decreasing in δ, *ceteris paribus* the manager is less likely to prefer bargaining at the firm level when worker's have considerable bargaining power. The critical value for b^E reaches its maximum value $\frac{1}{2}$ when $\delta = 0$ and its minimum value 0 when $\delta = 1$. In the case in which bargaining power is equally distributed between the two parties (that is, $\delta = \frac{1}{2}$), the critical value equals 1/3.

4. Managerial incentives in a bargaining environment

In the previous section, we assumed that the effort level was determined jointly with wages in the bargaining game between the manager and the worker. Such an assumption may not be entirely unreasonable if e consists of those aspects of the operation of the firm over which the manager has preferences, including the organization of production, administrative structure and managerial expenses. e then measures the extent to which these aspects differ from the manager's most-preferred mode of operation. That the operation of the firm may be the subject of negotiations with workers (or their representatives) is particularly likely if the workers themselves have preferences over these matters (to account for this, w should be interpreted as including costs of improving working conditions).

In some cases it may nevertheless be more plausible to assume that decisions over which the manager has preferences are within his or her own discretion. This would, for example, be in line with the 'right to manage' assumption often made in the labour market literature (Layard et al, 1991). The question then becomes whether in such a setting managerial incentives and decisions may depend upon how wages are set, and, in particular, on the extent to which worker's have bargaining power in wage negotiations. An optimal regulatory schemes must take into account how managerial incentives to undertake effort are affected by the fact that others share in the additional rent created.

It turns out that assuming managerial discretion over effort decisions does not change the results obtained in the previous section, as long as the manager's effort level is decided upon *after* the wage is determined.[7] To see this, suppose w is the negotiated wage. Then the manager chooses e so as to maximize $\pi = a - b\left[w + \beta - e\right] - \psi(e)$, and hence e is determined by the first-order condition $\psi'(e) = b$. This is the same condition as (3.3). When bargaining over wages, this effort level is anticipated by the agents, and the wage is determined by equation (3.2) as before. Therefore, for any given contract the effort level and the wage level is the same as when agents bargain over effort, and it follows that the optimal contract is unaltered as well. The reason for this equivalence result is that when wage is set before the manager exerts effort, the manager in effect becomes a residual claimant to the information rent. Consequently, from the point of view of the worker and the manager, and given the regulatory contract, the manager chooses e efficiently, just as e is set optimally in the Nash bargaining solution. Note that this result is independent of the assumed linearity of costs.

4.1. Rent sharing and managerial incentives

Given the above result, we now turn to a model in which the manager has to exert effort *before* wage negotiations take place, foreseeing how the resulting gains will have to be shared with the worker. In particular, we consider the following move structure: First the regulator offers a contract to the manager. If the manager accepts, he has to decide how much effort to undertake. Then the wage is determined by the Nash solution to a wage bargaining game.

It is assumed that once the bargaining game takes place costs of effort are sunk, and furthermore, that the manager's outside option is independent of the

[7] The same holds true in our set up if effort is determined before the wage is set, as long as the disutility of effort is felt only after wage negotiations are successfully completed. Then the wage is determined by the same condition as in the previous section. It can furthermore be shown that the first-order condition for the manager's choice of effort reduces to $\psi^{'}(e) = b$. Note that this result does not carry over to models with more general cost functions.

effort level. Consequently, the manager's disutility of effort does not enter the Nash maximand, which now reads (with $w^r = 0$)

$$N = w^{\delta} \{a - b[w + \beta - e]\}^{1-\delta}. \tag{4.1}$$

The first-order condition for the Nash solution becomes

$$\frac{1-\delta}{\delta} bw = a - b[w + \beta - e], \tag{4.2}$$

which yields

$$w = \delta \left[\frac{a}{b} - \beta + e \right]. \tag{4.3}$$

In the second stage, the manager maximizes $a - b[w + \beta - e] - \psi(e)$, where w is given by (4.3). The first-order condition for this problem becomes

$$\psi'(e) = [1 - \delta] b \tag{4.4}$$

Comparing (4.4) with (3.3), we obtain the following result:

Lemma 2. *For a given regulatory contract, and as long as the worker has any bargaining power (ie, $\delta > 0$), the level of effort exerted by the manager is lower in the case in which effort is set before wage bargaining takes place than when it is determined either in or after the bargaining process.*

This result reflects the 'hold-up' character of the game; the manager carries the full share of the costs of effort while the worker obtains a strictly positive share of the return. Consequently, the manager has less incentive to exert effort in this case than in the model analyzed above. This introduces two new effects that the regulator will have to consider when constructing an optimal contract. On the one hand, since less cost-reducing effort is undertaken, it becomes more important to provide incentives for effort. On the other hand, the marginal effect of increasing the power of the incentive scheme is smaller.

