TI 2002-118/1
Tinbergen Institute Discussion Paper

From Public Monopsony to Competitive Market

Josse Delfgaauw
Robert A.J. Dur

Dept. of General Economics, Faculty of Economics, Erasmus University Rotterdam, and Tinbergen Institute.

Tinbergen Institute
The Tinbergen Institute is the institute for economic research of the Erasmus Universiteit Rotterdam, Universiteit van Amsterdam, and Vrije Universiteit Amsterdam.

Tinbergen Institute Amsterdam
Roetersstraat 31
1018 WB Amsterdam
The Netherlands
Tel.: +31(0)20 551 3500
Fax: +31(0)20 551 3555

Tinbergen Institute Rotterdam
Burg. Oudlaan 50
3062 PA Rotterdam
The Netherlands
Tel.: +31(0)10 408 8900
Fax: +31(0)10 408 9031

Most TI discussion papers can be downloaded at http://www.tinbergen.nl.

From Public Monopsony to Competitive Market: More Efficiency but Higher Prices*

Josse Delfgaauw† and Robert Dur‡

Revised version January 2008

Abstract

This paper examines the consequences of creating a fully competitive market in a sector previously dominated by a cost-minimising

*We would like to thank two anonymous referees of this journal, Klaas Beniers, Amihai Glazer, Alan Manning, Hein Roelfsema, Klaus Schmidt, Elisabeth Schulte, Otto Swank, Bauke Visser, seminar participants at the University of California, Irvine, Erasmus University Rotterdam, Maastricht University, and conference participants at PCS 2003 in Nashville, EPCS 2003 in Aarhus, NAKE Day 2004 in Amsterdam, and the Silvaplana Workshop on Political Economy 2004 for valuable suggestions and comments. We gratefully acknowledge financial support from NWO, KNAW, and VSNU through a Vernieuwingsimpuls grant. Part of the research was done while the second author was visiting CES Munich. Their generous hospitality is gratefully acknowledged.

†Department of Economics (H8-24), Erasmus University Rotterdam, P.O. Box 1738, 3000 DR Rotterdam, The Netherlands. E-mail: delfgaauw@few.eur.nl.

‡Department of Economics, Erasmus University Rotterdam, Tinbergen Institute, and CESifo, Munich. E-mail: dur@few.eur.nl.

public firm. Workers in the economy are heterogeneous in their intrinsic motivation to work in the sector. In line with empirical findings, our model implies that firms in the competitive market 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.

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

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

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 organisations 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 increases efficiency. Megginson and Netter (2001) provide an extensive survey of the empirical literature and 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.[1]

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 in-

[1] 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).

duce workers to exert more effort on average 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 differ in their intrinsic motivation to work in the sector, which is their private information.[2] We assume that there are two types of workers, high-motivation and low-motivation workers, and that the number of high-motivation workers is sufficiently limited so that workers of both types are employed in the sector. As high-motivation workers find working in the sector less costly than low-motivation workers, they work harder and are willing to work for a lower wage. If production takes place within a single public firm, this firm has monopsony power over the high-motivation workers and, hence, can attract them at lower cost than firms in a competitive environment. Moreover, we show that the public firm can further reduce wage cost by demanding relatively little effort from low-motivation workers and reducing their wage ac-

[2]Equivalently, we can assume that workers differ in a hidden (sector-specific) innate ability, as in a standard adverse selection model (see for a recent overview Laffont and Martimort, 2002). Related applications include Jeon and Laffont (1999) on public sector downsizing and Booth and Zoega (2002) on the effects of competition. In contrast to our paper, these papers do not endogenize workers' effort.

cordingly. Although this increases the wage cost per unit of low-motivation workers' output, it enables the monopsonist to extract even more motivational rents from the high-motivation workers, because the low-motivation worker's contract becomes less attractive for high-motivation workers. However, the low effort of low-motivation workers implies that more workers need to be hired to meet demand for the sector's output, which is costly. To offset part of these cost, the public firm demands higher effort from the high-motivation workers. When the sector is liberalised, competition among firms for the high-motivation workers results in contracts where each worker is paid his full marginal product. As a result, low-motivation workers exert more effort and high-motivation workers exert less effort. On average, productivity increases and, hence, employment falls. Low-motivation workers earn more after liberalisation, whereas the effect on the wage of high-motivation workers is ambiguous. On average, wage cost per unit of output increase, implying that prices are higher after liberalisation.[3]

The model's implications concerning productivity and employment are well in line with the empirical findings mentioned above.[4] Our result on the

[3]Note that the public-private distinction is not crucial. For convenience, we label the monopsonist by 'public firm', but all results carry over to the case where production before liberalisation takes place in a single private firm, provided that regulation blocks the firm from exercising monopoly power. For a further discussion of this issue, see the concluding section.

[4]The empirical literature often attributes the increase in productivity to the provision of stronger monetary incentives (Megginson et al., 1994, Martin and Parker, 1997, Kikeri and Nellis, 2002). The productivity increase in our model is driven by the increase in effort

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 not only through job losses, but also through 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.[5] 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.

demanded from low-motivation workers, which can be interpreted as provision of stronger financial incentives. In a related paper, we argue that the finding that public organisations make far less use of monetary incentive schemes than private firms – often considered as a signal of inefficiency of public organisations (cf. Burgess and Metcalfe, 1999 and 2000) – can be rationalised by the exploitation of monopsony power by public firms (Delfgaauw and Dur, 2008).

[5]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).

There is surprisingly little other evidence on how privatisation and liberalisation affect prices (cf. Megginson and Netter, 2001).

