FROM PUBLIC MONOPSONY TO COMPETITIVE MARKET: MORE EFFICIENCY BUT HIGHER PRICES

JOSSE DELFGAAUW
ROBERT DUR

CESIFO WORKING PAPER NO. 1095
CATEGORY 4: LABOUR MARKETS
DECEMBER 2003

CESifo *Working Paper No. 1095*

FROM PUBLIC MONOPSONY TO COMPETITIVE MARKET: MORE EFFICIENCY BUT HIGHER PRICES

Abstract

This paper examines the consequences of creating a fully competitive market in a sector previously dominated by a cost-minimising public firm. Workers in the economy are heterogeneous in their motivation to work in the sector. In line with empirical findings, our model implies that firms in the competitive market provide stronger monetary incentives to workers, reach higher productivity, and employ less workers than the public firm. Allocative efficiency therefore increases. Nevertheless, prices of the sector's output rise as competition between private firms for the best motivated workers leads to higher wage cost than under the public monopsony. Political support for liberalisation may therefore be limited.

JEL Classification: H4, J3, J4, L2, L3, L5.

Keywords: liberalisation, monopsony power, incentive wages, intrinsic motivation.

Josse Delfgaauw
Tinbergen Institute
Roetersstraat 31
1081 WG Amsterdam
The Netherlands
delfgaauw@few.eur.nl

Robert Dur
Erasmus University Rotterdam
Department of Economics
H 7-21, P.O. Box 1738
3000 DR Rotterdam
The Netherlands
dur@few.eur.nl

We thank Klaas Beniers, Amihai Glazer, Alan Manning, Hein Roelfsema, Klaus Schmidt, Otto Swank, Bauke Visser and seminar participants in Aarhus, Amsterdam, Maastricht, Nashville, and Rotterdam for useful comments. We gratefully acknowledge financial support from NWO, KNAW, and VSNU through a Vernieuwingsimpuls grant. Part of the research was done while Dur was visiting CES Munich. Their generous hospitality is gratefully acknowledged.

1 Introduction

The last decades have seen much debate about privatisation of public firms and liberalisation of markets. During the seventies and eighties, people became more and more sceptical about the performance of public companies. The lack of profit motive and the absence of competition would give public firms insufficient incentive to produce efficiently, resulting in too low productivity, too high employment, and, hence, excessively high cost. This debate has led to an ongoing wave of privatisation of public companies, usually accompanied by introducing or strengthening competition among firms in the market.

The empirical literature by and large supports the notion that privatisation and liberalisation may increase efficiency. Megginson and Netter (2001) provide an extensive survey of the empirical literature on privatisation. They conclude that privatisation leads to an increase in productivity. Employment usually falls, unless the firm is able to increase its sales substantially. Another recent survey, by Kikeri and Nellis (2002), reaches similar conclusions. To what extent the mere change of ownership (privatisation) or the strengthening of competition (liberalisation) is responsible for efficiency gains is still unclear. As privatisation and liberalisation often take place simultaneously, it is hard to disentangle the effects empirically (Kikeri and Nellis, 2002).

This paper develops a model to examine the consequences of creating a fully competitive market in a sector previously dominated by a cost-minimising public firm. Our model implies that firms in a competitive environment provide stronger monetary incentives for workers to exert effort than the public firm. Hence, productivity increases and the sector's employment decreases after liberalising the sector. Even though liberalisation thus improves allocative efficiency of the economy, prices of the sector's output rise. The reason is that liberalising the sector not only intensifies competition between firms in the product market, but also in the labour market.

An important element of our model is that workers in the economy are heterogeneous in their intrinsic motivation to work in the sector. Thus, we assume that working in this sector has some particular trait which is valued differently by different workers. Better motivated workers work harder and are willing to work for a lower wage. Besides intrinsic motivation, workers' effort depends on the monetary incentives provided by the firm. We show that the public firm can save on wage cost per unit of output by providing weak monetary incentives for workers. This way, the public firm extracts part of the motivational rents of workers. Competition among firms for the best motivated employees leads to an increase in the incentive wage up to the point where each worker is paid his full marginal product. Wage cost per

unit of output and, hence, prices increase after liberalisation.

The model's implications concerning productivity and employment are well in line with the empirical findings mentioned above. Moreover, and consistent with our model, the empirical literature often attributes the increase in productivity to an increase in monetary incentives for workers (e.g., Megginson, Nash, and Van Randenborgh, 1994). Kikeri and Nellis (2002) discuss several studies which find an increase in performance-based incentives for workers in privatised firms. Martin and Parker (1997) report similar evidence for several British firms. In line with these studies, Burgess and Metcalfe (1999, 2000) find that firms in the private sector make far more use of incentive wages than in the public sector, and that incentive schemes are more common in competitive establishments than in non-competitive establishments, both for managers and non-managers. We argue that weak incentives in public firms may stem from exploitation of monopsonistic power, a power that firms in a competitive environment lack.

Our result on the level of wages seems to square less well with common belief. Indeed, it is often claimed that workers bear the burden of privatisation and liberalisation through job losses and lower wages. The empirical literature, however, suggests otherwise as regards wages. Kikeri and Nellis (2002) observe that "in many instances, and contrary to popular perception, those who retain their jobs in privatised firms receive higher wages, sometimes substantially so" (p. 18). For the UK, effects on wages appear to be mixed (Haskel and Szymanski, 1993, Martin and Parker, 1997). The most comprehensive study is by La Porta and López-de-Silanes (1999) for Mexico, where a massive process of privatisation and liberalisation has taken place. They report large increases in real wages of the privatised firms while overall real wages throughout Mexico stagnated.[1] In addition, they asked firms why they increased worker's pay. Interestingly, "matching the conditions offered by similar firms" was listed as an important reason for the increase in wages after privatisation. La Porta and López-de-Silanes (1999) also examine the effect of privatisation on prices. Prices tend to increase, albeit modestly. There is surprisingly little other evidence on how privatisation and liberalisation affect prices (cf. Megginson and Netter, 2001).