We derive the optimal contract by a similar procedure as in the previous section. For any given b, the optimal value of a must be such that $\pi = 0$ at $\beta = \overline{\beta}$, or $a - b\left[w + \overline{\beta} - e\right] = \psi(e) > 0$. From (4.1) we see that since the costs of effort are sunk, and even the least productive type must be compensated for this cost $\overline{\beta}$, it follows that the worker and the manager always bargain over a positive value. Consequently, the wage is always strictly positive.

Inserting w from (4.3) into the expression for π in (2.2) gives $\pi = [1 - \delta] a - b[1 - \delta][\beta - e] - \psi(e)$, and we may solve the condition $\pi(\overline{\beta}) = 0$ to find that the optimal a is given by

$$a = b\left[\overline{\beta} - e\right] + \frac{\psi(e)}{1-\delta}. \tag{4.5}$$

Inserting (4.5) in the expressions for the profit π, the wage rate (equation 4.3)), and summing the two give the equations

$$\begin{aligned} \pi &= b\left[1-\delta\right]\left[\overline{\beta} - \beta\right], & (4.6)\\ w &= \delta\left[\overline{\beta} - \beta\right] + \frac{\delta}{1-\delta}\frac{\psi(e)}{b}, & (4.7)\\ \pi + w &= \left\{b\left[1-\delta\right] + \delta\right\}\left[\overline{\beta} - \beta\right] + \frac{\delta}{1-\delta}\frac{\psi(e)}{b}. & (4.8) \end{aligned}$$

Consequently, for a given b, the manager's rent is the same as in the previous model, while the wage is always strictly greater than zero. Note that, unlike in the model of the previous section, in which the equilibrium wage was independent of b, here the wage level typically depends on the power of the regulatory contract.

The expected social welfare function (from equation 2.4) becomes

$$\begin{aligned} E\,SW &= S - \left[1+\lambda\right]\left[E\beta - e + \psi(e)\right] & (4.9)\\ &\quad -\lambda\left\{\left\{b\left[1-\delta\right]+\delta\right\}\left[\overline{\beta} - E\beta\right] + \frac{\delta\psi(e)}{\left[1-\delta\right]b}\right\} \end{aligned}$$

where $e = e(b)$ is given implicitly by (4.4). Comparing this with expression (3.8), we find that there is a new term, reflecting that the worker in this model always obtains positive rents. Furthermore, the relationship between effort and the power of the regulatory contract differs. Both the higher wage and the lower effort tend to reduce social welfare. Therefore, for any given value of b, social welfare is lower in this model than in the model considered in the previous section. Since this is true for all b, we have the following result:

Proposition 4. *Social welfare is lower in the case in which effort is set before bargaining between the manager and the worker takes place than when it is determined either during or after the bargaining process.*

The first-order condition for the regulator's maximization problem is given by

$$\left[1+\lambda\right]\left[1-\psi'\right]e'(b) - \lambda\left[1-\delta\right]\left[\bar{\beta} - E\beta\right] - \lambda\frac{\delta}{1-\delta}\left[\frac{\psi' e'(b)}{b} - \frac{\psi}{b^2}\right] = 0 \tag{4.10}$$

We want to compare the optimal value of b and the corresponding value of e, which we refer to as b^M and e^M, with b^B, e^B (from the case in which effort is determined by bargaining) and b^E, e^E (from the case in which wage is exogenous) derived above. One can show the following (for $\delta > 0$ and evaluated at (b^M, e^M)):[8]

$$e^M \lesseqgtr e^E \Longleftrightarrow 1 - \frac{\psi''}{\psi'}\frac{\psi}{\psi'} \gtrless 0 \tag{4.11}$$

$$b^M \lesseqgtr b^E \Longleftrightarrow \frac{\lambda}{1+\lambda}\left[1 - \frac{\psi''}{\psi'}\frac{\psi}{\psi'}\right] - b \gtrless 0 \tag{4.12}$$

$$e^M \lesseqgtr e^B \Longleftrightarrow \overline{\beta} - E\beta + \frac{1}{\psi''}\left[1 - \frac{\psi''}{\psi'}\frac{\psi}{\psi'}\right] \gtrless 0 \tag{4.13}$$

$$b^M \lesseqgtr b^B \Longleftrightarrow \frac{\lambda}{1+\lambda}\left\{\overline{\beta} - E\beta + \frac{1}{\psi''}\left[1 - \frac{\psi''}{\psi'}\frac{\psi}{\psi'}\right]\right\} - \frac{b}{\psi''} \gtrless 0 \tag{4.14}$$