Commonly used examples of sectors where workers' intrinsic motivation plays an important role are health care and education (Besley and Ghatak, 2003). Our model's predictions are well in line with recent experiences in these sectors. For instance, in Sweden, wages in the health-care sector have risen at three times the earlier rate, and have become more closely tied to individual performance, since private companies began competing with public units (Hjertqvist, 2001). Likewise, Hoxby (1994), Merrifield (1999), and Vedder and Hall (2000) show that competition from private schools increases teacher salaries at public schools in the US. Furthermore, Hoxby (2002) finds that school competition creates a more high-powered incentive environment within the teaching profession.[6] Empirical studies also show that competition among schools raises school productivity substantially (Hoxby, 1994 and 2000) and enhances the work effort of teachers (Rapp, 2000).

The paper is organised as follows. Section 2 discusses related literature. Next, Section 3 presents our model. In Section 4, we derive the optimal contracts in case of full information as a benchmark. In Section 5, we derive optimal contracts when workers' motivation is private information, and

[6] In line with our model, her interpretation of the evidence is based on heterogeneity in intrinsic motivation to perform job-specific tasks, e.g. working with school-aged children. Unlike our model, she assumes that competition affects a school's production function.

discuss the distributional consequences of moving from public monopsony to competitive market. Section 6 concludes.

2 Related Literature

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) and Hart, Schleifer, and Vishny (1997). 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: under monopsony, public ownership of the firm and public regulation of a private firm yield identical outcomes. Another group of studies emphasises that management objectives 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 (see, among others, Haskel and Szymanski, 1993, Boyco, Schleifer, and Vishny, 1996, Corneo and Rob, 2003). We abstract from such managerial concerns for workers and consumers.

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. Whereas 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 in the Introduction, particularly the evidence on wages, suggests that the effects arising from a decrease in monopsony power may dominate, at least in some important cases.

Our model closely relates to the literature on screening of workers' ability following the seminal work by Spence (1973) and Rothschild and Stiglitz (1976). While in a standard adverse selection model (see e.g. Laffont and Martimort, 2002), a firm hires a fixed number of workers, we study optimal contracts when the firm has to meet demand for its product and the supply of 'high-type' workers is limited. As we will see, this implies that not only the low-type workers' contract is distorted, but also the contract for the high-type workers.

A number of recent papers stress the importance of workers' intrinsic motivation for optimal incentive schemes and effort, particularly in pub-

lic service occupations (see, among others, Francois, 2000 and 2007, Dixit, 2002, Benabou and Tirole, 2003, Glazer, 2004, Besley and Ghatak, 2005, Prendergast, 2007, and Delfgaauw and Dur, 2007 and 2008). Corresponding to Dixit (2002), Glazer (2004), and Besley and Ghatak (2005), we assume that some of the economy's workers enjoy exerting effort or intrinsically value their contribution to output, if working in a particular occupation. Francois (2000) and Prendergast (2007), in contrast, assume that people care about the provision of public services, regardless of their own personal involvement in production (see also Hansmann, 1980, Glaeser and Shleifer, 2001, Grout and Yong, 2003, and Francois, 2007). The free-rider problem that arises in this situation is not present in the current paper.

There is quite some evidence for non-pecuniary motivations at the workplace. Marsden and French (1998) find that intrinsic rewards are important for many public sector workers in the UK across a wide range of types of occupational activity. For instance, they report that many headteachers "derive a lot of satisfaction from the nature of their activity" (p. 111) and that the staff of trust hospitals "appear highly motivated in their work, find it intrinsically interesting and worthwhile" (p. 100). Other studies include Antonazzo et al. (2003) on nursing workers, Edmonds et al. (2002) on teachers, and Frank and Lewis (2004) on employees in these and several other areas of the public sector. These studies also indicate that there exists substantial variation in

occupational preferences among workers (see also Daymont and Andrisani, 1984, and Harper and Haq, 2001).

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) and Manning (2003) 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 how a reduction in monopsony power affects optimal incentive contracts.

3 The Model

The model revolves around production of a homogeneous product in a particular sector of the economy. Production takes place either in one public organisation or in private firms which compete in price. For convenience, we assume a very simple production technology and very simple product demand characteristics. All firms in the sector, including the public firm in case of public production, have the same technology in which labour is the only input factor. Output depends linearly on workers' effort e, and we normalise

the marginal product of effort to unity. 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.[7] We assume that in case of public production, the public firm minimises the cost of producing Q^d and sets the price p equal to average cost, such that it runs a balanced budget. In case of a competitive market, private firms compete in price, and so equilibrium profits are zero.

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

$$U_i = w_i - \frac{1}{2}\theta_i e_i^2 \tag{1}$$

where w_i is the wage and θ_i measures the cost of exerting effort for worker i. Heterogeneity in θ_i among workers may stem from differences in an ability relevant for production in this sector, leading to differences in productivity. Alternatively, we interpret the heterogeneity in θ_i as stemming from differences in workers' intrinsic motivation to work in this sector. Thus, some workers enjoy working in the sector more than others, which results in lower

[7] Assuming, instead, a downward-sloping demand curve does not affect the results qualitatively. Price elastic demand enlarges the real effects of liberalisation in the sector and reduces the price effects.

(net) cost of effort.

For simplicity, we assume that there are only two types of workers in the economy, high-motivation workers (h) and low-motivation workers (l). High-motivation workers dislike exerting effort in this sector less than low-motivation workers: $\theta_h < \theta_l$. 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. The 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 workers' effort. To attract workers, firms offer contracts specifying a wage and a required level of effort. Worker i is willing to work in the sector if $U_i \geq U^o$. Substituting (1) gives:

$$w_i \geq U^o + \frac{1}{2}\theta_i e_i^2 \tag{2}$$

It follows from $\theta_h < \theta_l$ that for any given level of effort, high-motivation workers can be attracted at a lower wage than low-motivation workers. This implies that when product demand is low, the public firm optimally attracts only high-motivation workers by offering a single contract (w_h, e_h) that makes

high-motivation workers just indifferent between working for the public firm and taking the outside option. We assume that product demand Q^d is sufficiently high (or that the number of high-motivation workers in the economy is sufficiently low) such that in equilibrium the sector also employs some low-motivation workers.[8] Denoting the number of high-motivation workers in the economy by H, the number of low-motivation workers employed in the sector by L, and the required level of effort for worker type i by e_i^*, total employment in the sector is given by:

$$Q^d = (e_h^* H + e_l^* L) \Leftrightarrow H + L = \frac{1}{e_l^*} \left(Q^d - [e_h^* - e_l^*] H \right) \tag{3}$$

For convenience, we assume that there is an infinite supply of low-motivation workers.