Our setup and results deviate from other theoretical work on privatisation and liberalisation. There is a large literature on public versus private ownership given the degree of competition. One strand focuses on incomplete contracting problems; see in particular Laffont and Tirole (1991), Hart,

[1] The increase in wages is not confined to executive compensation: real wages of blue-collar workers rose even more than those of white-collar workers. Moreover, only a small part of the increase in wages can be attributed to composition effects. See section V in La Porta and López-de-Silanes (1999).

Schleifer, and Vishny (1997), and Francois (2000). We abstract from these kind of problems: firm's output and worker's effort are fully contractible in our model. This implies that ownership as such does not matter: public ownership of the firm and public regulation of a private firm yield identical outcomes. For convenience, we use the label 'public firm' in the monopsony case and 'private firms' in the competitive case, but it should be stressed that the monopsony analysis applies to a regulated private firm as well.

Another group of studies emphasizes that the objectives of the management may change after privatisation. Whereas private firms care only about profit, public firms are supposed to be concerned also about wages, employment, and (sometimes) consumer surplus. In Boyco, Schleifer, and Vishny (1996), these concerns stem from politicians' desire to preserve jobs and keep wages high in public firms. Privatisation raises the cost to politicians of influencing the firms' decision and, hence, results in lower wages and lower employment. Corneo and Rob (2002) argue that public firms set weaker work incentives than private firms, because a public firm incorporates workers' utility of socializing at the workplace into its' own objective function. Haskel and Szymanski (1993) model privatisation as a shift to more commercial objectives. Privatisation affects production, employment, and wages negatively as a private firm places less weight on consumer surplus and workers' welfare than a public firm.

In contrast to these papers, we abstract from differences in managerial objectives between public and private firms. In our model, both private firms and the public firm maximise profits. In the competitive equilibrium, private firms' profits are driven to zero because of free entry and exit of firms. Under the public monopsony, profits are zero because the government extracts all of the public firm's rents by designing an appropriate contract. As for the government's objectives, we assume that politicians represent the interest of consumers of the good produced in the sector. Therefore, the government induces the manager of the public firm to minimise cost. Alternatively - but in our view less plausibly - we could assume that the government is a social planner which seeks to maximise the sum of utilities of all individuals in the economy. In that case, the government would choose the competitive equilibrium. The public at large would lose from this policy (as it has to pay a higher price for the good) but this welfare loss would be more than offset by wage increases of the workers who remain employed in the sector and by an increase in national output as the dismissed workers find employment somewhere else in the economy. Insofar as politicians want to please the public at large, our analysis can thus be viewed as a positive theory of distortionary

regulation.[2]

The paper by Haskel and Szymanski (1993) is the only theoretical study that examines the consequences of both privatisation and liberalisation. It shows that liberalisation decreases the output price and increases the sector's employment, because firms can exploit product market power to a lesser extent. In the presence of trade unions, liberalisation reduces wages, as trade unions find themselves with less surplus to bargain over. Note that these results are exactly opposite to ours. While Haskel and Szymanski analyse the consequences of a decrease in power of the firm in the product market, we focus on the effects of a decrease in firm's power in the labour market. In practise, liberalisation will affect employment and wages through both channels. The empirical evidence discussed above suggests that the effects arising from a decrease in monopsony power may dominate, at least in some cases.

Lastly, our paper closely relates to the literature on monopsonistic power of employers. It has long been recognised that employer's power in wage determination may drive wages below marginal productivity. Bhaskar, Manning, and To (2002) review a number of intriguing implications of monopsonistic power of employers, among others for interfirm wage dispersion, for employer's incentive to pay for general training, and for the effect of minimum wages on employment. We contribute to this literature by examining the implications of monopsonistic power for the optimal design of pay-for-performance schemes. In our model, monopsonistic power arises because workers differ in the extent to which they intrinsically value working in a particular sector. We could as well assume that workers differ in an ability which is particularly valuable in one sector of the economy. Recently, Booth and Zoega (2002) have developed a model along these lines and argue that increased labour market competition may explain why wage inequality has risen in some countries.[3]

The paper is organised as follows. Section 2 presents the basic features of the model. In section 3, we derive the sector's employment, the wage scheme, and the output price in the competitive equilibrium. Next, we show

[2] In this respect, the paper relates to the optimal taxation literature where the government redistributes income from high-ability workers to low-ability workers at the cost of distortions in work incentives (Mirrlees, 1971). In the present paper, the government abstains from liberalisation and distorts work incentives in the public firm so as to extract rents from highly motivated workers. As in the optimal taxation literature, we assume that the government can not identify workers' types.

[3] In Booth and Zoega's model, workers' effort is exogenous. For our results to hold in a model where workers differ in ability instead of motivation, effort must be endogenous and complementary to ability.

in section 4 that a public monopsony produces output at a lower price by setting weaker work incentives and expanding employment compared to the competitive equilibrium. We also discuss the distributional consequences of moving from public monopsony to competitive market in section 4. Section 5 generalises the model to a continuum of worker types. We show that our results hold as long as workers in the neighbourhood of the marginal worker do not differ too much in motivation. Section 6 concludes.