It would appear that, depending on the parameters of the model, managerial effort, as well as the power of the regulatory contract, may be both lower than in the case in which wages are exogenous (ie, are not determined by bargaining at the firm level) and higher than in the case in which managerial effort is determined by bargaining with the worker (or set after wage bargaining takes place). In particular, compared with the outcome in the model considered in the previous section, in this case we may well have a more high-powered incentive contract (ie, $b^M > b^B$) and at the same time a lower level of managerial effort (ie, $e^M < e^B$). This happens when the disutility of effort is quaderatic and the worker has strong bargaining power:

Proposition 5. *Assume $\psi(e) = Ae^2$. Then $e^M < e^B$. Furthermore, $b^M > b^B$ for δ sufficiently close to 1.*

Proof. We get

[8] These results are derived as follows: Using (4.4) (ie, $\psi' = [1-\delta]\, b$, which implies $e'(b) = [1-\delta]/\psi''$), we can re-write the first-order condition (4.10) to

$$[1-\psi']\,\frac{1}{\psi''} = \frac{\lambda}{1+\lambda}\left\{\overline{\beta} - E\beta + \frac{\delta}{\psi''}\left[1 - \frac{\psi''}{\psi'}\frac{\psi}{\psi'}\right]\right\}.$$

The left-hand side is decreasing in e. Consequently, if we compare with the first-order conditions (3.9) and (3.12) (with b^k substituted out with $\psi'(e^k), k = B, E$), we obtain (4.13) and (4.11). In order to compare the incentive power of the contracts, we substitute $\psi' = [1-\delta]\, b$ back into equation (4.10) and get

$$[1-b]\,\frac{1}{\psi''} = \frac{\lambda}{1+\lambda}\left\{\overline{\beta} - E\beta + \frac{\delta}{\psi''}\left[1 - \frac{\psi''}{\psi'}\frac{\psi}{\psi'}\right]\right\} - \delta\frac{b}{\psi''}.$$

Noting that the left-hand side is decreasing in b, again we compare this first-order condition with the first-order conditions in (3.12) and (3.9) to obtain (4.12) and (4.14).

$$1 - \frac{\psi''}{\psi'}\frac{\psi}{\psi'} = \frac{1}{2}, \tag{4.15}$$

which, from (4.13), implies $e^M < e^B$. Furthermore, the left-hand side of (4.14) reduces to

$$\frac{\lambda}{1+\lambda}\left\{\overline{\beta} - E\beta + \frac{1}{4A}\right\} - \frac{1}{2A\left[1-\delta\right]}\left\{1 - \frac{2A\lambda}{1+\lambda}\left[\overline{\beta} - E\beta + \frac{\delta}{4A}\right]\right\}. \tag{4.16}$$

Using (4.4) and (4.10) we find:

$$e^M = \left[1-\delta\right] b^M = 1 - \frac{2A\lambda}{1+\lambda}\left[\overline{\beta} - E\beta + \frac{\delta}{4A}\right]. \tag{4.17}$$

Therefore, so long as parameters are such that problems are well defined (in particular, the left-hand side of (4.17) is strictly positive), (4.16) becomes negative for δ sufficiently close to 1. ■

5. Strategic wage setting

So far we have considered cases in which the regulator offers contracts before the wage level is determined, in effect assuming that the regulator can commit to a regulatory scheme which is independent of the outcome of the bargaining process, and that he will not respond to new wage agreements. In some circumstances such an assumption is unreasonable. As pointed out above, it is usually not within the jurisdiction of regulators to control wages directly. Furthermore, they often lack the power or are unwilling to enter into long-term contracts. A government usually have limited ability to bind future governments. And even if such commitments were possible the risk of regulatory failure or incompetence, and the necessity of allowing policies to be adjusted in the light of new information or unforeseen contingencies, may imply that they are unacceptable.