4 First-best: Observable Types

4.1 Competitive Market

In the competitive market, firms compete in prices. Hence, profits are bid away to zero and workers are paid their full marginal revenue product. Effort

[8] Precise conditions on Q^d for all cases (competition/public monopsony, observable types/unobservable types) are derived in the sections below.

and wage for a worker of type i are being chosen to maximise surplus given the prevailing price for output p, subject to the employing firm breaking even and the worker being willing to accept the job:

$$\max_{e_i, w_i} pe_i - \frac{1}{2}\theta_i e_i^2$$
$$\text{subject to } pe_i - w_i = 0 \text{ and } w_i - \frac{1}{2}\theta_i e_i^2 \geq U^o$$

The solution to this optimisation problem gives an individual worker's supply curve:

$$e_i = \frac{p}{\theta_i} \text{ if } p \geq \sqrt{2\theta_i U^o} \text{ and } e_i = 0 \text{ otherwise.} \tag{4}$$

Summing equation (4) horizontally over both types of workers gives the aggregate (sector) supply curve. Clearly, since $\theta_h < \theta_l$, it holds that if the prevailing price is below $\sqrt{2\theta_h U^o}$, sector supply is zero. If the price equals $\sqrt{2\theta_h U^o}$, all H high-motivation workers are willing to accept a job in the sector and exert effort $\frac{p}{\theta_h} = \frac{\sqrt{2\theta_h U^o}}{\theta_h}$. Hence, the supply curve is horizontal at price $\sqrt{2\theta_h U^o}$ over the range $Q \in [0, H\frac{\sqrt{2\theta_h U^o}}{\theta_h}]$. When the prevailing price is higher than $\sqrt{2\theta_h U^o}$ but lower than $\sqrt{2\theta_l U^o}$, again only high-motivation workers are willing to accept a job in the sector. In this range, all high-motivation workers are employed in the sector, and sector supply is increasing with the price because all H high-motivation workers exert more effort when

the price increases, see (4). Starting from $p = \sqrt{2\theta_l U^o}$ and $Q = H\frac{\sqrt{2\theta_l U^o}}{\theta_h}$, the supply curve becomes horizontal again. At this level of the price, both high-motivation and low-motivation workers are willing to accept a job in the sector. By our assumption that supply of low-motivation workers is infinite, the supply curve is horizontal. Following (4), high-motivation workers exert effort $\frac{\sqrt{2\theta_l U^o}}{\theta_h}$, while low-motivation workers exert effort $\frac{\sqrt{2\theta_l U^o}}{\theta_l}$.[9] Hence, since $\theta_l > \theta_h$, high-motivation workers exert more effort than low-motivation workers.

Summing up, the sector supply curve is horizontal at price $\sqrt{2\theta_h U^o}$ over the range $Q \in [0, H\frac{\sqrt{2\theta_h U^o}}{\theta_h}]$, increasing in price over the range $p \in (\sqrt{2\theta_h U^o}, \sqrt{2\theta_l U^o})$ and $Q \in (H\frac{\sqrt{2\theta_h U^o}}{\theta_h}, H\frac{\sqrt{2\theta_l U^o}}{\theta_h})$, and horizontal at price $\sqrt{2\theta_l U^o}$ over the range $Q \in [H\frac{\sqrt{2\theta_l U^o}}{\theta_h}, +\infty]$. The equilibrium price follows from equating this sector supply curve with the sector demand curve. Note that our assumption of perfectly price-inelastic demand implies that the sector demand curve is vertical at level Q^d. It follows that when product demand Q^d is sufficiently high such that in equilibrium the sector also employs some low-motivation workers (more precisely: $Q^d > H\frac{\sqrt{2\theta_l U^o}}{\theta_h}$), the equilibrium price in the competitive market is equal to:

$$p = \sqrt{2\theta_l U^o} \tag{5}$$

[9] Clearly, the price equals marginal cost of effort of both high-motivation and low-motivation workers. This can be seen by noting that the marginal cost of effort of a worker of type i equals $\theta_i e_i$, effort is given by $e_i = \frac{p}{\theta_i}$, and so $\theta_i e_i = \theta_i \frac{p}{\theta_i} = p_i$.

The price of the sector's output increases in low-motivation workers' cost of effort and in workers' outside option utility. Using (4) and (5) and the zero-profit condition $pe_i - w_i = 0$, we can solve for worker i's wage in equilibrium:

$$w_i = 2\theta_l U^o/\theta_i \tag{6}$$

Clearly, as $\theta_l > \theta_h$, high-motivation workers earn more than low-motivation workers. Moreover, substituting (4) and (6) into the utility function (1), it follows that high-motivation workers' utility is higher than their outside option utility. In contrast, low-motivation workers do not earn a rent. Note that in the competitive equilibrium, the price of the sector's output depends neither on the difference in the cost of effort between high- and low-motivation workers nor on the number of high-motivation workers in the economy. The reason is that high-motivation workers receive all of the rents from their motivation.

Lastly, employment is found by substituting the equilibrium values of effort (4) and the equilibrium price (5) into (3):

$$H + L = \sqrt{\frac{\theta_l}{2U^o}}Q^d - [\frac{\theta_l - \theta_h}{\theta_h}]H \tag{7}$$

Employment increases in demand for the sector's product and in workers'

cost of effort. Employment decreases in the workers' outside option utility and in the number of high-motivation workers.

4.2 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 the cost of producing Q^d and to set price p equal to average production cost.[10] For the moment, we simply assume that the public firm finds it optimal to hire some low-motivation workers in addition to all of the economy's high-motivation workers. At the end of this subsection, we derive the exact condition on the level of demand Q^d under which this is the case.