2 The Model

The model revolves around production in a particular sector of the economy. Production takes place either in one public organisation or in private firms which compete with each other. For convenience, we assume a very simple production technology and very simple product demand characteristics. All firms in the sector have the same technology and labour is the only production factor. Output depends linearly on workers' effort e. The marginal product of effort is denoted by κ. Introducing (dis)economies of scale in production does not affect the results as long as it does not preclude competition. Demand for the sector's product is assumed to be perfectly price inelastic and denoted by Q^d. Assuming, instead, a downward-sloping demand curve does not affect the results qualitatively.[4]

Workers in the economy differ in their intrinsic motivation to work in the sector, otherwise they are identical. Outside the sector, workers obtain utility U^o. If worker i is employed in the sector, his utility is described by:

$$U_i = w\left(e_i\right) + \gamma_i e_i - \frac{1}{2}\theta e_i^2 \tag{1}$$

where w is the wage, which depends on worker's effort e_i, γ_i measures the degree to which worker i is intrinsically motivated to work in this sector, and θ measures the cost of effort (the value of foregone leisure, tiredness). A worker with $\gamma = 0$ is a 'standard neoclassical worker' who dislikes effort and only works to make a living, see e.g. Lazear (1995). The higher is γ, the more a worker values exerting effort at work and, therefore, the higher his effort given the power of the incentive scheme $w(e)$. Equation (1) captures in a simple way the ideas that workers differ in the extent to which they are motivated to work in the sector and that motivation matters for workers' effort.[5] The

[4] Price elastic demand enlarges the real effects of liberalisation in the sector and reduces the price effects.

[5] A more general version of (1) is discussed in Delfgaauw and Dur (2002). Workers in our model have an action-oriented motivation: they find exerting effort enjoyable. Francois (2000) and Glazer (2002) study incentive pay when workers value the firm's output.

sector-specificity of motivation is important for the results as it gives the public firm monopsonistic power. In contrast, differences between workers' general work motivation would not give the public firm monopsonistic power as general motivation is valuable in many different jobs in the economy.

While worker's motivation is private information, firms observe worker's effort. For simplicity, we assume a linear wage scheme:[6]

$$w(e) = \alpha e + \beta \tag{2}$$

Substituting (2) into (1) and maximising with respect to e gives worker i's optimal level of effort, if employed in the sector:

$$e_i^* = \frac{\alpha + \gamma_i}{\theta} \tag{3}$$

Clearly, optimal effort increases in the incentive wage and in intrinsic motivation, and decreases in the cost of exerting effort.

Worker i is willing to work in the sector if:

$$U_i \geq U^o \tag{4}$$

For simplicity, we initially assume that there are only two types of workers in the economy, high motivated workers (h) with $\gamma = \gamma_h > 0$ and low motivated workers (l) with γ_l normalised to 0. In section 5, we generalise the model to allow for any distribution of motivation over the work force. Substituting (1), (2), and (3) into (4), it easily follows that for any combination of α and β, the participation constraint of low-motivated workers is more binding than that of high-motivated workers:

$$\frac{1}{2}\frac{(\alpha + \gamma_i)^2}{\theta} + \beta \geq U^o \tag{5}$$

Together with the result that high-motivated workers exert more effort, this implies that when product demand is low, only high-motivated workers will be employed in the sector. We assume that product demand Q^d is sufficiently high (or the number of high-motivated workers in the economy is sufficiently low) such that the sector also employs some low motivated workers. Obviously, in the more general case of a continuum of worker types, no restriction on demand is required, see section 5. Denoting the number of high motivated workers in the economy by H and the number of low motivated workers employed in the sector by L, total employment in the sector is given by:

$$Q^d = \kappa\left(e_h^* H + e_l^* L\right) \Leftrightarrow H + L = \frac{1}{\alpha}\left(\frac{\theta Q^d}{\kappa} - \gamma_h H\right) \tag{6}$$

[6] In the Appendix, we allow firms to offer separating contracts.

3 Competitive Market

In the competitive equilibrium, firms compete in both the product market and the labour market. Free entry and exit of firms guarantees zero profit. Given the linear production technology, profit on every single job is zero in equilibrium:

$$\pi_i = p\kappa e_i^* - (\alpha e_i^* + \beta) = 0 \text{ for } i = l,\ h \tag{7}$$

where p is the equilibrium price of the sector's output, which is an endogenous variable. Using (3) with $i = l$ and $i = h$ respectively, it follows that:

$$\begin{aligned} \alpha &= p\kappa \\ \beta &= 0 \end{aligned}$$

Hence, we obtain the familiar result that under perfect competition each worker earns his full marginal product and does not receive a fixed wage.

The participation constraint of the low-motivated workers must bind in equilibrium. If this is not the case, low-motivated workers who are employed outside the sector underbid the insiders. Hence, condition (5) must hold with equality for $i = l$. Substituting $\alpha = p\kappa$ and $\beta = 0$ into (5), we obtain the equilibrium price:

$$p = \frac{\sqrt{2\theta U^o}}{\kappa}$$

The price of the sector's output increases in workers' cost of effort and in workers' outside opportunity, and decreases in the productivity of effort. Note that in the competitive equilibrium, firms' cost and the price of the sector's output depend neither on the degree to which high-motivated workers are motivated (γ_h) nor on the number of high-motivated workers in the economy (H). The reason is that high-motivated workers receive all of the rents of their motivation.