If the regulator lacks sufficient commitment power there may be room for strategically using the wage setting to influence the regulatory scheme (cf the finding of Hendricks (1975) that wages were higher for utilities that expected the regulator to adjust prices following a new wage agreement). In particular, if the manager realizes that the incentive contract he is offered, and hence his information rent, depends on the outcome of the wage bargaining his strategy in the bargaining game will be correspondingly affected.

A fully satisfactory model of how wage bargaining may be used to influence regulatory schemes would require an explicitly dynamic framework. Our aim is not so wide here, and instead we briefly consider how our static set up may be used to throw light upon the issue. In particular, we consider a simple game in which the manager and the worker bargain over wages before the regulatory contract is offered.

First consider the model described above, and suppose wages are set prior to the contract in a bargaining game between the worker and the manager. Denote this wage by w^s. We assume that neither the worker nor the firm know the value of the efficiency parameter β at the time when they decide on wages, so that their wage setting behavior does not signal any information about costs. At the time when the regulator designs the contract the wage is given and consequently the optimal contract will be the same as in the model with exogenous wages, with $\bar{w}$ set equal to w^s. The profit of the firm and the optimal value of b will be given by (3.12), independently of w^s. It follows that the manager is indifferent with respect to the wage level.

Suppose there is an upper bound $\hat{w}$ on wages that the regulator accepts, and that he refuses to give a contract to any firm with a wage above this level. It is easy to see that the equilibrium wage in the bargaining game between the worker and the firm is $\hat{w}$: Assume the equilibrium wage w^s was below $\hat{w}$. Then an increase in the wage up to $\hat{w}$ results in a Pareto improvement for the agents involved in the wage bargaining, as it makes the firm just as well off and the worker better off. Since the Nash solution is Pareto efficient w^s can not be the Nash solution - a contradiction. We have thus shown the following proposition:

Proposition 6. *Assume wages are determined by Nash bargaining before the contract is in place. Assume also that there is an upper bound $\hat{w}$ on the wages that the regulator accepts. Then the equilibrium wage is equal to $\hat{w}$.*

The reason why in this model the manager is indifferent with respect to the level of wages is that he in effect send on to the regulator any increase in wage costs. However, the possibility of committing to a wage level prior to the design of the regulatory contract may have other strategic effects also, which the assumed (linear) cost structure is not rich enough to capture. For instance, the wage level may affect the amount of information rent that can be enjoyed by efficient types (for any given contract). The level of wages may also affect the regulator's choice of contract. As a high-powered incentive scheme leaves more rent to the manager, he may want to use wages strategically to obtain such a high-powered contract. In the rest of this section we illustrate these possibilities by means of some examples.

5.1. Direct effects of wages on rents

With a linear cost function, there is no relationship between wages and managerial rent for any given contract. In this sense the linear cost structure is rather special;

it implies that neither (exogenous) productivity differences nor managerial effort affect labour costs. Assume instead that the cost function is given as $C = w\beta - e$. Then cost differences between high-and low productivity firms are increasing with wages. An interpretation of this cost structure is that the efficiency parameter reflects differences in capital (or technology) and that labour and capital are alternative factors of production; in particular, if we let $w\beta$ reflect wage costs β can be interpreted as the number of workers needed in production for a firm of type β.[9]

For a contract (a, b), the rent to the manager is given by

$$\pi = a - b\left[w\beta - e\right] - \psi(e) \tag{5.1}$$

and the optimal choice of effort is $\psi'(e) = b$, independently of w. Since the regulator leaves no rent to the least efficient type, ie, $\pi = 0$ at $\beta = \bar{\beta}$, we find $a = b\left[w\bar{\beta} - e\right] + \psi(e)$. Inserting this value of a into the expression for π gives $\pi = bw\left[\bar{\beta} - \beta\right]$. Consequently, for any $\beta < \bar{\beta}$, and for a given contract (b), managerial payoff is increasing in w. This is the direct effect of wages on managerial rent.