As the public firm is the only supplier of jobs within the sector and worker types are observable, the public firm optimally sets wages such that the participation constraint (2) is binding for both worker types. The public firm's optimisation problem is to minimise total cost

$$C = w_h H + w_l L \tag{8}$$

[10] In the absence of agency 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 firm then results in cost minimisation, as in (8) below. This also holds in case of unobservable worker types.

with respect to the effort levels e_h and e_l, the wages of both worker types w_h and w_l, and the number of low-motivation workers L, subject to the production constraint (3) and to the participation constraint (2) of both worker types. Using these constraints to eliminate w_h, w_l, and L, we can derive first-order conditions for the optimal level of effort of high- and low-motivation workers, respectively:

$$\theta_h e_h H - \frac{H}{e_l}(U^o + \frac{1}{2}\theta_l e_l^2) = 0 \tag{9}$$

$$\theta_l \left(Q^d - e_h H\right) - \frac{Q^d - e_h H}{e_l^2}(U^o + \frac{1}{2}\theta_l e_l^2) = 0 \tag{10}$$

Solving (9) and (10) for e_l and e_h gives:

$$e_l^* = \frac{\sqrt{2\theta_l U^o}}{\theta_l} \tag{11}$$

$$e_h^* = \frac{\sqrt{2\theta_l U^o}}{\theta_h} \tag{12}$$

Hence, the optimal effort levels are identical to those arising in the perfectly competitive market. It follows that employment is also equal to the level of employment arising in a competitive market. Substituting for e_i^* in participation constraint (2) gives the wage of worker i:

$$w_i = U^o(\theta_i + \theta_l)/\theta_i \tag{13}$$

Hence, whereas low-motivation workers receive exactly the same wage as under perfect competition, its monopsony power enables the public firm to attract the high-motivation workers at a lower wage than firms in a competitive market. Lastly, the price of the sector's product is set equal to average cost:

$$p = \frac{C}{Q^d} = \sqrt{2\theta_l U^o} - \frac{\theta_l - \theta_h}{\theta_h} \frac{HU^o}{Q^d}$$

where the second equality follows from substituting (8) and using the results above for wages and employment. Comparing with (5), it follows from $\theta_l > \theta_h$ that the price under public monopsony is lower than the price that arises in a perfectly competitive market. The difference between the price under competition and the price under monopsony decreases in the cost of effort of high-motivation workers and increases in the number of high-motivation workers.

Summarizing, when workers' types are observable, the only difference between the contracts offered in the competitive market and by the public monopsonist is that high-motivation workers receive a lower wage under public monopsony. Firms in a competitive market compete for the services of the relatively productive high-motivation workers, which drives up their wage. In contrast, the public monopsonist can extract all motivational rents from the high-motivation workers, as it is the only supplier of jobs for which the

high-motivation workers are intrinsically motivated. The lower wage cost are reflected in a lower price of the sector's product.

The results above depend on the assumption that both high- and low-motivation workers are employed by the public monopsonist. It is easy to verify that, in this case of observable types, this happens under the same condition on demand ($Q^d > H\frac{\sqrt{2\theta_l U^o}}{\theta_h}$) under which firms in a competitive market hire both types of workers. The reason is intuitive: Both private firms and the public monopsonist find it optimal to hire low-motivation workers when the marginal cost of output produced by high-motivation workers exceeds the marginal cost of output produced by low-motivation workers. As we shall see, this is different when worker types are private information.

5 Second-best: Unobservable Types

When firms cannot observe whether a worker is highly motivated or not, contracts cannot be made contingent on worker type. This implies that in addition to the participation constraints, contracts must fulfill the incentive compatibility constraints: high-motivation workers must prefer the contract designed to attract a high-motivation worker over the contract designed to attract a low-motivation worker, and vice versa. Thus, contracts specifying

wage w_i and required effort e_i must satisfy:

$$w_i - \frac{1}{2}\theta_i e_i^2 \geq w_j - \frac{1}{2}\theta_i e_j^2 \text{ for } i,j \in [h,l],\ i \neq j \tag{14}$$

5.1 Competitive Market

Using (14), it is easily verified that the first-best contracts derived in Section 4.1 are incentive compatible. Hence, in case of competition with unobservable worker types, the incentive compatibility constraints are redundant and the first-best arises. Proposition 1 summarises the competitive equilibrium.

Proposition 1 *Under perfect competition, the optimal contract for worker i has wage* $w_i = 2\theta_l U^o/\theta_i$ *and effort* $e_i^* = \sqrt{2\theta_l U_o}/\theta_i$. *In equilibrium, employment and the price of the sector's product are, respectively, given by:*

$$\begin{aligned} H + L &= \sqrt{\frac{\theta_l}{2U^o}}Q^d - [\frac{\theta_l - \theta_h}{\theta_h}]H \\ p &= \sqrt{2\theta_l U^o} \end{aligned}$$

5.2 Public Monopsony

In contrast to the first-best contracts under competition, the first-best contracts under public monopsony are not incentive compatible: high-motivation

workers prefer the first-best contract designed for low-motivation workers.[11] Hence, when the public firm hires low-motivation workers in addition to all high-motivation workers, it is forced to leave some rents to the high-motivation workers.[12] As in the standard adverse selection model, the participation constraint of the low-motivation type and the incentive compatibility constraint of the high-motivation type bind. Thus, the public firm sets contracts and the number of low-motivation workers L so as to minimise total cost (8), subject to the participation constraint of low-motivation workers (2), the incentive compatibility constraint of high-motivation workers (14), and the production constraint (3). Proposition 2 describes how the resulting equilibrium under public monopsony compares to the competitive equilibrium.

Proposition 2 *Compared to the competitive equilibrium, the equilibrium un-*

[11] This can be easily verified: Using (11), (12), (13), and (14), it follows that high-motivation workers strictly prefer the first-best contract for low-motivation workers if

$$U^o < 2U^o - \frac{\theta_h \theta_l}{\theta_l^2} U^o.$$

Since $\theta_h < \theta_l$, this condition always holds.