Lastly, employment is found by substituting the equilibrium value of α into (6):

$$H + L = \frac{1}{\sqrt{2\theta U^o}} \left(\frac{\theta Q^d}{\kappa} - \gamma_h H \right)$$

Employment increases in demand for the sector's product and worker's cost of effort, and decreases in productivity of effort and the workers' outside option. While motivation of the labour force does not affect the price, it does affect the level of employment: the higher the number of high-motivated workers and the better their motivation, the lower is total employment.

Table 1 summarises the results for the competitive equilibrium.

Table 1: The Competitive Equilibrium

α	$\sqrt{2\theta U^o}$
β	0
p	$\dfrac{\sqrt{2\theta U^o}}{\kappa}$
$H+L$	$\dfrac{1}{\sqrt{2\theta U^o}}\left(\dfrac{\theta Q^d}{\kappa}-\gamma_h H\right)$

4 Public Monopsony

Let us now consider the case of a public firm (or regulated private firm) which is the sole supplier of output Q^d. Entry of firms is blocked by government regulation. The government induces the public firm to minimise cost.[7] The public firm's optimisation problem is:

$$\min_{\alpha,\,\beta,\,L}\ \alpha\left(e_h^* H + e_l^* L\right) + \beta\left(H+L\right) \tag{8}$$

subject to the production constraint (6) and the low-motivated worker's participation constraint (5), and where e_i^* is given by (3). The solution is summarised in Table 2.

Table 2: Public Monopsony

α	$\sqrt{\dfrac{1-\mu}{1+\mu}}\sqrt{2\theta U^o}$
β	$\left(\dfrac{2\mu}{1+\mu}\right)U^o$
p	$\sqrt{1-\mu^2}\dfrac{\sqrt{2\theta U^o}}{\kappa}$
$H+L$	$\sqrt{\dfrac{1+\mu}{1-\mu}}\dfrac{1}{\sqrt{2\theta U^o}}\left(\dfrac{\theta Q^d}{\kappa}-\gamma_h H\right)$
where $0<\mu=\dfrac{\kappa\gamma_h H}{\theta Q^d}<1$	

The public firm sets weaker incentives for workers, pays a fixed wage, and employs more workers than private firms do in a competitive market. Yet,

[7] In the absence of information problems, the government can offer a contract to the manager of the public firm to deliver Q^d at the minimum price p, which is derived below. Profit maximisation by the public firm then results in cost minimisation, as in (8).

the public firm supplies output at a lower price than results in a competitive market. The intuition is straightforward. As the public firm reduces the incentive wage α, it has to increase the fixed wage β so as to keep the low-motivated workers' participation constraint satisfied. Low-motivated workers need to be compensated for a reduction in α to a relatively small extent because they exert little effort. High-motivated workers, who exert more effort, therefore lose income. They face a reduction in their performance-related pay which is only partly compensated for by the increase in the fixed wage. Thus, by providing weak monetary incentives, the firm extracts part of the motivational rents of high-motivated workers. The cost of reducing the incentive wage is that workers reduce their effort, which necessitates an increase in employment so as to keep production at Q^d. Starting from the competitive equilibrium, a marginal increase in employment entails no additional cost because the fixed wage is zero. However, as α decreases, the increase in employment becomes more and more costly as the fixed wage β goes up along with the reduction in α. In the optimum, the cost of employing an additional worker exactly equals the marginal benefit of extracting rents from the high-motivated workers. Comparing Table 1 and Table 2, it is easy to see that the extent to which the wage scheme, employment, and output price differ between competitive market and public monopsony depends only on $\kappa\gamma_h H/\theta Q^d$, which is the share of motivation induced effort in total effort.

Note that the opportunity to extract motivational rents stems from the monopsonistic power of the public firm. The positive fixed wage implies that total pay per unit of effort is higher for low-motivated workers than for high-motivated workers. Thus, the public firm makes a loss on the input of low-motivated workers, while it makes a profit on the input of high-motivated workers. In a competitive environment, a competing firm would offer a slightly lower fixed wage and a higher incentive wage so as to attract the profitable high-motivated workers. In equilibrium, competitive firms pay the full marginal product and no fixed wage, as we have derived in the previous section.

The implications of the model square well with the empirical observations mentioned in the introduction. Incentive wages and productivity are higher in a competitive environment, while total employment is lower than under a public monopsony. Wage compensation increases after liberalisation, both of the low-motivated workers and of the high-motivated workers. Wages of the low-motivated workers are higher because stronger incentives induce them to work harder. High-motivated workers' pay increases even more, as their motivational rents are no longer expropriated by the public firm.

The welfare consequences of liberalisation are straightforward in the two-type case. Total production in the economy increases as a result of liberalisa-

tion because more workers become available for other sectors of the economy. Low-motivated workers throughout the economy nevertheless lose, as their job-related utility remains at U^o while they have to pay a higher price for the sector's output.[8] High-motivated workers gain all of the surplus from liberalising the sector. As high-motivated workers in a particular sector are a small group, the distributional consequences of liberalisation may well hinder its political viability.

5 A Continuum of Worker Types

This section relaxes the assumption that there are only two types of workers in the economy. We assume that intrinsic motivation of workers is distributed according to the cumulative distribution function $F(\gamma_i)$, where $F(0) = 0$ and $F(\gamma_n) = 1$. The upper boundary γ_n is introduced to rule out the case that one worker produces all output. The sector's employment as a share of the economy's labour force equals $F(\gamma_n) - F(\gamma_l)$, where γ_l denotes the motivation of the least-motivated employee in the sector.