Now, since the managerial information rent is increasing with the wage level a high wage makes it more costly for the regulator to induce a high level of effort. Therefore, the optimal contract will imply a lower b. Formally, assuming that worker payoff is given by the total wage bill, $w\beta$ (which measures worker rent over and above alternative wages), and inserting the expressions for π and C, we may express the regulator's objective function as follows:

$$E\,SW = S - [1+\lambda]\left[e - \psi(e)\right] - \lambda w\left\{E\,\beta + b\left[\bar{\beta} - E\,\beta\right]\right\}, \tag{5.2}$$

with e given implicitly by the condition $\psi'(e) = b$. The first order condition for welfare maximum is then

$$[1-b]\,e'(b) = \frac{\lambda}{1+\lambda} w\left[\bar{\beta} - E\beta\right]. \tag{5.3}$$

Since the left-hand side is decreasing in b, it follows that b is decreasing in w. Consequently, the higher is the wage the weaker are the incentives provided to the manager. The effect of an increase in the wage therefore has two opposite effects on managerial rent, and whether or not the manager has incentives to restrain worker wage claims is ambiguous and depends on parameter values.

Consider again the example in which $\psi''' = 0$, so that $z = \psi'' =$ constant. Then $e'(b) = 1/z$. From (5.3) we find

[9] Note that we are now in fact leaving the prevailing assumption so far, that the number of workers is given. With an endogenously determined labour force, it is no longer obvious how to model worker preferences. Below we will assume that workers aim for a maximum total wage bill.

$$\frac{db}{dw} = -z\frac{\lambda\left[\overline{\beta} - E\beta\right]}{1+\lambda} = -\frac{1-b}{w} \tag{5.4}$$

Now since $d\pi/dw = [b + wdb/dw]\left[\overline{\beta} - E\beta\right]$, using (5.4) we find

$$\frac{d\pi}{dw} = [2b-1]\left[\overline{\beta} - E\beta\right] \tag{5.5}$$

Using (5.5) and (5.3), we can show the following lemma:

Lemma 3. *Assume $C = w\beta - e$ and $\psi''' = 0$. Then managerial rent is increasing in the wage w if and only if $w \leq w'$, where w' is given by*

$$w' = \frac{1+\lambda}{2\lambda}\left[\overline{\beta} - E\beta\right]^{-1}. \tag{5.6}$$

Consequently, with a quadratic disutility of effort the manager may well prefer high wages, at least up to a certain point. It follows that in this case also the wage level may be set at $\hat{w}$ - the highest wage level accepted by the regulator - at least as long as $\widehat{w} \leq w'$.

5.2. Direct effect of wages on effort level

Consider next the cost function $C = \beta + w[1-e]$. We may interpret this as describing a technology in which labour and *managerial* effort are alternative factors of production. In this example, we will from the outset restrict attention to the case in which cost of effort is quadratic (ie, $\psi''' = 0$). We also assume that $e < 1$ for all relevant parameter values (which implies that some labour will always be required). Then, for a given contract (a, b), managerial rent is given by

$$\pi = a - b\left\{\beta + w[1-e]\right\} - \psi(e), \tag{5.7}$$

and the optimal choice of effort is determined by the condition $\psi'(e) = bw$. Note that, the higher is the wage w, the higher is managerial effort, which is reasonable as long as labour and managerial effort are alternative factors of production. The regulator leaves no rent to the least efficient type, hence $\pi = 0$ at $\beta = \bar{\beta}$, and consequently

$$a = b\left\{\bar{\beta} - w[1-e]\right\} + \psi(e), \tag{5.8}$$

where $e = e(b)$ is the manager's choice of effort. Inserting a from (5.8) into the expression for π gives $\pi = b\left[\bar{\beta} - \beta\right]$, as before. Therefore, for a given incentive contract managerial rent is independent of the wage.

Higher effort means less use of labour, and it is therefore natural to interpret $w[1-e]$ as the total wage bill. As in the previous section we assume that worker payoff is given by the wage bill (the rent over and above opportunity wages), so that, inserting $w[1-e]$ and the expression for π, we can express expected social surplus as

$$E\,SW = S - [1+\lambda]\,[E\,\beta + \psi(e)] - \lambda\left\{w\,[1-e] + b\left[\bar{\beta} - E\,\beta\right]\right\}, \tag{5.9}$$

where e is given by the condition $\psi'(e) = bw$. The first-order condition for welfare maximum becomes

$$w\left[\frac{\lambda}{1+\lambda} - b\right] e'(b) = \frac{\lambda}{1+\lambda}\left[\bar{\beta} - E\beta\right]. \tag{5.10}$$

The left-hand side is increasing in w, while the right-hand side is independent of w. Since $e'(b)$ is constant as long as $\psi''' = 0$, it follows that b is increasing in w. The higher is the wage, the more incentive powered is the contract and the higher is the rent to the manager. The reason is that managerial effort becomes more valuable to the regulator when the wage is high (since effort and labour are alternatives in production), while the rent to the manager (for a given b) is independent of the wage. The trade-off between effort and rent therefore pivots towards efficiency as wages increase. Note the contrast with our finding in the previous subsection, where increased wages were associated with a lower b. There (for a given b) higher wages increased the rent to the manager while the importance of managerial effort stayed unaltered.