[12] As a result, the condition on demand Q^d under which the public monopsonist finds it optimal to hire both types of workers is more stringent than in the previous cases. Appendix A shows that a sufficient condition under which both high- and low-motivation workers are employed by the public monopsonist is:

$$Q^d \geq \left(\sqrt{\theta_l} + \sqrt{\theta_l - \theta_h}\right) \frac{\sqrt{2U^o}}{\theta_h} H \tag{15}$$

We assume that this condition is satisfied.

der public monopsony has the following features:

(*i*) *Low-motivation workers exert less effort and high-motivation workers exert more effort;*

(*ii*) *Average productivity is lower and total employment is higher;*

(*iii*) *Wages of low-motivation workers are lower, wages of high-motivation workers can be higher or lower, but the average wage is always lower;*

(*iv*) *The price of the sector's product is lower.*

Proof. The proof for parts (*i*), (*ii*), and (*iii*) are given in Appendix B. Part (*iv*) follows immediately from the finding that the cost-minimising public firm offers different contracts than firms in the competitive market. ■

The intuition behind these results is as follows. The cost-minimising public firm wants to extract as much rents as possible from the high-motivation workers, but rent extraction is hampered by the revelation constraint. Reducing the effort requirement in the contract for low-motivation workers allows the public firm to reduce the wage for low-motivation workers. As low-motivation workers have higher cost of exerting effort than high-motivation workers, this wage reduction is relatively large, which makes the low-motivation workers' contract less attractive for high-motivation workers. As a result, more rents can be extracted from high-motivation workers.

The reduction in low-motivation workers' effort increases the cost per unit of low-motivation workers' output and necessitates an increase in employment (i.e. in L) so as to keep production at Q^d. The costs of this distortion can be reduced through an increase in the effort requirement for high-motivation workers. Hence, by distorting the contract for high-motivation workers, the public firm can reduce the cost of distorting the contract for low-motivation workers.[13]

In the optimum, total pay per unit of effort is higher for low-motivation workers than for high-motivation workers. As the public firm runs a balanced budget, it follows that the agency makes a loss on the input of low-motivation workers, while it makes a profit on the input of high-motivation workers. In a competitive environment, a competing firm could attract the profitable high-motivation workers by offering them a contract with the same wage but a slightly lower effort requirement than the contract offered by the public firm. In equilibrium, firms in competition are forced to pay workers their full marginal revenue product, as derived above.

[13]None of the results change if high-motivation workers also derive some constant intrinsic benefits from working in the sector (e.g. stemming from pride to work in the sector). As both high-motivation and low-motivation workers are needed in the sector, the participation constraint of high-motivation workers is never binding, implying that neither the public firm nor the private firms can extract any of these constant benefits from the high-motivation workers.

The model's implications for the effects of liberalisation of markets, which are described in Corollary 1, square well with the empirical observations mentioned in the Introduction.

Corollary 1 *Liberalisation of a public monopsony leads to an increase in average productivity, a decrease in employment, an increase in average wages for retained employees, and a higher price of the sector's product.*

The welfare consequences of liberalisation are straightforward. Total production in the economy increases as a result of liberalisation because more workers become available for other sectors of the economy. Social welfare (defined as the sum of utilities of all workers in the economy) also increases, see Appendix C. Low-motivation 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.[14] High-motivation workers gain all of the surplus from liberalising the sector. As high-motivation workers in a particular sector are a small group, the distributional consequences of liberalisation may well hinder its political viability. Insofar as politicians want to please the public at large, our analysis can thus be viewed as a positive theory of distortionary regulation.[15]

[14]The low-motivation 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.

[15]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

6 Concluding Remarks

This paper has developed a model which can explain the empirical observations that firms in a competitive market provide stronger monetary incentives, reach higher productivity, employ less workers, and pay higher wages than a public monopsony. We have argued that by inducing workers with little intrinsic motivation to exert little effort, a monopsonist can reduce the wage cost of highly motivated workers, which is not possible for firms in a competitive environment. 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 allocative efficiency of the economy.

We have compared two extreme cases, a competitive market without any market failures and a publicly owned or regulated monopolist without any government failures. Clearly, allowing for market failures and government failures could alter the results. For instance, barriers to entry or strategic deterrence by the incumbent firm may imply that, after privatisation or

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.

deregulation, an imperfectly competitive market arises in which firms can exploit their market power, both in the output market as well as in the labour market. Government failures may also have important implications for the effects of privatisation and liberalisation. As noted in Section 2, several papers have stressed that public firms may be susceptible to capture by lobbied politicians, trade unions, and other interest groups, implying that cost-minimisation is not the sole objective of public firms (see Haskel and Szymanski, 1993, and Boyco, Schleifer, and Vishny, 1996, among others). Insofar as interest groups aim to protect the interests of the public firm's work force, job losses may be larger and wage increases smaller (or even negative) after liberalisation. Further, if the government cannot perfectly regulate a profit-maximising monopolist, e.g. due to information asymmetries, then the firm may limit production (and hence employment) so as to raise the price of output. Creating a competitive market may then lead to lower prices and higher employment as the firm can no longer exploit its monopoly power. In practice, it seems likely that liberalisation of a sector reduces both monopoly power and monopsony power, implying that the effect of liberalisation on prices and employment is ambiguous. Allowing for monopoly power of the public firm does not affect our results on the optimal contracts, as it is also in the interest of a monopolist to exploit its monopsony power so as to reduce wage costs. This may explain why the empirical

evidence on the effect of liberalisation on wages and incentive pay is more conclusive than the evidence on prices and employment.