5.1 Competitive Market

In the competitive equilibrium, the zero-profit condition (7) holds for all $i \in [l, n]$. Hence, as in the two-type model, competition between firms implies that all workers earn their full marginal product: $\alpha = p\kappa$, $\beta = 0$. The price of output is such that the participation constraint of the sector's least-motivated employee is just satisfied:

$$\frac{(p\kappa + \gamma_l)^2}{2\theta} = U^0 \tag{9}$$

The production constraint reads:

$$Q^d = \kappa \int_{\gamma_l}^{\gamma_n} f(\gamma_i) e_i^* d\gamma = \kappa \int_{\gamma_l}^{\gamma_n} f(\gamma_i) \frac{p\kappa + \gamma_i}{\theta} d\gamma \tag{10}$$

Constraints (9) and (10) together implicitly define the equilibrium values of the price p and employment $F(\gamma_n) - F(\gamma_l)$. The comparative static results are qualitatively the same as in the two-type case and are, therefore, not discussed here.

[8] The low-motivated workers who remain employed in the sector earn a higher income but the utility gain from higher income is annuled by the utility loss of exerting more effort.

5.2 Public Monopsony

Total cost of the public firm is:

$$C = \int_{\gamma_l}^{\gamma_n} f(\gamma_i)(\alpha e_i^* + \beta) d\gamma$$

Substituting optimal effort (3) to eliminate e_i^*, and the least-motivated worker's participation constraint (5, with $\gamma_i = \gamma_l$) to eliminate β, yields after some rewriting:

$$C = \alpha \frac{Q^d}{\kappa} + \left[U^o - \frac{(\alpha + \gamma_l)^2}{2\theta} \right] [F(\gamma_n) - F(\gamma_l)] \tag{11}$$

where we have simplified the first term on the right-hand side by using the production constraint:

$$Q^d = \kappa \int_{\gamma_l}^{\gamma_n} f(\gamma_i) e_i^* d\gamma \tag{12}$$

The public firm's optimisation problem is to minimise (11) with respect to α and γ_l, subject to (12). Combining the first-order conditions results in:

$$-\frac{\alpha + \gamma_l}{\theta}[F(\gamma_n) - F(\gamma_l)] + \int_{\gamma_l}^{\gamma_z} \frac{\alpha + \gamma_i}{\theta} f(\gamma_i) d\gamma + \tag{13}$$

$$-\frac{[F(\gamma_n) - F(\gamma_l)]}{(\alpha + \gamma_l) f(\gamma_l)} \left\{ \left[U^o - \frac{(\alpha + \gamma_l)^2}{2\theta} \right] f(\gamma_l) + \frac{\alpha + \gamma_l}{\theta}[F(\gamma_n) - F(\gamma_l)] \right\} = 0$$

We can not derive explicit solutions for the optimal values of α and γ_l. However, we can characterise the properties of the optimal wage scheme by using the results for the competitive equilibrium described in the previous subsection. Condition (13) describes four effects of a change in the incentive wage α on total cost. The first term is the increase in the fixed wage necessary to keep the least-motivated worker's participation constraint satisfied. This increase in β, by $\frac{\alpha + \gamma_l}{\theta}$, must be paid to all workers, $[F(\gamma_n) - F(\gamma_l)]$. The second term describes cost savings as a result of a decrease in α: all units of effort are rewarded less when the incentive wage decreases. Because the average effort level is higher than the effort level of the least motivated worker, the first two terms are positive in sum. This is the cost-saving effect of giving weaker incentives for workers. The terms on the second line of (13) are the marginal cost of reducing the incentive wage. The term outside the brackets is the increase in employment necessary to keep production at Q^d. The first term inside the brackets describes the increase in cost of enhancing employment as the new hirees need to be paid the fixed wage. Starting from the competitive equilibrium outcome in which the fixed wage is zero, this term

is zero. The second term inside the brackets is the increase in the fixed wage necessary to attract outsiders to work in the sector. The increase in the fixed wage must be paid to all workers. This effect was absent in the previous section. In the two-type model, the firm could hire additional employees from the pool of equally motivated workers of type l. In the model with a continuum of worker types, increasing employment necessitates to increase the wage because outsiders are less motivated than insiders. This additional cost implies that we can not be certain about whether the incentive wage under the public monopsony is higher or lower than in the competitive market. The same holds for the level of employment and the fixed wage. Much depends on the specific distribution of motivation over workers. When individuals in the neighbourhood of the competitive sector's marginal worker differ a lot in intrinsic motivation, the public firm gives stronger monetary incentives for workers than in a competitive market. The fixed wage is negative, and employment is lower. If, instead, workers close to the marginal worker differ little in their intrinsic motivation, the increase in the wage cost to attract new employees is small and dominated by the cost-saving effect described on the first line of condition (13). Then, the public firm gives weaker incentives, as in the two-type model. In case of a uniform distribution, the marginal cost and marginal benefits just equal, and the public monopsony can not take advantage of its monopsony power. In all other cases, the public firm is more cost-efficient than firms in a competitive market.

The welfare effects of liberalisation are more dispersed than in the two-type model. The reason is that with a continuum of workers, all those employed in the sector obtain a rent except for the marginal worker, who is just indifferent between working inside and outside the sector. When liberalisation entails stronger work incentives and less employment, the workers who are laid off lose this rent. Also, some of those who remain employed in the sector (the ones with relatively low motivation) lose as the increase in the incentive wage does not make up for the decrease in the fixed wage. The other workers in the sector - those who are relatively highly motivated - gain. Workers outside the sector lose as a consequence of the price increase, as in the two-type model.