We turn now to worker incentives to increase wages. Worker objectives are to maximize the total wage bill $U = w[1-e]$. Then

$$\frac{dU}{dw} = 1 - e - w\frac{de}{dw}. \tag{5.11}$$

From the first-order condition for managerial effort, we find (with $z = \psi''$)

$$z\frac{de}{dw} = b + w\frac{db}{dw}. \tag{5.12}$$

That is, an increase in w has two effects on managerial effort. Firstly, for any given contract (b) a higher wage raises incentives to exert effort. Secondly, a higher wage increases b, which also leads to higher effort. From (5.10) it follows that

$$\frac{db}{dw} = \frac{1}{w}\left[\frac{\lambda}{1+\lambda} - b\right]. \tag{5.13}$$

Inserting the expression for db/dw into (5.12), which gives $de/dw = \lambda/z\,[1+\lambda]$, and substituting the result into (5.11), we get

$$\frac{dU}{dw} = 1 - e - \frac{w}{z}\frac{\lambda}{1+\lambda}. \tag{5.14}$$

Except in the pathological case in which no workers are employed (ie, $e = 1$), workers prefer higher wages as long as the initial wage is low, but not if the initial wage is high. In the latter case workers trade off higher wages for an increase in the work force (ie, lower managerial effort). In the extreme case in which the shadow price of public funds is nil ($\lambda = 0$), workers always want wage increases.

Lemma 4. *Assume $C = \beta + w[1-e]$ and $\psi''' = 0$. Then the manager always prefers higher wages. Workers, on the other hand, prefer higher wages only if the initial wage is relatively low.*

We conclude that, if wages are high, we may experience the slightly unusual outcome that managers insist on high wages in order to obtain a contract with strong incentives and consequently a high rent, while the workers - who want to avoid a cut in the labour force - prefers a lower wage.

6. Conclusion

In this paper we have provided an analysis of how optimal regulatory contracts should be modified if wages are endogenously set in regulated firms. A fairly robust conclusion, at least when workers have sufficiently large bargaining power, is that optimal regulation provides stronger incentives for cost efficiency than in the case in which wages are exogenous. There are three reasons for this: Firstly, when wages are determined by bargaining at the firm level the regulatory contract affects the incentives for management to resist high wage claims and hence reduces costly transfers to the firm. Secondly, since gains from managerial efforts to reduce costs will be shared by the workforce *ceteris paribus* incentives to undertake such efforts are lower when workers have bargaining power than when they have not. In order to provide sufficient effort incentives the power of the incentive scheme must be increased. Thirdly, if the firm has the ability to commit to a high wage, and managerial effort and labour are alternative factors of production, the optimal contract will provide strong incentives to reduce labour costs.

Our analysis has been conducted in a highly simplified framework. While we do not believe that our main conclusions depend critically on the assumptions made, it would be interesting to extend the analysis in various directions. Apart from the obvious extensions to more general technologies and contracts, extending the framework in the following directions seems particularly interesting:

- While we have demonstrated that the management of regulated firms may strategically exploit wage setting to influence rents, there are also strong incentives to reduce the extent to which rents are shared with labour. This raises the question of how regulation may affect firms' choice of technology.

One conjecture is that regulated firms may have incentives to substitute labour for fixed-priced inputs. This incentive may be enhanced if unions bargain for slack' (low effort, over-manning) as well as wages.

- Regulation may not only affect the outcome of wage bargaining directly, but also indirectly by influencing the degree of unionization. A common conjecture is that regulation raises industry rents and hence increases incentives for labour to organize (if Hendricks, 1986). An analysis of this issue would require a more developed model of the labour market in which firms operate.[10]
- We have, somewhat arbitrarily, compared the outcome in our model with the outcome in the case in which wages are fixed at their expected level. A fully satisfactorily comparison of our model with a case in which wage bargaining occurs at the industry, or national, level would require a set up that allows for interaction between wage setting and employment decisions.

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