Appendices

A Condition for Hiring Low-Motivation Workers by a Public Monopsonist

As in the case of observable worker types, if demand is low ($Q^d < H\frac{\sqrt{2\theta_h U^o}}{\theta_h}$), then the public firm hires a limited number of high-motivation workers. For higher levels of demand, the public monopsonist hires all high-motivation workers. The issue is under which condition the public monopsonist finds it optimal to also hire low-motivation workers. Suppose the public firm only hires high-motivation workers. Then, the public firm offers a contract which satisfies the participation constraint of the high-motivation workers. In order to meet demand, the public firm must induce each high-motivation worker to exert Q^d/H units of effort. Substituting this level of effort into the participation constraint (2) to find the wage required to attract the high-motivation workers, we find that cost per unit of output are given by:

$$\frac{C_H}{Q^d} = \frac{w_h H}{Q^d} = \frac{HU^o}{Q^d} + \frac{1}{2}\theta_h \frac{Q^d}{H} \tag{A1}$$

If the public firm hires both high- and low-motivation workers, average cost per unit of output are given by

$$\frac{C_{H+L}}{Q^d} = \frac{w_h H + w_l L}{Q^d}$$

In the proof of Proposition 2 below, we show that the public firm optimally distorts e_h and e_l. Unfortunately, closed-form solutions for e_h and e_l and, hence, for w_h and w_l cannot be derived. However, since the contracts offered by the cost-minimising public firm differ from those offered in the competitive market, cost per unit of effort are lower under public monopsony than in the competitive market, given that both high- and low-motivation workers are employed in the sector. Hence, a sufficient condition on demand Q^d so that the public firm finds it optimal to hire both types of workers is that the cost per unit of output as given by (A1) are higher than the cost per unit of output in the competitive market when firms hire both types of workers. The latter equals $\sqrt{2\theta_l U^o}$, see Section 5.1. Hence, a sufficient condition is:

$$\sqrt{2\theta_l U^o} \leq \frac{HU^o}{Q^d} + \frac{1}{2}\theta_h \frac{Q^d}{H}$$

which can be rewritten as condition (15) in the main text.

B Proof of Proposition 2

Proof of part (i)

The public firm sets contracts and the number of low-motivation workers L so as to minimise total cost (8), subject to the participation constraint of low-motivation workers (2), the incentive compatibility constraint of high-motivation workers (14), and the production constraint (3). Using these constraints to eliminate w_h, w_l, and L, we can derive first-order conditions for the optimal level of effort of high- and low-motivation workers, respectively:

$$\theta_h e_h H - \frac{H}{e_l}(U^o + \frac{1}{2}\theta_l e_l^2) = 0 \tag{A2}$$

$$(\theta_l - \theta_h) e_l H - (U^o - \frac{1}{2}\theta_l e_l^2)\frac{Q^d - e_h H}{e_l^2} = 0 \tag{A3}$$

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. The effort of low-motivation workers in the competitive case equals $\sqrt{2\theta_l U^o}/\theta_l$. Substituting this into (A3), the second term becomes zero. Hence, as the first term is positive, the public agency sets e_l below the competitive level. Using this result, it follows from (A2) that e_h is larger than the effort level of high-motivation workers in the competitive equilibrium.

Proof of part (ii)

Given that total production and the number of high-motivation workers are fixed at Q^d and H, respectively, for the results on employment and average productivity it suffices to show that the number of low-motivation workers employed in the sector is higher under public monopsony than under competition. Total employment under competition is given by (7), implying that the number of low-motivation workers under competition L^C is:

$$L^C = \sqrt{\frac{\theta_l}{2U^o}}Q^d - [\frac{\theta_l}{\theta_h}]H$$

Using (A2) to substitute for e_h in the expression for total employment (3) gives the number of low-motivation workers under public monopsony L^P as a function of e_l:

$$L^P(e_l) = \frac{1}{\theta_h e_l^2}(\theta_h Q^d e_l - [U^o + \frac{1}{2}\theta_l e_l^2]H)$$

We have that $L^P = L^C$ when

$$e_l = \sqrt{2\theta_l U^o}/\theta_l \text{ or } e_l = \frac{2U^o H}{2\theta_h Q^d - H\sqrt{2\theta_l U^o}} < \sqrt{2\theta_l U^o}/\theta_l$$

The marginal effect of e_l on L^P is given by:

$$\frac{\partial L^P(e_l)}{\partial e_l} = -\frac{Q^d}{e_l^2} + \frac{2U^o H}{\theta_h e_l^3}$$

Evaluated at $e_l = \sqrt{2\theta_l U^o}/\theta_l$, the marginal effect is

$$\frac{\partial L^P\left(\sqrt{2\theta_l U^o}/\theta_l\right)}{\partial e_l} = -\frac{\theta_l}{2U^o}\left(Q^d - \frac{\sqrt{2\theta_l U^o}}{\theta_h}H\right) < 0 \tag{A4}$$

where the sign follows from condition (15) which assures that Q^d is sufficiently high. Evaluated at $e_l = \frac{2U^o H}{2\theta_h Q^d - H\sqrt{2\theta_l U^o}}$, the marginal effect is

$$\frac{\partial L^P\left(\frac{2U^o H}{2\theta_h Q^d - H\sqrt{2\theta_l U^o}}\right)}{\partial e_l} = \frac{\theta_h(2\theta_h Q^d - H\sqrt{2\theta_l U^o})^2}{(2U^o H)^2}(Q^d - \frac{\sqrt{2\theta_l U^o}}{\theta_h}H) > 0 \tag{A5}$$

where the sign follows again from condition (15). Hence, to prove that $L^P > L^C$, it is sufficient to show that the public monopsony optimally sets the effort of low-motivation workers such that $\frac{2U^o H}{2\theta_h Q^d - H\sqrt{2\theta_l U^o}} < e_l < \sqrt{2\theta_l U^o}/\theta_l$. We have derived in Section 5.1 that first-order condition (A3) implies that optimal $e_l < \sqrt{2\theta_l U^o}/\theta_l$. It remains to be shown that $e_l > \frac{2U^o H}{2\theta_h Q^d - H\sqrt{2\theta_l U^o}}$. Using (A2) to substitute for e_h in (A3), and evaluating this first-order condition for e_l at $e_l = \frac{2U^o H}{2\theta_h Q^d - H\sqrt{2\theta_l U^o}}$, we find after some rewriting