6 Conclusion

In this paper, we have developed a model which can explain the empirical observations that firms in a competitive market provide stronger monetary incentives to workers, reach higher productivity, employ less workers, and pay higher wages than a public monopoly. We have argued that weak incentives

for workers in public firms may stem from exploitation of monopsonistic power, which firms in a competitive environment lack. Our model implies that strengthening competition between firms may raise wage cost and, thus, output prices. Hence, liberalisation of a sector may particularly favour the workers who remain employed in the sector at the expense of the public at large. Political support for liberalisation may therefore be limited, even though liberalisation improves allocational efficiency of the economy.

We have compared two extreme cases, a competitive market without any market failures and a publicly owned monopolist without any government failures. Allowing for market and government failures would enrich the results. Particularly, it would be interesting to examine cases where the public firm can not be completely prevented from exploiting its power in the product market, and where private firms have some monopsonistic power.

7 Appendix: Separating Contracts

This appendix relaxes the assumption that firms offer a single wage scheme. Obviously, in the case of a competitive market, none of the results change: the participation constraint of the low-motivated workers binds, and the high-motivated workers receive all of the rents of their motivation as each worker is paid his full marginal product in equilibrium. In the case of a public monopsony, the results are in the same spirit as we will show now.

For convenience, assume that each contract specifies a fixed wage and an effort level: (β_l, e_l) and (β_h, e_h). We could as well assume that contracts consist of a fixed and an effort-related component, as above, but this unnecessarily complicates the analysis. The first contract must satisfy the low-motivated workers' participation constraint:

$$\beta_l \geq U^o + \frac{1}{2}\theta e_l^2$$

The second contract must satisfy the high-motivated workers' revelation constraint:

$$\beta_l + \gamma_h e_l - \frac{1}{2}\theta e_l^2 \leq \beta_h + \gamma_h e_h - \frac{1}{2}\theta e_h^2$$

Using these two constraints and the production constraint $[Q^d = \kappa\left(Le_l + He_h\right)]$, we can write the cost of production as:

$$\begin{aligned} C &= \beta_l L + \beta_h H \Longleftrightarrow \\ C &= \left(U^o + \frac{1}{2}\theta e_l^2\right)\left(\frac{Q^d - \kappa H e_h}{\kappa e_l}\right) + \left(U^o - \gamma_h\left(e_h - e_l\right) + \frac{1}{2}\theta e_h^2\right) H \end{aligned}$$

Minimising C with respect to e_l and e_h results in the following two first-order conditions:

$$\left(\frac{1}{2}\theta - \frac{U^o}{e_l^2}\right)\frac{Q^d - \kappa H e_h}{\kappa} + \gamma_h H = 0 \tag{14}$$

$$-\frac{U^o + \frac{1}{2}\theta e_l^2}{e_l} + (-\gamma_h + \theta e_h) = 0 \tag{15}$$

We can not derive explicit solutions for the optimal values of e_l and e_h. We can, however, compare them with the effort levels in the competitive equilibrium. Recall that the effort of low-motivated workers in the competitive equilibrium equals $\frac{\sqrt{2\theta U^o}}{\theta}$. Substituting this into first-order condition (14), the first term becomes zero. Hence, as the second term is positive, the public firm sets e_l below the competitive level so as to increase the rents that can be extracted from the high-motivated workers, just as in the case of a single wage scheme. Using this result, it follows from first-order condition (15) that e_h is larger than the effort level of high-motivated workers in the competitive equilibrium. The intuition is straigthforward. As the reduction in e_l entails an increase in the cost of output that is produced by the marginal worker, it is profitable to let the high-motivated workers work harder. Total employment is higher and average productivity is lower in a public monopsony compared to the competitive equilibrium if:

$$(\theta Q - \kappa\gamma_h H)\left[\left(\theta Q - \kappa\gamma_h H - \kappa H\sqrt{2\theta U}\right)^2 - \kappa^2\gamma_h H^2\sqrt{2\theta U}\right] + \kappa^3\gamma_h H^3\theta U > 0 \tag{16}$$

This follows from rewriting and combining first-order conditions (14) and (15) and using the results for the competitive case. A sufficient condition is that the term in square brackets is positive, which can be rewritten as:

$$\alpha_c L_c^2 > \gamma_h H^2$$

where α_c and L_c are the incentive wage and the number of low-motivated workers in the competitive equilibrium, respectively; see Table 1. Hence, when the public firm can offer separating contracts, employment may be lower than in the competitive equilibrium if the number of high-motivated workers and their motivation are high relative to the contribution of low-motivated workers to production. Note, however, that if $\gamma_h H$ becomes sufficiently high, only high-motivated workers will be employed in the sector, both in the competitive equilibrium and in the case of a public monopsony. Then, competition and monopsony yield identical outcomes. A numerical analysis suggests that if both low-motivated and high-motivated workers are

hired, condition (16) is almost always satisfied and, hence, employment is lower in the competitive equilibrium. Finally, prices are always lower in the case of a public monopsony. If this would not be the case, the public monopsony would offer the same contracts as those that result in the competitive equilibrium.

References

[1] Bashkar, V., Manning, Alan, and To, Ted (2002), Oligopsony and Monopsonistic Competition in Labor Markets, *Journal of Economic Perspectives*, vol. 16 (2), pp. 155-174.

[2] Booth, Alison L., and Zoega, Gylfi (2002), If You're So Smart, Why Aren't You Rich? Wage Inequality with Heterogeneous Workers, Institute of Economic Studies Working Paper 02:06.

[3] Boycko, Maxim, Shleifer, Andrei, and Vishny, Robert W. (1996), A Theory of Privatisation, *Economic Journal*, vol. 106 (March), pp. 309-319.

[4] Burgess, Simon, and Metcalfe, Paul (1999), The Use of Incentive Schemes in the Public and Private Sectors: Evidence from British Establishments, CMPO Working Paper 99/015.

[5] Burgess, Simon, and Metcalfe, Paul (2000), Incentive Pay and Product Market Competition, CMPO Working Paper 00/28.

[6] Corneo, Giacorno, and Rob, Rafael (2002), Working in Public and Private Firms, *Journal of Public Economics*, forthcoming.

[7] Delfgaauw, Josse, and Dur, Robert A.J. (2002), Signaling and Screening of Workers' Motivation, Tinbergen Institute Discussion Paper 02-050/03.

[8] Francois, Patrick (2000), 'Public Service Motivation' as an Argument for Government Provision, *Journal of Public Economics*, vol. 78, pp. 275-299.

[9] Glazer, Amihai (2002), Production when Workers Value Output, UCI Economics Department Working Paper 01-02-04.

[10] Hart, Oliver, Shleifer, Andrei, and Vishny, Robert W. (1997), The Proper Scope of Government: Theory and an Application to Prisons, *Quarterly Journal of Economics*, vol. 112 (4), pp. 1127-1161.

[11] Haskel, Jonathan, and Szymanski, Stefan (1993), Privatization, Liberalization, Wages and Employment: Theory and Evidence for the UK, *Economica,* vol. 60 (May), pp. 161-181.

[12] Kikeri, Sunita, and Nellis, John, (2002) Privatisation in Competitive Sectors: The Record To Date, World Bank Policy Research Working Paper 2860.

[13] La Porta, Rafael, and López-de-Silanez, Florencio (1999), The Benefits of Privatization: Evidence from Mexico, *Quarterly Journal of Economics,* vol. 114 (4), pp. 1193-1242.

[14] Laffont, Jean-Jacques, and Tirole, Jean (1991), Privatization and Incentives, *Journal of Law, Economics, and Organization*, vol. 7, pp. 84-105.

[15] Lazear, Edward P. (1995), *Personnel Economics,* Cambridge: MIT Press.

[16] Martin, Stephen, and Parker, David (1997), *The Impact of Privatisation: Ownership and Corporate Performance in the UK*, London: Routledge.

[17] Megginson, William L., Nash, Robert C., and Van Randenborgh, Matthias (1994), The Financial and Operating Performance of Newly Privatized Firms: An International Empirical Analysis, *Jounal of Finance*, vol. 49 (2), pp. 403-452.

[18] Megginson, William L., and Netter, Jeffrey M. (2001), From State to Market: A Survey of Empirical Studies on Privatization, *Journal of Economic Literature,* vol. 39 (June), pp. 321-389.

[19] Mirrlees, James A. (1971), An Exploration in the Theory of Optimum Income Taxation, *Review of Economic Studies*, vol. 38 (114), pp. 175-208.

CESifo Working Paper Series

(for full list see www.cesifo.de)

1031 Ivar Ekeland, James J. Heckman, and Lars Nesheim, Identifcation and Estimation of Hedonic Models, September 2003

1032 Kjetil Bjorvatn and Alexander W. Cappelen, Decentralization and the Fate of Minorities, September 2003

1033 Lars-Erik Borge and Jørn Rattsø, The Relationships Between Costs and User Charges: The Case of a Norwegian Utility Service, September 2003

1034 Maureen Were and Nancy N. Nafula, An Assessment of the Impact of HIV/AIDS on Economic Growth: The Case of Kenya, September 2003

1035 A. Lans Bovenberg, Tax Policy and Labor Market Performance, September 2003

1036 Peter Birch Sørensen, Neutral Taxation of Shareholder Income: A Norwegian Tax Reform Proposal, September 2003

1037 Roberta Dessi and Sheilagh Ogilvie, Social Capital and Collusion: The Case of Merchant Guilds, September 2003

1038 Alessandra Casarico and Carlo Devillanova, Capital-skill Complementarity and the Redistributive Effects of Social Security Reform, September 2003

1039 Assaf Razin and Efraim Sadka, Privatizing Social Security Under Balanced-Budget Constraints: A Political-Economy Approach, September 2003

1040 Michele Moretto, Paolo M. Panteghini, and Carlo Scarpa, Investment Size and Firm's Value under Profit Sharing Regulation, September 2003

1041 A. Lans Bovenberg and Peter Birch Sørensen, Improving the Equity-Efficiency Trade-off: Mandatory Savings Accounts for Social Insurance, September 2003

1042 Bas van Aarle, Harry Garretsen, and Florence Huart, Transatlantic Monetary and Fiscal Policy Interaction, September 2003

1043 Jerome L. Stein, Stochastic Optimal Control Modeling of Debt Crises, September 2003

1044 Thomas Stratmann, Tainted Money? Contribution Limits and the Effectiveness of Campaign Spending, September 2003

1045 Marianna Grimaldi and Paul De Grauwe, Bubbling and Crashing Exchange Rates, September 2003

1046 Assar Lindbeck and Dennis J. Snower, The Firm as a Pool of Factor Complementarities, September 2003

1047 Volker Grossmann, Firm Size and Diversification: Asymmetric Multiproduct Firms under Cournot Competition, September 2003

1048 Dan Anderberg, Insiders, Outsiders, and the Underground Economy, October 2003

1049 Jose Apesteguia, Steffen Huck and Jörg Oechssler, Imitation – Theory and Experimental Evidence, October 2003

1050 G. Abío, G. Mahieu and C. Patxot, On the Optimality of PAYG Pension Systems in an Endogenous Fertility Setting, October 2003