$$\frac{1}{2\theta_h Q - H\sqrt{2\theta_l U^o}}\left((\theta_l - \theta_h)2U^o H^2 - \frac{\sqrt{2\theta_l U^o}Q^d}{U^o H}\left[\theta_h Q^d - H\sqrt{2\theta_l U^o}\right]^2\right)$$

which should be negative for $e_l > \frac{2U^o H}{2\theta_h Q^d - H\sqrt{2\theta_l U^o}}$. Clearly, it follows from (15) that the term outside the brackets is positive. The term inside the brackets

is negative for sufficiently high values of Q^d. Substituting the minimum value of Q^d as given by condition (15) into the expression in brackets gives (after rewriting):

$$-\frac{\theta_l - \theta_h}{\theta_h} 2U^o H^2 \left(2\theta_l - \theta_h + 2\sqrt{\theta_l^2 - \theta_l \theta_h} \right) < 0$$

This completes the proof that the public firm sets $\frac{2U^o H}{2\theta_h Q^d - H\sqrt{2\theta_l U^o}} < e_l < \sqrt{2\theta_l U^o}/\theta_l$, and hence it follows that $L^P > L^C$.

Proof of part (iii)

The wage of low-motivation workers is increasing in e_l, as given by participation constraint (2). First-order condition (A3) shows that the optimal level of effort of low-motivation workers is smaller under public monopsony than in the competitive equilibrium. Hence, the wage of low-motivation workers is lower under public monopsony.

Under competition, high-motivation workers' wage is $2\theta_l U^o/\theta_h$. Using (A2) to substitute for e_h in the incentive compatibility constraint for high-motivation workers (14) gives the following expression for the wage under public monopsony as a function of e_l:

$$w_h(e_l) = U^o + \frac{1}{2} e_l^2 (\theta_l - \theta_h) + \frac{(U^o + \frac{1}{2}\theta_l e_l^2)^2}{2\theta_h e_l^2} \qquad \text{(A6)}$$

As the second derivative $\partial^2 w_h/\partial e_l^2 > 0$ for $e_l > 0$, it follows that w_h has only one minimum. We cannot derive the levels of e_l for which w_h equals $2\theta_l U^o/\theta_h$. However, substituting the level of effort of low-motivation workers under competition $e_l = \sqrt{2\theta_l U^o}/\theta_l$ into (A6), we find that:

$$w_h\left(\sqrt{2\theta_l U^o}/\theta_l\right) = \frac{(\theta_l^2 + 2\theta_l\theta_h - \theta_h^2)}{\theta_l\theta_h}U^o < \frac{2\theta_l U^o}{\theta_h}$$

At this level of effort, a decrease in e_l leads to a lower wage for high-motivation workers:

$$\frac{\partial w_h\left(\sqrt{2\theta_l U^o}/\theta_l\right)}{\partial e_l} = \sqrt{2\theta_l U^o}\left(\frac{\theta_l - \theta_h}{\theta_l}\right) > 0$$

Hence, initially, the decrease in low-motivation workers' effort leads to a decrease in high-motivation workers' wage. However, we cannot be sure that for lower values of of e_l, it is never optimal for the public firm to set $w_h > 2\theta_l U^o/\theta_h$.

Lastly, the average wage per worker is simply total cost divided by total employment. As cost are lower and employment is higher under monopsony, it follows that average wage per worker is lower under monopsony than under competition.

C Maximising Social Welfare

Suppose the public firm maximises the sum of utilities of all workers in the economy. Since utility is linear in income, we can write the social welfare function as:

$$\Psi = (K - L)U^o + LU_l + HU_h - C \tag{A7}$$

where K is the total number of low-motivation workers in the economy, C is the cost of production of the sector's output, and we have imposed that Q^d is sufficiently large such that it is optimal for the public firm to hire also low-motivation workers, as in the main text. Our assumption of price-inelastic demand implies that the utility from the sector's output is a constant, so we can safely ignore it. Substituting total cost C, described in (8), and the workers' utility function (1) with $i = l$ and $i = h$, respectively, into (A7) gives after some rewriting:

$$\Psi = KU^o - L\left(U^o + \frac{1}{2}\theta_l e_l^{*2}\right)U^o - H\left(\frac{1}{2}\theta_h e_h^{*2}\right) \tag{A7}$$

Note that the wages paid by the public agency do not affect social welfare, but must satisfy the low-motivation workers' participation constraint (2) and the high-motivation workers revelation constraint (14). Substituting the production constraint (3) into (A7) and maximising with respect to e_h and e_l

gives exactly the same first-order conditions as in the first-best outcome, (9) and (10). This implies that effort levels and, hence, employment are the same as in the competitive equilibrium.

References

[1] Antonazzo, Emanuela, Scott, Anthony, Skatun, Diane, and Elliot, Robert F. (2003), The Labour Market for Nursing: A Review of the Labour Supply Literature, *Health Economics*, Vol. 12 (6), pp. 465-478.

[2] 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.

[3] Benabou, Roland, and Tirole, Jean (2003), Intrinsic and Extrinsic Motivation, *Review of Economic Studies,* vol. 70 (3), pp. 489-520.

[4] Besley, Timothy and Ghatak, Maitreesh (2003), Incentives, Choice, and Accountability in the Provision of Public Services, *Oxford Review of Economic Policy*, vol. 19 (2), pp. 235-249.

[5] Besley, Timothy and Ghatak, Maitreesh (2005), Competition and Incentives with Motivated Agents, *American Economic Review*, 95(3): 616-636.

[6] Booth, Alison L., and Zoega, Gylfi (2002), If You're So Smart, Why Aren't You Rich? Wage Inequality with Heterogeneous Workers, CEPR Discussion Paper 3190.

[7] Borjas, George J. (2003), Wage Structures and the Sorting of Workers into the Public Sector, in: Donahue, John D., and Nye, Joseph S. Jr., eds., *For the People; Can We Fix Public Service?*, pp. 29-54, Washington, D.C.: Brookings Institution Press.

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

[9] 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.

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

[11] Corneo, Giacorno, and Rob, Rafael (2003), Working in Public and Private Firms, *Journal of Public Economics*, vol. 87 (7-8), pp. 1335-1352.

[12] Daymont, Thomas N., and Andrisani, Paul J. (1984), Job Preferences, College Major, and the Gender Gap in Earnings, *Journal of Human Resources,* vol. 19 (3), pp. 408-428.

[13] Delfgaauw, Josse, and Dur, Robert (2007), Signaling and Screening of Workers' Motivation, *Journal of Economic Behavior and Organization*, vol. 62 (4), pp. 605-624.

[14] Delfgaauw, Josse, and Dur, Robert (2008), Incentives and Workers' Motivation in the Public Sector, *Economic Journal*, vol. 118 (525), pp. 171-191.

[15] Dixit, Avinash (2002), Incentives and Organizations in the Public Sector: An Interpretative Review, *Journal of Human Resources*, vol. 37 (4), pp. 696-727.

[16] Edmonds, Suzanne, Sharp, Caroline, and Benefield, Pauline (2002), Recruitment to and Retention on Initial Teacher Training – A Systematic Review, Slough: National Foundation for Educational Research.

[17] Francois, Patrick (2000), 'Public Service Motivation' as an Argument for Government Provision, *Journal of Public Economics*, vol. 78 (3), pp. 275-299.

[18] Francois, Patrick (2007), Making a Difference, *RAND Journal of Economics*, vol. 38 (3), pp. 714-732.

[19] Frank, Sue A., and Lewis, Gregory B. (2004), Government Employees: Working Hard or Hardly Working?, *American Review of Public Administration*, vol. 34 (1), pp. 36-51.

[20] Glaeser, Edward L., and Shleifer, Andrei, (2001), Not-For-Profit Entrepreneurs, *Journal of Public Economics*, vol. 81 (1), pp. 99-115.

[21] Glazer, Amihai (2004), Motivating Devoted Workers, *International Journal of Industrial Organization*, vol. 22 (3), pp. 427-440.

[22] Gregory, Robert G., and Borland, Jeff (1999), Recent Developments in Public Sector Labor Markets, in: Ashenfelter, Orley, and Card, David, eds., *Handbook of Labor Economics*, vol. 3C, pp. 3573-3630, Amsterdam/New York: Elsevier Science B.V.

[23] Grout, Paul, and Yong, Michelle, 2003, The Role of Donated Labour and Not for Profit at the Public/Private Interface, CMPO Working Paper 03/074.

[24] Grout, Paul, and Stevens, Margaret (2003), The Assessment: Financing and Managing Public Services, *Oxford Review of Economic Policy*, vol. 19 (2), pp. 215-234.

[25] Hansmann, Henry B. (1980), The Role of the Nonprofit Enterprise, *The Yale Law Journal,* vol. 89 (5), pp. 835-901.

[26] Harper, Barry, and Haq, Mohammad (2001), Ambition, Discrimination, and Occupational Attainment: A Study of a British Cohort, *Oxford Economic Papers*, vol. 53 (4), pp. 695-720.

[27] 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.

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

[29] Hjertqvist, Johan (2001), Swedish Health-Care Reform: From Public Monopolies to Market Services, Montreal Economic Institute (url: http://www.iedm.org/library/Hjertqvist_en.html).

[30] Hoxby, Caroline M. (1994), Do Private School Provide Competition for Public Schools?, NBER Working Paper no. 4978.

[31] Hoxby, Caroline M. (2000), Does Competition Among Public Schools Benefit Students and Taxpayers?, *American Economic Review*, vol. 90 (5), pp. 1209-1238.

[32] Hoxby, Caroline M. (2002), Would School Choice Change the Teaching Profession?, *Journal of Human Resources*, vol. 37 (4), pp. 846-891.

[33] Jeon, Doh-Shin, and Laffont, Jean-Jacques (1999), The Efficient Mechanism for Downsizing the Public Sector, *World Bank Economic Review,* vol. 13 (1), pp. 67-88.

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

[35] 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.

[36] Laffont, Jean-Jacques, and Martimort, David (2002), *The Theory of Incentives,* Princeton: Princeton University Press.

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

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

[39] Manning, Alan (2003), *Monopsony in Motion*, Princeton: Princeton University Press.

[40] Marsden, David, and French, Stephen (1998), What a Performance; Performance Related Pay in the Public Services, CEP Special Reports No. 10, London School of Economics.

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

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

[43] 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.

[44] Merrifield, John (1999), Monopsony Power in the Market for Teachers: Why Teachers Should Support Market-Based Education Reform, *Journal of Labor Research*, vol. 20 (3), pp. 377-391.

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

[46] Prendergast, Canice (2007), The Motivation and Bias of Bureaucrats, *American Economic Review,* vol. 97 (1), pp. 180-196.

[47] Rapp, Geoffrey C. (2000), Agency and Choice in Education: Does School Choice Enhance the Work Effort of Teachers?, *Education Economics*, vol. 8 (1), pp. 37-63.

[48] Rothschild, Micheal, and Stiglitz, Joseph (1976), Equilibrium in Competitive Insurance Markets: An Essay on the Economics of Imperfect Information, *Quarterly Journal of Economics,* vol. 90 (4), pp. 629-649.

[49] Spence, A.M. (1973), Job Market Signaling, *Quarterly Journal of Economics*, vol. 90 (3), pp. 355-374.

[50] Vedder, Richard, and Hall, Joshua (2000), Private School Competition and Public School Teacher Salaries, *Journal of Labor Research,* vol. 21 (1), pp. 161-168.