1051 Carlos Fonseca Marinheiro, Output Smoothing in EMU and OECD: Can We Forego Government Contribution? A Risk Sharing Approach, October 2003

1052 Olivier Bargain and Nicolas Moreau, Is the Collective Model of Labor Supply Useful for Tax Policy Analysis? A Simulation Exercise, October 2003

1053 Michael Artis, Is there a European Business Cycle?, October 2003

1054 Martin R. West and Ludger Wößmann, Which School Systems Sort Weaker Students into Smaller Classes? International Evidence, October 2003

1055 Annette Alstadsaeter, Income Tax, Consumption Value of Education, and the Choice of Educational Type, October 2003

1056 Ansgar Belke and Ralph Setzer, Exchange Rate Volatility and Employment Growth: Empirical Evidence from the CEE Economies, October 2003

1057 Carsten Hefeker, Structural Reforms and the Enlargement of Monetary Union, October 2003

1058 Henning Bohn and Charles Stuart, Voting and Nonlinear Taxes in a Stylized Representative Democracy, October 2003

1059 Philippe Choné, David le Blanc and Isabelle Robert-Bobée, Female Labor Supply and Child Care in France, October 2003

1060 V. Anton Muscatelli, Patrizio Tirelli and Carmine Trecroci, Fiscal and Monetary Policy Interactions: Empirical Evidence and Optimal Policy Using a Structural New Keynesian Model, October 2003

1061 Helmuth Cremer and Pierre Pestieau, Wealth Transfer Taxation: A Survey, October 2003

1062 Henning Bohn, Will Social Security and Medicare Remain Viable as the U.S. Population is Aging? An Update, October 2003

1063 James M. Malcomson , Health Service Gatekeepers, October 2003

1064 Jakob von Weizsäcker, The Hayek Pension: An efficient minimum pension to complement the welfare state, October 2003

1065 Joerg Baten, Creating Firms for a New Century: Determinants of Firm Creation around 1900, October 2003

1066 Christian Keuschnigg, Public Policy and Venture Capital Backed Innovation, October 2003

1067 Thomas von Ungern-Sternberg, State Intervention on the Market for Natural Damage Insurance in Europe, October 2003

1068 Mark V. Pauly, Time, Risk, Precommitment, and Adverse Selection in Competitive Insurance Markets, October 2003

1069 Wolfgang Ochel, Decentralising Wage Bargaining in Germany – A Way to Increase Employment?, November 2003

1070 Jay Pil Choi, Patent Pools and Cross-Licensing in the Shadow of Patent Litigation, November 2003

1071 Martin Peitz and Patrick Waelbroeck, Piracy of Digital Products: A Critical Review of the Economics Literature, November 2003

1072 George Economides, Jim Malley, Apostolis Philippopoulos, and Ulrich Woitek, Electoral Uncertainty, Fiscal Policies & Growth: Theory and Evidence from Germany, the UK and the US, November 2003

1073 Robert S. Chirinko and Julie Ann Elston, Finance, Control, and Profitability: The Influence of German Banks, November 2003

1074 Wolfgang Eggert and Martin Kolmar, The Taxation of Financial Capital under Asymmetric Information and the Tax-Competition Paradox, November 2003

1075 Amihai Glazer, Vesa Kanniainen, and Panu Poutvaara, Income Taxes, Property Values, and Migration, November 2003

1076 Jonas Agell, Why are Small Firms Different? Managers' Views, November 2003

1077 Rafael Lalive, Social Interactions in Unemployment, November 2003

1078 Jean Pisani-Ferry, The Surprising French Employment Performance: What Lessons?, November 2003

1079 Josef Falkinger, Attention, Economies, November 2003

1080 Andreas Haufler and Michael Pflüger, Market Structure and the Taxation of International Trade, November 2003

1081 Jonas Agell and Helge Bennmarker, Endogenous Wage Rigidity, November 2003

1082 Fwu-Ranq Chang, On the Elasticities of Harvesting Rules, November 2003

1083 Lars P. Feld and Gebhard Kirchgässner, The Role of Direct Democracy in the European Union, November 2003

1084 Helge Berger, Jakob de Haan and Robert Inklaar, Restructuring the ECB, November 2003

1085 Lorenzo Forni and Raffaela Giordano, Employment in the Public Sector, November 2003

1086 Ann-Sofie Kolm and Birthe Larsen, Wages, Unemployment, and the Underground Economy, November 2003

1087 Lars P. Feld, Gebhard Kirchgässner, and Christoph A. Schaltegger, Decentralized Taxation and the Size of Government: Evidence from Swiss State and Local Governments, November 2003

1088 Arno Riedl and Frans van Winden, Input Versus Output Taxation in an Experimental International Economy, November 2003

1089 Nikolas Müller-Plantenberg, Japan's Imbalance of Payments, November 2003

1090 Jan K. Brueckner, Transport Subsidies, System Choice, and Urban Sprawl, November 2003

1091 Herwig Immervoll and Cathal O'Donoghue, Employment Transitions in 13 European Countries. Levels, Distributions and Determining Factors of Net Replacement Rates, November 2003

1092 Nabil I. Al-Najjar, Luca Anderlini & Leonardo Felli, Undescribable Events, November 2003

1093 Jakob de Haan, Helge Berger and David-Jan Jansen, The End of the Stability and Growth Pact?, December 2003

1094 Christian Keuschnigg and Soren Bo Nielsen, Taxes and Venture Capital Support, December 2003

1095 Josse Delfgaauw and Robert Dur, From Public Monopsony to Competitive Market. More Efficiency but Higher Prices, December 2003